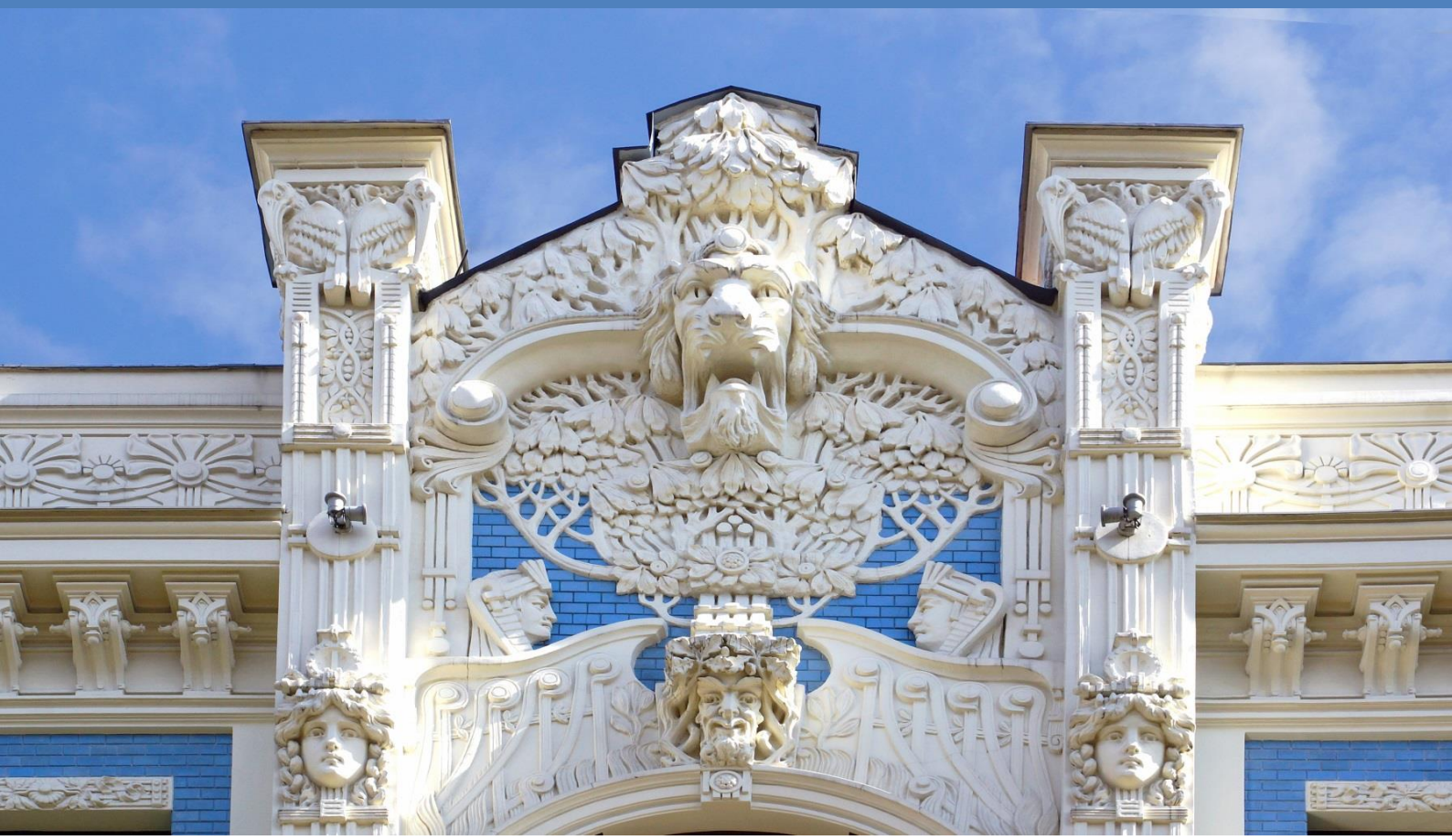
Project Management Development – Practice and Perspectives
Fifth International Scientific Conference on Project Management in the Baltic Countries

CONFERENCE PROCEEDINGS



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Project Management Development – Practice and Perspectives

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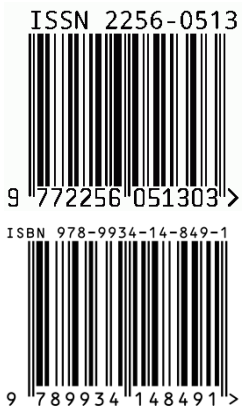

Fifth International Scientific Conference on Project Management in the Baltic Countries "Project Management Development – Practice and Perspectives": Riga, Latvia, April 14-15, 2016. Conference Proceedings. Riga: University of Latvia, 2016, 408 p.

Project Management Development – Practice and Perspectives

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CONFERENCE PROCEEDINGS

Conference is organized by the Faculty of Economics and Management, University of Latvia
in cooperation with the Professional Association of Project Managers

April 14-15, 2016
Riga, University of Latvia

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EVF Ekonomikas un vadības fakultāte

LATVIJAS UNIVERSITĀTE
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PREFACE

Riga city and Latvia plays important role in the project management field in the Baltic States. The International Scientific Project Management Conference organized by the Professional Association of Project Managers of Latvia in co-operation with the Faculty of Economics and Management, University of Latvia has now become a proven value for the 5th year in a row. Its international recognition has considerably grown and similarly has the quality of the submitted articles.

The articles in the proceedings are aimed at both theory and practice. They present extensive depiction of the contemporary situation in project management by covering the internationally applied methods and tools, the standards project management methodology is currently based on and developments expected in the field in the nearest future.

In the articles professionals set forecasts for the future project practice. The forecasts underline the importance of project managers' social competences. The project manager's role as a project work organizer, leader and competent implementer cannot be overestimated. Project success defineteley depends on project team. Several articles of the proceedings deal with such project management part as human resource management and competencies in project management.

In project management processes it's important to have appropriate stakeholder management what was topical for several authors' studies presented in this book.

For the last decade we can see significant increase in IT project management practice development. Recent studies have paid attention also to practical and theoretical aspects for application of *Agile* methods in IT project management.

Project management is closely connected with the risks influencing the project time-span, costs and quality. The issue of coping with project risks, implementation of risk planning and supervision of the subsequent process is discussed based on the experience of constructing a football field.

Project management applies not only for business environment. In the global context those tools and methods have been implemented also in public administration. Several research results for project management in the public sector have been presented also in this publication.

All above mentioned practical study cases makes a conference content and will be wide discussed by project management experts, practicioners and scientists from different countries.

We are thankful to all involved persons and supporters what invested their time to organize this important event. We wish to all participants and readers of this book reach new practical horizons in the project management field.

Prof. (emer.) Dr. oec. Žaneta Ilmete
Chairman of the board of the Professional
Association of Project Managers

CONTENTS

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ESTIMATION OF THE PROJECT COST BY NONLINEAR METHOD ACCORDING TO DIFFERENT MANAGERIAL ATTITUDES

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Abstract

Minimalizing the error between estimated cost in the earlier time of the projects with actual one at the end of the projects by intervening the managerial belief and unexpected risks in new method (nonlinear regression) that has structured for estimation of the cost in the project according to all of the possible subjective risks may happen during the project timeline,

Since in describing Roles of the risks in estimating project cost, decision of the individual managers concerning forecasting cost is so determinant factor, so according to this issue, the attitude of the managers can be classified generally in three sub categories, managers that are optimistic and in opposite manner managers that are pessimistic about their estimation of actual cost of the project, and also we can have logical one as middle managers that they are not optimistic and not pessimistic, and lastly we can assign specific formula but in common method for each group, and compare expected costs of each other, obviously each expected cost represent specific attitude of the manger, and this view gives the manager to be so flexible about his or her forecast of the cost during project scheduling, if we consider and intervene kind of the managers attitudes including being pessimistic or optimistic viewpoints in our forecasting way of the cost, amount of the error (APE) decrease considerably because By doing this method we can translate subjective risks to objective one.

Key words: *cost estimation-nonlinear method-managerial belief-earlier time of the project*
JEL Code: *G17*

Introduction

Since long time ago up to now a lot of modifications are made in order to have better estimate of the cost such as considering time scheduling beside the cost scheduling in order to find formula that could be valid for entire project including also late project, however as time goes by highlighting role of the risk in the project, better estimation of cost done with understanding effects of the different situations in the different projects concerning critical activities and uncompleted task as another factors of the risk.

These studies are strengthened by using software tools as main tool for estimation of the cost and decision support system (DSS) as computer-based systems that support decision making by combining and analyzing data and providing analytical models and tools that contribute to the selection of alternatives.

But in today's rapidly changing, competitive environment, organizations faces to manage portfolios of projects ,they are not enough and it is needed to find other methods except to IB method which demonstrate expected variable in the proper way. Monte Carlo simulation has been widely used in the literature. The reviews of Kwaka and Ingall (2007) and Vanhoucke (2013) summarized the advantages and disadvantages of using Monte Carlo simulation to model projects, especially for risk analysis and control, But we need to find new dynamically equations that works in the easier way and better ways Among the different equations and

simulations, ciofffi paper is pioneer in this way that introduce growth model (S-curve) as nonlinear regression model of EAC. He proposed a parameterized S-curve tool for managing the cost of an ongoing project; Regression techniques (EAC) that have been regarded as an alternative to traditional IB methods are improved significantly by paper "An earned schedule-based regression model to improve cost estimate at completion Timur Narbaev, Alberto De Marco" (Narbaev T., De Marco A., 2014, p. 10).

However main problem in nonlinear regression method in EAC is that we could have a lot of subjective parameters that should be chosen by different managers, on the other hand lack of the distinctive managerial belief is the main drawback.Furthermore the most significant factor in determining risk related to EAC is managerial attitude which is actually dynamic decisions are done by managers regarding to dynamic risks happen during the project, Managerial belief as dynamic decisions are made according to unexpected risks happen during the project timeline, these decisions have significant influence on the outcome of project respect to the cost and time scheduling, lack of the formulas that could characterize managerial opinions in the our estimation of the coast(EAT) is desired strongly these days.

This paper is structured to intervene managerial belief as main factor of the risk in estimation of the cost project by using nonlinear method the basic concept that can help us related to have better illustrations about the risk and unexpected happening, is the confidence level, the scope that is extended and limited by subjective decisions and is done arbitrary by cost estimators and managers, concept of the confidence level gives us wide area of personal decisions in order to have better exploratory studies about managerial belief and different point of the views.

Nonlinear Cost estimate at completion methods

Providing appropriate context for managerial attitudes

In order to interfere managerial belief in the cost estimation at competition(CEAC)formulas, firstly we need to have appropriate procurement method that provide proper context for characterizing managerial view points, this provision is created by nonlinear regression method and growth models, which have also more precise outcome for CEAC, there is no doubt that index-based methods for CEAC (cost estimate at completion) forecasting is widely accepted formulas and is proper, but according to primary limitations, as follows: (1) reliance on past cost performance only, (2) unreliable forecasting in early stages of a project life, and (3) no count of forecasting statistics (Flemingand Koppelman 2006; Kim and Reinschimdt 2010; Tracy 2005; Zwikael et al. 2000), nonlinear regression is absolutely preferred to traditional method, moreover, concerning to" Combination of Growth Model and Earned Schedule to Forecast Project Cost at Completion Timur Narbaev,and Alberto De Marco," new regression based nonlinear in CEAC methodology is proposed that integrates a growth model with earned schedule (ES)concepts. This methodology provides CEAC computations for project early-stage and middle-stage completion.

To this end, this paper establishes to continue this way by innerving managerial attitudes in the most logical possible way, which is exactly nonlinear method and using growth model.

But firstly, summarization of new regression based nonlinear cost estimate at completion (CEAC) methodology should be described. Before going analysis, it should be noted that Based on statistical validity analysis of the four growth models and comparison of CEAC errors, the

CEAC formula based on the Gompertz model is better-fitting and generates more accurate final-cost estimates than those computed by using the other three models and the index-based method:

$$\mathbf{GM(X) = \alpha e^{[-\exp(\beta - \gamma X)]}} \quad (1)$$

(GOMPERTZ_Bates) growth model is selected for main formula forr estimation of the cost.

The CEAC methodology proposed in this paper integrates ES concepts into its equation to take into account the project work progress. The ES technique overcomes limitations inherent to the EVM method when it comes to computing Expected Duration at Completion (EDAC) or time estimated at completion (TEAC) of a project (Lipke, 2003). It measures the schedule progress in time units and eliminates a deficiency of EVM-based SPI, which tends to unity as the project approaches its completion, regardless of any early or late finish. As far as the accuracy of the ES method in computing EDAC is concerned, comparative studies with EVM methods show that the ES technique provides more accurate estimates than SPI-based calculations (e.g., Vandevoorde and Vanhoucke, 2006).

The value of ES is obtained by projecting to actual date the EV curve onto PV curve assuming that the current EV should actually have been earned at that projected time. Therefore, the ES is defined as per Eq :ES(x)=C(x)+I(x)

Where C denote the number of total time units for which EV exceeds PV and the incremental portion I(x) = (EV(x) - PVc)/(PVc+1 - PVc) which is more or equal to 0 and less than 1.00. As a consequence, a time-based SPIt can be defined as per Eq : SPIt(x)= ES(x)/AT

Thus, the resulting TEAC when the project is at time (x) is the ratio of Planned Duration (PD) to SPIt(x). As the proposed approach utilizes the ES concept to consider schedule impact in CEAC, the model uses the inverse of SPIt(x), which is the ratio of TEAC, to PD.

For the purpose of better understanding the proposed equation, this inverse ratio is referred to as Completion Factor (CF). The CF indicates EDAC yielded to unity and it can also be defined as inversely related to SPIt(x):

$$\text{CF(x)} = \frac{\boldsymbol{TEAC(t)}}{\textbf{Planned Duration (PD)}}. \qquad \text{TEAC(t)} = \frac{\text{Planned Duration (PD)}}{\text{SPI(t)}} \quad (2)$$

If the value of the CF, based on work progress to date, is greater than 1.00 it indicates that a Project is likely to be delivered late, whilst less than 1.00 shows an early finish.

The proposed CEAC model*:*

This section develops the new methodology following three steps. First, the values of the three parameters of the GGM (Eq. (1)) are found through nonlinear regression analysis.

Then, the new CEAC formula is introduced with integrating parameter and the new CEAC formula is introduced with integrating parameters of GGM to calculate CEAC.

Finally, the CEAC formula is modified by the purpose of reflecting schedule progress on the cost performance. To this end, the ES-based CF is integrated into the formula. Here, the CEAC equation has two variants: a base one without integrating the CF, and an ES-based one that interpolates the value of the defined CF.

Narbaev and De Marco (2013) provided comparative study on this CEAC methodology integrating four growth models (Bass, Gompertz, Logistic, and Weibull) into its equation. They

found that GGM is the best statistically valid model converging to approximate values of its parameters in nonlinear regression curve fitting. In addition, the GGM generates more accurate CEAC for early and middle stages of the project life. This work provides further extended applicability and reliability of the previous model by providing accurate late estimates, analysis of forecast precision, model timeliness, and integration of the influence of schedule progress on the CEAC computation.

The first step in developing the methodology is to find the three GGM parameters through nonlinear regression curve fitting. For this, both time (a predictor variable) and cost (a response variable) units are normalized to input into the GGM equation. The normalization of all the values of time points to unity (1.00) assumes a project is 100 percent time complete (i.e.,PD=1.00). Each next time point is a cumulated portion of this unity with the final time point representing PD (1.00) of a project. These values represent a predictor variable (x) of the GGM.

Each time point (x), a value of the predictor variable, has a corresponding cost point, a value of the response variable. These corresponding cost points are formed as follows. The values of AC from time zero (x=0) to AT are normalized to unity (i.e., BAC=1.00) while the values of PV from AT onto project completion with the final value of the normalization representing BAC (1.00, i.e., 100 percent complete). Then, the normalized values of to date AC and PV are combined to form the values of the response variable (y) in the GGM.

Finally, each time point (x) of the GGM equation (Eq. (1) has its corresponding cost value (y) to run the nonlinear regression with the GGM. This allows finding the values for the three fitting parameters. Both time and cost units have final values equaling 1.00 (PD=1.00 for time and BAC=1.00 for cost).

The following requirements are taken into account for the GGM equation in the nonlinear regression curve fitting: the normalization of the predictor and response variables and what the three parameters represent an initial value for these parameters is 1.00 with the confidence level 95% and the approximation algorithm the Gauss-Newton (which converges the parameter values not heavily depending on their initial values). Then, via running this regression procedure, the values of the three parameters are obtained: α asymptote, the y-intercept β, and γ-scale. The Minitab® software tool is used for this task.

The second step requires computing CEAC by using Eq. (3). This equation is the refined version of a classical IB formula as previously given in Eq. (5). The difference is that Eq. (3) calculates the remaining expected cost by regression analysis, while the IB formula adjusts it with a PI. The second summand is an estimate to complete a project. It is equal to the product of BAC times the difference of the two values of GGM (Eq. (1)): when a project is 100 percent time complete (the result of the GGM function when time (x) is 1.00) and at AT (the result of The GGM function when time (x) is at AT).

$$CEAC(x) = AC(x) * [GGM(1.00) - GGM(x)] \, BAC \qquad (3)$$

Finally, the GGM is modified to consider possible influence of work progress on CEAC. The Main assumption of this refinement is that favorable schedule efficiency tends to improve the Final cost, while a poor schedule progress may increase the final cost. To this end, in Eq. (4), the Value of x=1.00 (which implies that a project finishes on time) is replaced by the CF (the ratio of TEAC to PD). This is less than1.00 if a project is ahead of schedule and greater

than 1.00 if a Project is behind schedule. This modification represents a cost-schedule integrated approach because the cost estimate considers the schedule impact as a determinant factor of cost behavior.

The refined CEAC formula is given in Eq. (4).
CEAC(*x*) = AC(*x*) *[GGM (CF(*x*)) -GGM(*x*)] BAC (5)

Minitab developed Equation from growing model based on the options the writers set for the nonlinear regression analysis, as discussed next. The writers define good starting values for the three parameters. Taking into account the normalization to unity of both the predictor and response variables the writers define 1.0 as a starting value for all parameters.

This method (nonlinear) is done successfully while resulting better estimation of the cost compare to traditional approach (IB),non-linear method approach has more accuracy and also better precision of the IB cost estimation, these results are proven by measuring parameters like APE(Absolute percentage error) which defines level of the outcome accuracy respect to actual cost at completion and SD(Standard Deviation, which is an indicator of a statistical dispersion of the values of prediction errors from the average forecast within the population).

Up to now we reached more précised and accurate formula for estimation of the cost, but how managerial ideas are combined with that method and how it is possible minimizing absolute percentage error (APE)?

Firstly it could be better if we have exploration about kind of the managerial belief and ideas, in order to have better concept about this idea, again we refer to paper from the Denis F. Cioffi (tool for managing projects: an analytic parameterization of the S-curve), they concluded from population growth method equations such as below and regarding to them we are able to determine cost of the project:

ln(&+2)=8rb(1/2) (6)
Y (b) =Y (1) *(1-exp (-8rb)/1+&exp (-8rb)) (7)

For any project, the manager can choose values for b (1/2) and r, then calculate & from Eq. (6), after the normalization factor (y1), plots the desired evolution curve with Eq. (7).and calculate cost growth Y (b) according to the Growing model. But main question is that how it all is used?

As you read from cioffi paper; selecting parameters like r is subjective choice that are made by different managers, So we can detect this fact that, decisions of the managers related to the parameters is the key in determining cost of the project, furthermore every manager can arbitrarily choose values for b and r, so what is obvious is that, those formulas are dependent strongly to the subjective decisions are made by different managers in the different situations, so in the logical point of the view ,they could not be used for general cases totally and it should be restricted to limited cases.

Another example is the paper from: “A Bayesian Approach to Improve Estimate at Completion in Earned Value Management Franco Caron" again in that paper writer refers to subjective choice of values such as Alpha and Beta, alpha and beta are inputs to the model.

Every manger can select values according to his or her idea about the project and there is no logical concept behind their choice, selecting the values is made only according to their

experience and expectation about the kind of the project execution and actual past data of the project.

Furthermore, extreme complexity in calculations of the cost makes this method to somehow difficult to analysis, if we want to characterize managerial attitude in the formula related to cost estimation, it is needed having distinctive definition of the kind of managerial belief. actually it is subjective decision, millions of the mangers think in million ways, in addition in nowadays practical projects, every project has its own culture and past experience of the mangers may cannot be exactly and correctly related to the new project because structure and culture of every project differs by kind of the circumstances happen during the projects.

What is most important for us is that we need to know before that one manger how should think logically and properly about Executive progressive of the project in order to have better estimation of the project cost and having accurate CEAC with lowest amount of the error.

On the other hand, according to the psychological studies, no one can deny this fact that that managers thought is limited in the area between; pessimistic, optimistic and logical one, is obvious, although there are so tolerance between each attitudes and ideas, but all of them is arranged and limited in these three though stream ;pessimistic, logical and optimistic

Methodology

What is obvious is that in the previous paper, regression model is created according to the real past data and some points as expected point data. So we can conclude this decision that there are only two parts that they are not considered as fixed items for us. First is the way that expected points of the cost and time are selected, which is completely done arbitrary by the different managers, and second is choosing in the way that which formula of the growing model should be selected. And after that next question is what is the reason for considering 95 percent of the confidence level as probability of the simulation? On the other hands, it is intended to improve this method for subjective risks or unexpected risks and dynamic decision which made by mangers in different situations. Main factor in this research is attitude of the managers, and knowing that attitude of the managers is affected by kind of the their specific visions to the projects, furthermore it could be optimistic or pessimistic or middle point of the view, the basic concept that can help us related to have better illustrations about the risk and unexpected happening, is the confidence level, the scope that is extended and limited by subjective decisions and is done arbitrary by cost estimates and managers, concept of the confidence level gives us wide area of personal decisions in order to have better exploratory studies about managerial belief.

Logical solution could be considering positions of the points in the cost curve in the confidence level area resulting from nonlinear regression by using growth model formula, points of the cost curve could be divided in the three categoryies, furthermore, we can select points below the main line (center line in the confidence level) of the cost curve as cost that is less than expected one (trend of the past performance) so it could be considered as optimistic view to the cost performance, Consequently points upper than center line are considered as pessimistic view because cost is more than expected, and points that are exactly on the centerline as middle viewpoint. Results of calculations are shown in Minitab software, author also describe them totally in this research, but first of all, it is needed to explain a little about what have done up to now. In the results of the (ListOfProjects_r03_1-3_BaseWith0_EV), in

the project execution we have 7 time points including ACWP, BCWS and BCWP and it is normalized fraction of the unity.

Among the growth models that could be taken in to account, author has selected growth model which is advised (GOMPERTZ_Bates), time units normalizing (predictable variables) and cost units normalizing (response variables) are selected as input for nonlinear regression in the growth model.

The Outcome of the regression in the growth model (GOMPERTZ_Bates) according to the time units and cost unit gives us 3 main parameters: α (final value asymptote), B(y (cost normalized) intercepts -initial size) and γ (as scale, governing rate of the growth), these parameters are main factors of the growth model equation, $\mathbf{GM(X)} = \boldsymbol{\alpha e^{[-\exp(\beta-\gamma X)]}}$ α (GOMPERTZ_Bates).

After defining parameters of the Gompers model equation, two variables are selected as input X (normalized time) to the growth model equation, first is the time that we expect project would be finished and second is the time that we are now in the project, and then output of the this equation(Gompertz) is replaced in the CEAC formula according to the Regression-Based Method in order to find cost estimation at completion:

$$\mathbf{CEAC(X)} = \mathbf{AC(X)} + [\mathbf{GM(1)} - \mathbf{GM(X)}] * \mathbf{BAC} \qquad (8)$$

Before analyzing these data as author has mentioned in the beginning of this research, all of the phases together should be included in order to estimate the cost, for example result from previous paper dictated us this fact that TEAC should be considered (time of the completed project considering real time scheduling) as input, then we have to calculate the cost related to that time.

For example, According to the result from (List of Projects miafiori3_BaseWith0_EV) we observe that plan duration related to BI method is 6.20 while actual duration of the project is 7, And strong point about TEAC is that, when the one third of the project progress occurred, it is estimated 7.02 that is so close to actual one, this is why author emphasize on this issue. For explanation our procedure, firstly Data table as cost report of the project is illustrated below:

Table 1

Cost report of the project

Time	PV(BCWS)	EV(BCWP)	AC(ACWP)
1	370,220	124,120	535,000
2	2,080,080	1,333,220	2,461,000
3	5,730,920	4,442,640	4,562,480
4	9,625,720	7,201,100	7,468,600
5	16,050,000	11,249,980	11,936,920
6	19,688,000	14,768,140	15,729,000
7	21,400,000	21,400,000	21,913,600

Source: author's calculations based on the Mirafiori Industrial Facility Project (MIFP) by Timur Narbaev, (Narbaev T., De Marco A., 2014, p. 10)

Table 1 shows Cost data about the project, we are in the month 3, so from time zero up to third month actual cost (AC) or EV is considered, since 4th month expected points is forecasted and we use PV instead of the AC, then both time (a predictor variable) and cost (a response variable) units are normalized as input in to the GGM equation, (Table 2) and after replacing new parameters in the CAEC formula, new estimation of the cost would be achieved

Table 2

Cost report of the project

Time	Cost	Growth
0.000	0.000	0.000
0.143	0.006	0.006
0.286	0.062	0.057
0.429	0.208	0.145
0.571	0.450	0.242
0.714	0.750	0.300
0.857	0.920	0.170
1.000	1.000	0.080

Source: author's calculations based on the MIFP by Timur Narbaev

Outcome of the Regression method considering predictable variables(time) and response variables (cost) in the GOMPERTZ model equation could be shown as Fitted line plot (cumulative-growth curve) in the figure 3, as you see it is resulted from mirafiori industry report; (calculations is done by Ali Bargrizan regarding to MIFP.)

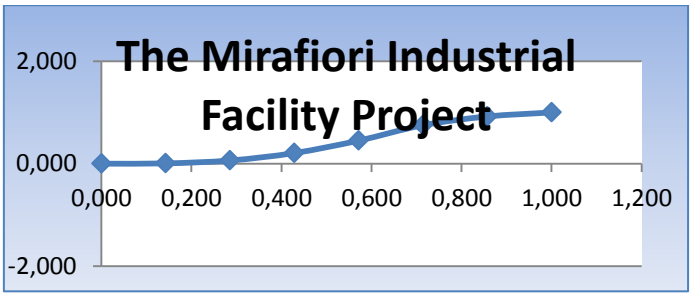
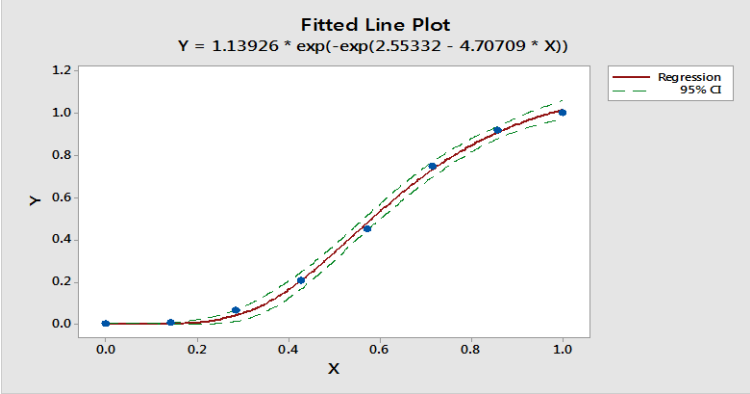


Figure 1. **The Mirafiori Industrial Facility Project**

Source: Author's construction

While demonstrating this curve considering 95 level confidence levels (resulted from gauss-newton distribution from Minitab software), it could be demonstrated as below in figure 2:



α =1.139β =2.553γ =4.707.

Figure 2. **Gauss-newton distribution from Minitab software**
Source: Calculations is done by Ali Bargrizan regarding to MIFP in Minitab software)

These parameters (α, β, γ) are achieved by outcome of the regression model of cost and time from minitab). As you see, in this case, after gauss-newton distribution and having area of the confidence level, we can compare situation of the blue points (response variables across predictable variables) to the red center line (outcome of the regression),

Regarding the note that author described earlier; three categories of the points could be selected, first, the points that are under the main line (center line in the confidence level in red color) of the cost curve as cost that is less than expected one (trend of the past performance) so it could be considered as optimistic view to the cost performance, And secondly points that are upper than center line considered as pessimistic view because cost is more than expected one and consequently points that are exactly on the line as middle view point.

For this purpose, points 1, 2,3,6,7 are considered in the upper points as pessimistic point of the view, because the related cost is more than middle one and points: 1,2,4,5, are supposed as lower point of the center line as optimistic view point since the cost is lower than middle one, And then we can make new nonlinear regression of them again with same equation and the itineration and compare result of the new regression with privies one.

This idea is tested in mirafiori industry report, wonderful results is achieved, If we consider pessimistic stream which means selecting points such as: 1, 2,3,6,7 (they are in the position that are upper than mean cost curve from gauss-newton distribution) and then make new nonlinear regression according to the Gompers formula with same itineration, we reach to the new parameters of the growth model and parameters like α (final value asymptote), B(y (cost normalized) intercept -initial size) and γ and change consequently as below,

X-upper	Y-upper	
0.000	0.000	α= 1.11193
0.143	0.006	B= 2.40275
0.286	0.062	γ= 4.68896
0.714	0.750	
0.857	0.920	
1.000	1.000	

Figure 3, demonstrate Pessimistic view, selecting points that are upper than mean line of the gauss-newton distribution Method:

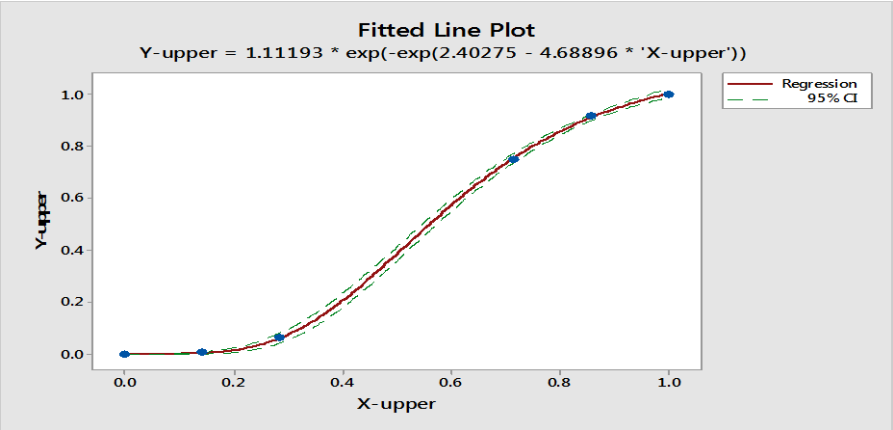


Figure 3. **Pessimistic view**

Source: Calculation is done by Ali Bargrizan regarding to MIFP in Minitab software)
Pessimistic view, Algorithm Gauss-Newton Max iterations: 200 Tolerance: 0.00001

By replacing these new parameters in the CEAC formula (while we consider TEAC not planed duration) amounts of the APE (absolute percentage error) decrease significantly from the 5.22% to 1.02%. For more explanation, actual cost of the project at completion is 21,913,600 and cost estimation of the project in the third month considering all point is 23,058,536 with has 5.22% error with privies number. While estimation of the cost according to the pessimistic point view is 21,690,209 which have 1.02% error compare to actual one.

On the other hand, if at the beginning we compare earn value (BCWP) points with actual one (ACWP), we realize that in the project work executed, actual cost is always more than budget cost (planed) in the first three month of the project execution, So it dictate us this idea that being pessimistic about the cost estimation, could be beneficial and logical.

Implications, Limitations, and Future Research

3 main findings can be extracted, first of all is that nonlinear method is preferred way compare to other methods such as CPI method, because it has more accurate outcome with more degree of the precision, especially if growth model equations are selected.

Secondly, considering time estimation at completion (TEAC) along with considering nonlinear method together is good way for estimating the cost.

Lastly and main conclusion is mixture of the those formulas(nonlinear) with attitude of the managers in the different situations, as you see, amount of the error (APE) decrease considerably, if we consider and intervene kind of the managers attitudes including being pessimistic or optimistic viewpoints in our forecasting way of the cost, one of the these views helps us more than before in order to expect cost at completion in the perfect way, this method was tested on three practical projects and checking outcomes demonstrated us this fact that selecting different viewpoints of the managers rise the accuracy of the results unbelievably,

In the reports that tested, if we select the points that shows only pessimistic attitude, APE decrease more than 50 percent, initial actual data of the project also help us in choosing that

which viewpoint is selected, but author has chosen only Gompertz growth model in the calculations.

Nevertheless what is so interesting for me is that, we can repeat this method again and again, furthermore, after dividing points in to the two categories and selecting accurate one of those groups, we have to face only pessimistic points or optimistic one, it means we can remove improper groups(points) and work on only remaining points, and in the next step we can again repeat previous method for remaining point and generating again pessimistic points and optimistic points, this method can be repeated up to reach exactly the best accurate expected points that are so close to actual one, this fact that how we realize which upstream of the thought is correct is achieved by comparing time by time expected points with actual one,so it is needed reporting of the project costs continuously respect to the time progress.

Regarding what discussed up to now, what is important is that you have to test and compare your data regularly in order to realize which group points gives you smaller amount of the APE, however, these precise estimates are achieved only by checking reports continuously respect to the time. If we combined two last implications together, we will reach to great achievement about having proper precaution about the project costs, firstly, a manager can estimate CEAT at the beginning time of the project according to his personal vision to the project, and then after passing initial time of the project when actual data of project for earlier time are achieved, secondly manager could compare amount of the his or her estimation with actual one, but what gives him more forecasting accuracy is that at that time, 3 expected value of CEAC (pessimistic-optimistic-middle) are available for calculation and not only one point ,that give managers more general view about estimate of the project cost.

And lastly manager can estimate expected values according to the kind of the thought stream happening during the project execution, moreover, being pessimistic or optimistic is investigated Every moment by the manager, and anticipated points that have behavior in opposite to the actual data can be removed easily from our estimation and only expected points (pessimistic or optimistic or middle) that are close to actual data can be remained for further calculations and again in the remaining points we can repeat same method, dividing points to the 3 categories(pessimistic-optimistic-middle) in contrast to each other and compare them with next actual data. Certainly we could have best estimation of the cost at completion with lowest error, because at that moment we know exactly which subjective risks exist in the project and how we can behave with those risks in order to have proper forecasting of the cost at completion.These precise estimates are achieved only by checking reports continuously respect to the time, otherwise we couldn't reach accurate outcome.

Main feature of this method is simplicity in calculation, managers can calculate without using complex formulas, it is trait that needed these days particularly in the practical projects especially in construction projects, since most experienced managers did not care about the theoretical methods and their trust to experiences is more than theoretical in estimation of the cost. Future study could be in the way that which formula of the growing models (logistic model (LM), Gompertz model (GM), Bass model (BM),and model(WM)should be selected for having better anticipation , For example in the logistic model we see better estimation compare to other models, but it not validated until now, what is Instead Question for author is difference in kind of the theory(opinion) in each formula, for instance, logistic model have the inflection point at 50% of total growth, it means in practical project we assume that when project reach to half of the project time line, exactly we reach to maximum cost of the project accumulation, in

contrast to Gompertz model that inflection point happens approximately at one third of the project scheduling, it means when we reach to the one third of project timeline, peak point of the cost happens, these differences in behavior of the these curves (logistic compared to Gompertz) can be influential in managerial attitudes, because these models dictates this fact to the manager that at which time of the project scheduling maximum point of the cost occurred.

Conclusions

Several steps should be done chronologically together in order to create the best method for estimation of the cost while minimizing the error.

First step is that nonlinear regression model is dominated way compare to traditional method including index based model, in fact nonlinear methods and growth models provide the best provision for combining managerial attitudes with CEAC formula, in addition other method(IB) cannot be appropriate bye characterizing managerial belief.

Second one is that among the nonlinear growth models, Gompertz model is preferred one in contrast to another 3 models, especially in construction projects, also other growth models should be tested for other kinds of the project, there is no certainty about this subject, although, Future study could be in the way that which formula of the growing models should be selected according to kind of the project for having better prospect of the cost.

Third step is that considering time estimation at completion (TEAC) gives more reality to the our forecasting of the cost, because time is selected as input in CEAC formula and cost is function of these inputs (time) since time and cost are related to each other entirely.

Fourth step and last one is the fact that, CEAS methods could be improved significantly in way that minimizing distance between anticipated costs with actual one by combining managerial belief in the formulas, and one of the these ways in order to put these ideas in the practical projects and characterizing them in the CEAC formulas is considering positions of the points in the fitted cost curve in the area of confidence level by using nonlinear method.

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THE SOCIO-POLITICAL DYNAMICS AND COMPLEXITY OF ORGANISATIONAL CHANGE PROJECTS: A RESEARCH AGENDA

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Abstract

There has been a rapid and significant growth in the use of projects as a method to drive the implementation of organisational change, thus a shift to a management paradigm. In practice, a project manager is often allocated to projects post scoping where the focus is on governance and execution; often with little understating of the real problem statement and the socio-political dynamics of the project environment. This paper provides a critical literature review which explores the current state of research relating to organisational change projects and argues that increased attention to socio-political dynamics and complexity within the front-end of projects would likely influence assessment of project viability, scope and approach. The paper identifies a gap in the literature focused on the pre-initiation phase of complex organisational change projects that puts people and uncertainty at the heart of this phase. It draws on the dynamics of the project environment, people and decision making under the umbrella of complexity during the critical pre-initiation phase of a project, where real value can be injected or destroyed. In doing so, the paper outlines a research agenda to inform future empirical work which is likely to hold significant implication for the boundaries of the project management discipline and the role of project management practitioners.

Keywords: *complexity, project management, organisational change, socio-political*
JEL code: *M1*

Introduction

With historical roots in the engineering discipline, project management has been dominated by a rational, linear approach (Johnson 1997, Levene 1996, Eisenhardt & Tabrizi 1995, Whittington & et al, 1996, Morris, 1994), but is increasingly applied in complex organisational settings (Hall, 2012). Exploring the unresolved contradiction between non-linearity and controllability within the pre-initiation phase of complex change projects could deliver a significant contribution to interdisciplinary research across project management and organisational change theory, along with stretching the traditional boundaries of project management for the practitioner.

There has been a rapid and significant growth in the use of projects as a method to drive the implementation of organisational change and continuous improvement to processes (Pellergrinelli and Bowman, 1994; Grundy, 1998; Turner, 1999; Stryhre, 2011; Hall, 2012). The pre-initiation phase[1] of projects is considered as a critical success factor (Miller and Lessard, 2001; Flyvbjerg et al., 2003; Mier, 2008). However, in practice project management often refers to the execution of a project post scoping and indeed, a new or different project manager may be assigned after the scoping and pre-initiation phase (reflected in the professional bodies 'Books of Knowledge' (APM, 2006; PMI, 2008)). If this is the case, it becomes questionable who is or should be responsible for leading the scoping of projects and whether the

[1] that is from the point when the project exists conceptually and before it is planned and implemented, from the time the idea is conceived until the decision is made to finance it (Williams and Samset, 2010)

complexities of social and political dynamics of the project environment are explored and considered during this phase.

As with many fields of management there is not one agreed definition of project management (Soderlund, 2011). As noted earlier, the value proposition behind project management is changing rapidly. For the purpose of this paper, the following definition is selected 'a project is the whole of a group of activities limited in time and space, inserted in, and integration with a political, social and economic environment, towards a goal progressively refined by the dialectic between the thought (the project plan) and the reality' (Bredillet, 2010, p23). The chosen definition of project management is some distance from the traditional definition of being a temporary endeavour undertaken to create a unique product or service (Project Management Institute, 2008). The driver for the preferred definition is that it incorporates the political and social dynamics which puts the context of the environment at the core of the definition, along with its interaction with the more traditional view on project execution. This paper will unpack some of the reasons why the social and political elements are crucial to the future of project management research and practice (Morris, 2013).

This paper engages with the literature on domains, paradigms and role boundaries and explores the shifting terrain within project management to further understand the implications to the practitioner and to the academic discipline. Secondly, this paper explores taking socio-political dynamics and complexity seriously. It is generally accepted that projects are becoming more complex, with one of the key reasons behind this relating to the increased bidirectional interaction between the social and technical aspects (Balio and Price, 2003; Henrie and Sousa-Poza, 2005).

Domains, paradigms and role boundaries: A shifting terrain?

Project management is transforming from traditional infrastructure-based sectors to a management paradigm as project management is being used to drive and deliver organisational change (Kuhn, 1962; Williams, 2005; Cicmil & Hodgson, 2006) There is evidence to suggest that there is a need for a shift from a dependence on planning and control to a more organic managerial model (Bredillet, 2004; Crawford, et al. 2006; Pollack, 2007; Kolltveit , et al. 2007). There is a growth in project management being used to effectively manage and control change within organisations and therefore can be considered an important business process in its self, that touches many other processes and stakeholders (Hall, 2012). Stryhre (2011) identifies the opportunity project management can make to enabling creativity outside the norms of organisational structures, which is key to change projects. Whilst organisations may be using discrete projects to encourage innovation and change (Curran and Niedergassel, 2009) the reach and impact is not discrete with many aspects of the organisation and its stakeholders being touched.

It is noticeable that projects with substantially different characteristics are emerging, which are inherent in organisational change projects where socio-political dynamics of the project environment are key (Hall, 2012). This has potential implications for the discipline's future research and development of practitioner training that go beyond the linear and often deterministic approaches thus far adopted (Winter & Szczepanek, 2008; Antonacooulou E and Michaelides R, 2014). In addition, project management experience and skills are seen increasingly as a growing expectation of the modern manger (Leybourne & Sainter, 2012), therefore the signficance and reach is wider than purley the project management domain.

However, there appears to be a lack of work within the discipline in the area of complexity during the front-end work of projects. Instead, a great deal of the literature focuses on practitioner tools and training focused on the management and control of projects within a seemingly rational environment. Incorporating and acknowledging the complexity of the organisational environment appears a far better context by which to appreciate the needs of and demands on the Project Manager.

The foundation of project management as a discipline explains the existence of the rational, linear approach that is dominant. Project management's historic foundations arise from engineering, operations and organisation theory (Morris, 1994; Eisenhardt and Tabrizi, 1995; Levene, 1996; Whittington et al., 1996; Johnson 1997) with prescriptive research being the core (Ahlemann, et al., 2013). Literature focused on scheduling and control within projects with high certainty during the 1960s (Biedenbach & Muller, 2011). This was followed by a decade of work focused on teamwork and bringing temporary teams together effectively (Biedenbach & Muller, 2011). In addition management writing and research saw a shift from governance and structures to process during this period (Biedenbach & Muller, 2011). The 1980s saw an emergence of complex projects and the literature sought to reduce uncertainty, as a key aspect of complexity, in projects with the use of boundaries to exclude or manage out complexity. The discipline has now shifted towards looking at dynamism, uncertainty and the changing characteristics of projects and complexity (Laufer et al., 1996; Cicmil S at al., 2006; Winter at al., 2006), but it is acknolwled that there is still a need for this to go beyond attempting to measure complexity (Sense, 2011; Antonacopoulou and Michaelides, 2014). This suggests the focus on control and management of projects in a very rational way has influenced the project management practitioner tools and training where are still very visible now with the professional associations and key methodologies such as Prince2 and Six Sigma.

Project Management has been seen as a discipline focused on planning and organising resources to deliver project outputs within the accepted golden project management triangle of time, budget and scope (Granot and Zuckerman, 1991; Atkinson, 1999; Williams, 1999; Meijer, 2002; Jaafari, 2003; Stryhre, 2011; Antonacopoulou and Michaelides, 2014). Shifting the discussion from these mechanical one size fits all approaches to a more contingency perspective with an improved understanding of the organisational response within its context is supported by Geraldi (2011) and Williams (1999).

The literature suggests that a unified area of research does not exist within project management, therefore project research is considered as being in a pre-paradigmatic state (Bedeian, 2004; Bredillet, 2010; Hallgren, 2012,), with paradigms being defined as being the combination of a basic belief system or world views (Guba and Lincoln, 1994). Soderlund's (2011) paper, which supported the notion of pluralism for the discipline, was a response to Koskela and Howell's (2002) controversial paper entitled 'The underlying theory of project management is obsolete', which made a bold statement that described project management as a discipline that was in a crisis and that a long overdue paradigm change had to be realised. Hallgren (2012) who analysed research question construction and the contribution to theory development within project management research presents a different perspective that turns the previous discussion on its head. This work identified a lack of research question or focus and in turn Hallgren (2012) suggested a greater contribution could be generated if the research question was constructed from a theoretical view point.

Often the project manager is appointed at the stage where the focus is on the execution or implementation of the project with little or no time on the requirement setting; often jumping straight to the implementation of a solution without understanding the real problem statement or the dynamics of the project environment within complex change projects. It is acknowledged that the pre-initiation phase is where a real value can be injected or destroyed (Faulconbridge and Ryan, 2002). Best practice relating to this phase can be very deterministic and covers elements such as setting objectives, defining the resource frame, defining the activity portfolio, deciding on structures, defining implantation methodologies and establishing rules and processes for information procedures and systems (APM, 2006; PMI, 2008). Geraldi et al. (2011) criticised this deterministic approach due to its lack of connection to the project context.

A project can be delivered on time, within scope and in budget, as per the golden triangle of project management, which remains the core of practitioner training (Granot and Zuckerman, 1991; Atkinson, 1999; Stryhre, 2011; Antonacopoulou and Michaelides, 2014) but if the project scope was not sufficiently developed then the benefits the project delivers are questionable. Studies on critical success factors studies support the need for better front-end work, with firstly a focus on socio-political factors and stakeholder engagement (Rycroft and Szyliowicz, 1980; Morris and Hough, 1987; National Audit Office, 2004) and secondly a need for better defined project requirements and mission that contribute to organisational strategic priorities (Pinto and Slevin, 1987; Whittaker, 1999; National Audit Office, 2004, Lind, 2011). The importance of quality during the front-end phase is noted by many (World Bank,1996; Miller and Lessard, 2001; Flyvbjerg at al., 2003; Meier, 2008; Flyvbjerg 2009; Williams, et al. 2009). Wearne, (2014) empirical work provides evidence that supports the view that poor discipline at the front-end of projects results in much 'fire-fighting' in project execution

The front-end phase of project management is becoming an increasingly popular area of work in domains such as the analysis of needs and benefits (Naess 2009), risk management, business cases and stakeholder analysis (Williams and Samset, 2010), but the need of future work is agreed in areas such as the alignment of projects to organisational strategic intent and complexity - to include the interrelatedness within project decisions, uncertainty implicit in change projects and the social and political dynamics within decision making (Williams et al. 2009, Williams and Samset, 2010; Morris, 2013,). Hjortso and Meilby (2013) highlight that complexity is often added to projects due to the influence of stakeholders' whose position was not necessarily understood or uncovered during the front-end phase. The decision making process during the pre-initiation phase is critical to the success of the project in terms of delivering strategic intent. It is a time when most decisions will have the biggest impact and during a time when there is limited knowledge and high complexity (Williams and Samset, 2010). Conversely a review of the literature demonstrates an assumption of principles of bounded rationality (Simon and March, 1958) where decision makers have the full knowledge of all alternatives.

These traditional tools and assumptions are focused on delivering projects in a managed and controlled way rather than exploring a deeper understanding of the complexity of projects (Leybourne, 2007). The importance of the pre-initiation phase is understood, but the work in this area has been much slower than the development of tools for the execution stage (Morris, 2013; Williams and Samset, 2010). This presents a further gap in the literature around decision making during the pre-initiation stage of a project. Building upon the argument that decision making during this stage of change projects is critical, a further important interrelated factor is

human behaviour. It is clear from the literature that a better understanding of the neglected human dynamics of project management is needed (Curran and Niedergassel, 2009). A common theme to project success or failure is around people, whether it be the selection of the project manager, the management of the process of engaging stakeholders or decision making (Henrie and Sousa-Poza, 2005).

Socio-political dynamics of the project environment

Despite the focus on prescriptive research a number of key authors within project management claim that it suffers from a low adoption rates (Ahlemann et al. 2009) which arises a fundamental question around the impact of research. The literature suggests that a combination of the lack of consideration of the usage environment or project context (Besner and Hobbs 2006, Morris et al. 2006, Russo et al. 1996), too much of a distance between the relationships of researchers and practitioners and the lack of theory underpinning project management research as key factors.

It is generally accepted that projects are becoming more complex, with one of the key reasons behind this relating to the increased bidirectional interaction between the social and technical aspects (Balio and Price, 2003; Henrie and Sousa-Poza, 2005). The nature of dynamics within managing projects, in particular the emerging use of projects to deliver change within organisations has not been explored fully within the current project management literature and therefore there is a need to understand better the dynamic nature of complexity within projects and how an individual or organisation responds to it (Brown and Eisenhardt, 1997; Austin et al, 2002; Thomas and Mengel, 2008; Sense, 2011; Antonacopoulou and Michaelides, 2014). The literature on complexity within the project management discipline has in general examined complexity of projects by focusing on complexity theories to aid identification and measurement of complexity (Mason, 2001, Cicmil and Marshall, 2005; Ivory and Alderman, 2005; Cooke-Davies et al., 2007; Vidal & Marle, 2008). Geraldi (2011) develops this further by highlighting the need to move beyond measuring complexity to further understanding of it and how complexity can be actively managed for the better outcome of deliverables that are aligned to strategic intent. This demonstrates an assumption that rational control of complexity is possible and desirable (Stacey, 2001; Wood, 2002).

A key thread via the literature on complexity with the project management literature is uncertainty. Whilst there is a body of thought that see uncertainty and complexity as two separate concepts (Baccaromo, 1996), there is also a strong view from other authors that uncertainty is a key element of complexity (Williams, 1999; Turner and Cochrane, 1993). The literature within project management on ambiguity provides a similar definition as uncertainty where ambiguity is perceived when there is a lack of clarity, high complexity and more than one plausible alternative (Hagen and Park, 2013; Martin, 1992). Hagen and Park (2013) also argue the acceptance of ambiguity by the project manager is a key critical success factor. It has been suggested that for projects with higher levels of uncertainty more soft skills are required by the project manager than what the traditional project management frameworks and methodologies currently provide (Pich, et al., 2002).

Whilst the growing trend of project management being used as a mechanism to deliver change is generally accepted (Grundy, 1998; Pellegrinelli & Bowman, 1994; Turner 1999 pg 35,), there is an inherent tension between the literature on successful change management and the recognised project management paradigm of plan and execute in a controlled manner

(Leybourne, 2007). Whilst there is an acknowledgement of a shift away from the traditional, structured project management approach (Clegg & Coupasson, 2004; Cicmil and Hodgson, 2006; Lindgren & Packendorff, 2006; Winter at al., 2006; Smith, 2007; Brown 2013) the implications can be problematic due to the tension between controllability and uncertainty

There is a body of literature that recognises human actors within projects as important which brings with it potentially conflicting interests and different behaviours (Maylor, 2001; Clegg and Courpasson, 2004). The work of Cicmil et al. (2009), which drew on the work of Cooke-Davies et al. (2007) and R Stacey's (2001) work which focused the emergent properties of groups of people as 'complex responsive processes of relating'. Socio-political complexity has been examined with a focus on measuring complexity relatively recently (Geraldi & Adlbrecht, 2007; Maylor, et al., 2008; Remmington & Pollack, 2007). Socio-politically complexity has also been focused on the study of the ambiguity or uncertainty of agreement between stakeholders which Reminton and Pollack (2007) grouped under the term 'complexity of interaction'. It has been suggested that the socio-political dynamics within change projects are significant influences to the project outcomes (Leybourne, 2006). Whilst there has been a shifting focus from traditional of planning in the prescriptive mode to a more behaviour approach there remains a contested space academically between the two camps (Leybourne and Sainter, (2012). The traditional camp focuses firmly on process and control which limits the role boundaries and responsibilities of the project manager to one of implementation with the golden triangle of cost, time and quality. Whilst the emerging view considers there a need to resolve uncertainty caused by the project environmental turbulence. It is suggested that one key driver for the pace of shift more towards the behavioural camp will increase as further understanding of the dynamics of the project environment is developed (Cook-Davies at al. 2007).

Managing activity over tasks is a new challenge for the project manager (Leybourne, 2006). Geraldi (2009) describes complexity as partly inherent and partly induced within projects which suggest that project managers should consider complexity as being negotiated. This suggests support for the notion that project managers need to embrace complexity within organisational change projects.

Morris (2013) recently stimulated thought around the role of the project manager crucially being the single point of integrated accountability from the earliest stage of the project right through to the end to deliver the outcome desired by the sponsor and where possible the stakeholders. Note, Morris (2013) talks about outcomes not tasks and the project manager having a key role from the earliest point of the project, this requires understanding of what is trying to be achieved by the project and the underlying reasons for this. Morris (2013) develops this idea further by recognising the need to understand and influence the projects environment to enable the alignment of the project outputs to strategic intent. Morris (2013) talks about shaping the context or environment, and the importance of understanding the context to improve the understanding of the organisational and individual responses to complex projects is further supported by Brown and Eisenhardt (1997); Austin et al. (2002); Augustine et al. (2005); Thomas and Mengel (2008); Geraldi (2011). Geraldi (2011) explicitly identifies this as a critical success factor of delivering successful complex projects which deliver outputs.

Conclusion

The pre-initiation phase of projects is arguably the time when particular decisions will have the biggest impact, during a time when there is limited knowledge and high complexity (Williams and Samset, 2010). This calls for a dynamic view of the interrelatedness of project decisions, the uncertainty implicit in change projects and the social and political dynamics within decision-making (Williams et al., 2009; Williams and Samset, 2010; Morris, 2013). Yet, traditional project management tools and their underlying assumptions are premised on delivering projects in a managed and controlled way, rather than exploring a deeper understanding of complexity and uncertainty (Leybourne, 2007). To serve this task, a better understanding of the neglected human dynamics of projects is needed (Curran and Niedergassel, 2009).

The key questions these knowledge gaps suggest the discipline needs to answer are how (and the extent to which) the socio-political dynamics of the project environment are considered during the pre-initiation phase of organisational change projects. This leads to two further issues. First, the literature on complexity within the project management discipline identifies the need to move beyond measuring complexity to further understanding of it and how complexity can be actively managed for the better outcome of deliverables (Geraldi, 2011), which demonstrates an assumption that rational control of complexity is possible and desirable (Stacey, 2001; Wood, 2002). To move towards this understanding, we need to know what tensions exist, if any, between embracing complexity with the project management tradition of controllability during the pre-initiation phase of complex organisational change projects Second, questions exist around specific responsibility for leading the scoping of projects and whether the complexities of social and political dynamics of the project environment are explored and considered during this phase.

The reconcpetualisation of the front end of project work, in the manner mapped out here, has far reaching implications for the project management discipline and the role of project practitioners. In practice, a Project Manager is often allocated to projects at a stage where the focus is on the governance and execution of the project with little or no time on the requirement setting; often jumping straight to a solution without understanding the real problem statement and the dynamics of the project environment within complex change projects. Geraldi et al., (2011) criticised this deterministic approach due to its lack of connection to the project context. This paper suggests that developing a better understanding of the dynamics of a projects environment (political and social dynamics) would contribute to exploring the tension between the prevalent project management tradition of control and the complexity of the project environment. The proposed research agenda will aid future thinking on the assessment of project viability, scope, approach and the role of the project management practitioner during the pre-initiation phase of organisational change projects.

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THE SECRET INGREDIENT FOR SUCCESSFUL PROJECT LEADERSHIP

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Abstract

When it comes to understanding how to ensure the successful delivery of organisational value, stakeholder engagement has been one of the best kept secrets. There is now an emerging recognition of the importance of people in the formula for success: recognition that projects are really about 'people doing work for the benefit of other people'. As a result, there must also be recognition that an essential role of the project leader is to ensure effective consultation with stakeholders and to convince the organisation's executive of the benefit of doing so.

For decades project management literature and research have identified the need to focus on stakeholder engagement as a means for delivery of value to organisations through successful delivery of a project's objectives – whether product, service or result. At the same time organisations are requiring the project leadership to do more with less. It should come as no surprise then, that senior managers in organisations are resisting calls to spend more time (and therefore more funds) on additional communication to build the necessary relationships between the project (or organisation) and its stakeholders.

In studies of extractive industries around the world, including South America and New Guinea, it has become increasing clear that neglecting the lives and economies of the indigenous communities will cause a backlash that can lead to early closing of these projects and often radical action from those most affected. The findings of each of these studies have shown that a long-term peaceful and profitable resolution will only come from consultation with those who are affected – not just their leaders. This is an example of how timely stakeholder engagement with its consequent additional consultation, communication and negotiation will add value to the project and all the partner organisations – a practice that is not always supported by the management of those organisations.

This conceptual paper draws on some case studies of projects within the extractive industries in New Guinea and South America to develop arguments that may persuade corporate executives to apply more funding and support on stakeholder engagement activities within their own organisations. The paper will focus on the value of stakeholders to an organisation through emphasis on the connection between risk management and effective stakeholder engagement activities. It also provides guidance to project leaders on how to encourage and assist organisational leadership improve stakeholder engagement activities. Suggestions for further research will be included.

Key words: *stakeholder, stakeholder engagement, maturity models, organisational value*
JEL codes: *M14, G32, F6*

Introduction

Just as each project is unique, so are its stakeholders! Whether as individuals, groups or organisations, every stakeholder and every stakeholder community has a unique and evolving set of cultures, expectations and perceptions. To deal with this environment, when managers engage with these diverse communities the traditional approach of regular reports and other 'one size fits all' strategies needs to be replaced, or at least intelligently enhanced, especially in

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major extractive programs involving affected communities (Bourne, 2015). Effective communication takes into account the complexity of the people who work with or benefit from the outcomes of the program, and works to engage the constantly changing group of people whose support and involvement are essential to success. This type of engagement requires ongoing consultation and recognition of the importance of all stakeholders to the successful delivery of value to the organisation. At the same time, the organisation's financial imperatives require its leaders, including project managers, to do more with less. The paradox is that it takes more time and focus to effectively engage and consult with stakeholders, to maximise value and enhance corporate reputation at a time when resources including time and people are increasingly restricted. It's necessary to spend money to make money.

The findings of studies of extractive industries around the world, including South America and New Guinea, have shown that a peaceful (and financially efficient) resolution will only come from early and frequent consultation with the communities who are most affected – not just their leaders. Stakeholder engagement with its consequent additional consultation, communication and negotiation has been shown to add value to the project outcomes and all the partner organisations no matter how large or small the project or program.

This conceptual paper draws on some case studies of projects within the extractive industries in New Guinea and South America to develop and describe the connection between risk management and stakeholder engagement, and describe ways that project leaders can the organisation's financial community of the benefits of early consultation, instead of the compensation claims, costs of sabotage and lost reputation that have plagued extractive programs such as the ones described in this paper. Finally, suggestions for further research will be discussed.

Discussion

There are many cases of stakeholder disadvantage and unrest in extractive industries resulting from inadequate consultation. This paper uses only a small sample: British Petroleum's (BP) Macondo oil well disaster in the Gulf of Mexico, two of BHP Billiton's partnerships: one in Brazil at Samarco, and another in Papua New Guinea (the Ok Tedi), and also the El Mauro copper mine in Antofagosta, Chile, run by Antofagosta PLC, still 65% owned by a highly influential Chilean family. These examples have been chosen either because they are topical or because there is sufficient information available to allow appropriate analysis of the issues. They also represent the range of issues within the industry, where state-run companies, large multinationals or influential national companies have followed the business model of shareholder value to the detriment of the original landholders; but paradoxically this narrow focus has destroyed shareholder value.

BP's Macondo Well in the Gulf of Mexico: In April 2010, the 'well from hell' - the *Deepwater Horizon* Macondo well in the Gulf of Mexico exploded and eventually sank: 11 workers died. By July 15, 2010 when the well was finally capped, 5 million gallons of oil had leaked into the Gulf of Mexico, with significant loss of livelihood and lifestyle to business and residents, and damage to the environment and wildlife of the areas affected by the oil spill. BP's shares lost 'billions' in value (Simms & Boyle, 2013) driven down by expectation of major losses to the company – and its investors. At the time of writing (2016) the costs to BP are greater than US$6billion. The US Government Report into the disaster (Simms & Boyle, 2013;

Udo & Kcik, 1994; US Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011) blamed cost-cutting for contributing to the disaster: *"Management put time and money ahead of safety measures to prevent the accident.* The Report also stated that the industry regulatory bodies were 'starved' for Government funding to meet their own responsibilities. The cost-cutting was focused on maintaining 'shareholder value' – a healthy bottom-line to encourage shareholder investment: it actually destroyed stakeholder value.

BHP partnership at Ok Tedi, New Guinea: In 1999, BHP reported that 90 million tons of mine waste had been discharged into the OkTedi River every year for more than ten years and the contamination had destroyed the agriculture and fisheries of the downstream villages. After heavy rain mine tailings were swept into the surrounding rainforest, swamps and creeks and leaving 30 square kilometers of dead forest, killing or contaminating fish consumed by the surrounding villages. A tailings dam damaged by an earthquake was not repaired – the company considered this work to be too expensive. The PNG government took over control of the mine in 2013 without compensation and with the support of the local community – but it may take up to 300 years to clean up the toxic contamination (Stevens, Kooroshy, Lahn, & Lee, 2013). The capital invested and value of unmined resources was stripped from BHP's shareholders.

BHP Billiton partnership at Samarco, Brazil: In November 2015, two tailings dams ruptured releasing toxic material, destroying homes of around 600 people, and causing the deaths of at least 11 people with many still unaccounted for. Water supplies within the region have been contaminated with a mixture of mercury, arsenic, lead, copper, fish killed and a protected coastal area endangered. At the time of writing (early 2016) the causes of this disaster have not yet been disclosed, but there are a number of lawsuits already in train naming both BHP and its Brazilian partner Vale. The costs and consequences are yet to be determined but there is no doubt that earlier concern for the environment, safety and stakeholders may have averted the disaster and loss of shareholder value.

Antofagosta copper mine in Chile: Protests against the El Mauro dam in Chile have been going on for nearly a decade says Jonathan Franklin for *the Guardian* in 22 March 2014. The protests centre on a tailings dam built above the village of Caimanes to contain the waste from the Los Pelambres copper mine, mostly owned by a wealthy Chilean family and listed on the London Stock Exchange. The villagers claim that the dam has meant that they now have no source of fresh water; it has to be brought in by truck. They also fear that the village is in danger from the dam that could burst if an earthquake were to hit the area around the village. Chile is subject to frequent earthquakes. In April 2015, a Chilean court ruled that the mine was safe, rejecting a lawsuit presented by the residents and supported by environmentalists in other parts of the world. Other reports cite the inequality in Chile – where the inhabitants of the Antofagosta region have the highest per capita income in the country, but also where around 4000 families continue to live in slums. Sustained stakeholder opposition continues from those with most to lose, and they are supported by international organisations in their quest for relief from the situation.

Each of these cases, representing many other similar extractive enterprises world-wide share a common set of problems:

- Degradation of the environment,
- Degradation of the lifestyle and livelihood of the original residents, leaving them with no substitute for their previous means of living,

- Influx of foreign 'expert' workers, meaning that the locals were left with underpaid menial jobs (if at all),
- Drift of younger people to the cities,
- Promise of education and better life not fulfilled,
- Sustained stakeholder opposition – 'them against us',
- Potential for actual destruction of shareholder value when 'powerless' locals decide to react.

These problems persist despite the growth in reports from organisations of dedication to corporate social responsibility (CSR) and sustainability: in 2012 more than 50% of the Fortune 500 companies reported on their programs for CSR and sustainability (Bader, 2014). Many of these organisations and other corporations frequently fail to invest resources effectively in stakeholder engagement.

The extractive enterprises focus on financial success, tangible results, strong 'bottom line' for 'shareholder value'. By only focussing on the needs of the small group of stakeholders – investors and executives, and possible state interests, the needs and expectations of some of the most important stakeholders are ignored. These stakeholders, local residents and the environment in particular, are the most adversely affected by the existence of the extractive program either through a combination of degradation of the environment or degradation of lifestyle, or even more urgently through outright danger to life. These stakeholders are also the groups with the least formal power. When organisations ignore the needs and requirements of these powerless stakeholders, they fail to recognise the interests of ALL stakeholders, AND to ignore risks in the name of 'shareholder value'. This is unethical business practice, at odds with the quest for CSR and raises the prospect of extreme reactions by disenfranchised stakeholders. These issues will be further discussed later in this paper.

The purpose of this paper is to propose a different, more ethical approach to developing extractive programs that can benefit ALL stakeholders, reduce the risk of such operations and still ensure that the organisation (and its shareholders) achieves 'value'. The model for improvement of stakeholder engagement practices is readily applicable to all organisations, not just those involved in extractive programs.

Implications for successful engagement of stakeholders in programs (and projects)

If certain groups or individuals can influence the success delivery of the outcomes of a program through provision (or withholding) of funds, support, or resources such as materials or people with the essential skills, they should be identified by the project team as stakeholders. Others will self-select - protesters, objectors or authorities. If any of these groups or individuals fit the definition of stakeholders then an appropriate level of effort should be directed towards engaging them by developing appropriate relationships driven by communication.

Relationships that are appropriate and sustainable are two-sided: both parties gain from participation in this relationship – or have expectations of gaining something. The relationship will not flourish unless both parties participate. To make the relationship work it is essential to understand the *expectations* and fears of each stakeholder, in particular the stakeholders who have been identified as being the most important in the stakeholder community for any given time in the life cycle of the project or other organisational activity.

Knowing the expectations of important stakeholders will support early identification of potential conflicts between important stakeholders. It will also be the means to develop a useful message to provide the stakeholder with the feeling of confidence that his needs are known and understood. Through targeted communication the stakeholder can also be assured that the team will make every effort to provide these requirements or ensure that the reasons for NOT being able to provide these requirements are explained so that the stakeholder's NEW expectations can be established. By doing these things stakeholders will *perceive* that their needs are understood and from that will be more effectively engaged in contributing to the success of the project, or have their fears and opposition reduced.

Stakeholder risk management

Extractive programs are high-risk, the high costs of exploration will only occasionally be rewarded. Organisations focus most on financial risk, and not enough on the consequences of ignoring the needs and expectations of many of its stakeholders. This section focuses on stakeholder risk management and the importance of stakeholder engagement in reducing risk.

Effective risk management involves more than simply gathering data and applying actuarial calculations to define risk premiums or contingencies. Effectively managing stakeholder risk involves interacting with people's deepest needs for control, safety, and comfort (Rock & Cox, 2012). Apart from the significant exploration risks most other risk are related to stakeholders:

- More than 90% of risks to any program or project are the direct consequence of the action or inaction of stakeholders.
- The perception of what is acceptable or unacceptable is closely connected to individual stakeholders and their attitudes or needs.
- The identification, assessment and management of risks depend on the decisions and actions of stakeholders.

When stakeholders whose needs are ignored and whose life is significantly worse as a result of the organisation's activity they are most likely to react negatively and within the limits of their power will seek compensation or cessation of the work at times these reactions will be extreme. To reduce these risks stakeholder engagement activities such as user consultation and community engagement should be regular and early elements in a stakeholder engagement plan. These activities consume resources, take time and have cost consequences. There are a number of practices that can assist in the efficient management of this work. The starting point is using a robust stakeholder engagement methodology that has the capacity to identify and track stakeholder attitudes over an extended period. Monitoring the effectiveness of stakeholder communication and engagement processes generates usable data to feed into the assessment process; subjectivity needs to be minimised. The elements that feed into the risk management system include:

- A contingency (cost and time) for additional stakeholder engagement activities, identified as a consequence of planned consultation.
- Allowances for changes in the stakeholder community which should be tracked and communication strategies and plans updated accordingly.

The value proposition for the effort involved in stakeholder engagement is derived from an understanding of the difference between crisis management (a result of inadequate or non-existing stakeholder risk management), stakeholder management and stakeholder engagement. Table *1*1 shows the main differences.

Table 1

Difference between crisis management, stakeholder management and stakeholder engagement

	Crisis Management	**Stakeholder Management**	**Stakeholder Engagement**
Stakeholder relationships	Reactive	Proactive	Interactive
Exposure to stakeholder issues	Vulnerable	Anticipate	Encourage
Stakeholder involvement invited	Episodic	Regular	Inclusive
Organisation/project attitude to stakeholder involvement	Hostile	Defensive	Prepared to change

Source: Adapted from (Jeffrey, 2009)

The four aspects in the table are as follows:

- *Stakeholder relationships*: building relationships with stakeholders is good risk management. If the relationship is strong through proactive or even interactive communication strategies, any issue that occurs can be resolved more effectively. When organisations react to crisis without a strong relationship with stakeholders it becomes difficult to resolve the crisis to the satisfaction of everyone involved.
- *Exposure to stakeholder issues*: organisations are more exposed to issues or crises that arise through poor attention to stakeholder relationships. The stronger the relationship the less vulnerable the organisation is to the impact of any issues or crises.
- *Stakeholder involvement invited*: the stronger the relationships between the organisation and its stakeholders the more stakeholders are treated as partners, invited to participate in decision making and other organisational activities regularly.
- *Organisation's attitude to stakeholder involvement*: when organisations move from a hostile or defensive approach to their stakeholders and recognise the need to embrace the involvement and ideas of their stakeholders, many of the sources of issues of loss of trust or reputation will reduce (or disappear).

Building a business case for more effective stakeholder engagement activities

Financial measures of value, primarily 'shareholder value' has been the source of decisions made by organisations without understanding (or heeding) the impact that such actions will have on other stakeholders – employees, customers, the public and the threat they pose to 'shareholder value'. The best way for organisations to survive and prosper is to focus on wants and needs of all stakeholders and try to deliver appropriate value to each one. 'Value' will be different for each stakeholder group: linked to their expectations and requirements.

In the corporate world tangible 'value' is known and understood: these definitions are applied to financial balance sheets and often focused on 'shareholder value' – driving a culture of short-term decisions to maximize share price, investor return and executive bonuses. The intangible definitions of 'value' are less easy to measure. This is the contribution of the human element – stakeholders such as the customer, employees, the public, users of a product,

organisational reputation. Failure to consider how these other stakeholders perceive organisational value, and to enhance organisational value is failure of the organisation to be as effective as it can be and will affect tangible values. An organisation's assets and structures – tangible and intangible – are ALL the result of human actions. The assets of the organisation related to human competences are in the form of knowledge, skills, experience, and social networks of the stakeholders within the framework of the communication ecosystem (Sveiby 1997).

Zero cost of quality

The concepts of the 'zero cost of quality' can be useful in assisting organisations monitor and measure investment in people through a focus on what happens when this investment is missing. *Quality is free* (Crosby, 1979): what really costs an organisation is failure to do things right *the first time*. This concept is a useful basis for building a business case to persuade management of the benefits of improving stakeholder engagement practices and stakeholder consultation in an organisation. One of the impediments to developing a viable business case is the lack of data about both what is invested but also the costs of not investing in stakeholder engagement and consultation.

CRC Industries first started tracking the cost of quality in 1997 (Donovan, 2006). They measured 'failure dollars' (money spent because of product and services that do not meet customer requirements). Using this approach, CRC reported that 'failure dollars' reduced from 0.7% of sales to 0.21% of sales from 1997 to 2005. In this organisation 'cost of quality' means *the expense of failing to provide a quality product or service,* and requires the measurement of the costs of:

- Materials and labor for rework,
- Correct shipping and customer service errors,
- Product replacement and waste.

When organisations focus on reducing costs they will usually do this at the expense of customer and employee satisfaction: "the costs of poor quality make up as much as 15% to 30% of all costs" (DeFeo, 2001). On the other hand, when organisations focus on eliminating 'poor quality' by elimination of waste, reduction in inaccurate orders or billings, reduced allowances to customers for late delivery, they can reach their targets for cost reduction in ways that result in improved relationships with customers and employees, and other stakeholders.

It is possible to extend this concept to stakeholder engagement processes and practices. 'Stakeholder engagement is free' – makes it more relevant to today's organisations. The cost of NOT understanding and engaging ALL stakeholders is tangible[3]:

- Substantial costs in compensation to affected stakeholders or product recall,
- Loss of assets,
- Loss of share value.

More importantly, intangible costs include loss of reputation and reduced morale of staff.

[3] The case study of BP's disaster in the Gulf of Mexico in 2012. One hypothesis is that too much focus on cost cutting for 'shareholder value' resulted in the failures of the Macondo Well and subsequently the oil spill and loss of life and livelihood.

A maturity model for stakeholder engagement

A maturity model approach enables the organisation to define a starting point for improvement efforts and a means of measuring improvements. The Stakeholder Relationship Management Maturity (SRMM) (Bourne, 2012) has been developed as a tool for measuring the levels of use of consistent, wide-spread stakeholder relationship management processes and practices. Each level defines the existing state of stakeholder relationship management in an organisation. This existing state is the starting point for planning the implementation of processes improvements to enhance the effective management of stakeholder engagement within the organisation. In developing this concept, a number of levels of organisational readiness have been described that link:

- Organisational willingness to engage proactively in developing and maintaining stakeholders relationships; and
- Techniques, processes or practices that can assist in achieving those objectives.

Through an understanding of the level of readiness an organisation its management can define the starting point for improvements in stakeholder relationship management. Using SRMM will enable effective and pragmatic implementation of stakeholder relationship management processes and practices within an organisation. It provides a framework for progressively building capability towards proactive and creative management of its stakeholder relationships in alignment with a structured approach to achieving organisational maturity in stakeholder relationship management.

Stakeholder Relationship Management Maturity (SRMM)

The five levels of SRMM are:

- Level 1 - Ad hoc**:** some use of processes, but isolated, reactive and not consistent.
- Level 2 - Procedural: focus on processes and tools, as a reflection of focus on delivering traditional, measurable results – schedule, budget, quality without necessarily recognising the importance of relationships with stakeholders.
- Level 3 - Relational: focus on the stakeholders and mutual benefits, and the recognition that communication is the tool for stakeholder relationship management, but the communication must be targeted to meet the needs (often conflicting) of the stakeholder community as well as the needs of the organisation within the capacity and capability of the team.
- Level 4 - Integrated: the organisation's methodology is repeatable and integrated across all areas and functions of the organisation that are responsible for activities that in some way contribute to the organisation's business strategy.
- Level 5 - Predictive: used for health checks and predictive risk assessment and other creative and proactive ways to measure improvements in the delivery of the business' strategy (Bourne, 2012).

The benefits of using a tool such as SRMM are that the improvements agreed by the organisation's senior management can introduced to the extent that the organisation can absorb the changes and also measure the benefits of doing so. It avoids over-ambitious implementations which can lead to failure.

Table 2 shows an overview of the model.

Table 2

Guidelines for implementing SRMM

SRMM Level	Features	Methodology Steps	Reporting / Tools	Comments
1. Ad hoc: some use of processes	Individuals recognise the need for stakeholder relationship management; may not use an existing methodology	Generally focuses on simplified selected steps:	Self-developed tools - Word templates - Spreadsheet lists	Requires continuous and significant management 'push' to maintain impetus
2. Procedural: focus on processes and tools	SHM introduced as part of the implementation of consistent processes	Sometimes all five steps but truncated and simplified	Standardised tools - Word templates - Spreadsheets - Simple database	Require continuous and significant management 'push' to maintain impetus
3. Relational: focus on the stakeholders and mutual benefits	Recognition of usefulness for consultation, competitor analysis, or support for mergers/acquisition	Move towards valuing insights / information in decision making	Fully functional tools - Spreadsheets with macros - Sophisticated databases	Useful for specific applications or events; rarely with an intention of continuous application
4. Integrated: methodology is repeatable and integrated	'Business as usual' application using the full methodology for all projects and selected operational work	All Steps of stakeholder methodology evidence of success	Graphic reports, engagement profiles, etc, used in management reports and KPIs	The methodology and tool repeatable application within that part of the organisation
5. Predictive: used for health checks, predictive risk assessment, management:	Implementation of the full methodology and supporting tools	'Lessons Learned' & comparative data. Integrated data	Trend reporting, pro-active risk identification Comparison between projects and different categories of work	Organisation –wide and complete focus on continuous improvement as competitive advantage

Source: Author construction

Ethical approaches, reputation and CSR

The starting point for a correct approach to stakeholder engagement is that "most people, most of the time, want to, and do, accept responsibility for the effects of their actions on others" (Freeman, Harrison, Wicks, Parmar, & deColle, 2010). If business is separated from ethics there can be no moral responsibility for business decisions. What this means is that:

- People engaged in value creation and trade (in business) is responsible precisely to *"those groups and individuals who can affect or be affected by their actions".*
- This means at least: customers, employees, suppliers, communities and financiers (shareholders).

Stakeholder theory, then, is fundamentally a theory about how business could work at its best.

It is descriptive, prescriptive and instrumental at the same time. Stakeholder theory is more than just considering value for shareholders – it is more complex, because there are many

relationships involved. For any organisational activity there will be a complex web of human beings and their needs and wants (stakes). Instead of the flawed shareholder value paradigm, developing a 'stakeholder mindset' in organisations and by extension in projects and programs is, paradoxically, a better way to maximize profits, where:

- Business is a set of relationships among groups which have a stake in the activities that make up the business.
- *Business is about how customers, suppliers, employees, financiers (stockholders, bondholders, banks), communities and managers interact and create value.*
- To understand business is to know how these relationships work.
- The executive's job is to manage and shape these relationships (Freeman et al., 2010).

There is great value to be gained in examining how the stakes of each stakeholder or stakeholder group contribute, positively or negatively, to the value creation process of a business; and what the role of the executive is in stakeholder relationship management. In this context stakeholders are defined:

- Narrow: those groups without whose support the business would cease to be viable: categorized as 'primary' by (Freeman et al., 2010). Such thinking was also the basis of the categorization of stakeholders as 'legitimate' and 'salient' (Mitchell, Agle, & Wood, 1997), leading to the accepted viewpoint that only the 'important primary' stakeholders matter.
- Wider: those who can affect the business, or be affected by its activities categorized as secondary or instrumental (a means to an end). This wider idea of stakeholder includes those who are affected by the introduction of extractive programs because they do not benefit and are nominally powerless to change the way the business operates.

(Freeman et al., 2010) have the final word:

Executives need to understand that business is fully situated in the realms of human beings; stakeholders have names and faces and children AND they are not placeholders for social roles.

In addition, when 'powerless' communities are pushed too far, they can resort to extreme action attacking and destroying the cause of their oppression.

Conclusions, proposals, recommendations

The focus of this paper was on the treatment of the powerless by large organisations introducing mining and other extractive programs into communities. These organisations range from multinational corporates, Government enterprises, private companies and partnerships between local companies and international conglomerates. It looks at the readily available date from the treatment of local communities by these organisations and seeks to analyse the causes and consequences as well to define a more effect way to approach stakeholder engagement to prevent the catastrophes described in the four cases. It also emphasizes that the adverse reactions of the 'powerless' can often cause these programs to fail entirely, or at least result in significant losses for the organisation. The principles are the same for all projects and programs, even the business projects that we are most familiar with. Early and frequent consultation with those affected by the work is essential – it is prudent but also more cost effective in the long-

run. Understanding stakeholder expectations and working to meet those is far more effective than the risky business of trouble shooting issues as they appear.

The info from the study of these four cases gives a strong indication of the need for organisations to invest in early and frequent consultation with ALL stakeholders, but more research needs to be conducted in enterprises other than in the extractive industries. Senior managers often require a business case before agreeing to invest more in stakeholder engagement practices – they are not convinced that there is benefit. Research needs to be conducted on ways to gather the costs of 'failure' dollars. The managers I have interviewed are reluctant to do so because it may be seen to reflect poorly on their management capabilities. Research may uncover other ways to track the negative costs of stakeholders who are not consulted or weaknesses in the current stakeholder engagement practices. Finally more research needs to be conducted into the scalability and feasibility of using the SRMM model to drive effective improvement of stakeholder engagement practices within an organisation

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THE CRITICAL FACTORS FOR PROJECT TEAM COLLABORATION IN DEVELOPING NEW PRODUCTS: QUALITATIVE PERSPECTIVE

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Abstract

Human factor is the biggest challenge to project success and results. New product development (hereinafter NPD) projects require not only different competencies from different fields, but collaborative approach as well. Collaboration in project management is considered as one of the most important factors allowing to reach project's success (Hansen M.T. et al., 2006). The paper deals with the factors determining an efficient collaboration of teams developing new products. The analysis of the scientific literature reveals three levels of critical factors of collaboration: organizational, team and individual. However, this paper is focused on theoretical and empirical analysis of organizational and team level factors of collaboration by employing qualitative research approach (focus group, and content analysis). A list of critical factors for project team collaboration in developing new products has been developed on the basis of team performance success theoretical findings. As a result of the content analysis, categories and sub – categories of collaboration factors have been revealed.

Key words: *collaboration, new product development projects, team, factors.*
JEL code: *O15, M12*

Introduction

Dynamically and rapidly changing environment, perfection of technologies, development of innovations, and, herewith, changing needs of clients raise new challenges to business. These reasons are conditioning organizations' need to improve products' quality, to tackle related problems more efficiently and to improve activity results (Edmondson E.C. et al., 2009). Successfully developed new products become one of the most important factors that create business competitiveness, and the human factor is a presumption for development of successful new products. In development of new products there are often used methodologies and tools of project management (Rolstadås A. et al., 2014). It is noticed in scientific literature that properly formed and managed team of new product development allows to reach better results and more successful products (Hirunyawipada T. et al., 2010; Hirunyawipada T. et al., 2015). A topic of new products development is analysed in scientific literature widely enough: Bstieler L. et al. (2003) analysed an effect of environmental uncertainty on process activities, project team characteristics, and new product success; Dayan M. et al. (2009) analysed antecedents and consequences of team reflexivity in new product development projects; Islam et al., (2009) analysed the relationship between team learning and top management support; Holtzman Y. et al. (2011) analysed a role of diversified teams in development of new products, Martinuso M. et al. (2013) analysed the organizational impact of product development projects; Parkinson C. (2006), Son J.W. et al. (2011) analysed teams' collaboration as organization's strategical necessity. Abundance of scientific studies that analyse factors of new product development success indicates the interest of academic society and importance of the problem, however role and factors of team collaboration in new product development still remains researched poorly

enough. In scientific literature, a topic of collaboration in projects is analysed by distinguishing levels of both organization, and team and individual. In other words, we can distinguish three categories of factors positively or negatively affecting teams' collaboration. Hence, we distinguish the factors of organization, team and individual levels. Further in this article we will analyse the factors of project teams' collaboration at organization and team levels only.

The goal of the article is to examine the factors determining an efficient collaboration of teams developing new products.

Literature review

Collaboration. Collaboration concept is used to describe the organizational relationship. Collaboration concept is often used intuitively or as a synonym to coordination, cooperation, communication and partnership (Atkinson J. et al. 2004; Brown K. et al. 2003; Hara N. et al. 2003). Many different descriptions of the collaboration concept can be found in scientific literature. Son J.W. et al. (2011); Parkinson C. (2006); Patel H. et al. (2011) describe collaboration as a reciprocal process when two or more persons or organizations work together. A presumption can be made that participants of this process have common goals. Persons that participate in the process are taking higher benefit by collaborating when they share their experience and knowledge, than when working separately. Calantone R. et.al (2011) and Kahn K.B. (1996) in collaboration concept highlight a reciprocal understanding, common vision, common goals and sharing resources between divisions. Patel H. et al. (2011) state that collaborating persons have a sense they are doing good job together, and ask for advice of each other. Gibson C.B. et.al (2003) highlights common efforts in striving for a common goal, and Kahn K.B. (1996) highlights an emotional process. Again, Deutch M. (1949) developed a theory of collaboration and competitiveness, which compares the work of persons in a competitive environment, when persons are working together, and in a competitive environment, when persons are working independently and competing with each other. Collaboration and competitiveness relationship are analysed through dimensions of communication, interrelationship, work distribution, valuables, responsibility, knowledge and skills as well as interests. In the theory, collaboration is in contrast to competitiveness; positive influence of collaboration on team activity and its results are highlighted, and in contrary in case of influence of competitiveness. The positive influence of collaboration creates an effect of synergy and makes presumptions for the team's productivity (Johnson D.W., 1979).

Collaboration in project management is considered as one of the most important factors influencing the project's success (Hansen M.T. et al., 2006). Due to inter-sharing of knowledge and experience, successfully collaborating project teams can reach an increase of benefit, decrease of input, more efficient process of problems tackling and shorter period of the project's implementation.

New product development team. Project Management Institute, PMBOK (2013) describes project's team as project manager and group of persons that are working together in striving for implementation of project goals. New product' development *project team* is a group of persons, the goal of which is to work together by implementing new products development projects that require knowledge, abilities, experience in different areas, and in striving for successful implementation of the project (Brown K. et al., 1995; Shen X., 2002). Project Management Institute, PMBOK (2013) describes project's team as project's manager and group of persons that are working together in striving for implementation of project's goals. New

products' development *projects team* is a group of persons, goal of which is to work together by implementing new products' development projects that require knowledge, abilities, experience in different areas, and in striving for successful implementation of the project (Wynstra F. et al., 2001; Shen X., 2002; Burford L.D., 2013). Teams consist of persons with different knowledge and skills are also being called diversified or heterogeneous teams of NPD (Holtzman Y. et al. 2011). Diversified teams differ from the usual team by the fact that every person of the team is a specialist of different area with certain knowledge, competencies required to develop a particular project (e.g. research-development, marketing, production and other) (Hackman J.R., et., 2010).

Factors determining project team collaboration. In scientific literature, a topic of collaboration in project is analysed by distinguishing levels of both organization, and team and individual. In other words, we can distinguish three categories of factors positively or negatively influencing projects team collaboration. Hence, we distinguish factors of levels of organization, team and individual. Further in this article we will analyse the factors of project teams' collaboration at organization and team level only.

Organizational culture, structure, processes and involvement of team members in processes can be attributed to the factors of organizational level. Team's vision and goals, conflict management, communication, team learning and motivation can be attributed to the factors of team level.

Organizational culture. Organizations in striving for own strategic goals are following the provisions and system of valuables established in the organization. Organizational culture positively affects collaboration, trust, and reciprocal accountability, higher levels of initiative and proactivity among team members (Furst S. et al., 1999). Organizational culture results in a high level of shared leadership perception, which, in turn, causes high proactive behaviour by team members. Moreover, Erkutlu H. (2012) investigated that organizational culture, moderated the positive relationship between shared leadership and proactive behaviour. Development of organizational culture is one of manager's activities, allowing to form an environment of mutual trust and respect in which employers' value their team membership (Paul J. et al., 2001; Avolio B.J. et al., 2004); inspire and motivate teams to perform at their best (Shamir B. et al., 1993). Jones S. (1996) highlights two priorities of the point of view oriented towards people that is based on the main collaboration provisions and skills: long term, agreement, collaboration, learning relationship with employees, suppliers and users; investment in training, research and development, equipment. Culture, valuables, principles allow to reach desirable results if they are clearly communicated in the organization, supported by an organization's management (PMBOK, 2013; Shen X. 2002; Hershock R.J. et al., 1994; Burford L.D., 2013). Management support and clear agreements and standards are strong motivations for teams' collaboration (Kumar T., 2005; Holtzman Y. et al., 2011). If organization's management does not estimates NPD team properly, gives different priorities and responsibilities to team members, there appear collaboration barriers (Griffin *et.al*, 1996). In point of view of project management, discontentment in organizational culture is the main reason causing failures of project management (Besta A. et al., 2013).

*Organizational structure***.** NPD teams have to collaborate with organization's different internal divisions, different project teams, and supply chain partners. Strict hierarchic structure is considered as one of the barriers for efficient team work. It often determines limited information flows. Flexible, transparent and interactive hierarchy of organizational structure

motivates team to strive for results by collaboration of different functional groups (Hershock R.J. *et.al*, 1994; Holtzman Y. et al., 2011).

Organization's processes and team members' involvement into them. Well-structured process of new product development with clearly described integrated activities and importance and role of every functional group as well as involvement of team members into the processes is a base for successful collaboration of project team (Ahmed C.S., 2000; Ulrich K.T. et al., 2008). Consistent and concerted technology, optimally evaluated need for resources and schedule, eliminated overlapped activities and responsibly planned works not only create presumptions of successful collaboration but also decrease a probability of mistakes, develop better understanding of responsibilities, well-run work. Besides, having strengthening a dimension of collaboration, team's inter-integration can be improved, period of product development process shortened (Ahmed C.S., 2000; Schilling M. *et.al*, 1998). In order to ensure collaboration, it is very important that members of product development team would be responsible for the whole process of product development, and not for the part of it (Strazdas R. et al., 2010; Holtzman Y. et al., 2011). Product development teams with higher integration while analysing needs of users, generating and analysing new ideas, developing new products according to market needs, analysing users' requirements or revising results of market testing usually are collaborating successfully (Griffin A. *et.al*, 1996).

Goals and vision. Diversified NPD teams have a lot of potential in the implementation of successful projects. However, they also are the teams that are difficult to manage successfully (Dreu C.K. et al., 2003; Pelled L.H., 1996). The ability of all team members to name and understand project's goals directs them towards purposeful work and allows to combine them to personal goals. Project goals enable team members to determine what actions are suitable or unsuitable for project implementation. Clear goals and formed vision are related to better activity results and strategy development at both individual and team levels (Lynn G.S. et al., 2001). However, hidden and vague goals negatively affect collaboration (Pun, P.K., 2007). Knowing of vision allows understanding of the totality of projects'goals, priorities and relationship with the organization. Holtzman Y. (2011) states that understanding of goals is not enough. In striving for better results, the team has to be committed also. If knowing of the goal allows people to know direction of activity, then commitment is what motivates the team to work and strive for results. Besides, commitment shows ownership of the goal and mutual accountability. Presentation and positioning of goal and vision is an underlying activity of project manager (Schilling M. *et.al*, 1998).

Complex nature of NPD projects together with strict costs of product development and time limitations inevitably stimulates *conflicts* in the team, and management of these conflicts becomes very sophisticated (Song X.M. *et. al*, 1997). Conflicts have different influence at different stages of the project (Hsieh T. *et.al*, 2008): Ideas of new products generated at the stage of *initiation* require for coordination of different point of views and experiences, proposal of new ideas. Conflicts between team members at the stage of initiation are useful and allow estimating different opinions, analysing different information and so on. However, emotional conflicts disturb sharing of information between team members and negatively affect team collaboration at the primary stage of NPD. At the stage of implementation, there is a striving for /realising of chosen product concept. Conflicts that appear at this stage, without reference to tasks, or emotional ones, disturb team's collaboration.

Another essential competence of any team manager is the ability to create a *qualitative communication* and information flow in the team (Holtzman Y. et al. 2011). In modern collaborating team, members communicate often (Brown S.L., *et. al*, 1995), openly and honestly (Mountfort J.M.P., 1997). Clear and often communication of team manager and members become very important (PMBOK, 2013). Knowledge should be shared within all functional groups because successful collaboration requires knowledge integration between members of NPD project teams. Team members by interacting and spreading information in projects of new products development decrease probability of indetermination and stimulate collaboration (Zahay D. *et. al*, 2011).

By scientific researches it was proved (Lynn G.S. *et.al*, 2003), that *team's learning* is a corporate activity based on knowledge development and sharing, by involving collection, interpretation of information in striving to implement team's and organization's tasks. NPD projects require for a wide spectrum of knowledge integration and collaboration between team members. Ability to learn is considered as another factor of collaboration (Holtzman Y. et al., 2011), which allows to learn from each other, create the totality of different knowledge and competencies (Brown S.L., *et. Al*, 1995). Rapidly learning NPD project teams collaborate more successfully: they develop and introduce into market new products more rapidly and with a higher probability of product success (Lynn G.S. *et.al*, 2003).

Product development team and manager have to be well *motivated* to develop successful product (Strazas R. *et.al*, 2010). Collaboration and commitment of team members are strengthened by obtaining benefits and assessment. Because different persons are being stimulated by different things, it is useful for a team manager to strive to know those motivations of team members (Holtzman Y. et al., 2011). Motivation of team members is being increased by system of product innovations' proposals when employees can give their ideas for coming of new product. Success of team collaboration is positively influenced by innovation friendly environment that is developed in organization, toleration of risk, free working time given to employees for development of their ideas (Strazdas R. *et.al*, 2010). Besides, team manager has to strive for development of the atmosphere that stimulates creativity and involvement of team members (Mountfort J.M.P., 1997).

Methodology

The 1 figure illustrates the logical sequence of this research; the dashed rectangle embeds the scope of research which results are presented in this paper. The empirical research aimed at exploring the critical factors for the effective project team collaboration. This paper deals with the results of focus group only, the qualitative research will be conducted in the near future and after having generated the main aspects of this phenomenon to prepare the questionnaire for the quantitative research.

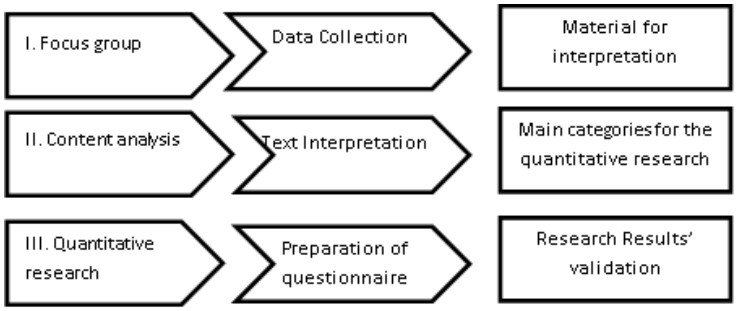

Fig. 1. **Research framework**
Source: Authors' construction

Data collection method. The focus group was chosen as the data collection method. This method has widely been adopted in practice, especially in health, market and social research (Liamputtong P., 2011). Its distinct feature is interview of group of respondent. The distinct between structured and less structured focus group research is usually discussed, the first type needs for more involvement of moderator and the manner of the focus group is more to answer a particular question, while in the other type – less structured focus group - the discussion in the group is essential (Liamputtong P., 2011).

Following the main research question (what are the critical factors for the new product project team collaboration), the discussion questions were prepared for the participants of the focus group. The focus group consists of 9 project managers from different types of sector (service sector, manufactory and beverage industry). The main criteria for the participant were as follows: experienced (no less than 5 years) project manager in new product development projects.

In this paper the less structured focus group technique is presented as the main data collection method. Thus the main topic questions for the focus group discussion have been elaborated and are as follows: perception of collaboration in project teams; driving factors of collaboration in the project team, the role of organizational culture and structure in project team collaboration.

Data interpretation method. Text is a transcript of focus group records. In order to make an in-depth interpretation an analytical technique - the qualitative content analysis has been employed. The essence of content analysis – interpret text with caution to maintain/preserve the important message coded in the text. Mainly content analysis is classified as qualitative and quantitative (Hsieh T. et al., 2005; Mayring Ph., 2000).

This method is widely used in a various scope of sciences, for example, health and social sciences. The three different approaches are identified in content analysis: directed, conventional, and summative. The differences among them lie in the coding system, origins of

codes, and threats to trustworthiness (Hsieh T. et al., 2005). For instance, categories in conventional content analysis are derived directly from the text data. A directed content analysis approach begins with the theory analysis and the research findings are prerequisite for initial codes. During a summative content analysis counting and comparisons of keywords are central issue (Hsieh T. et al., 2005). In this paper the conventional content analysis is employed. The categories were carefully founded and revised within the process of analysis.

Results

Having analysed the interview material the following results were extracted and divided in to subsections.

Project team collaboration categories. The interview with experts has revealed that during the new project initiation and implementation the individuals from different departments are engaged. Therefore the focus for the need of collaboration and integration of several of competences and skills within the team was argued in the focus group ("New product development team includes people from different departments, therefore it is important to align different expectations. For example, if you are talking about the quality department, production, marketing department, all people, have their own expectations and has their own desires."). And usually the collaboration in the project team embeds such features like members' involvement, contribution and others (see table 1).

Common view category means that every team member equally perceives the target and expected result ("We need to be sure that talking about the same thing. Our ultimate goal must be equally understood by all team members, e.g. other specialists.").

Table 1

The features of collaboration, in new product development team

Category	**Sub-category**
Involvement	*Involvement in the project*
Contribution	*Contribution to the project results*
Clear idea	*Explicitly transferring idea to the rest of team member*
Effective communication	*Effective communication [among team members]*
Common view	*Common understanding of final result for each team member*
	Common target
Respect to individual expectations	*Aligning different expectations*
	Identifying individual expectations

Source: author's summary based on the interview with experts

To sum up the categories extracted during the content analysis regarding the perception of collaboration is concordant with the main idea of communal in the theoretical discourse (Calantone et.al, 2011; Gibson et.al, 2003; Roger et.al, 2005). The communal refers to *Common understanding of final result for each team member* and *Common target* (see table 1). And moreover the team member involvement, the effective communication, contribution to the project results, pursue for a common goal and clear idea, meaning „to be on the same page" are essential features for describing collaboration in new product development project team.

Factors for the project team collaboration. The results have indicated that "Team leader features" is the core factor for the project team collaboration in new product development team,

according to the discussion in the focus group the essential features embeds: proactivity, open to innovation, capable to moderate, communicate with the team members and also open to innovation (see table 2).

Table 2

The factors for the effective project team collaboration in new product development team

Category	Sub-category
Team members' engagement	Product team member engagement
	Individual willingness to contribute to the project results
	Integrating of each member's competences
Team leader's features	The influence of team leader to the collaboration
	Very proactive
	Interested
	Open to innovation
	Listen to other team members
	Moderator
	Effective conflict management
Effective communication	Effective communication [among team members]
	Rules of communication
	Periodically assessments and meetings
	Timely corrections (if needed)
	Explicit plan for processes
Organizational culture	Friendly environment/surrounding
	Formation of intercommunion
	The way of behaviour
	Organization values
	Mutual collaboration
Organization's leadership role/ organisational structure	Organization's leadership approach to cooperation
	Enhancement of collaboration
	Tolerance towards well-founded risk
	Support in critical situations
	Open leadership
	Democracy structure

Source: author's summary based on the content analysis

The content analysis revealed that organization culture is one of the project team collaboration factors. To illustrate "Culture is an important for collaboration, because it forms the mutual cooperation relations, the way we work, we treat each other". Not forgetting the values of organization like tradition, culture and responsibility.

The results illustrate that the leadership of the organization influences the collaboration in the project team significantly in terms of formation of organizational culture, communication of values, both internally and externally and supporting of troubled projects.

Conclusions

The content analysis of focus group has revealed that that organization culture is one of the project team collaboration factors and it embeds such sub-categories like *Friendly environment/surrounding; Formation of intercommunion; The way of behaviour; Organization value; and Mutual collaboration*.

Moreover the role of Organization's leadership also has appeared to have the influential impact on the collaboration within project team, and it refers to such sub categories like *Organization's leadership approach to cooperation; Enhancement collaborate; Tolerance towards well-founded risk; Support in critical situations; Open leadership and Democracy structure.*

Following the research framework presented above the quantitative research will take place in the near future, which will integrate the categories and sub categories extracted within this research scope, not forgetting the psychological dimension like conformism and stigmatism as the barriers for the effective collaboration.

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STAKEHOLDERS IMPACT ANALYSIS IN HIGHER EDUCATION STUDY PROJECTS

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Abstract

The environment of higher education institutions became more and more dynamic and market oriented. Comprehending raising problems and possibilities is not an easy task. In order to cope with it higher education institutions initiate and implement various projects. However changing environment of higher education institutions affects project management activities and projects results as well. Beside of the importance of the implemented projects results, one of the main challenges of higher education projects is the identification and harmonization different stakeholders' needs, expectations and their impact to project activities and project results.

Based on growing higher education stakeholders' impact on higher education institutions projects the purpose of this paper is to determine and analyse the impact of stakeholders on higher education study projects.

To explore raised problem the paper integrates logical and systematic scientific papers analysis. The research process focusses on higher education study projects examples and empirically based on Olander (2007) stakeholders' impact index. In order to determine higher education study projects stakeholders influence research calculates stakeholder's impact index in relation to the project lifecycle stages.

The analysis of higher education study projects stakeholders' points to the future research area. Longitudinal research results could provide contributions to project management theory.

Key words: *Higher education institutions, study projects, stakeholders.*
JEL code: *O22, I23.*

Introduction

Changing environment, increasing competitiveness brought changes to higher education institutions. Higher education institutions management processes expanded from student oriented approach to partnership oriented approach. Consequently these changes brought the changes of stakeholders connected to higher education institutions (Mainardes et al., 2010). For example students have more and more power related with study process, employers require creating a system of learning wide spectrum and interdisciplinary knowledges, the financially strict conditions of government institutions forces of finding new sponsorships ways.

For some years scientific literature has identified projects or innovative approaches as a key source of higher education competitive advantage (Harrow, 2014). However at the organizational level, project management literature focus on the business field for e.g. construction projects rather than on the higher education projects. Even more the awareness of changing environment requires reviewing a fundamental shift of higher education project stakeholders' management. Stakeholder opposition has been reported as the main reason for project failure (El-Gohary et al. 2006). Moreover Beringer et all (2013) states that stakeholder management are key success elements for project management. As higher education project

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stakeholders can make an important impact to the project results it becomes one of the central issues in order to achieve a high quality and coherent project results.

To address this gap in higher education projects stakeholders' management research filed, this article takes the first step in understanding stakeholder impact to higher education projects by the setting up research question: How to determine the impact of stakeholders and to assure their successful management while implementing higher education projects? Based on the Stakeholder theory approach, paper uses a systematic review approach to formalize higher education projects stakeholders' identification and provides impact analysis based on developed and tested Olander (2007) stakeholder impact index.

Literature review

Origins for project stakeholders' analysis

A considerable amount of literature has been published on stakeholders' analysis. As well as in project management area there has been published demanding amount papers on understanding stakeholders' definition. While scientific literature on stakeholders' management can be traced back to 1980s, project stakeholders' theory construction is a much more recent development. A dominated theoretical issue related with stakeholders' definition in the field of project management was based on general stakeholders' definitions. As reported by Freeman (1984:46) stakeholder is "any group or individual who can affect or is affected by the achievement of the organization's objectives". Similarly, Eden and Ackermann (1998: 117) suggest defining stakeholders as "a people or small groups with the power to respond to, negotiate with, and change the strategic future of the organization".

The diversity of stakeholders' definitions implies that project stakeholders' definition combines broad and narrow approaches. Typically broad project stakeholders' definitions initially focus on the Freeman (1984) definition and shows project impact on stakeholders. For example PMI (2004) stakeholders describe as a persons or organisations, who are actively involved in the project or whose interests may be positively or negatively affected by the performance or completion of the project. Similarly Edum-Fotwe and Price (2009) stakeholders describe as individuals or group of individuals and organizations directly involved in the activities of the project. The narrower project stakeholders' definition highlights the individual interest of a particular stakeholder (Aaltonen & Kujala, 2010). Numerous studies have argued that project stakeholder could be defined as a person or group of people who are interested in project success and cares about environment which the project operates (Turner, 2014). For example McElroy and Mills (2000) uses a narrower approach and stakeholders describe as an individuals or groups who have interests on the project success and are acting at the same project environment. Moreover, detailed examination of projects stakeholders' definition by Miles (2015) indicated that there is no any of logical and systemic construction of project stakeholders' definition. Rather than doing so the author suggest focusing on the delineation of the stakeholders' contextual analysis.

Project stakeholders' analysis is an important part of project stakeholder management (Missonier, & Loufrani-Fedida, 2014). Typically stakeholders' analysis refers to the project planning phase. During that stage it is necessary to understand how different stakeholders may impact project results. However, according to Olander and Landin (2005) successful transactions with stakeholders are built on project team awareness on stakeholders. A negative

stakeholders' perception or inadequate management can obstruct a project. As project stakeholders may be affected by project processes or project results they must not be ignored in project management (Beringer et al., 2013). Moreover scientists focus on a pivotal role of the project stakeholders' relationships analysis. As reported by Schiller et all (2013) stakeholders concept emphasize the importance of the stakeholders relationships' during project evolution process by answering to these questions: are the stakeholders being affected by or are they affected something or someone? In order to understand why this is so, recent scientific contributions have showed the importance of stakeholders' dynamics during the project lifecycle (Aaltonen & Kujala, 2010). Aaltonen and Kujala (2010:383) argue that "<…> each phase of the project lifecycle presents different environmental and social risks and opportunities for the project and for the stakeholders<…> so <…> different stakeholder engagement practices need to be employed during the different phases of the lifecycle". In a general approach, the main purpose of project management to win stakeholder support in order to make issues driven project processes than stakeholders driven (Jergeas et al., 2000).

According to Missonier and Loufrani-Fedida (2014:1108) "the management of a project's stakeholder means that the project is explicitly described in terms of the individuals and institutions that have a stake or an interest in the project". In this context, the ground on which stakeholders hold a power relative to project possibility to change depending on the impact which the stakeholders has. According to Van Offenbeek et all (2016:46) "developing an eye for the varying nature of issues, the forms of interrelatedness between project stakeholders, and how issues are intertwined with stakeholders' developing positions and views, may be a start in dealing with issues more consciously and choosing more deliberately and strategically which issues to prioritize".

While a number of studies have addressed the relationships between the various project stakeholders, the project stakeholders' identification and clustering as an operational construct is a gap in project management literature. In order to accomplish project stakeholders' analysis adequately, Gibson (2000) proposes to decompose project stakeholders into two project stakeholders' groups which are directly and indirectly related to the project activities. Winch (2004) suggests dividing project stakeholders into internal stakeholders who primary supports the projects (for. e.g. project owners, project client or client organization, project management team, user of final project result, suppliers, contractors, subcontractors, employees, creditors, financiers and etc.) and external stakeholders who are not formal members of the project, but may affect or be affected by the project or project results (for e.g. local and national authorities and governments, social organizations, political organizations, local communities, the general public, environmental agencies, interests groups, real estate owners, nearby residents, trade and industry, social services, media or anyone who believes he or she has a stake in the project). Kloppenborg (2009) developed a stakeholder grid which classifies project stakeholders into internal or external to the organization executing the project whether are they affected by the project processes or project results.

Project stakeholders' analysis incorporates different methods potentially useful to set up analysis, which can be classified into empiricism and rationalism analytical perspectives (Yang, 2014). Empiricism analytical perspective is based on the experienced way of stakeholder analysis. While rationalism analytical perspective is based on the almost all stakeholders' analysis results. According to Yang (2014) empiricism analytical perspective of project stakeholders' could be measured by focus groups, interviews, stakeholder circle methodology,

surveys, workshops, while rationalism analytical perspective of project stakeholders' could be measured by snow-ball sampling and social network analysis. Most of the project stakeholders' analysis methods can be recognized as a 'diagnostic behavioural instrument' (Davis, 2016 cite Pinto & Slevin's, 1987). However in the domain of the project stakeholders' management project stakeholders' analysis goes only beyond the project planning phase. It represents a significant gap in a more detail internal and external project stakeholders' analysis questions during different phases of the project lifecycle.

Origins for higher education stakeholders' analysis

With prospects of changing higher education environment, accelerating growth of different stakeholders' impact requires a new way of thinking about overcoming obstacles and acting on new opportunities. The higher education stakeholders' perspective might help higher education institutions to analyse reactional interaction of various stakeholders' (Jongbloed et al., 2008). Mainardes et all (2010:77) states that "identifying the stakeholders involved in higher education institutions is a fundamental step towards not only establishing competitive advantages for teaching institutions but also towards identifying their needs and setting up the means to meet them". Successful transactions with stakeholders are built on understanding stakeholders and determine their relevance to an organization or project (Brugha & Varvasovszky, 2000).

With the number of common characteristics higher education institution stakeholders could be analysed from organizations and individuals point of view. Mainardes et all (2010) propose that in many cases higher education institutions stakeholders are being analysed according to the influence or benefit gained from higher education institution. As higher education institutions are a complex and multifaceted systems, every stakeholder has a particular role dependent on their specific needs (Voss, Gruber & Szmigin, 2007). The core stakeholders of higher education institutions are students. As the main funder of higher education, another important group of stakeholders are government institutions (Jongbloed, Enders & Salerno, 2008). Lecturers and administrative staff are the other groups of stakeholders who have a significant impact on higher education institutions development. Table 1 presents findings related with higher education stakeholders groups.

Table 1

Higher education stakeholders groups

Researches	Higher education stakeholders
Wagner, Hassanein and Head (2008)	Students: undergraduate or graduate students who are enrolled at a university or college. Instructors: who may have (or have not) face-to-face interaction with their students. Educational institutions: include colleges and universities. Content providers: instructors. Technology providers: include broad range of service providers. Accreditation bodies: organizations that assess the quality of education institutions as a whole or higher education institutions developed programs. Employers: those organizations that will hire graduates of higher education institutions.
Jongbloed, Enders and	Governing entities: State & federal government; governing board; board of trustees, buffer organisations; sponsoring religious organisations. Administration: President

Researches	Higher education stakeholders
Salerno (2008); Marić (2013)	(vice-chancellor); senior administrators. Employees: Faculty; administrative staff; support staff. Clienteles: Students; parents/spouses; tuition reimbursement providers; service partners; employers; field placement sites. Suppliers: Secondary education providers; alumni; other colleges and universities; food purveyors; insurance companies; utilities; contracted services. Competitors: direct: private and public providers of post-secondary education; potential: distance providers; new ventures; substitutes: employer-sponsored training programmes. Donors: individuals (including trustees, friends, parents, alumni, employees, industry, research councils, foundations). Communities: neighbours; school systems; social services; chambers of commerce; special interest group. Government regulators: Ministry of Education; buffer organisations; state & federal financial aid agencies; research councils; federal research support; tax authorities; social security; Patent Office. Non-governmental regulators: Foundations; institutional and programmatic accrediting bodies; professional associations; church sponsors. Financial intermediaries: Banks; fund managers; analysts. Joint venture partners: Alliances & consortia; corporate co-sponsors of research and educational services.
Avcı, Ring, and Mitchell (2015)	Government: federal government institutions that are responsible for grant and aid funding, mandating laws, assessment and regulation processes. Parents and students, as well as student government associations. Governing board: responsible for electing, hiring, firing higher education institution presidents or faculty deans; responsible for the financial stability of institutions, compliance issues with federal and non-federal regulator bodies. Presidents as well as upper administrators. Faculty and staff. Communities. Donors such as foundations: Community Foundations, Family or Personal Foundations, Special Purpose, Foundation, Company Foundations, National Independent Foundations, who have significant effects on program development and higher education institutions operations.
Chapleo, and Simms (2010)	Students: sub-divided in a number of ways - prospective, current, or alumni; UK based or overseas; undergraduate or post graduate. Parents: as ‘funders’ and influencers. Schools: as a source of students as well as influencers. Student bodies such as The Student Union and National Union of Students. Local businesses and national business organisations. Staff of the university: divided into ‘academic’ and ‘non-academic’ staff groups. Academic and research bodies, including funding councils: Quality Assurance Agency, Higher Education Statistics Agency, Higher Education Funding Council and research councils. Regionally focused stakeholders: local government, local community, local police and community forums. The Government: Department of Education , Department of Innovation, Universities, etc. Societies, bodies and groups relevant to universities: ‘learned’ societies, such as the British Academy of Management, networking societies such as the Association of Business Schools, professional bodies. Trustees and governors.
Mainardes, Alves and Raposo (2013)	Students. Teacher staff and (or) researches. Employers. Research and development partner companies. National government: ministries, accreditation bodies. Municipality hosting the university (local public authorities). Non-teaching staff. Other universities and/or higher education institutions: public or private. The university/s surrounding local community: populations, company, services. Secondary level schools. Student families. Research and development actors: incubators, technological parks, patent agencies, research centres, external researches. Society in general. Senior university management: rectory team, general counsel. Professional orders. Private financiers: business angels, risk capital firms, investors.

Researches	Higher education stakeholders
	Business/commercial associations. Ex-students. Scientific communities and their publications and outputs. European Union. International students.

Source: Wagner, Hassanein and Head (2008); Jongbloed, Enders and Salerno (2008); Marić (2013); Avcı, Ring, and Mitchell (2015;. Chapleo, and Simms (2010) Mainardes, Alves and Raposo (2013).

As can be seen form the table, different scientist demonstrates different approach and different research data regarding to the groups of higher education institutions stakeholders. Moreover, it shows that higher education institutions extend their recognizing of the importance of different stakeholders included in the all higher education institution processes.

According to Jongbloed et all (2008) for mapping the relationships with higher education institutions external and internal stakeholders three attributes: power, legitimacy and urgency could be used. It may help to identify crucial stakeholders to deal with and which relationships to maintain. Detailed examination of higher education institution stakeholders by Bjørkquist (2009) showed that mapping stakeholders relationships with higher education institutions could be managed from voting, economic and political point of view. By the examining the effects of group influences, the author offers:

- to the group of voting add internal stakeholders as: University College Board, academics, students and technical-administrative staff, elected rector, faculty boards, elected deans and heads of department, appointed deans and heads of department; and external stakeholders as: external members of the University College Board, Tele mark county, the parliament, the government and the ministries;
- to the group of economic influence add internal stakeholders as: students; and external stakeholders as: the government, the parliament, the ministries, regional and local businesses contracting teaching and research;
- to the group of political influence add internal stakeholders as: students; and external stakeholders as: Tele mark county, regional and local businesses contracting teaching and research.

As can be seen from given examples, higher education institutions stakeholders can vary depending on the power to influence the higher education institutions decisions, processes and activities as well. Mainardes et all (2013) indicate that no one stakeholder holds a static position and the level of their influence can vary over the time. Understanding stakeholders' influence over higher education institutions can be done by evaluating various stakeholders influence over the time.

Origins for higher education projects stakeholders' impact analysis

Typically project success is measured by the time, costs and performance. According to Dvir et all (2003) there are a lot of evidences that project was executed as planned on time, within the budget and with perceived project results but turned out to complete failures. The problems is even more sense when the kind of project activities depend on the stakeholders impact on the outcomes of earlier project activities. It shows that if the time of project stakeholders' identification is usually the phase of project planning, the project could fail in 'neglecting' stakeholders' possible impact during project life cycle. According to stakeholder theory all the projects should allow to take into account the complexity of all project activities

and the returns of the activities results for all stakeholders. As stakeholders may influence projects in various stages: insights regarding to the probable stakeholders' reaction to a project activities and (or) outcomes necessarily need to be in parallel during the periods of project life cycle. In order to delineate the impact of projects stakeholders Yang (2014) proposed rationalism and empiricism analytical perspectives. Moreover delineation of stakeholders' perspectives requires analysing the different foundations for stakeholders influence such as power, legitimacy or urgency.

To summarise, the higher education stakeholders' review, the paper authors highlights that most of the research carried out in the higher education institutions context still employs almost the same groups of stakeholders. Consequently there is still much to be done ensuring higher education institutions stakeholders in a more contextual way, for example as higher education projects. As there are no scientific evidences about the higher education project stakeholders, this study contribute towards by using higher education stakeholders groups presented in the 1st table.

After outlining the higher education projects stakeholders' analysis, the other question that has to be answered is: how to measure stakeholders' significant impact on different project lifecycle stages. As different stakeholders impact analysis models (Stakeholders cooperation / threat model, Friedman and Miles stakeholder model, Mitchell's stakeholder salience model, stakeholder circle™ model, stakeholder grid, power / interest matrix, Rowley's stakeholder network model) emerge various stakeholder attributes, they are only used to identify important project stakeholders. According to the Wessinger (2012) the potential project stakeholders' impact index should include the information about: the source of stakeholders' power that makes them important in the context of the project; the level of stakeholders influence the project using their source of power; and stakeholders' possible interactions to look after their interests.

In order to achieve the objectives set, higher education projects stakeholders' impact analysis theoretically based on Olander (2007) developed projects stakeholders' impact index. Projects stakeholders' impact index provides a measure of the degree of stakeholders' impact in relation to the project. As the project stakeholders may influence projects in various project stages, the higher education project stakeholders' impact index incorporates different project lifecycle stages. Moreover the project stakeholder impact index emphasizes the role of internal and external project stakeholders. Internal higher education project stakeholders' impact index of each lifecycle stage of the project could be calculated as follow:

$$ISII_j = ViII \times A \times Pos \quad (1)$$

Where: $ISII_j$ – concrete project stage stakeholders impact index,
j - project lifecycle stage,
ViII – vested interest–impact index,
A - stakeholder attribute value,
Pos - position value.

External stakeholder impact index of each lifecycle stage of the project could be calculated as follow:

$$ESIIj_i = ViII \times A \times Pos \quad (2)$$

Where: $ESII_j$ – concrete project stage stakeholder impact index.

The stakeholder attribute value (A) is assessed by the weighing of power, legitimacy or urgency attributes. The position value (Pos) is numerically assessed as: active opposition,

passive opposition, not committed position, passive support position and active support position. If stakeholders' impact index is positive, the concrete stage of the project has a favourable stakeholder impact; if it is negative, the stakeholder impact is unfavourable.

Research methodology

To verify the usefulness of the empirical insights, a qualitative research strategy within interview method was completed. The data for the analysis was carried out during 2014 - 2015. The case of two ongoing higher education study projects was analysed. Because of the lack of higher education projects stakeholders existing research, the use of case study method contributed to understanding how higher education project stakeholders' impact index is actually conducted. Data was completed through structured interviews with the projects stakeholders and based on the initiation, planning, execution, control, and closing project life cycle phases (PMI, 2008). Firstly, the internal and external project stakeholders were identified and analysed. The analysed study projects included 16 project stakeholders who were indicated at the stage of project initiation. The first and the second study project had the same amount of identified stakeholders (see 2 table).

Table 2

Higher education study projects stakeholders groups

1st project	
Stakeholder	**Description**
Embody institution	European Social Fund Agency which was carrying out of project agreement obligations.
The head of the project	University representative who was carrying out the project agreement obligations and took responsibility for the project implementation activities.
Project team	These were responsible for the implementation of project activities, coordination, and control and project finance management.
Project employees: scientists, researchers, etc.	These were responsible for the certain organized activities, for e.g. research.
Target group of the project: university administrative staff	These were responsible for the internal study quality system design and implementation.
The Ministry of Higher Education	Was carrying the content of the project completion with the provisions of the national program.
Project participants	Students, faculties' members, alumni and others. They were responsible for providing information.
Final project result users	Students, teachers, and other persons associated with University.
2nd project	
Embody institution	European Social Fund Agency which was carrying out of project agreement obligations.
The head of the project	University representative who was carrying out the project agreement obligations and took responsibility for the project implementation activities.
Project team	Responsible for the activities of the project implementation, coordination, monitoring and finance management.
The Ministry	Ministry of Education and Science, which carried out the project contract

1st project	
Stakeholder	**Description**
	liabilities. The representatives of the ministry were responsible for project approval and funding.
Partners of the project	Union of the Architects which was carrying out the obligations of the project contracts.
Project participants	Integrated studies students. Students will use new learning materials and tools.
Final project result users	All university staff and students who will be able to use project results and developed study material.
Teachers	During the project implementation there were carried teachers training sessions, which were linked to the curriculum update.

Source: information based on the empirical research data.

Secondly the level and probability of higher education projects stakeholders was evaluated (from 1 to 5) and calculated vested impact index (ViII), thirdly the attributes for each higher education study project stakeholders' during project different life cycle phases were evaluated, finally the position of each stakeholder was evaluated by the calculation of internal and external higher education project stakeholders' impact index.

Pilot study research results

The higher education project stakeholders' impact index has been calculated as the mean of the influence of each study project stakeholder (see 3 table). The mean was calculated by summing the scores for influence for each column in the influence matrices (personal, positional and political). The average score for the 1st higher education study project internal stakeholders' impact index for analysed study projects implementation phase was 2.6 external stakeholders' impact index for analysed projects was 1.915.

Table 3

Project 1. Project life cycle phase: initiation.
The calculation of Higher education study project stakeholders' impact index

Stakeholders	**Attributes***			**Position**	**Higher education study project stakeholders' impact index**			
	Power	**Legitimacy**	**Urgency**		**ViII**	**A**	**Pos**	***ISIIj,* ESII$_i$**
Embody institution	0.4	0.3	0.3	Active support	1.00	1	1	*1*
The head of the project	0.4	0.3	0.3	Active support	1.00	1	1	*1*
Project team		0.3	0.3	Active support	1.00	0.6	1	*0.6*
Project employees: scientists, researchers, etc.	0.4	0.3	0.3	Active position	1.00	1	-1	-1
Target group of the project: university			0.3	Active support	0.57	0.6	1	0.342

Stakeholders	Attributes*			Position	Higher education study project stakeholders' impact index			
	Power	Legitimacy	Urgency		ViII	A	Pos	*ISIIj*, $ESII_i$
administrative staff								
The Ministry of Higher Education			0.3	Active position	0.45	0.4	-1	-0.18
Project participants			0.3	Neutral position	0.60	0.3	0	0.18
Final project result users			0.3	Active support	0.77	0.3	1	0.213

Source: information based on the empirical research data.

** The distribution of attributes weights was based on Olander (2007) example, and varied from 0.4 till 0.3, where power distribution max. was 0.4, legitimacy and urgency - 0.3.*

Table 3

Project 2. Project life cycle phase: initiation.
The calculation of Higher education study project stakeholders' impact index

Stakeholders	Attributes*			Position	Higher education study project stakeholders' impact index			
	Power	Legitimacy	Urgency		ViII	A	Pos	*ISIIj*, $ESII_i$
Embody institution	0.4	0.3	0.3	Active support	1	1	1	*1*
The head of the project	0.4	0.3	0.3	Active support	1	1	1	*1*
Project team		0.3	0.3	Active support	0.69	0.6	1	*0.414*
The Ministry	0.4	0.3	0.3	Active position	1	1	1	1
Partners of the project		0.3	0.3	Active support	0.77	0.6	1	0.462
Project participants	0.4		0.3	Active position	0.20	0.7	-0,5	*-0.07*
Final project result users			0.3	Neutral position	0.69	0.3	0,5	0.104
Teachers			0.3	Active support	0.60	0.3	0,5	0.09

Source: information based on the empirical research data.

** The distribution of attributes weights was based on Olander (2007) example, and varied from 0.4 till 0.3, where power distribution max. was 0.4, legitimacy and urgency - 0.3.*

The average score for the 2nd higher education study project internal stakeholders' impact index for analysed study projects implementation phase was 2.407 external stakeholders' impact index for analysed projects was 1.575.

Analysis revealed that the relative importance of different stakeholders depends on the evaluation of stakeholder attributes. Olander (2007) found that project stakeholder impact analysis data shows that the power is the most important attribute to affect the project's

decision-making process. Accordingly, adopting methodology for the higher education projects stakeholders' analysis provides objective insights.

Discussion and Conclusions

The higher education projects stakeholders' impact index could be implemented as a tool to identify and evaluate higher education project stakeholders' impact on different project life cycle stages. The calculation of the index gains to understand how the results of project activities affect the higher education projects stakeholders.

This is the first pilot study which incorporates study project stakeholders as a pivotal dimension for the project performance results. Previous studies have not addressed the higher education projects stakeholders' analysis comprehensively. The operationalization of higher education institutions study projects impact index and the pilot findings represent an important extension of Olander (2007) conceptualization of stakeholders' impact index. More specifically, it's significant impact on the higher education projects stakeholders' impact index supported by the theoretical insights and enabling role for higher education project stakeholder impact management, which have not been previously tested.

Another important finding turns to the impact of higher education internal and external project stakeholders. There was find out that low level of external higher education project stakeholders may change rapidly moving through the project lifecycle stages. This extends the traditional higher education situation where usually project authorities ignore the role of external higher education project stakeholders. Indeed the higher education project stakeholders' impact index may help to indicate the value of each project life cycle results.

While is acknowledged that many factors are outside domain of the project management which influence project performance, the theoretical part of higher education projects stakeholders analysis enhance our understanding of such phenomena. This study also has implications for higher education projects management practice. The first implication is the need of recognize the central role of the stakeholders impact index during each stage of project life cycle. The second implication for project management points the need to find the other measures of higher education project stakeholders attributes. The results of this study indicated that higher education project stakeholder's power, legitimacy and urgency attributes do not explain the crucial role of project stakeholders.

There is also limitation of this study. The study is not representative of all higher education projects. The case study was completed from two projects data. Also the study was time constrained and the researchers only had limited access to project stakeholders..

However this study also points to the areas of potential future research. As is often the case, longitudinal research could prove valuable contributions to project management theory development. Research from the different higher education projects perspectives would complement and add findings to this study.

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THE DESIGN THINKING APPROACH TO PROJECTS

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Abstract

Project success is one of the most studied topics in project management. Notwithstanding this vast literature base, project results continue to disappoint stakeholders. Turner and Cochrane (1993) argued that the traditional measure of success, completing the project on time and within budget, is based on the assumption that in projects both the goals and the method of achieving them are well understood at the start of the project. For some projects however, the objectives and/or the methods are not clearly defined. These projects, so-called type-4 projects, are only successful if they achieve a unitary, beneficial change with value for users.

A domain that has great experience in dealing with these type of problems, where only the aspired end value is known, not the goals and methods, is Design Thinking. In project management literature, however, little mention is made of Design Thinking. The aim of this paper is to contribute to the missing link between project management and Design Thinking and to give project managers insight in the application of Design Thinking in their approach to projects

The paper reports a conceptual analysis of the concept of Design Thinking and its application in Project Management. The research question of this study was formulated as: How does the Design Thinking approach to project management differ from the Rational Analytic approach? Based on a study of the literature, the study developed a conceptual framework of the differences between the Rational Analytic approach and the Design Thinking approach to projects.

Keywords: *Project management, Success, Design thinking, Agile.*
JEL code: *M1*

Introduction

Project success is one of the most researched topics in project management (Joslin & Müller, 2015). Research focuses on identifying critical factors for success (Cooke-Davies, 2002) or on the definition of success (Joslin & Müller, 2015). In these studies, different criteria for success are used. Most early research on project success seems to emphasize the three traditional dimensions (Silvius & Schipper, 2015): (within) time, (within) budget and (within) specification, also known as the known 'iron triangle' of time, budget and quality, "despite the fact that this method is currently subject to widespread criticism" (Bakker et al., 2010). More recently, Turner and Zolin (2012) expand project performance factors beyond the standard consideration of time, cost, and quality, and suggest inclusion of measures of user appreciation. Aspects of sustainability can also be introduced into the definition of project success (Silvius & Schipper, 2015). Project success, both the determination and the achievement, is a widely discussed subject. Literature seems to agree on one thing: whether a project is considered a success depends on the perspective taken to judge it (Koops et al., 2015). In spite of these well-known research results and despite column-miles of words that have been written about project management, project results continue to disappoint stakeholders (Cooke-Davies, 2002).

Some research focuses on the definition of projects and it's relation to project success. Turner and Cochrane (1993) propose a new definition of projects. They argue that traditional

definitions of projects are based on the assumption that in projects both the goals and the method of achieving them are well understood at the start of the project. These objectives become part of the definition of success, and the project manager is said to be successful if they deliver them on time and within budget. For some projects however, the objectives and/or the methods of achieving them are not clearly defined. These two parameters – how well defined are the goals, and how well defined are the methods – result in a 2 x 2 matrix that Turner and Cochrane have named the "goals-and-methods matrix". What should be clear in any project, is the fact that a project is only successful if it "achieves a unitary, beneficial change" (Turner & Cochrane, 1993). This beneficial change is also described as "purpose" or "value for users".

A domain that has great experience in creating value for users is the domain of design. Designers and engineers often create products where at the start of the problem solving ONLY the aspired end value is known, NOT the goals and methods (Dorst, 2011). In research literature, the term 'Design Thinking' has emerged as a way of thinking which leads to transformation, evolution and innovation, to new forms of living and to new ways of managing business (Tschimmel, 2012). The term Design Thinking has been part of the collective consciousness of design researchers since Peter G. Rowe used it as the title of his 1987 book "Design Thinking" (1987) . It has gained popularity and is widely seen as an exciting new paradigm for dealing with problems in sectors as far afield as IT, Business, Education and Medicine (Dorst, 2011). It has become a label for the awareness that any kind of business and organization can benefit from designers' way of thinking and working (Tschimmel, 2012). Studying the way designers work and adopting some 'designerly' practices could be interesting to organizations, because designers have been dealing with open, complex problems for many years (Dorst, 2011).

Problem solving where only the aspired value is known, not the goals and methods, can be related to Type-4 projects, as described in the goals-and-methods matrix (Turner & Cochrane, 1993). Figure 1 presents this matrix.

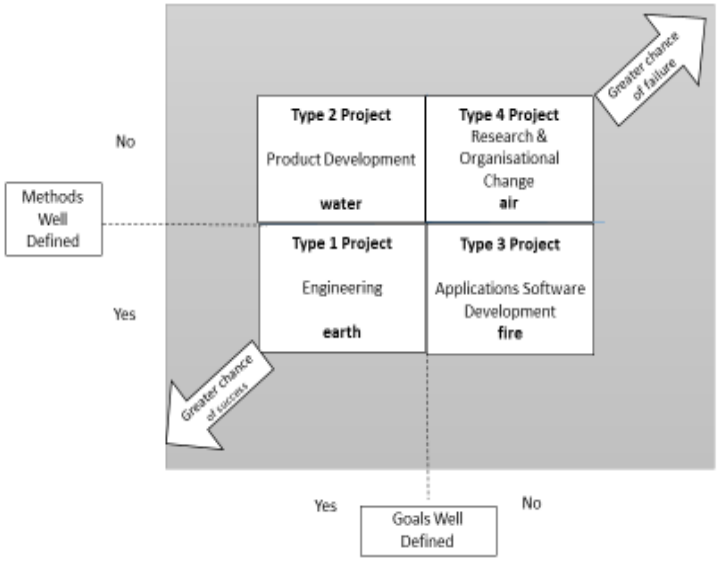

Figure 1. **Goals-and-methods matrix.**
Source: Adapted from Turner & Cochrane, 1993

Type-4 have a greater chance of failure (Turner & Cochrane, 1993), because project management traditionally assumes that in projects both the goals and the methods of achieving them are known at the start of the project. Cochrane and Turner therefore propose new methods in dealing with these types of projects, such as working with multi-disciplinary teams, a facilitator to negotiate agreement between parties, milestone planning and configuration management. But as projects still continue to disappoint users, *what can Project Management learn from Design Thinking*?

Design Thinking has provided useful new insights into the general management domain, especially where it concerns complex, wicked, problems (Dorst, 2011). Type-4 projects show similar characteristics to design-problems. However, in Project Management literature and research, little mention is made of Design Thinking. So, what novel ways of approaching open, complex problems is the project management community missing out on? The research question of the study reported in this paper was formulated as: *How does the Design Thinking approach to project management differ from the Rational Analytic approach?*

The paper will report an extensive literature review of the concepts of design thinking and will confront project management with these concepts. As a conclusion, we will provide a conceptual framework, comparing the Design Thinking approach to project management with the Rational Analytic approach. The goal of this study is to contribute to the missing link between Project Management Theory and Design Thinking. And to give project managers insight in the application of Design Thinking in their approach to projects.

Methodological approach

As this study aims to develop an understanding of a relatively unexplored territory, it is considered to be of an exploratory nature. We used the systematic literature review methodology (Tranfield et al, 2003) of selection, extraction, analysis and synthesis of published academic books and articles. And although all the data we collected was already published, it is generally accepted that worthy insights and contributions can be derived also from existing theoretical works (Martens and Monteiro de Carvalho, 2014).

Following the recommendation by Bauer and Bakkelbasi (2005) that "researchers should consult Google Scholar …, especially for a relatively recent article, author or subject area.", we used Google Scholar as search engine. For data extraction, we used the databases Science Direct, Business Source Premier, Ebsco-Host and JSTOR to retrieve the full publications for our analysis. We used qualitative content analysis methods to analyze the articles. In this analysis, we combined the conventional, directed and summative content analysis approaches (Hsieh and Shannon, 2005).

Findings

The section consists of two parts: firstly the concept of Design Thinking is explained using a variety of academic sources. Secondly, an overview is given of the occurrence of (related) concepts of Design Thinking in Project Management research literature.

The Concept of Design Thinking

The concept of Design Thinking has been defined in the literature in a variety of ways. This section will start with the most commonly used terminology to describe the phenomenon.

Secondly, the core of Design Thinking will be explained by looking into the key reasoning patterns in design.

Design Thinking can be described as team based, user centered process, powered by a thorough understanding of what users want and need (Brown, 2008). It is used for finding a solution for an often ill-defined problem in any organizational or social context. The problem solving process includes a complex inquiry phase and a suspension of decisions and even suspension of the problem definition itself (Kuiper & Kolsteeg, 2012). It originated in the last decade of the 1900's, where researchers studied the essential mental strategies of designers (Cross et al., 1992). More recently (2001 – 2012), the concept of design thinking has been stretched, and has broken free from its domain limits. Today, Design Thinking is understood as a complex thinking process of conceiving new realities, expressing the introduction of design culture and its methods into fields such as business innovation (Tschimmel, 2012). It is not a predefined series of orderly steps, but "a human-centered, creative iterative and practical approach to finding innovative ideas and solutions (Brown, 2008).

In his article "The core of "design thinking" and its application, Dorst (2011), explains the core of Design Thinking and what it could bring to practitioners and organizations in other fields. He uses a model from formal logic to describe the key reasoning patterns in design and explains how this type of reasoning is very different from other fields. He then explains how designers adopt and create "a frame" to deal with a problem at hand.

Problem solving

In problem solving humans adopt different kinds of reasoning patterns. In the sciences two types of reasoning are distinguished: Deduction an Induction. The difference between the two is the different setting of the knowns and unknowns in this equation:

WHAT (thing) + HOW (working principle) leads to RESULT (observed)

In Deduction, because the "what" and the "how" are known, the result can be predicted and informs "justification". In Induction, the "what" and the "result" are known, the proposing of a "working principle" that could explain the observed result is a creative act and a "discovery".

In design however, the result is not a statement or a fact, but the creation of value for others.

WHAT (thing) + HOW (working principle) leads to VALUE (aspired)

This basic reasoning pattern is called Abduction. Dorst (2011) explains two forms of Abduction, one of which most closely represents the open, complex problems for which organizations are seeking new approaches:

??? (thing) + ??? (working principle) leads to VALUE (aspired)

The challenge in this form of Abduction is to figure out "what" to create, while there is no known "working principle" that can be trusted to lead to the aspired value. Designers resolve this type of problem by framing and frame creation.

Design Reasoning

A "frame" is the general implication that by applying a certain working principle a specific value will be created (Dorst, 2011). This means that he "thing" and the "working principle" are created together:

WHAT + HOW leads to VALUE
--------frame----------

In design literature (since Schön (1988)) "framing" is the term used to describe the creation of a (novel) standpoint from which a problematic situation can be tackled. The "frame" is a complex set of statements that include a specific perception of a problem statement. The reasoning is as follows: IF we look at the problem situation from this viewpoint, and adopt the working principle associated with that position, THEN we will create the value we are striving for. This type of reasoning requires an iterative process of reasoning "backwards" (starting with the value) and then "forward", to see whether the "thing" that has been created, together with the working principle, actually creates the aspired value.

The uniqueness of design reasoning is found with various authors on the subject. Different terms are used, but they all seek to explain how designers think differently. Tschimmel (2012) calls it: "thinking in new and different perspectives and about future possibilities". Tim Brown, CEO of IDEO, a company specialized in organizational change from the perspective of Design Thinking speaks about "a fundamental way of thinking" (Brown, 2009) . The most important aspect of Design Thinking in his view is "insight". Insight in a problem is obtained by observation and empathy, as opposed to relying on quantitative data. To explain this central concept of "insight" he uses Thomas Edison's invention of the light bulb (Brown, 2008). Thomas Edison invented the electric light bulb and then wrapped an entire industry around it. The light bulb is most often thought of as his most signature invention, but Edison understood that the bulb was just an object, and that without a system of electric power generation and transmission, it never would be truly useful. Edison's genius lay in his ability to envision how people would want to use what he made, and he engineered towards that insight. "Insight" and "aspired value" both represent design reasoning as a "methodology that imbues the full spectrum of innovation activities with a human-centered design ethos" (Brown, 2008).

The core of design practice

In this section the core of design practice will be introduced. Frame creation as a deliberate strategy by designers is explained. Moreover, it will be explained how designers reframe a problem as is initially presented by the client. The setting in which designers engage in the activity of framing and reframing, is called briefing. We will explore this activity and show what designers perceive their role to be in this process and how they work towards new frames.

- Frame creation and changing frames
  The ability to create frames and " to reframe a problematic situation in new and interesting ways is widely seen as one of the key characteristics of design thinking" (Paton & Dorst, 2011). *So how are frames created?* In creating new frames, what expert designers are engaging in is a subtle process of analysis that has much in common with phenomenological methods of analysis, through which a complex situation is read in terms of "themes" (Manen, 1990). In this method, a "theme" is

the experience of focus, of meaning. Themes are not clearly positioned in either the problem space or the solution space. The process of distilling themes is described as insightful invention, discovery and disclosure. These "themes" become triggers for creation of new frames that allow the central problem to be approached in a new and interesting way. This gathering of clues is a deliberate strategy with designers. To an outsider it may look like an informal activity, and the terms designers use are sometimes vague: they talk about "getting close to a situation", the importance of "richness" of the problem area, they stress the importance of "getting first-hand-experience" of the problem situation.

Dorst (2011) illustrates this practice in an example: "*The situation described is that of an entertainment Quarter in a metropolis. The area involved is one with bars and clubs, attracting 30.000 young people on a good night. Issues that arise in the area include drunkenness, fights, petty theft, drug dealing and sporadic violence. Over the years, local government has been using mainly "strong arm tactics", i.e. increasing police presence and putting in CCTV cameras. All that extra visible security has made for a grim public environment and the problems have persisted.*

A group of designers was brought in to try and find alternative solutions. They soon realized that the problem was framed by the local government as a law-and-order problem, needing law-and-order answers. After emerging themselves in the neighborhood and observing the behavior of the young people, the themes that emerged were: young people wanting to have a good time, getting bored and frustrated by lack of good organization in the area and excessive safety controls. The designers suggested to treat the problem AS IF they were dealing with a good-sized music festival. This metaphor triggered new scenarios for action, improving transportation, crowd control, safety and way finding. These measures significantly improved the area.".

This example shows that by reframing a problem, based on emerging themes from their investigation, designers develop new solutions. The original frame limits the solution space: only measures that fit into the law-and-order paradigm are taken. By reframing it as a music festival, and defining the value to be achieved as: "young people wanting to have a good time", a different solution space can be tapped into.

In design practice, as well as in organizational change in general, the problem situation as is first presented to the designer – the change manager or project manager – is often implicitly framed by the client organization. Designers actively uncover this implicit frame and develop new frames in close cooperation with their client. In the next section this process is explained.

- Briefing and the role of the designer

  A design project usually starts with a brief, formulated by the client. The designer and the client engage in a series of interactions, in order to develop a mutual understanding of the project. The end-result is an accepted brief that is understood and agreed upon, in which the designer's and the client's frame have come to overlap or align to a certain extent (Dorst, 2011). Designers describe this process as a process of negotiation to define a "vision" of what the project should be, and what the shared appreciation is of the value to be achieved.

In their research, Dorst and Patton (2011), describe the particular roles that designers perceive themselves to play in this process:

- Technician: the designer is given a solidly defined brief and is expected to carry this out.
- Facilitator: the client knows what he wants, but not what is required to achieve it completely. The designer gives expert advice.
- Expert/Artist: the client knows what he needs, and the designer is responsible for framing the project with the client to a workable outcome
- Collaborator: both client and designer work mutually on framing the project in terms of both problem and solutions space.

The designers interviewed in the research identified the expert/artist role and the collaborator role as being the most desirable mode for briefing. The aim of the research was not to identify whether projects in which the designer had acted as a "collaborator" were more successful. So no claims can be made to that effect. However, the interviewees describe the reason for negotiating to change a client-given brief to be: to make the project more successful.

In the table below (Table 1), the four roles identified are shown in relation to topics involved in the process of briefing: point of entry of the designer to the project, involvement in problem space formulation, involvement in solution space formulation and amount of iterations.

Table 1

Briefing modes an ability to reframe during briefing

Mode	Point of entry to project	Involvement in problem space formulation	Involvement in solution space formulation	Amount of iteration
Technician	End of planning	No	No	Low
Facilitator	Near end of planning	No	Partial	Low
Expert/Artist	Mid-planning	Partial	Yes	Med
Collaborator	Beginning of planning	Yes	Yes	High

Source: Authors' construction

So how do designers negotiate new frames? An important aim for designers is to shift clients away from a problem-solving approach. First, the conversation should be about the exploration of the aspired value. To do this, designers use abstractions in the form of visual abstractions or analogies. "Mood board" discussions are a good example of this form. The abstraction of the mood board allows the designer to highlight desirable aspects of the outcome, but not the particular resolution. The mood board assists in creating a more open conversation about the project.

Another way to negotiate new frames is identified as contextual engagement: designers create interaction and activities with the client that facilitates reframing the project with the client. This can take the form of workshops in which client and

designer co-explore the problem space, often in playful, "fun" –type meetings where a variety of ideas are played with in order to "loosen" fixation on a particular outcome.
Language plays an important role in this form of co-creation: the process of reframing comes through regular dialogue, and through sharing a context-specific language framework. Decision-makers in the clients' organization need to participate in this dialogue, in order to adopt the new frame.

Design Thinking in Project Management Literature

In this section, an overview is given of the occurrence of (related) concepts of Design Thinking in Project Management research literature. And although there are a great number of articles relating to General Management in relation to Design Thinking, specific mention of Design Thinking in Project Management academic literature is rare. Related terms that have been found, will be described in this section: Agile, problem-setting, uncertainty, change/innovation and chaos theory.

Agile

In software development, the term design is used in relation to software design management. The 12 Principles of Agile Software have influenced the Project Management practice since the Manifesto for Agile Software Development was published in 2001 (Beck & Beedle, 2001). Characteristics of Design Thinking are echoed in some of the terminology used in Agile: customer collaboration, iterative development cycles, welcome change. Nerur and Balijepally (2007) corroborate this view, but provide a critical note by observing a lack of academic foundation of Agile methods. The authors argue that Agile has the same theoretical basis as conceptual shifts in patterns of thought in other disciplines (Design and Strategy), but the rich perspectives that these other disciplines could provide for the emerging Agile philosophy is conspicuously absent in research. They argue that the metaphor of design offers a strong theoretical basis for the conceptual foundation of Agile methods. The authors urge the Agile community to examine it's theoretical roots. This call has not been answered, since no academic articles on the subject can be found.

Problem setting

De Blois and De Coninck (2008) elaborate on the relationship between project management and design. The authors introduce the notion of the "organizing project". A project is seen as an organizing process, in which all actors and stakeholders play a predominant role as opposed to the traditional perspective on projects as "the organized project". A project is not an object itself, independent of its context. Rather, the trilogy action, stakeholder, transformation defines the project: the project links the ideas, the intentions, the aims, the stakeholders, it produces the project and the objects. The concept of the organizing project is explained by the notion of thinking/management by design, highlighting the role of actors' and stakeholder participation through the design process. The authors stress that knowledge of design as an activity needs to be developed further, because what is usually NOT taken into account is the "iterative" nature of the design activity. Designing serves the purpose of establishing and conceiving the problem space, while keeping it open to welcome potential emerging solutions. In Project Management theory, the problem-setting activity seems often ignored and is usually referred to as the

feasibility phase (Macmillan, 2001). The authors recognize the need for the Project Management community to develop tools for conducting projects that are moulded over problem-setting mode (defining the problem space), rather than solution driven (devising the solution of a given problem). In his paper that builds on discussions that took place over a series of meetings in the UK of the Rethinking Project Management Network, Atkinson et al. (2006) also conclude that in professional Project Management guidelines the role of conception at the front end of the project life cycle is minimized. The assumption is that project objectives are clear, or clarified in the feasibility phase. But in practice objectives are often unclear, contradictory, or impossible. Many projects that are managed in this way, experience problems for this reason. The project manager is regarded as a convenient recipient of project risk, providing psychological relief to the project owner from the burden of uncertainty and risk bearing, and someone who subsequently unwillingly serves as scape-goat if things fail to turn out as desired by the project owner.(Atkinson et al., 2006). The Rethinking PM Network regards management of uncertainty as a necessary condition of effective PM. What is needed, however, is the development of project uncertainty management as ambiguity management. The next section of this literature review will focus on that subject.

Uncertainty

In traditional PM uncertainty is approached as management of risk and opportunity. The solutions to tackle these uncertainties originate in the "control" space: control of performance and results of execution (de Blois & De Coninck, 2008). The measures that Cochrane and Turner (1993) propose, milestone planning and configurations management, are examples of solutions that originate in the "control space". This type of uncertainty can be anticipated, planned and managed. It leaves no room for identifying unknown spaces (de Blois & De Coninck, 2008). Sources of uncertainty are wide-ranging (Atkinson et al., 2006). They are not confined to potential events, but include lack of information, ambiguity, varying agendas in different stages of the project life cycle. The Rethinking PM Network concludes that common PM does not address these uncertainties.

Conventional pm focuses on operational planning and control. Many projects, however, are characterized by very high, difficult to quantify, levels of uncertainty where management flexibility and tolerance of vagueness is necessary. This calls for the need to develop less tangible management processes associated with building trust, sense-making, organizational learning and building a culture that is more suited to deal with high levels of uncertainty.(Atkinson et al., 2006)

The result is that project management is commonly regarded as concerned with ensuring things get done right, assuming that there is a well-defined idea of what needs to get done. With this view, project management is not concerned with thinking about whether the right things are done, why the project should proceed, or what performance criteria would be appropriate. Perhaps the conventional common view of pm is essentially to see the project task as a set of processes to ensure a project meets its (predetermined) objectives. The whole 'raison d'étre' of project management is to remove (or substantially reduce) uncertainty about meeting specified objectives. However, project management in this sense is a castle built on shifting sand, if in practice objectives are unclear, contradictory, or impossible.(Atkinson et al., 2006).

In their article, Atkinson et al. (2006) make a clear distinction between uncertainty and ambiguity. Uncertainty is defined by the difference between the data required and the data

already possessed: it is "lack of information". Ambiguity means the existence of multiple and conflicting interpretations: it is linked to confusion and lack of understanding. Uncertainty warrants the acquisition of objective information and answering of specific questions. Ambiguity warrants sense-making, the exchange of views and the definitions of situations/problems. This sense-making is especially important in the concept stage of the project life-cycle, and during preliminary design and planning activities. Unfortunately, if the need for ongoing sense-making is not acknowledged, pressures to finish a project may increasingly preclude further sense-making. He concludes by giving directions for development of project uncertainty management: what is needed is to formulate qualitative success measures to assist managing projects, instead of just quantitative success measures. Also: to develop ideas about the role of trust, and to balance trust and control. Furthermore: learning by experience and managing stakeholder expectations.

Change/Innovation

Project management in academic studies tends to be regarded as an adequate solution to the problems raised by innovation (Lenfle, 2008) .The authors argue that in the literature, there is a missing link between project management and innovation management. Justification for Project Management lies in the fact that something "new" is created, but the divers situations of "newness" are not addressed. Also, the rational view of PM in which the accomplishment of clearly defined goals within budget, quality requirements and time is dominant, does not address the fact that innovation is first and foremost characterized by divergence and unforeseeable uncertainties that render the rational approach irrelevant. (Lenfle, 2008). Is the project format suited to the management of this kind of change? To deal with these issues, they propose the following managing principles:

1. Set up a dedicated organization
2. The central role of experimentation and concurrent exploration: making a plan of action to tackle unforeseeable uncertainties in order to allow problems and solutions to be discovered.
3. The dual nature of performance and goal reformulation: the management process must take into account the two different dimensions of performance: the value of the product AND the accumulation of knowledge. The accumulation of knowledge during the project is not the same as "lessons learned" after the project is completed. Knowledge accumulated must allow for reformulation of the objectives along the way.

Hornstein (2015) also stresses the necessity of the integration of project management and organizational change management. He also notes that organizational change involves more than obedient adherence to a technical process. Effective change management and leadership is necessary, as is demonstrated in management and organizational literature. However, the academic analysis of project outcomes focuses mainly on the project process. In researching project success, researchers focus more on technical issues (time, budget, scope, quality), less on the human factor. This human factor deals with: whether or not employees adopt the change, organizational resistance, user/customer satisfaction. Change management is about creating ownership and shared meaning, more important than following the process steps.

Chaos-theory

In her dissertation, Mulder (2012) researched the premise that in Project Management Theory, modern management concepts are used insufficiently. This premise is validated in her research: concepts such as 'social', 'motivate', and 'create', 'value' en trust are significantly less present in literature on project management than in literature on general management. Her research has resulted in an approach called: Value-based Project Management. Based on chaos theory, it describes an format to deal with projects that are complex, ambiguous and uncertain. There is no reference to Design Thinking, however, some of the terminology are reminiscent of its concepts, e.g.: use a development approach that allows for vagueness, make sure users participate right from the beginning, keep the dialogue with the stakeholders going.

Concluding remarks

In summary, one might observe that in academic literature on Project Management a few references are made to Design Thinking or related terms. Various authors (Nerur & Balijepally, 2007; Hornstein, 2015; Mulder, 2012; Lenfle, 2008) observe a lack of theoretical connection to modern general management concepts. All authors argue that dealing with uncertainty, ambiguity and creating value for customers are key issues around which Project Management theory should evolve. De Blois (2008) explicitly argues that knowledge about design as an activity needs to be developed further. Project Management should be more focused on the problem space, instead of the solution space. Where the goal of projects are unclear, more time should be dedicated to sense-making and reformulating objectives along the way (Lenfle, 2008) Ambiguity warrants sense-making, the exchange of views and the definitions of situations/problems. This sense-making is especially important in the concept stage of the project life-cycle, and during preliminary design and planning activities.(Atkinson et al., 2006). Design Thinking can contribute to just these type of issues.

Discussion: The Design Thinking Approach to Projects

The literature presented in the previous sections has shown that the core of design practice lies in the ability of designers to frame and reframe a given problem. Designers use a systematic human-centered approach to explore the definition of a problem and synthesize solutions (Buchanan, 2010). In order to create a paradigm shift in Project Management towards applying Design Thinking, the Project Manager needs to reassess his/her mode of thinking. Applying Design Thinking implies a different approach to a project than the Rational Analytic approach that is dominant in Project Management theory and practices.

Tschimmel (2012) and Glen et al. (2014) both compare the Design Thinking approach to problem solving to a traditional, Rational Analytical, approach. These two models are very similar and for the purpose of this paper, the two are combined into one conceptual framework (Table 2). The model used by Tschimmel is a list of characteristics of a Design Thinking Manager versus a traditional thinking manager. The characteristics are listed without further categorization. Glen et al. use a comparison between the rational analytic manager and a design thinking manager, and arrange the comparison into seven categories: problem formulation, criteria, method, information-processing emphasis, solution process, rationale and outcome. The descriptions of the approached in both models are very similar. By introducing the categories used by Glen et al. to the descriptions used by Tschimmel, the two models can be integrated into a single conceptual framework. To complement the characteristics of the two contrasting approaches, descriptions were added by the author of this article using the literature on Design

Thinking and definitions from the IPMA Competence Baseline version 3 (International Project Management Association, 2006).

Table 2

Comparison of Rational Analytic and Design Thinking approaches

Problem formulation	Well-defined goal and constraints. Immediate perception and quick interpretation of a situation. Result oriented. Views the start of a project as receiving an assignment to achieve a "job" in the form of a project. Receives orders from the client. (International Project Management Association, 2006)	Goals and constraints uncovered during the design thinking process. Intensive observation and wondering, challenging stereotypical perception, asking questions and postponing decisions/ problem definition. Views the start of a project as the start of a dialogue with decision-makers and users. Interacts with the client.
Criteria	Objective definition of criteria, established before generation of alternatives. Project sponsor and stakeholder- driven. Focused on a well-defined project result. Meeting commitments and fulfilling expectations. (International Project Management Association, 2006)	Both objective and subjective criteria used to define design objectives, since the end user is the ultimate judge of efficacy. Empathic and human-driven, deep understanding of peoples' needs and dreams. Focused on the wants and needs of the user.
Method	Mainly rational and objective. Planning and analysis—thought precedes action. Sequential process. Analytical, deductive and inductive. Technician and facilitator. A method is a linear process	Iterative exploration of the design "space," where thinking and doing are intertwined. Emotional and rational at the same time, subjective. Adductive and inventive, thinking about future possibilities. Expert and collaborator. A method is an Iterative process.
Information-processing emphasis	Preference for objective formulations, especially verbal and quantitative. Emphasis on project documents, use of waterfall planning sheets, Product/Work Breakdown Structures, diagrams and tables. (International Project Management Association, 2006)	Preference for visual and spatial representations, which evoke both objective and subjective insights. Use of sketching and prototyping tools
Solution process	Ideally based on conscious, rational-logical reasoning process, which, over time, becomes formalized into a set of rules. Lead by organizing, planning and control	Solutions evolve as the result of interaction with users and the ongoing creation and refinement of possible solutions. Incorporates experience-based insights, judgment, and intuition. Comfortable with ambiguity and uncertainty.
Rationale	"Get it right." Reduce chances of failure though careful prior analysis	Use rapid experimentation and prototyping to learn from early, inexpensive "failures".
Outcome	Solution optimizes predefined criteria to arrive at "best" answer. Looking for 'correct' answers *"analyze, come up*	Obtain "better" answer. Process may expose additional problems and solutions. Failure is a part of the process.

	with the solution and implement the solution" (International Project Management Association, 2006, p. 107). Concerned with ensuring things get done right (Atkinson et al. , 2006)	Concerned with thinking about whether the right things are done (Atkinson et al., 2006).

Source: Authors' construction

From the comparison of the Rational Analytic approach and the Design Thinking approach summarized in Table 2, it becomes clear that the 'Design Thinking Project Manager' differs on many aspects in his/her approach to project from the Rational Analytic Project Manager.

Conclusion

The study reported in this paper aimed to contribute to the missing link between Project Management and Design Thinking, by conceptually analyzing the concepts of Design Thinking and apply these to Project Management. The rationale for this study was the analogy we see between 'Type-4' projects, of which the objectives and/or the methods are not clearly defined and the goal is to achieve a beneficial change with value for users, and the design domain. Applying a Design Thinking approach to these type of projects, might therefore provide useful insights.

Based upon our analysis of the literature on Design Thinking, we found that one of the key characteristics in Design Thinking is the ability to create frames and to reframe a problematic situation in new and interesting ways. This 'reframing' of the problem and constraints contrasts the Rational Analytic approach that is dominant in Project Management, in which the start of a project usually has the form of the project manager receiving an assignment from the project sponsor or executive.

Nest to this difference in approach to the 'Problem formulation', our study found also differences in the 'Criteria' of the project result, the 'Methods' to achieve these, the emphasis in 'Information-processing', the 'Solution process', the 'Rationale' and the 'Outcome' of the project, when comparing the Design Thinking approach with a Rational Analytic approach (Table 2 summarizes these differences). This answered our research question: *How does the Design Thinking approach to project management differ from the Rational Analytic approach?*

The limitation of the study reported in this paper is that it is based upon an analysis of literature and a conceptual mapping. However, the conceptual framework of the differences between the Design Thinking approach and the Rational Analytic approach, developed in the study, provides a good foundation for empirical testing of the differences between the two approaches.

A logical follow-up question for further research would be *What aspects of the Design Thinking approach should be integrated into Project Management in order to contribute to the successful management of projects of which goals and methods are not completely clear at the start of the project?* It is this question that is central in our current study that will be reported in later publications. This study will also include an empirical investigation into how project managers experienced the differences of a more Design Thinking approach to a project, compared to their natural more Rational Analytic approach.

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A CONCEPTUAL MODEL OF NATIONAL PUBLIC PROJECTS IMPLEMENTATION SYSTEMS

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Abstract

Many countries have established practices of public projects governance and management which they systematically apply. These practices can be grouped into three well-defined, interrelated territories: Execution, Governance and Development. Each territory consists of functional areas. The Execution Territory consists of The Portfolio Management Area, Project Management Area, Actors Management Area, and Stakeholder Engagement Area. The Governance Territory consists of a single Governance Area, and the Development Territory similarly consists of just one Development Area. These Territories, Areas together with institutions, organizational units and other entities interrelate one with another and together constitute National Public Projects Implementation System (NPPIS). This paper presents conceptual model of NPPIS created on the basis of analysis of public projects governance and management solutions from over 70 countries all over the world. The model contributes theoretically to the knowledge of public projects. As projects are the main tool of public administration, it also contributes to countries' economical development.

Key words: *public administration, project management, National Public Projects Implementation System*
JEL code: *H110*

Introduction

A public project is a project executed by a public administration or with the participation of a public administration, or implemented with the involvement of funds from the budget of such an administration.

Public projects account for a growing portion of expenditure in most countries of the world. Turner et al. (2010) estimate that about one-third of the global gross domestic product ($16 trillion) is generated by projects. Public projects, like investments in road infrastructure or information technology often consume large budgets. The number of publications devoted to public projects management, as well as the growing budgets they involve, point to increasing interest in this type of projects. One can easily find hundreds of pages describing specific solutions for public projects implementation online, with some of them cited in the references section of this article. It is evident that the importance of public projects is growing rapidly. However, to date there exists no consistent model for public projects management. This paper aims to propose a conceptual framework that addresses this gap.

The paper elaborates on, and further develops the concept of National Public Projects Implementation System (NPPIS) defined by Gasik (2014), who defined basic areas of public projects management and governance.

The research, on which the paper is based, consisted of three key stages. First, the literature and Internet resources published by institutions and organizational units responsible for public projects were analyzed, resulting with data collection from over 70 countries. At the

second stage, a survey was conducted amongst people engaged in public projects management, with 512 respondents from over 60 countries.

The research, on which the paper is based, started from the review of literature and internet resources published by institutions and organizational units responsible for public projects management. More than 70 countries were analyzed at this stage. The third phase of the research consisted of face-to-face interviews with 36 public project actors from 6 countries (United States, Australia, Brazil, Canada, Argentina, and Poland). One of the goals of both the survey and the interviews was triangulation of data collected in the first phase of the project by the Internet review, i.e. verification whether earlier identified practices are really performed and beneficiary for project goals. The other goal of interviews was gaining deeper knowledge of public project implementation practices.

Public Projects Governance Territory

Public projects Governance Territory consists of one area of Project Governance. Governance is employing institution, authority structures and collaboration in order to assign resources and to coordinate activities in a society or economy. Public project governance is this part of governance which is applied to public projects and covers the area from the government through institutions down to projects (Klakegg et. al., 2008).

In the United States several regulations starting from guidelines on Cost/Schedule Control Systems criteria (C/SCS) (DoDI, 1967), through Government Performance and Result Act (GPRA) (White House, 1993) up to Program Management Improvement and Accountability Act (PMIAA) (US Congress, 2015) were enacted.

C/SCS guidelines required that all major defense acquisition projects must apply earned value management techniques. GPRA laid the foundations for American public projects management. It required that government agencies must have strategic plans, which set out the objectives to be achieved through the implementation of programs. PMIAA requires, among others, establishing an interagency body on program management, appointing a senior executive responsible for program management, and establishing models of program management in each federal institution.

Governance processes are sequences of operations, usually conducted at planned intervals, checking project status and taking on this basis the key decisions, in particular regarding their initiation, and checking during their implementation the reasonableness of continuing to implement the project. Implementation of such processes is required by several governments. Probably the most popular public projects governance process was defined on demand of UK Government and is called OGC Gateway Process (OGC, 2007).

A special attention of governance process is focused on project initiation. The initiation process may consist of one or two steps. The two-stage start-up process is one in which decisions about the project are taken as a result of two assessments, each of which may lead either to transition to the next phase or to rejection. The first evaluation is usually related to compliance with the strategy, the second to business effects of the proposed project (NTNU 2013). The one-step process is one in which there is only one decision on project initiation (PAF Western Australia 2013). This does not mean that there are no well-defined components within this process, but the execution of each such component does not end with a formal decision being made.

Public projects are subject to business supervision during their implementation. The compatibility of the project with its business case, and viability of expected business results are the main areas of interest during such verification. The above mentioned OGC Gateway Process consists of six main gates: strategic assessment, business justification, delivery strategy, investment decision, readiness for service, and operations review and benefits realization.

National standards may be conceived as components of governance systems. They usually deal with knowledge needed for the management of individual projects (e.g., PMBOK ® Guide, PMI 2013; Prince 2 ®, OGC 2009). In addition to such general standards, there is a standard pertaining only to public projects management. This is the government extension of the Project Management Institute's PMBOK ® Guide (PMI 2006). This standard takes into account specific features of public sector projects such as dependence of the complex regulations in the sector, responsibility of the project team members before the communities that are relevant for projects of public interest, or the use of public resources.

Execution Territory

The Execution Territory consists of four functional areas: Portfolio Management, Project Management, Actors Management, and Stakeholder Management.

Portfolio Management

Public project portfolio management covers the processes of selecting, initiating and modifying the set of public projects in a given country, state or local government.

An organization's strategy usually makes up the basis for project portfolio management (PMI 2013b). Government agencies must have strategic plans, for example, for periods of no less than five years (White House 1993), which set out the objectives to be achieved through the implementation of programs. The strategic plan must also include an assessment of ways to achieve these objectives, i.e. the ways to measure the effectiveness of the programs. The annual plan defining a set of programs to be implemented by the agency must be consistent with the strategy of the agency. This approach ensures that only projects aligned with the strategy of government agencies will be selected for execution.

A document specifying the requirements for the formulation of objectives of public administration units may be published each year (PMD India 2013). Such a document is a tool to support understanding between the minister and the particular execution unit. The document requires definition of the measurable goals of the individual organizational units. Projects and programs can only be run when they support the achievement of a specific goal.

The strategy can also be defined directly by identifying the programs that need to be implemented. In Hawaii, ten basic activities of state transition programs (e.g., governance, modernization of taxes, education, and consolidated infrastructure) have been defined. To ensure the achievement of program objectives, rigorous rules of project and program management (OIMT Hawaii 2013) should be introduced – this is one of state's strategic goals.

The predefined strategy is not the only reason to launch a project or a program. The other reason is the occurrence of a specific situation which necessitates a reaction. If there is a chance or if it is found that certain areas of public services operate inefficiently, the government outsources analysis to teams led by eminent scientists and experts in their fields. This approach is often used in the UK. The Byatt Report (Byatt 2002) may serve as an example. It dealt with

the situation regarding contracts for local executive bodies. The writing of reports results in the development of recommendations describing new ways of running the administration. These recommendations are implemented through public projects.

One of the categories of services provided by Public Projects Management Offices (PPMO, below) is that of supporting public project portfolio management. PPMO's manage their own project portfolios (EPMO Vermont 2013) and support other public agencies in this area (EPMO New York 2013). PPMO may also define rules for selection of projects for the portfolio (MPA UK 2013). These criteria relate primarily to compliance with the country's strategy, but may also include other parameters, such as cost, risk profile, uniqueness (SP WA 2013). Project portfolios are subject to review by the PPMO (PMO Maine 2013). In appropriate cases, for example when a project is not implemented in accordance with the application or there is a substantial risk of its failure, it may be killed or suspended – this means reducing the content of the project portfolio (ASET Arizona 2013).

Project Management

Projects are managed according to methodologies. Project management methodology is a structured collection of guidelines describing the ways of project management. Methodologies may be associated with the governance processes. From this point of view, the methodology describes activities that must be performed in order to effectively pass the governance process gates. In Texas, for each of the gates of the Texas Project Delivery Framework process (DIR Texas 2013) the processes necessary for passing these gates have been developed, together with the techniques, tools and applicable forms. With this approach, the methodology is complementary to the process of governance.

Methodologies can also be constructed and applied without reference to the governance process. Then the process of governance does not exist alone. The methodologies contain the actions conducive to and verifications of the conformity of the project with the business case (PMBOK ® Guide, PMI 2013). In this case, the project management methodology can be regarded as an extension of the governance process. In Montana, the Project Lifecycle Framework is the parent methodology (SIT PMO Montana 2013), which includes a project governance cycle, project management cycle, procurement cycle and product development cycle.

Project management methodologies may be characterized by the standards on which they are based, by their sets of phases, and by their scope of application. ANSI PMBOK ® Guide (PMI 2013) is used as the basis for building project management methodology. For instance, New York (NY SOT 2013) and Michigan (PMRC Michigan 2004) project management methodologies are based on it.

The set of methodology phases (together called “project life cycle”) may cover, for example, the preliminary evaluation phase, business case development phase, sourcing suppliers phase, establishment of service capability phase, and services delivery phase (PAF QTF Queensland 2013). The life cycle of the project can be divided into initiation, planning, execution (with monitoring and control) and closure of the project (PMBOK ® Guide, PMI 2013). Transportation project management methodology (WSDOT Washington 2013c) describes the project's life cycle, consisting of five phases: initiation and alignment to business objectives, planning the work, endorsement of the plan by engaged agencies, implementing the plan, transition of the product to operations, and closing the project.

Public Projects Management Offices

Institutions or agencies supporting public projects management – Public Projects Management Offices (PPMO) – have been established in many countries. The overall objective of a PPMO is always to support public projects delivery.

Very often, PPMO's take full responsibility for the implementation of projects and manage them. These solutions have been adopted, for example, in the United Kingdom (UK MPA 2013) and the state of New York (EPMO New York 2013).

PPMO's perform separate, well-defined project management services for other government units. In this variety of PPMO services they take responsibility for specific project management functions, and not for the entire projects. PPMO's generally provide advisory services to project management teams (SSC New Zealand 2011). At the beginning of the project life cycle, PPMO employees develop the business case and feasibility studies (PM Missouri 2013). PPMO's provide services in the area of determining project governance rules (MPV Victoria 2013). In the period of project implementation PPMO's provide various services, such as document management (PM Missouri 2013), management of time, resources, and quality (JKRM Malaysia 2013), and independent risk management (SSC New Zealand 2011). Risk minimization may be the objective of the Project Assurance Team (QAT Texas 2013).

PPMO's check whether projects and programs are implemented according to guidelines of the authorized bodies (SSC New Zealand 2011). They perform audits, reviews and project evaluations (e.g., MPMO Canada 2013; MPA UK 2013). PPMO services do not terminate at the end of the projects. EPMO Vermont (2013) supports the measurement and reporting of benefits after project completion.

Knowledge that can be useful later in the project or in subsequent projects is generated as public projects are implemented. The task of PPMO's is to store and transfer such knowledge (CPPM Singapore 2013). This knowledge mostly has the form of "best practices", i.e. optimal solutions of particular problems, or ones that facilitate smooth process implementation. Knowledge can be obtained as a result of encountering a problem (IPMD India 2013). PPMO's support the exchange of knowledge between the contractors and other stakeholders (PMSC Missouri 2013).

Public Institutions

Public institutions play pivotal role in public projects delivery. They represent and work for communities, which benefit from public projects execution. Public institutions may perform three basic types of public projects: direct service projects (like organizing sport or cultural events), investment projects (like housing and infrastructure projects) and internal projects (like restructuring projects or implementing internal IT infrastructure). All these types of projects are aligned with given institution strategy. Public institutions provide resources for public projects, including the most important of them: funds. Public PMOs, described above are organizational units of public institutions.

The skills and capabilities of public agencies concerned with public projects management are at different levels. Some institutions base their approach to project management solely on the ability of project managers. Others, at the opposite level of capabilities, have deliberate, efficient organizational systems. In some countries, like Canada (TBoCS Canada 2013) and Australia organizational project management maturity models are applied for assessing and

improving their capabilities. In Australia, the British P3M3 ® (OGC 2010) model is applied to assess project maturity.

Stakeholder Engagement

The most important stakeholders of public projects are communities for which they are performed. They are involved in each phase of project life cycle, from its inception to gaining project benefits. Their representatives are being obligatory included into the project selection process (e. g. Government of WA, 2016) and into other project phases (PMI, 2006).

Public projects typically have multiple other stakeholders like governments, politicians, regulatory bodies, communities of interest, to name just a few of them. Due to the large number of stakeholders, it is important to provide efficient, easily accessible channels of information transfer between actors implementing projects and other stakeholders. In order to gather such information, repositories of information on public projects are maintained (EPMO Vermont 2013).

Internet tools are used as communication tools. In the simplest case, only the project identification data are published (e.g., DTPR Alaska 2013). The portals also contain data on major projects, their annual reports (MPA UK 2013) and information on project status (POCD California 2013; VAT Vermont 2013). Portals may be a source of knowledge about prospective contracts for subcontractors (MeO Saskatchewan 2013), as well as about awarded and executed contracts (e.g., MPMO Canada, 2013b).

Actors Management

The main actors involved in public projects implementation, in addition to the Public Projects Management Offices, are project managers and external companies implementing projects. Public institutions incorporate such entities into projects in various ways.

Vendors

Including private firms in public projects implementation is based on existing legal regulations on public procurement (e.g., President of the Republic of China 2011). Such regulations usually define the general rules of conduct for the conclusion and execution of contracts between a public and a private party, not only in the area of public project implementation. These regulations form a complex legal system and their detailed analysis is beyond the scope of this study.

The requirements to be met by companies implementing public projects are defined in order to facilitate the management of contracts by contracting their execution only to qualified companies. Such requirements concern the experience and the characteristics of the company (direct qualification) – or they specify certifications required from the companies implementing public projects (indirect qualification). To directly enter the register of qualified suppliers, companies must provide evidence of having qualified managerial staff, experience in implementation of projects and good financial standing (DB Hong Kong 2013). The condition of indirect qualification (DoFD Australia 2012) is met by having CMMI ® (SEI 2006), or OPM3 ® (PMI 2008), or P3M3 ® (OGC 2010) certification. Based on directly or indirectly defined requirements, registers of qualified public project contractors are maintained (DoFD Australia 2012).

Project Managers

In addition to companies, project managers have significant influence on public projects. For them too, as for companies, the pertinent requirements are formulated. In some countries, only people who meet these requirements may manage public projects.

Requirements for public project managers usually focus on three areas: general project management skills, specific skills needed to manage public projects (e.g., knowledge of the applicable regulations) and knowledge of local realities.

Having a certificate issued by a recognized body (like the Project Management Institute's PMP®) may be the basis for recognition as a qualified project manager (PMO Maine, 2013). Certificates that qualify to conduct public projects are also issued upon completion of training organized in a given country (e.g., PAI Ireland 2013). A more advanced requirement is the completion of full studies of public projects management (University of Oxford 2012).

Criteria which must be satisfied by public project managers are formulated (VITA Virginia 2011). These criteria may include, for example, the ability to identify project products and services, or the ability to develop and implement a project plan.

The institutions involved in public projects implementation designate professional development of their employees as their statutory goal (IPMD India 2013). They provide training in public projects management. The Washington State Department of Transportation maintains the Academy of Project Management (WSDOT Washington 2013b). Comprehensive training for project managers, including the basics, soft skills and advanced topics is done in the state of Michigan (DTMB Michigan 2013). Training is provided both in the traditional (e.g., EPMO Vermont 2013; IPMD India 2013) and the e-learning mode (WSDOT Washington 2013).

Development Territory

The development territory consists of one area of Development of NPPIS.

Development of Public Projects Management Systems

The countries that want to optimize the benefits gained from public projects, clearly define their strategic goals in this area and prepare plans pursuant to achieving these goals.

The goals and methods of developing public projects management systems are defined in different ways in different countries. The future course of development for project management can be determined on the basis of results from customer satisfaction surveys about these services (Mays and Bromead 2012), as well as audits of public projects management (ANAO 2011). In most countries, such strategies are worked out on the basis of analysis of public projects management systems, often in the broader context of the country's strategic development (Brewer et al. 2013).

The following development prospects for public projects management systems may be defined: general goals (e.g. recommendation that a public projects management strategy be developed (ANAO 2011)), business goals (e.g. increasing the capacity to implement ICT projects (DoFD Australia, 2011)), management goals (e.g. projects should be implemented in a way that achieves the objectives of time and budget (OCIO Washington 2011; OIT Maine 2009)), operational goals (like the creation of a Major Projects Authority), and knowledge-related goals (like collecting knowledge developed in projects for the purpose of reusing it in the future (ANAO, 2011)).

Advisory Bodies

The advisory bodies can define and improve processes, procedures and project document templates (EPMO North Carolina 2013; EPMO Kansas 2008, p. 18). They may also advice at

the country level in the area of project governance – this is one of roles of the council of program management established by PMIAA (US Congress, 2015). In addition advisory bodies may have specific tasks, such as general consultation in projects management (PMAC Tasmania 2013). These bodies are involved in promoting and supporting project management (PMOAG Montana 2013c; PMAC Tasmania 2013), removing obstacles to project management and supporting project managers (PMAG North Carolina 2013). They may review applications for the most important projects (ITAC Arizona 2013).

Summary and Conclusions

Many countries have established practices of public projects management, which they systematically apply. These practices can be grouped into three territories and six well-defined, interrelated functional areas.

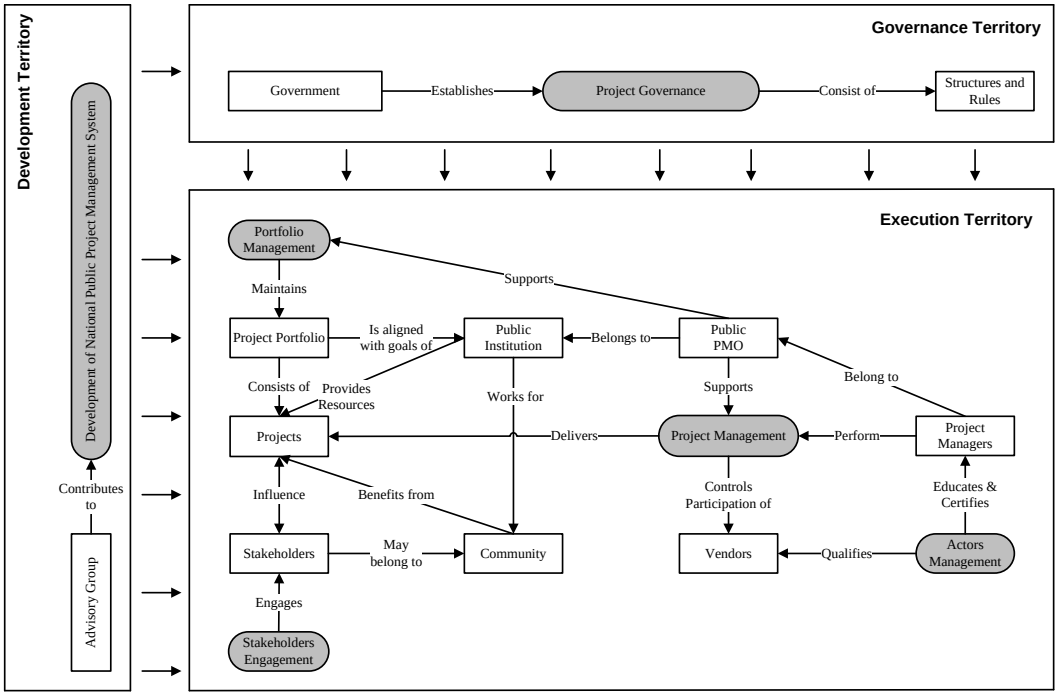

Fig. 1. **A Model of National Public Projects Implementation System**
Source: Author construction

The territory of public projects Governance consists of one area of public Project Governance. Project governance is established by authorized government. The effect of project governance is establishing structures and rules which must be followed while executing public projects.

The territory of project Execution consists of four functional areas: Portfolio Management, Project Management, Actors Management and Stakeholders Management.

The area of public projects Portfolio Management covers identification and maintenance of a set of projects, aligned with public institution strategic goals that are being executed.

Projects can be initiated on the basis of a strategy operating in a specific area, or as the result of an emergency situation disrupting strategy execution, which requires intervention by public administration. Portfolio management is supported by activities of Public Projects Management Offices.

The main goal of the area of public Project Management is successful delivery of public projects. Public projects are managed by certified project managers. The deliverables are usually produced by external vendors from in majority private sectors. Public projects management is supported by public PMOs.

The area of Actors Management deals with the most important actors engaged in public project execution: vendors and project managers. This area is responsible for education, training, and certification of public project managers. It also qualifies private firms to execution of public projects.

The area of Stakeholder Engagement is responsible for engaging stakeholders into public projects. These stakeholders may or may not be members of communities for which public institutions work. When they are members of these communities, they benefit from public projects. The other stakeholders may positively or negatively influence public projects.

The territory of Development covers only one area of Development of NPPIS. This territory may influence the territory of Project Governance as well as the territory of Project Execution.

These territories, areas and other components together form the National Public Projects Implementation System. Building such model contributes both to the theory and to the practice of public projects delivery. Form the theoretical point of view this is an original model substantially enriching knowledge about public projects execution. From the practical point of view it may be treated as a set of guidelines for governments which desire to implement an effective and efficient NPPIS contributing to development of national economy.

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INTRODUCTORY OF RENEWABLE ENERGY SOURCES IN ASEAN COUNTRIES AND GREEN-Y MODEL FOR PREDICTING FIT-IN TARIFF IN MALAYSIA

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Abstract

ASEAN is enriched with renewable energy sources (RES) and this is the major advantage as compare to other countries. However, the endowed RES are not being fully utilized because they are mainly relied on non-renewable energy sources (NRES) such as fossil and coal. Even though the cost of acquiring NRES is low nowadays, but the cost will be hiked sooner or later when the currently available NRES are running out. The awareness towards the implementation of the RES has been taken into consideration by the ASEAN due to the conveniences. The principal aim of this paper is to provide an insight to the ASEAN countries in preparing themselves towards the adapting of renewable energy and guidelines for the policies for RES. The developed Green-Y model is used to advise the ASEAN governments to evaluate and predict the economic concept included a feed-in tariff. Forecasted photovoltaic cost analysis results in Malaysia show the increasing of feed-in tariff for every year.

Key words: *ASEAN RES, Photovoltaic Cost Analysis, Renewable Energy, RES Policies, RES Potential*.
JEL code: *O21*

Introduction

ASEAN countries are enriched with many renewable energy sources (RES) such as wind energy, hydropower energy, solar energy, biomass and many more. Most of the countries in ASEAN are utilising fossil and coal as the primary energy resources. According to the statistic of global energy consumption, only 11% of renewable energy resources were used as shown in Fig. 1 in the year 2012. Moreover, about 29%, 32% and 21% of coal, oil and gas subsequently had been utilised (Sieminski, 2014). Most of the countries in Asia are using fossil and coal as main sources to generate electricity instead of using the highly available renewable energy. Therefore, just a small amount of renewable energy resources has been utilised to generate electricity for daily usage in the particular country.

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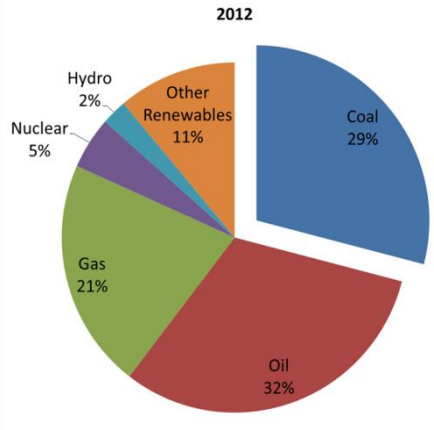
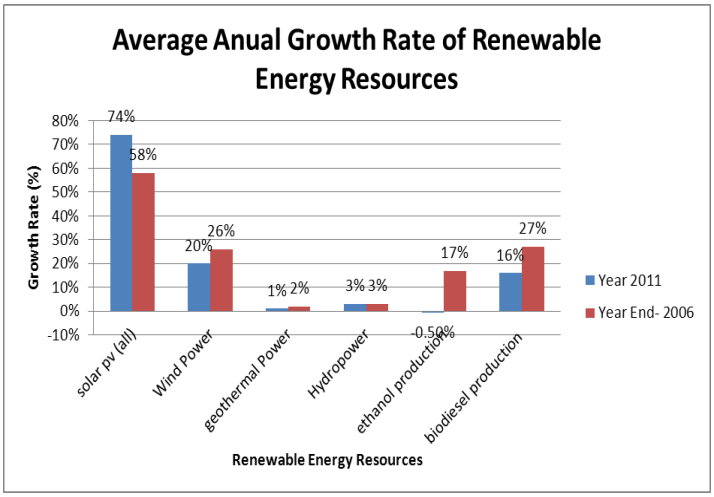


Source: author's construction based on (Sieminski, 2014)

Fig. 1. **Global energy consumption**

Renewable energy market grew rapidly for several years; photovoltaic energy has the rapid expansion with the fastest growing energy, followed by wind power for about 164 GW, and biodiesel production. Hydropower and geothermal power have the least growth rate. The average annual growth rate of renewable energy resources in ASEAN from 2006 to 2011 is provided in Fig. 2. Approximately half of the available renewable energy resources were supplied to the world in 2011.



Source: author's construction based on (Al Jaber et al., 2012)

Fig. 2. **Average annual growth rate or RES**

Presently, most of the governments are starting to implement more RES to generate electricity as it is more environmental protection, energy access improvement and energy security enhancement (Martinot, 2005). Furthermore, some states in ASEAN started to propose policies' model of generating performance based on the electricity inducement that synthesizes these policies contained in the context of better renewable energy practice framework, policy

instrument and sustainable economic concept. The main objective of this paper is to assist ASEAN, mainly for Malaysia's government in preparing the implementation of renewable energies and to guide a Malaysia policy for RES in the mid to long term. Besides that, this paper also will assess the current best practices, and future cost or RES and corresponding support necessary to initiate stable growth of RES. Moreover, integration of better RES policies with climate and innovation policy as well as liberalized energy market is also part of the objective of this research work. Last but not least, the selected recommendation for the future deployment of RES based on the Green-Y model in order to assist Malaysia in implementing national action plans and to support a long term vision of ASEAN RES.

Literature reviews

Renewable energy resources and policies

Energy and RES policies in ASEAN regions have been growing over the last two decades ago that shared some feed in tariff design features, RES potential and RES utilization. Economics of RE growth increased in energy consumption up to 3.6% per annum since 1995 to 2007 (Suryadi, 2012). This section reviews the involvement of RES in each country's policies and a summary table of the energy consumption and feed in tariff data.

Solar energy resources

Southeast Asia's countries are very popular with the sunny weather that consumes to solar energy resources. Approximately 4 to 7 kWh/m^2 of solar radiation have been produced per day (Essays, 2013). Solar photovoltaic technologies are becoming the alternative resources of generating the electricity in most of the ASEAN countries, especially for water pumping, street light, telecommunication network, and home. Table 1 shows the solar energy resources potential and utilisation of high penetration regions in Philippines, Vietnam, Malaysia, Indonesia and Thailand (Fürsch et al., 2010).

Table 1

Potential and utilisation of solar energy resources

Country	Potential	Utilisation
Vietnam	5 kWh/m^2/day (4-5.9 hours) 2MW	0.6 MW (solar PV)
Philippines	5.1 kWh/m^2/day	1 MW (centralised solar PV)
Indonesia	4.8 kWh/m^2/day	5 MW
Malaysia	4.5 kWh/m^2/day	1.5 MWp (PV stand alone) 450 kWp (grid connected PV)
Thailand	>5000 units (solar PV)	6 MW

Source: author's construction based on (Fürsch et al., 2010)

Biomass energy resources

Biomass derived from the dead plant, agricultural and forestry residues, municipal waste and animal residues. In ASEAN countries, the energy that can be generated is depended on the production structures it as the resources of the residue is varied from country to country. Table 2 shows the biomass energy resources potential and utilization. From Table 2, the potential of

biomass energy resources is high in a certain country such as Indonesia, Thailand and Malaysia. However, the utilization of biomass energy resources is low.

Table 2

Potential and utilization of biomass resources

Country	Potential	Utilization
Philippines	**Commercial Potential** 120 MW	-
Malaysia	**Technical Potential** 2700MW	211 MW
Indonesia	**Technical Potential** 49810 MW	302 MW
Thailand	**Technical Potential** 7000 MW	560 MW
Vietnam	**Technical Potential** 400 MW	50 MW

Source: author's construction based on (Hoogwijk et al., 2003)

Renewable targets and strategies

Every country in ASEAN has their renewable energy target and goal. Setting up their renewable energy policy strategies is one of the keys to achieve the target and goal. For example, all 27 member of European Union (EU) had set their 2020 target to 20% of establishment energy efficiency (Fürsch et al., 2010). ASEAN countries also have prescribed the renewable energy target with respective strategy to promote the renewable energy development. The strategies and target are a long term direction, and it is a correct signal to the world market. The renewable energy strategy and targets of all over Southeast Asia's country are shown in Table 3.

Table 3

Renewable Energy Strategy and Target

Indonesia National Energy Policy (2004) • 5% the power capacity should be based on RE in 2020
Malaysia Small Renewable Energy Power Programmes • 5% (500MW) grid connected electricity to be generated from renewable energies by the end of 2005 Biomass-based for Power Generation and Cogeneration in the Malaysia Palm Oil Industry • The strategy involve the implementation of barrier removal activities (2002-2004) and the implementation of innovative loan/grant mechanism (2005-2008)
Philippines Renewable Energy Framework (2003) • Increase RE-based power capacity by 100% 2013 (from 2003), increase non-power contribution of RE to energy mix by 10 MMBFOE in the next 10 years Regulation governing RE Development • Geothermal • Mini-hydro

• Ocean, Solar and Wind
Thailand Strategic Plan for Renewable Energy Development : new option for Thailand • Increase the share or renewable energy to 8% of commercial primary energy consumption in 2011 • Renewable portfolio standard (RPS). 4% of new power plant must be generated by renewable energy in 2011 • Inactive measures being developed
Vietnam National Energy Policy (September 2004 Draft) • To provide electricity in 2020: 3% share in primary commercial energy; 5-6% in electricity generation Rural Electrification Policy • To provide electricity services in the rural areas, either grid-based or off-grid, to imp rove the living conditions of the rural population and ability to earn household income as well as to reduce poverty in the rural areas Renewable Energy Action Plan • To support an acceleration of renewable electricity production, to meet the needs of isolated households and communities that cannot receive electricity services from the national grid, and to supplement grid supply cost effectively in remote areas • Phase 1 targets the addition of 25-51 MW of renewable energy capacity; Phase 2 aims to achieve between 175-251 MW additional renewable energy capacity

Source: author's construction based on (Pacudan, 2005)

In order to achieve the renewable energy developmental goals, the specific renewable energy policy framework has been established in each of the ASEAN countries. Every framework of ASEAN shows the current government concern, renewable energy development status, development concern and etc. The policies promoting renewable energy development are shown in Table 4.

Table 4

Policies Promoting Renewable Energy Development

Indonesia National Energy Policy (2004) • Guarantee sustainable energy supply to support national development Green Energy Policy (2004) • Provide sufficient supply to satisfy needs of the community • Secure sufficient supply for future generation
Malaysia Five-Fuel Diversification Policy (2000) • Renewable Energy as the fifth fuel • Ensure reliability and security of supply • Balance energy supply mix • Protect the environment
Philippines Renewable Energy Policy Framework (2003)

• Reduce the country's dependence on imported energy • Broaden resource base • Save foreign exchange and reduce emissions
Singapore National Energy Efficiency Committee (2001) Address the increasing energy consumption • Promote energy conservation; use of cleaner energy sources and renewable energy; promote test-bedding of pioneering energy technologies and commercialisation of energy technologies
Thailand Strategic Plan for Renewable Energy Development (2003) • Seek alternative to fossil fuels • Reduce import and save foreign exchange • Reduce environmental impacts • Optimise the value of domestic energy resources
Vietnam Rural Electrification Policy (2001) • Provide electricity services in the rural areas, either grid-based or off-grid, to improve the living conditions of the rural population and ability to earn household income as well as to reduce poverty in the rural areas

Source: author's construction based on (Finon, 2006)

Feed in Tariff

Feed in tariff (FiT) is a major instrument for promoting the generation of electricity from RES for many decades in Europe countries. FiT also called as a regulatory, which is a minimum guaranteed price per kWh of electric utility that has to put to the private sector, independent producer of renewable electricity. The concept of FiT is the total amounts of electricity per kWh received by the independent producer of renewable electricity including the production subsidies add to the market price of electricity but it's excluding the tax rebate because the government pays it.

There are many variables that vary the cost of FiT and its difference with every country that implements FiT. The FiT cost is depended on the renewable energy technology used, variable time, season of feeding renewable energy, national characteristic, potential cost, cost of RES (Finon, 2006). Feed in tariff policy was implemented more than 40 countries worldwide, but the most successful renewable energy market is in Germany and Spain. The FiT was experiences in European countries begin to demonstrate the proper FiT because it more costs effectiveness. Feed in tariff supply policy is focusing on the development of RES generation. The feed in tariffs have two designs which are fixed price and premium price, the premium price also called as 'spot market gap'(Held et al., 2006). However, some ASEAN member implemented FiT as it is the best economic concept for renewable energy cost. In this further project, there will be a model that can calculate and forecast the FiT and others' economic concept of renewable energy. The model is called Green-Y model.

Methodology

The material in this project is designed and simulates the solar PV and Biomass by using preliminary Green-Y model by excels software. The green-y then calculates the feed-in tariff of solar power and biomass system. The total cost includes the investment cost, fuel cost, operation and maintenance's cost and total installed cost. The feed-in tariff is found from the variety of equation, which includes the total cost, annual digression, and period of the RES. The analysis is based on the FiT in Malaysia.

Green-Y model

The appropriate relevant parameters are one of the important keys to calculate the cost generation. The most important parameters when determining the generation cost are (De Silva, 2012).

- Investment and operational costs
- Full load hours
- Fuel price (biomass)
- Discount rate
- Expected return on equity
- Electricity price

The Green-Y model basically calculates by the amount of net present value (NPV) as shown in Equation 1 and Equation 2 together analysis over the payback period in Equation 3.

$$NPV = \sum_{t=2030}^{t_0=2010} \frac{\left(\frac{income}{year}\right) - \left(\frac{\cos tO\&M}{year}\right)}{(1+r)^{t-t0}} - Investment\cos t \quad (1)$$

$$NPV = -S + \sum_{J=1}^{N} \frac{(Q_j)}{(1+i)^J} \quad (2)$$

$$NPV = -S + \frac{Q_1}{(1+I)} + \frac{Q_2}{(1+I)^2} + \ldots + \frac{Q_N}{(1+I)^N} \quad (3)$$

Where:
I = Discount rate = interest rate + inflation rate
N = Lifespan of renewable energy in year
J = Specific year for calculation

Photovoltaic cost analysis in Malaysia

In order to determine the FiT cost, the generation cost per technology must be known then the FiT can be fixed accordingly. Therefore, the NPV has to assume to be zero or no net present value. All the parameters need to calculate personally before put into the Green-Y equation. The full load is estimated to be 10 hours / day and approximately 3760 hours/year. While, the cost for O&M is the cost of operation and maintenance and it is estimated with Rm

2400/kW/Year. Besides that, the investment cost or the project cost is approximately Rm 104000/kW and the interest rate; r is about 6% or equivalent to 0.06. The total duration of the entire estimation takes about 21 years starting from 2010 with the annual digression about 8% (2010 to 2013) and 10% (2013 to 2030). Table 5 shows the parameters that need to be considered for conducting economic analysis on a photovoltaic system.

Table 5

Important parameters for the photovoltaic system

Parameters	Values
Capacity (kW)	4
Full load hours/year	3760
Investment cost (Rm/kW)	104000
Operation and maintenance cost (Rm/kW/year)	2400
Interest rate, r (%)	6
Duration of support, t (years)	21
Feed-in tariff (Rm/kWh)	?
Annual Digression %	8 (2010 to 2013) 10 (2013 to 2030)

Source: Authors' construction

Research results and discussion

The example of FiT calculation for year 2010 is enclosed in the following. However, the FiT for the year 2011 to year 2030 can be calculated subsequently by following the example as stated.

$$NPV = 0$$

$$\frac{income}{year} = Capacity * Full\_load * FiT^{*} = 4 * 3760 * FiT = 15040FiT$$

$$\frac{CostO\&M}{Year} = 2400\left(\frac{Rm}{kW.Year}\right)$$

$$0 = \sum_{t=2030}^{t_0=2010} \frac{(15040 * FiT) - (2400)}{(1+0.06)^{2010-2010}} - 104000$$

$$\frac{FiT}{AnnualDigression(8\%)} = 7.0745$$

$$FiT = 8\% * 7.0745$$

$$FiT = 0.56596\ Rm/kWh$$

According to the graph provided in Fig. 3, the FiT for photovoltaic is increasing by years. The FiT initially is low as the value of 0.599 Rm/kWh and it started to increase by years up to 2.367 Rm/kWh in 2030. The proportional increment showed that the capital FiT for photovoltaic system is successful and reliable.

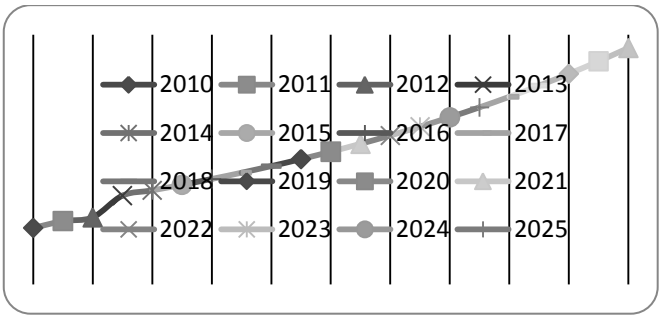


Fig. 3. **The predicted FiT values for year 2010 to 2030**
Source: Authors' construction

Therefore, ASEAN countries including Malaysia are expected to play an important role in the global energy market for the upcoming years. Primarily, the consumption energy demands in ASEAN will be expanded to 76% between 2007 and 2030 with the annual growth rate of 2.5%. This is the highest statistical analysis as compared to the rest of the world (Birol, 2010).

Conclusions

Most of the ASEAN countries have undertaken the step toward sustainability, saving energy resources for the next generation. ASEAN countries start to emphasize in implementing the policies and start to develop the model for the economic concept of renewable energy that covered all economic analysis of generating electricity from RES. ASEAN countries, especially Malaysia has shared some feed in tariff, RES potential and RES utilization. Some countries in ASEAN to implement FiT but some they do not implement FiT as it is depending on their policies. Green-Y model shows the simple and reliable calculation of FiT for the photovoltaic application in Malaysia.

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ACTIVITY THEORY PERSPECTIVE FOR PROJECT MANAGEMENT RESEARCH IN THE BUILT ENVIRONMENT

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Abstract

This paper presents a conceptual perspective that will assist project management professionals in the development of its theoretical underpinning framework. There is a need for a unified theory of project management with links embedded in all aspects of the profession, be it in the humanities or sciences. Management science tradition and the social science tradition are considered to be incompatible on important issues, although project management skills are founded from these two disciplines. This conceptual unified perspective is based on activity theory (AT). The implications of using activity theory within project management (PM) for the built environment, its conceptual formulation and benefits for use in PM is presented in this paper.

Keywords: *Activity theory, Built environment, Engineering and Construction, Projects, Project management*
JEL code: *L74*

Introduction

It is generally accepted that the lack of an adequate theory of project management is one reason that progress in the field of PM is relatively modest. People come to the field from different built environment disciplines – architecture, engineering, quantity surveying, building survey, structural engineers and others – as such there are serious problems in coordinating and combining their different efforts and perspectives. Apart from the distinct areas of classical management, and management science very little has been provide in way of research and development. Traditional conceptual approaches cannot provide an appropriate basis for addressing the integrated nature of the human elements as well as the technological elements within the PM profession. Rather a unified approach is attempted through the dedicated body of knowledge or institutions of project managements, guidelines and materials that certify the profession (PMI, 2000; Morris, 2003; 1998). The down side is that there are many different PM bodies providing their own views of the profession. When PM is compared to the classical professions (i.e. medicine, law and engineering), which can be quite different, one finds that there are no underlying theoretical basis in which you can identify the standards, practices and well demarcated structure. As with classical professions development, project management needs an underpinning theory that will have structure, identifying the standards, practices and the body of knowledge.

The aim of this paper therefore is to evaluate current works on the developing of a PM theoretical bases, identifying its shortfalls and highlighting possible solutions. The paper also investigates activity theory and its implications as a framework to be used in developing sound theoretical bases for project management. It examines the main advantages of activity theory and highlights recent attempts to apply activity theories in other scientific areas. The paper

outlines the importance of activity for future research and theoretical underpinning of project management.

The Current State of Project Management (PM)

The historical model of project management is central around control and organisation; increasingly it is being seen as relating also to strategic, technical and commercial issues. Too often project management is considered to be a planning, execution, implementation only discipline: it needs to be seen in a much broader understanding embracing issues of the whole life cycle of the project being undertaken. While there are clearly common practices (i.e. project development cycle: concept, definition, development, execution and delivery), the environment in which they are deployed are significantly different. This leads to a difference in the way project management topics are handled (Morris, 1998:2003).

A project delivers a specified objective within a defined budget and a defined timescale and quality. Project management therefore is all about tightly defined solutions to problems, many of which are well understood before the task is undertaken. PM is a conscious activity that is goal oriented. Project management relies upon hierarchical decomposition of the overall project into smaller sub-elements so as to achieve manageable tasks.

A project relies upon hierarchical decomposition of the required tasks via some form of Work Breakdown Structure (WBS) such that the final work packages are sufficiently bounded, defined and achievable. The total project is reconstructed from the WBS under the assumption that the sum of the WBS elements equals the project output.

Other attributes of project management worth mentioning are as follows (Turner 1995; Cicmil, 2006)):

- Emergent properties – in project management the whole may equal the sum of the parts although overhead effects can imply that the whole is less than the sum of its parts.
- Lifecycles – life cycle phases are often interspersed with decision or review points at which logical break in the project occur.
- Processes – the processes of project management is predominantly a sequential nature.
- Research and development – the continued development of project management has moved into the practising profession of the industry.
- Holistic view – although they have to keep the whole project in mind, but in reality the project manager is only interested in the remainder of the project as far as defining new action is concerned.
- Focus on the delivery of the project
- Drivers - delivery of the project to time cost and quality, while improving profit and productivity.

Hence project management is about getting things done, and as such it is goal oriented.

Although, one might argue that the field of project management (both the practical and theoretical parts of it) has developed rapidly in recent years, some authors focus has been too narrow. A number of authors have argued that, despite the academic interest in courses and programs, the research aspect of project management is not very well developed. Morris (2006) argues, for example, that the academic awakening of interest in project-based undertakings is far

too slow. Furthermore, in a review of the literature and theories of project management, Packendorff (1995) claimed that project management is largely considered as a general theory that is not sufficiently empirical. Moreover, he stressed, in the dominant line of research, projects are seen as tools and project management is seen as a set of models and techniques for the planning and control of complex undertakings. Thus, a number of writers have, in recent years stressed the importance of a diversity of theoretical perspectives and in-depth studies in order to construct ‘‘middle-range’’ theories on different types of projects. In a recent literature review, Pinto [8] claimed that the major developments of the research on project management have been into project risk management and critical chain project management. Pinto does not fully acknowledge the problem that the research referred to suffers from almost an entire lack of empirical studies. The developments related to the research on temporary organizations are not fully acknowledged.

The nature of project as a temporary organisation considers the following (Turner, 2006):

- The project as a production function
- As an agency for change
- As an agency for resource utilisation
- As an agency for uncertainty management

Many of the classical definitions of project emphasise the role of a project as a production function, just as the earliest definitions of the firm in classical economics (Cicmil, 2006).

Viewing the project as a temporary organisation introduces many of the elements of concerns, including (Turner, 2006):

- The conflict of interest between the various stakeholders
- The role of the manager, the broker and steward
- The need to put in place information and communications systems to monitor delivery of the project, to monitor achievement of the owner’s objectives, and to avoid self-interest and opportunism by the project’s participants, especially the agent.

As such, Soderlund (2003) concluded that there exist two main theoretical traditions in project management research. The first tradition with its intellectual roots in the engineering science and applied mathematics, are primarily interested in the planning techniques, and methods of project management that can be theorised successfully by a mathematical approach (Turner, 2003). The other tradition with its intellectual roots in the social sciences, such as sociology, organization theory and psychology, are especially interested in the organizational and behavioural aspects of project organisations (Cicmil, 2006).

Another important matter for empirical social research is that of perspective versus phenomenon. For instance, it could be claimed that projects are nothing else than a way of looking at industrial and organizational activity. Whether projects really exist is of less importance in this respect, which is similar to the argument stated that the researcher’s perception of a single project does not necessarily have to correspond with the ones of the actors involved on the project. Researching into projects is thus more a matter of looking and trying to capture the unique, complex and time-limited processes of interaction, technical innovation, organization and management (Packendorff, 1995).

On the other hand, it might be possible to identify research, which states the importance of providing knowledge and theories about the organization and management of projects. Following this line of reasoning it might be stated that the research into the ‘‘management by

projects'', i.e. studies that look at firms but pay special attention to the project dimension, advocates that projects provide a perspective for analyzing corporate activity.

In a project context, the universal elements are normally uniqueness, task complexity and time-limitedness. Whether the project management is viewed in different ways, or multiple ways, one thing is certain, we need to find ways of unifying these approaches within a particular theory, which are widely acceptable. The theory should contain elements of the personal, social and environmental nature of project management coupled with its scientific aspects. One such unifying approach is offered by the psychological *activity* theory.

Background to Activity Theory (AT)

Before embarking on *activity* theory (AT), it is expedient to position the theoretical understanding considered within this paper. A theory, when shared, provides a common language or framework, through which the co-operation of people in collective undertakings, like projects, firms, etc., is facilitated and enabled. Theory can be seen as a condensed piece of knowledge; it empowers novices to do the things that formerly only experts could do. It is thus instrumental. When explicit, it is possible to constantly test the theory in view of validity and new innovations. A theory provides an explanation of observed behaviour, and contributes thus to understanding. A theory provides prediction of future behaviour. On the basis of the theory, tools for analysing, designing and controlling can be built. Innovative practices can be transferred to other settings by first abstracting a theory and then applying it in target conditions (Koskela, 1999).

Thus, AT appears to be the oldest and most developed of the psychological theories founded in the former Soviet Union. According to cognitive psychology, the human mind is a very specific information-processing unit. Like cognitive psychology, and unlike some other approaches in psychology, AT tends to be a 'real', that is, a 'natural science like,' theory. Like Piaget's (1950) approach, and unlike traditional cognitive psychology, AT analyzes human beings in their natural environment. Moreover, AT takes into account cultural factors and developmental aspects of human mental life (Bødker 1991; Leont'ev 1978, 1981; Wertsch 1981). AT has been used more widely in the West for HCI (Human-Computer Interaction) research and IS (Information Systems) research (Heirscheim, 1995).

AT defines *activity* as a '*goal directed system in which cognition, behaviour and motivation are integrated and organised by goals and the mechanisms of self-regulation*'. Thus, a particular strength of AT is the simultaneous formulation of external behaviour in terms of inner mental concepts and dynamics. This unity of consciousness and behaviour, embedded in a socio-historical context is a major principle of AT (Rubinshtein 1957, Vygotsky 1960). The relationship between conscious and unconscious processes has important implications in the study of human labour. When studying work activity for the purpose of intervention, the ways in which unconscious levels of regulations can be elevated to conscious once are particularly relevant.

Activity may be divided into three components: *orientation*, *executive* and *evaluative* (Bedny and Meister 1997). From the orientation components, people develop a subjective model of reality from which they actively extract distinct representations. As a result, a dynamic picture of the world is formed, providing a meaningful interpretation of reality. Executive

components of activity involve the transformation of obtained data according to the required goal. This process involves not only external behavioural components, but also internal mental actions. Evaluative components of activity involve assessment of results and – where appropriate – modification of mental and behavioural actions. The self-regulative system is comprised of tightly interconnected and separate mechanisms.

There are two approaches in the study of activities; one through individual psychological perspectives, another in terms of cultural-historical perspectives. The first considers activity as an attribute of individuals, under which the individual is an agent of the activity. The second, points toward a formulation of an activity, not only as an individual trait, but as normative standards for activity that transcend separate individuals (Bedny, 2000). In this latter perspective, the individual emerges not so much as an agent, but a subject adjusting and adapting to the normative standards and requirements of activity. Activity captures individuals and engenders individuality as much as individuals create activity. Social and physical environment prescribes the space of possible actions for individuals. To establish effective social interactions, an individual must develop standardised actions. Expectations are formed and predictions made about how different people will act in different situations. In AT, goal-orientation mobilises cognitive, behavioural and motivational components into integrated system composed of discrete cognitive-affective units that includes goal-oriented feed-forward and feedback components. AT utilises diverse, dynamic functional units of analysis, the most fundamental of which is the concept of *Action*, which affected the development of action theory in Western Europe (Bedny, 2000).

The study of human labour dominated the development of AT. AT is formulated in terms of a logically ordered system of goal directed mental and behavioural actions rather than reactions. Under the rubrics of AT, plans, motives, methods of performance and goal directed behaviour as a whole can be formulated consciously or unconsciously, but the goal of an *activity* is always conscious (Bedny, 2000). Labour and the use of tools (i.e. artefacts) modify not only *nature*, the object of the labour, but *man*, the agent of the change.

Tools possess a mediation function; Vygotsky called tools that mediate mental activity *signs*. When an individual performs a mental activity, he uses signs as tools in the same way that he uses tools for performing external activity. Language is a major system of signs that mediate the mental activity of man. Because speech is considered the most important sign system, social interactions and communications assume critical importance in human consciousness and cognitive functions. The acquisition of signs as cultural tools empowers the regulation of one's own behaviour.

The General Structure of Activity Theory (AT)

AT is distinguished by the careful delineation of the structure of activity describing both the basic components of activity and their interrelationships. Activity may be represented as an integrated system of cognitive, motivational and behavioural components organised as a system of mental and behavioural actions directed to attain conscious goals.

A goal is formulated as the physical location of an object or a formal description of the final situation that is to be achieved during the functioning of technical or biological systems. AT provides five parameters for describing activity (Bedny, 2000):

1. the method of performance – concrete way of achieving the goal

2. a resulting index of work completed compared with goal
3. an informational basis of activity – the sum of all attributes like signals, etc. that empower the organisation of activity
4. a standard style of performance – method of work activity prescribed by instructions and
5. an individual style of performance – method of work activity dependent upon individual features of personality and preferences.

The methods for the study of activity can be represented as follows:

1. *Formulation* experiment –derived from the work of Vygotsky (1960) based on genetic explanation
2. *Systemic-structural* analysis – sub-classified into the following:
   - Parametrical method – concentrated on the study of different parameters of activity that are treated as relatively independent.
   - Morphological analysis in which the major units are actions and operations, based on which one may describe the structure of activity, in terms of logical and temporal-spatial organisation of actions.
   - Functional analysis – in which major unit of analysis is the function block.
   - Macro-structural and micro-structural analysis – that determines the level of analysis. Macro-analysis includes larger units of analysis. Micro-structural analysis suggests more detailed ones. These levels of analysis can be used in morphological as well as functional analysis.

All methods of analysis of activity are intimately related and mutually interactive, so that, according to the system-structured method of analysis, all methods are a unity (Bedny, 2000). AT over the next few decades became part of the larger research community. The focus has moved form the psychological to also take into account the social context as well. In this regard AT has gained popularity as an approach that takes into account the cultural and organisational context and also directly focuses on day to day practical work that involves the innovative use of technology (e.g. IS/HCI research).

According to AT, to understand a phenomenon means to know how it developed into existing form. The principle of development gives an opportunity to conduct thorough, scientific analysis of complex phenomenon while avoiding mechanistic oversimplifications. Thus the choice of unit of analysis of such phenomenon is vital. Project management is a discipline that has evolved and developed over time into its existing form. Project management has permeated into several recognised disciplines and industries across different environmental and social domain. What is lacking is the thorough scientific study and understanding of PM interactive complex phenomenon in different industrial sectors, domains and disciplines.

Levels of Analysis in Activity Theory (AT)

Activities can be studied at different levels of analysis. An activity found at one level of analysis often affects behaviour on the level below. A fundamental components of AT, is the task. Analysis of task performed by the worker allows the efficiency of their work to be

estimated. The goal organises task element as whole, around which task may be represented as a logically organised system actions.

In the AT, actions are considered the major, discrete units of analysis that conform to the criteria. Actions are fundamental elements through which one can recreate holistic activity. Each action has separate conscious goals that must be reached to attain the overall goal of the task. The intimation of the goal formulation constitutes the starting point of any action. The conclusion of the action occurs when the result of the action is evaluated in relation to the established goal. In some cases, goals are very specific in others they may be general and contingent. Any action includes several components, called operations, the performance of which contains its own purpose. Zinchenko et al. (1971) introduced the notion of a function block as a component of cognitive action.

The general schema of components and unit analysis may be represented as follows:

Activity ⟶ Task ⟶ Action ⟶ Operation ⟶ Function Block (1)

Activity and tasks are considered as objects of study because they are composed of diverse units with complicated internal structures that represent particular kinds of activities that are directed to achieve terminal goals. Actions, operations and function blocks emerge as units of analysis. Action being the most used unit of analysis.

The Implications of AT for Project Management Research

According to AT, project management (PM) is a tool that mediates the interaction of human beings within their environment. PM is also a tool to effect change when working within a framework of a temporary organisation. One distinction to be made is that within PM, *activity* is not the same as that defined in AT. In PM, activity and task are used interchangeably. Although task in AT is more closely related in definition to task in PM. If the next higher level of abstraction of task in PM is an '*activity*', then we can use the AT approach in understanding PM. This gap is the fundamental difference that will bridge socio-cultural conceptualisation that has been missing in other theoretical approaches in PM research. Task in PM are arranged in hierarchical/sequential structure, starting at the work breakdown structure, through the work packages, which in effect mirrors the structure of Activity theory. This represents a shift from model-based approach, or mathematical theorising of researching projects and project management, towards a more holistic-based understanding of the project management research.

In contrast to other types of project management research which draws on models and objective, instrumental rationality of actors, a pragmatic research of project generates knowledge and builds on AT which have the following qualities.

- The understanding of the actors' moral and ethical motives and their sense making processes and how their actions unfold over time and in connection with other, multiple events;
- The experience of emotions and feelings that drive action in complex project environments,

- Closer insight into intentions, political agendas and personal drives of individual actors; and
- The identification of tensions, power asymmetric and patterns of communicative relating among individuals and groups and how they are being negotiated in the context.
- Remodelling of artefacts or tools to new understanding and appreciation for the eventual use of *actors* in their environment. as such answering life cycle issues.
- Development of the PM discipline through research in a more holistic academic understanding.

In sum, AT provides a wider theoretical basis for studies of PM interaction in different project management domains than other tried and tested methods. It can take account of social interactions and cultural factors, the developmental aspects, and higher-level goals and values. Also the unit of analysis when researching PM can be done at different level (i.e. project level, sub-project level, task, etc.). At the same time, this conceptual framework does not reject the experimental results and techniques accumulated within the more traditional methods of project management, when viewed as artefacts that can be remodelled to fit new and uncertain demands, as well as the ever changing environmental conditions.

AT in the Construction Industry of the Built Environment

Large firms make up about 9% of the construction industry firms, and contribute 80% to the UK's GDP from the construction industry. Whilst the smaller and medium size enterprises (SMEs) make up the bulk of the industry's firms contribute 20% of the remaining.

Most of the larger firms have emerged from smaller firms that have grown or merged in one way or another through *innovative* processes. If one should consider the size and structure of firms within the construction industry, the larger firms will be more involved in using recognised PM practice, for example practitioners, from Project Management Institute (PMI) using the PMBoK.

The PMBoK structure is written with PM practice of larger firms in mind it was not intended for SMEs. SMEs are not really the main subject matter, where the bulk of the construction industry firms are situated. However, most of the large and smaller firms work together on a majority of projects within the industry, main contractors and subcontractors on the same projects, hence, there should be a theoretical bridging framework within the construction industry where both parties can understand project management from the same framework; AT offers this approach.

Another area of difference is in the management of people between the large firms and the SMEs. Usually the role of HRM is more recognised in large construction firms than the SMEs. From their history most of these large construction firms have emerged with discrete human resource department, unlike the SMEs that still practice the classical or traditional management approach as put forward by Fayol and other pioneers. However, most of the tools and techniques applied in PM as used by large firms and SMEs, which are applied in PM are similar in nature.

Considering the fact that AT takes into account the human subjective elements, it may be that, whether HRM or classical management approach, the AT framework will be useful for future analysis of PM practice within the construction industry. Wherever you are operating on

the project life cycle spectrum, be it a large firm or a small firm, AT can be used to conceptually analysed issues of PM practice in the construction industry, particularly as firms work together most of the time.

Conclusions

In the above discussion, some theoretical areas for further exploration of project management can be identified. The unity of analysis is one area that will be essential to carrying out research into project management in the future. The project itself can be viewed as a unit of analysis in investigating the different areas of projecting across different sectors and industries. Also the way the work breakdown structure is done and the different actions within a project is another relevant construct for future investigation of project. Projects within built environment can be viewed within sectors like building services, architecture. Actions when considered in the wider context of project management can be those relating to sustainability issues like, carbon footprint, energy reduction and other essentials of environmental concerns. Activity theory provides the framework for relevant study areas; some generic, one-off projects, or a multitude of projects as well as very specific studies of particular actions that are related to human interactions. Activity theory can be used within research both empirically as well as experimentally in addressing current issues of sustainable project management when fully understood. Also because activity theory embraces the systems approach (Bedny, 2000), it is possible that activity theory can be fully integrated within the soft system methodology as areas of future development (Checkland, 2000). Within the built environment AT can be used to integrate all aspects of project management.

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BENEFITS OF AGILE PROJECT MANAGEMENT IN A NON-SOFTWARE DEVELOPMENT CONTEXT – A LITERATURE REVIEW

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Abstract

In the last fifteen years we have witnessed a vast spread of new methods for managing projects within software development. In 2001, the Agile Manifesto stated the common values and principles of these methods, all aimed at producing better software. Several of these values and principals are specifically expressed for designing and programming software products. Since then, the benefits of these methods have led to a widespread use of agile project management even in non-software development contexts. But, how does these values and principals affect projects in non-software areas since some values and principals are not applicable? Do they perceive the same benefits?

This paper presents a systematic literature review aimed at identifying benefits in projects adopting agile methods in non-software development contexts. Out of the 21 case studies analysed, most reported projects were from manufacturing companies but even from areas such as library management and strategy management. The most frequently reported benefits were related to team work, customer interaction, productivity and flexibility. The main parts of the benefits were corresponding to the first value in the Agile Manifesto: Individuals and interactions over processes and tools.

Key words: A*gile project management, Scrum.*
JEL code: ***M10***

Introduction

The methods originating in the nineties such as Scrum (Schwaber & Beedle, 2001; Schwaber, 2004) or eXtreme programming, XP, (Beck 1999) has now become famous under the term "agile project management" or "agile methods". Today, most of the agile methods have been used in the IT industry for projects within software development (Mafakheri et al. 2008; Sheffield & Lemétayer, 2013). But although *originating* in the IT industry, agile project management is now moving into other businesses. Methods spreading from one context to another are nothing new. For example, Toyota Production System (TPS), originally used for car manufacturing, later became famous under the name Lean and has now moved into all kinds of industries such as healthcare (Kim et al. 2006).

Although there is extensive evidence of agile project management used in software development, there is a lack of empirical studies in other types of industries and projects. In an article by Pope-Ruark (2015, page 116) she states that "agile is not only popular in software development; a quick Google search reveals its reach in design, marketing, publishing, energy management, financial services, and civil and mechanical engineering, to name a few." That can be found by executing a Google search, but what about published articles describing actual case studies of organizations that are not within software development? This literature review is an attempt to map articles showing case studies of agile project management used in other contexts than software development.

The main research question (MRQ) for the systematic literature review is: *What are the experiences from using agile project management in a non-software development context?* In order to answer the MRQ and evaluate the results, the question has been divided into the following two specific research questions (SRQ):

SRQ1: *What benefits are experienced from using agile project management in non-software development contexts?*

SRQ2: *What challenges are experienced from using agile project management in non-software development contexts?*

Agile project management

The popularity of agile project management methods are growing and research shows an increasing amount of successful projects due to the transition into agile project management (Schatz & Abdelschafi, 2005). In a project executed with agile project management, project plans are aimed at being flexible and to allow changes even late in the process. Reoccuring reviews of the project result and retrospectives to learn from experience allow the project team to constantly decide new ways of action for the project. Follow-up does not have the purpose of comparing progress with the original plan but instead to show the actual status in the project for better decisions for the future (Schwaber, 2004). Agile project management is characterized by working in short iterative cycles with delivery of some part of the project result at the end of every cycle. In 2001, seventeen of the originators of these methods met to state what values and principles that are common for these methods. The Agile Manifesto (Beck et al. 2001) states that agile practitioners have come to value:

> *"Individuals and interactions over processes and tools*
> *Working software over comprehensive documentation*
> *Customer collaboration over contract negotiation*
> *Responding to change over following a plan."*
> *(Beck et al. 2001)*

To further explain the values of the Manifesto, it was also accompanied by twelve principles:

> *"1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.*
> *2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.*
> *3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.*
> *4. Business people and developers must work together daily throughout the project.*
> *5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.*
> *6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.*
> *7. Working software is the primary measure of progress.*
> *8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.*
> *9. Continuous attention to technical excellence and good design enhances agility.*
> *10. Simplicity -- the art of maximizing the amount of work not done -- is essential.*
> *11. The best architectures, requirements, and designs emerge from self-organizing teams.*

12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly."
(Beck et al. 2001)

Since the second value of the Manifesto implies only to software development, non-software development organizations are not able to live totally according to the Agile Manifesto. Also, principles 1, 3 and 7 are directly related to a software development context.

Planning and executing the review

All searches were executed by using OneSearch which is a new type of library research system (also called a "discovery tool") available within on-line university library resources. OneSearch finds books, e-books, magazines, journals, newspaper articles, documents and publications. This includes databases such as Scopus, Business Source Premier, Inspec, Science Direct and IEEE Digital Library to name a few. The start-up of the search process by executing ad hoc searches was in order to stabilize the search strings. Especially, the start-up was used to find out the proper use of Boolean operators (NOT, AND and OR). The resulting keywords and search strings are presented in the concept table (Table 1**)**. The use of a concept table (Rumsey, 2008) is to start the information gathering process by defining a relevant search term (in my case: "agile project management NOT software") and thereafter define search terms that are: synonyms, broader terms, narrower terms, related terms, alternative spelling and parts of speech.

Table 1

Concept table

Concept (first search)	**Agile project management NOT software**
Synonyms (second search)	Agile project management NOT software NOT IT
Broader terms (third search)	Agile NOT software NOT IT
Narrower terms (fourth search)	agile AND scrum NOT software NOT IT
Related terms (fifth search)	Agile method* NOT software NOT IT
Alternative spelling	(none used)
Parts of speech	(none used)

Source:author's construction based on Rumsey's concept table (2008)

The search for literature was delimited to apply only to articles published after 2001 since that was the year for signing the Agile Manifesto. An initial selection criterion was performed against title and abstract. An article was considered relevant if, after evaluation of the title and the abstract, it contained one or several case studies that contributed to answer the main research question. The execution of all search strings yielded over 21 000 articles distributed according to Table 2. For the first iteration of the review, the first 100 results were considered of each search engine. For each article, data was extracted as presented in Table 3. The selection criteria by title and abstract narrowed the set down to 51 references whose full text was downloaded and

studied in detail. The main amount of search hits not relevant for the study depended on the common use of the word "agile" not related to the investigated term "agile methods".

Table 2

Total results by search engine (with highest amount of hits)

Search phrase and number of total hits	Business Source Premier	Scopus	Science Citation Index	Inspec
Agile project management NOT software (6 173 hits)	3638	61	46	85
Agile project management NOT software NOT IT (595 hits)	135	50	28	31
Agile NOT software NOT IT (13 506 hits)	1188	1782	1037	1325
agile AND scrum NOT software NOT IT (50 hits)	1	3	3	0
Agile method* NOT software NOT IT (1136 hits)	120	74	291	0

Source:author's construction based on Rumsey's concept table (2008)

Table 3

Data extraction categories

Category	Criteria	Related to research question
Author	Author/Authors of the article	
Title	Title of the article	
Context	Within what context was the described case?	
Implementation	What parts of agile methods did they use?	
Benefits	What benefits did they experience?	SRQ1
Challenges	What challenges did they experience?	SRQ2

Source:author's construction based on research questions.

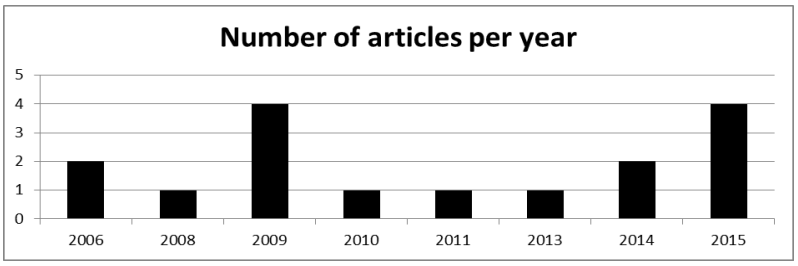
The following iterations focused on reviewing and extracting the information required in Table 3. For this purpose, an Excel sheet was designed which served as data extraction template. Each line of the excel sheet represented a relevant paper and columns represented the categories in Table 3.

In the analysis of relevancy of the case studies, an important aspect was to identify what parts of "being agile" the projects actually implemented in order to verify if the article referred to the actual agile methods apart from articles referring to the term "agile" in general. That is why implementation was an important part of the data extraction for every case. The most widespread method within the family of methods for agile project management is Scrum (VersionOne 2014). Scrum has its own language and interpretation of what was documented in

the Agile Manifesto (Beck et al. 2001) and its principles. In this analysis iteration, two case studies from articles were delimited from this literature review since the information presented did not show actual agile project management implementation. Some articles presented more than one case study so, although 16 articles where finally selected, the final amount of case studies to be analysed actually became 21.

Data analysis

The number of published articles per year (figure 1) contains too few articles to make any relevant analysis regarding trends. However, it is interesting to see that there were no earlier articles found than from 2006 (since the Agile Manifesto was written already in 2001).



Source:author's construction based on analysed articles.

Fig. 1. **Number of articles per year.**

As explained earlier, in some articles there was more than one case study described. Therefore, a total of 21 case studies (from 16 articles) have been analysed and detailed in Table 4.

Table 4

Details of the analyzed case studies

Authors (year the article was published)	**Context (type of project if applicable)**	**What "parts" of agile ways of working did they describe as implemented?**	**Reported benefits**
Andersson et al. (2006)	Supply chain management/manufacturing	Short sprints, daily stand-up meetings and a PO team.	Increased productivity, speed and quality.
Denning, S. (2015)	Top-level management, strategic work	Customer value-focus, self-organizing teams, short sprints and visual transparency.	Transparency and collaboration in the team, increased customer interaction, productivity, quality and speed.
Edin Grimheden, M. (2013)	Education, course development project	Not described.	Flexibility, quality, focus, knowledge sharing and coping with change.
Gangjun et al. (2009)	Industrial design	Iterative planning, iterative evaluation and iterative tracking.	Productivity, speed, flexibility, know-ledge sharing and coping with change
Gangjun et al. (2010)	Industrial design (product development projects)	Demand management, iterative planning,	Productivity, speed and knowledge sharing

		iterative evaluation and iterative tracking.	
Molhanec, M. (2008)	Product design, packaging and electronics	Iterations and reviews.	Not specifically described in the article.
Molhanec, M. (2009)	Product design, packaging and electronics	Iterations and reviews.	Not specifically described in the article.
Niemi-Grundström, M. (2014)	Library management	Not specifically described in the article.	Collaboration, productivity, speed, flexibility, quality (tasks/goals/req.).
Pope-Ruark, R. (2015)	Higher Education (course development project)	Short sprints, scrum board, daily stand-ups, sprint planning, review and retrospectives.	Collaboration in the team, Better understanding of goals/tasks/req. and clear sense of progress.
Quaglia et al. (2011)	Simulation modelling in electronics factory	Defined backlog, spring planning, 1-2 week sprints and customer reviews.	Collaboration in the team, understanding of goals/tasks/req., increased customer interaction, priority process.
Sommer et al. (2015)	Manufacturing, Pharmaceuticals	Scrum boards, burn-down chart, daily Scrum, product backlog and value-chain model.	Collaboration in the team, understanding of goals/tasks, Increased customer interaction, know-ledge sharing and resource allocation.
Sommer et al. (2015)	Manufacturing, Toys	Scrum boards, burn-down chart, daily Scrum, product backlog and work packages.	Collaboration in the team, task/goals/req work, transparency priority and autonomy.
Sommer et al. (2015)	Manufacturing, Electronics	Scrum boards, burn-down chart, daily Scrum and product backlog.	Collaboration in the team, increased customer interaction, productivity, speed, flexibility and motivation (less complaints).
Sommer et al. (2015)	Manufacturing, Windows	Scrum boards, burn-down chart, weekly Scrum, product backlog and value-chain model.	Collaboration in the team, increased customer interaction, priority process and collaboration.
Sommer et al. (2015)	Manufacturing, Power cables	Scrum boards, burn-down chart, daily Scrum, product backlog and work	Collaboration in the team, increased customer interaction, collaboration and motivation.

		packages.	
Sutherland, Altman (2009)	Management, strategy, in-house consultancy	Scrum principles and one-week sprints.	Interaction, understanding of goals/tasks/req., transparency, impediment removal process.
Sutherland, Altman (2009)	Management, strategy, in-house consultancy	Scrum principles and one-week sprints.	Productivity, speed, transparency and individual autonomy.
Sutherland et al. (2009)	Non-profit (internal change project)	Scrum principles.	Collaboration, transparency, focus and coping with change and impediments.
Tolf et al. (2015)	Health care, hospital management	Not specifically described in the article.	Flexibility and motivation, coping with change and priority process.
Van Ruler, B. (2014)	Public relations	Scrum principles.	Increased flexibility and coping with change.
Wainer, M. (2006)	Higher Education (course development project)	Scrum roles, short sprints, review, and retrospective.	Collaboration and focus in the team, increased customer interaction, productivity, quality and speed.

Source:author's construction based on analysed articles.

The name of the articles can be found in the reference list at the end of this article. The reported implemented "parts" (values, principles or practices) of agile ways of working in the different case studies shows what the authors put forward as implemented agile elements. A problem in completing the analysis has been that some case studies refer to the Agile Manifesto (and its principles) while others refer to Scrum and its terminology. This cause problems in analysing what parts of agile methodology the organizations implemented since the terminology as well as level of detail differed.

SRQ1: What benefits are experienced from using agile project management in non-software development contexts?

The above presented Table 4 contained a detailed description of the different case studies and reported benefits. Table 5 presents the 17 reported benefits and number of occurrences in total identified by the systematic review.

Table 5

Reported benefits from the case studies

Number of occurrences	#	Reported benefits
11	1	Better collaboration in the team
9	2	Increased customer interaction
8	3	Increased productivity and speed
7	4	Increased flexibility , coping with change
6	5	Better understanding of goals/tasks/requirements

6	6	Increased transparency and visibility
5	7	Increased quality
5	8	Customer-centered value-add priority process
4	9	Increased knowledge sharing
3	10	Increased cross-organizational collaboration
3	11	Better focus
2	12	Impediment removal process
2	13	Increased individual autonomy
2	14	Decreased customer complaints
2	15	Increased motivation
1	16	Clear sense of progress
1	17	Improved resource allocation

Source:author's construction based on identified benefits in the analysed articles.

Table 5 shows that the most reported benefits are related to team work, customer interaction, productivity and flexibility. Some of the reported benefits are concepts that are not explicitly stated in the agile manifesto, such as the impediment removal process or better focus.

SRQ2: What challenges are experienced from using agile project management in non-software development contexts?

Table 6 shows 11 challenges identified by the systematic review. Although with very few references to challenges, the most reported challenges were problems in changing mindset to allow flexibility, lack of process visibility and buy-in from managers.

Table 6

Reported challenges from the case studies

Number of references	Reported challenges
3	Changing mindset to allow flexibility
3	Lack of process visibility
2	Buy-in from managers
2	Difficult to see benefits early in the project
2	Inadequate knowledge sharing
2	Individual work, lack of communication
2	Long-term planning
1	Lack of stakeholder engagement
1	Scope creep
1	Insufficient resource allocation
1	Redundant work

Source:author's construction based on identified challenges in the analysed articles.

Interpretation of the results

Regarding SRQ1: *What benefits are experienced from using agile project management in non-software development contexts?* To get a better overall view of the reported benefits, table 7 was constructed to show what benefits that correlates to specific values of the agile manifesto.

The number after each reported benefit shows list placement in table 5 (which was organized based on number of references).

Table 7

Values of the agile manifesto and corresponding benefits

Value from the agile manifesto	Corresponding reported benefit
Individuals and interactions over processes and tools	Better collaboration in the team, 1 Increased transparency and visibility, 6 Increased knowledge sharing, 9 Better focus, 11 Impediment removal process, 12 Increased individual autonomy, 13 Increased motivation, 15 Clear sense of progress, 16 Improved resource allocation, 17
Working software over comprehensive documentation	Increased productivity and speed, 3 Increased quality, 7
Customer collaboration over contract negotiation	Increased customer interaktion, 2 Better understanding of goals/tasks/requirements, 5 Customer-centered value-add priority process, 8 Increased cross-organizational collaboration, 10 Decreased customer complaints, 14
Responding to change over following a plan.	Increased flexibility , coping with change, 4

Source:author's construction based on identified benefits compared to values of the Agile Manifesto ((Beck et al. 2001).

A look at the reported benefits in table 7 shows that the highest amount of benefits corresponds to the first value of the Agile manifesto "Individuals and interactions over processes and tools". The second highest amount of benefits corresponds to the third value: "Customer collaboration over contract negotiation". The second and fourth value of the agile manifesto corresponds only to three of the reported benefits, together.

Regarding SRQ2: *What challenges are experienced from using agile project management in non-software development contexts?* As earlier reported, the most reported challenges were related to changing mindset to allow flexibility, lack of process visibility and buy-in from managers. However, very few case studies actually reported specific challenges from their projects. Rather than presenting challenges, the differences in strength of each benefit was mostly highlighted.

Limitations

Typical threats in systematic literature review studies come from misclassifying by the researcher, a bias in the selection of articles or inaccuracy in the extraction of data. These issues have been addressed in this study. To deal with the risk of misclassification, a control mechanism was introduced where some papers have been reviewed by other colleague researcher at the Karlstad University. The selection of papers was mainly limited by the available research resources, limiting the review to the top 100 results from each search engine.

Finally, with regards to data extraction, the articles were frequently discussed among fellow researchers.

Conclusions

As this research work has shown, there is a vast interest for using agile project management in areas not even close to software development. Several articles were identified that showed successful case studies were agile project management had been applied. Nevertheless, these are initial results and more research is needed to better generalize and build on their success.

The main benefits reported from case studies in a non-software development context were related to team work, customer interaction, productivity and flexibility. Some of the reported benefits are concepts that are not explicitly stated in the agile manifesto or the accompanying principles, such as the impediment removal process or better focus. Also the highest amount of benefits corresponds to the first value of the Agile manifesto "Individuals and interactions over processes and tools".

These findings are interesting for further research since they imply that the first value of the agile manifesto could have the largest impact on benefits in agile applications in non-software development contexts. Further research needs to be carried out in order to make that kind of conclusions, however.

As noted, very few challenges have been reported (and sometimes only differences in strength of each benefit). Is it possible that there are so few challenges in agile implementations or could the authors have been biased when studying the cases so that they did not investigate challenges enough? Or could it be that the selected cases for this study, only 21, were not representative for the experiences from implementing agile in general? Even here, further research is needed to make any kind of conclusions regarding reasons for the absence of reported challenges.

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BARRIERS TO ADOPTING BUILDING INFORMATION MODELLING (BIM) WITHIN SOUTH AUSTRALIAN SMALL AND MEDIUM SIZED ENTERPRISES

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Abstract

A review of literature on BIM reveals a bias towards focusing on large companies and overlooking SMEs in South Australia. This paper explores the main barriers hampering the widespread adoption of BIM among SMEs within the South Australian construction industry building upon the theories of innovation diffusion. To achieve this questionnaire survey was administered and 41 responses were received from construction SMEs. Afterwards, semi-structured interviews with seven experts were conducted to compensate for the small sample size and to cross-validate the survey data. The findings brought to light that current knowledge of BIM in SMEs is negatively biased with an inclination towards underlining challenges and overseeing the advantages. The most influential barriers to BIM turned out to be associated with a lack of demand from clients and perception of unviability of setup costs of BIM for small sized projects. The study contributes to the field by providing an illuminating insight into the main barriers to adoption of BIM in SMEs in South Australia. Policy makers in other states and countries can also benefit from the findings in order to overcome the barriers and promote BIM adoption in SMEs.

Keywords: *Building Information Modelling (BIM), Barriers, SMEs, South Australia*
JEL code: L74

Introduction

Level of BIM implementation is still approximately 20% lower in Australia against that of the Northern America (Stanley and Thurnell, 2014). When it comes to South Australia, the findings by Newton and Chileshe (2012) showed that around 83% of South Australian construction companies have not been engaged with BIM in any form. As a result, the objective of promoting BIM adoption on projects and attempts to encourage non-users has been high on the agenda in South Australia. Against this backdrop, the major part of the construction industry in Australia is comprised of SMEs that control 98% of all businesses in the sector (ABS, 2013). It was estimated by Mills *et al.* (2012) that around 94% of construction companies in Australia have fewer than four personnel with merely 0.5% employing more than 13 people. This brings to light the profound positive impacts envisaged for promoting BIM within SMEs in the South Australian construction industry.

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BIM methodology is an unconventional procedure, which is still deemed an innovation for construction practitioners (Murphy, 2014). The way companies treat, adopt and accept BIM is strongly affected by the size of the company (McGraw-Hill, 2012). This was acknowledged by McGraw-Hill (2014, p. 8) in regards to BIM stating that smaller companies have a much lower rate of BIM engagement in Australia. Nevertheless, review of literature reveals a lack of research on BIM adoption in construction SMEs in South Australia. To address such a gap, the present study is aimed at providing a picture of the current state of BIM in SMEs in the South Australian construction context. Of particular interest is to reveal the main barriers to adoption of BIM in SMEs in South Australia. This is deemed necessary for promoting BIM in South Australia. That is, the findings would facilitate identifying the main sources of reluctance to BIM adoption and assist policy makers in directing available resources towards suppressing the true sources of the current sluggish uptake.

Background

BIM has become renowned throughout the construction industry in view of the wide range of advantages envisaged for its use on projects. These include resource savings, productivity enhancements and improvement of quality (Azhar, 2011). In spite of such advantages, review of literature shows that the extent to which BIM benefits has been embraced in different countries varies notably. It seems Australian construction firms have been slower in adopting BIM in comparison to their counterparts in the UK and North America (Stanley and Thurnell, 2014). Things get worse in South Australian small companies (McGraw-Hill, 2014). As evidence, Newton and Chileshe (2012, p. 8) argued that "…none of the firms with an annual turnover of less than $10 Million were currently using BIM…". Yet, a number of investigators such as Olatunji (2011) contended that Australian SMEs have the potential to benefit from BIM more than large-sized firms. That is, more opportunities to introduce BIM and make the necessary changes are available in organisations of smaller size as pointed out by Engineers Australia (2014). On the other hand, according to Stanley and Thurnell (2014) discovering the barriers and accordingly suppressing and moderating the effects of barriers is a precursor for success in achieving the advantages of BIM in the construction industry. Hence, discovering the barriers to adoption of BIM in SMEs has become an active field of research in different countries. For example, Olatunji (2011) stated that SMEs with different organisational structures require dissimilar training and hardware tools to adopt BIM. Besides, the cost of BIM implementation for SMEs was found to be higher compared against large-sized firms as a barrier specific to SMEs. Likewise, Stanley and Thurnell (2014) asserted that software and hardware upgrades and training requirements are significant barriers to BIM implementation for SMEs in New Zealand whereas large-sized companies are capable of fulfilling such requirements. In the same vein, observations by McGraw-Hill (2012) in North America showed that lack of resources and experience with technology detrimentally affects SMEs capacity to adopt BIM on their projects. Similarly, the findings by Mellon and Kouider (2014) in the UK showed that initial cost and increase in the overall cost of project delivery is a major barriers for SMEs. According to Mellon and Kouider (2014, p. 240) "SMEs in general will require substantial support in order to become BIM compliant…". These acknowledge the observation by McGraw-Hill (2012, p. 10) indicating "the size of an organisation has the biggest influence on the likelihood that it has adopted BIM.". The South Australian construction industry's role in Australia's Gross Domestic

Product (GDP) amounts to about 7%, and thus plays a crucial role in contributing to public and private economy at the national and state level (Newton and Chileshe, 2012). Therefore, increasing the interest in BIM in South Australia has been a target pursued by the federal and state government alongside professional bodies. However, such attempts are almost entirely focused on large-sized companies. For instance, Department of Planning, Transport and Infrastructure (DPTI) in South Australia has plans to promote BIM on projects over $10 million. Basically, review of literature brings to light that previous inquiries on BIM in Australia have had a bias towards large-sized construction firms. Furthermore, previous studies within South Australia have been very few and have paid scant attention to SMEs. Consequently, there is a clear lack of research on BIM in SMEs within the South Australian construction context.

Research methods

A mixed-methods sequential explanatory design was the leading method deployed in the present study. This consisted of two distinct phases i.e. a quantitative phase followed by a qualitative phase. The reason for considering a mixed method was because; (1) combining diverse methods of data collection and analysis yields richer and deeper insights and facilitates overcoming the weaknesses of using a single method for doing research (Venkatesh et al., 2013, p. 26). (2) as asserted by Venkatesh et al. (2013, p. 26) qualitative analysis in mixed methods serves in the capacity of compensating "…the small sample size in the quantitative study.", which was another reason for conducting a qualitative study subsequent to the quantitative phase. The sample of companies for the quantitative phase was considered as a combination of the authors' own private contacts in the industry alongside Yellow Pages listing of the South Australia's telephone directory. This sampling method was regarded as justifiable inasmuch as the same method was used for sampling SMEs by Mills et al. (2012) in Australia. A total of 326 invitations to complete the online survey were sent to SMEs in South Australia, which resulted in receiving 41 duly-completed responses, thus giving a response rate of 13%. This sample size was relatively small, thus as suggested by Venkatesh et al. (2013) a qualitative analysis was considered in order to compensate for the small sample size of the survey questionnaire. In total, 7 semi-structured interviews were conducted with experts in the field. Interviewees A, B, C and D were working in SMEs with at least 6 years of experience whereas Interviewee E was the BIM manager of a large-sized company in which a wide range of SMEs as subcontractors were using BIM. Interviewee F was involved in training and education of BIM while interviewee G was the manager of the government body directly working with South Austrian companies in promoting BIM.

Research results and discussion

Respondents' profile

As defined by ABS (2013) the size of construction businesses based on the number of employees could be classified as 'small' with up to 19 employees, 'medium' with 20 to 199 employees and 'large' employing more than 200 employees. Therefore, collected data was reflective of the perceptions of different sizes of SMEs as illustrated in Table 1 with similar share for each category. Besides, only 5 companies were SMEs with 6-10 years of service. As a result, the findings were deemed reflective of the perception of SMEs with adequate experience.

Table 1

Years of service and the number of employees of the companies

Employees (number)	Service in the construction industry (number of years)			Total
	6-10	11-20	Over 21	
24 ≥	4	6	5	15
25-114	1	2	10	13
115-200	0	1	11	12
Total	5	9	26	40

Source: Authors' construction

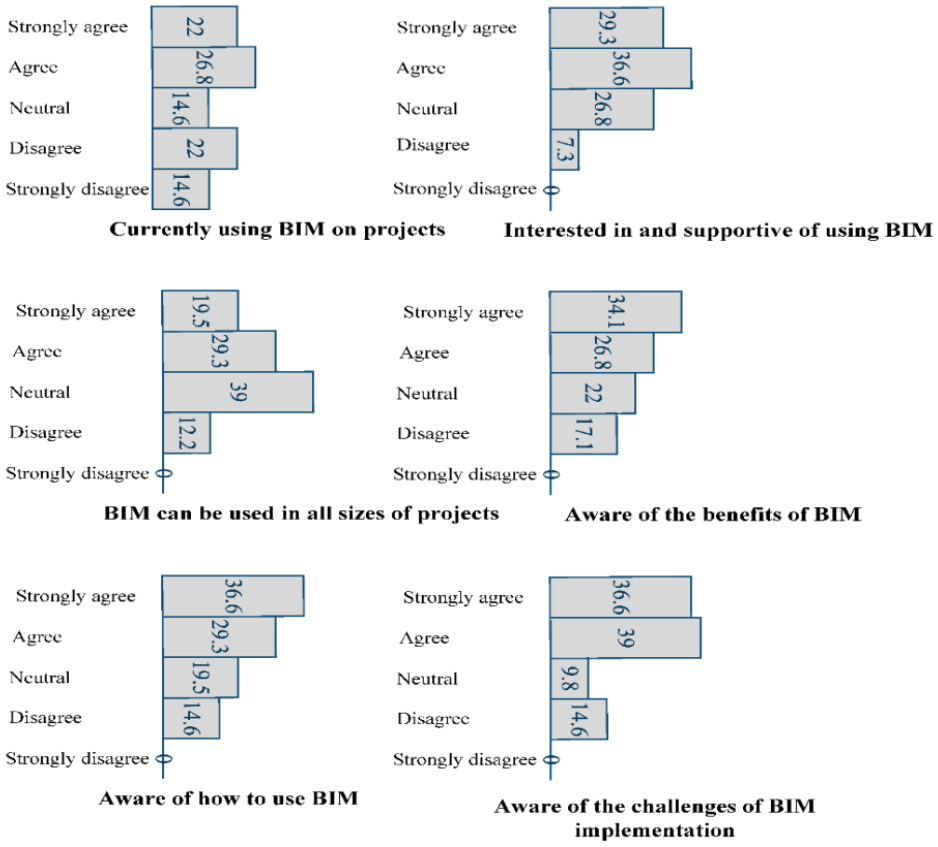

Figure. 1. **The status quo of BIM in South Australian SMEs**

Figure 1 illustrates a summary of different aspects of BIM status quo in SMEs in South Australia. The percentages for each option on the survey regarding implementation and awareness of BIM among the respondents are noted. As illustrated in Figure 1, at least 48% of SMEs indicated that they have implemented BIM to some extent on their projects. This was consistent with the observation by McGraw-Hill (2014) that the level of BIM implementation in

SMEs (48%) is lower compared to the general implementation rate (64%) in Australian companies. Nevertheless, 48% is higher than the estimation by Newton and Chileshe (2012) in 2012 which might be due to the time factor. Yet, it points to of the large number of companies, which have joined BIM adopters in two recent years.

There was no consensus regarding the appropriateness of BIM for all sizes of projects (48% in favour of the idea, 40% with no idea and 12% were against it). This observation implies that South Australian SMEs are not sufficiently informed of the business values of BIM on small projects. In the same vein, interviewee E and interviewee G stated that SMEs have an incomplete level of knowledge of potential profits of BIM on projects as pointed out by Newton and Chileshe (2012). This reveals a barrier to BIM implementation in SEMs because companies that fail to comprehend the business value of BIM, will have no motivation to go to the process of change in order to adopt BIM as enunciated by Kassem et al. (2012), Another reason for such lack of awareness of the values of BIM was attributed by the interviewees to the small size of the typical projects of SMEs, which are doable without innovative methods. In addition, interviewees contended that business values of BIM for SMEs is only achievable through using BIM in a large number of projects due to the unjustifiable initial cost and investment needs of BIM for only a few projects. Even so, as many as 67% of companies expressed interest in BIM and implied that they are supportive of BIM use on their projects in the future. Likewise, McGraw-Hill (2014, p. 4) stated "all users predict a strong increase in implementation (the percentage of their projects that involve BIM).". While only 61% of companies are aware of BIM benefits, 76% claimed to possess knowledge of the challenges of BIM (see Figure 1). This reveals another barrier to widespread use of BIM on projects being the partial and one-sided knowledge of BIM among SMEs. Such one-sided knowledge in South Australian SMEs is justified in view of the nature of SMEs' knowledge management. That is, as observed by Scozzi et al. (2005) SMEs commonly overlook available knowledge about innovative methods. Likewise, the interviewees pointed out that SMEs merely accept advantages of innovations only through having first-hand experience or through their peers.

Major barriers to BIM

The test of reliability using Cronbach's Alpha for the ten drivers included in the questionnaire resulted in a value of 0.94, which was well above the accepted cut-off point of 0.7. For ranking the relative importance of the ten barriers the mean value of each barrier was considered as the criteria for identifying the relative importance of the item as an acceptable method recommended by D. Holt (2013) for identifying the relative importance of items using Likert-scale survey. As illustrated in Table 2, the most important barrier to implementation of BIM in SMEs turned out to be the lack of demand from clients and other members of the construction supply chain. This acknowledged the observations by Kassem et al. (2012) and was in line with the findings of the descriptive statistics and the statements of interviewees who frequently highlighted the crucial role of clients' demand on pushing companies towards BIM. Yet, clients' demand is strongly dependent on awareness of clients' of the business value and advantages achievable out of investing in BIM. As a result, the most important measure to take for promoting BIM in SMEs would be to increase the level of awareness of clients of the business value of BIM and how they can take advantage of BIM.

Table 2

Major barriers to BIM implementation in South Australian SMEs

Barriers	N	Mean	Std. Deviation	Relative Importance
Clients and other builders are not demanding BIM	41	3.17	1.202	1
Setup costs	41	3.15	1.131	2
Smaller projects do not warrant using BIM	41	3.02	1.151	3
Lack of protocols and standards for adopting BIM	41	2.83	1.070	4
Cultural resistance in the company	41	2.78	.936	5
Software compatibility issues	41	2.71	.929	6
Our current software is adequate	41	2.68	1.128	7
Lack of collaboration decreases BIM effectiveness	41	2.66	.911	8
Potential for increased risk exposure (e.g. legal issues)	41	2.63	.888	9
Incompatibility with common industry standards	41	2.61	.862	10

Source: Authors' construction

Setup costs as the second most important barrier also highlights the crucial role of comprehending the wide range of gains from investing in BIM. This is because construction practitioners make a business-oriented comparison between the gains and requirements of a technological innovative. This is a key stage of the lifecycle of diffusion of an innovation in a construction company termed by Murphy (2014) as the 'evaluation' process. That is, based on the outcome of the evaluation stage, a decision will be made. Thus, the innovation will be adopted as long as the business gains outweigh the investments and resource requirements. The 3rd and the 7th most important barrier turned out to be rooted in the adequacy of current practices for small-sized projects. This is also understandable considering the evaluation stage. According to Peansupap and Walker (2006) construction practitioners valuate all the alternatives for an innovation and select the option that fulfils their requirements with the best value for money. Thus, due to lack of awareness of the values achievable in using BIM, they keep on using traditional methods for small projects. The 4th, the 5th, the 8th, the 9th and the 10th barriers refer to the perceived issues and potential risks with adopting BIM including the lack of protocols and standards, software complications and incompatibility with the current

standards. This could be explained by the concept of 'difficulty of adoption' as pointed out by Au and Enderwick (2000) implying the level of perceived difficulty in using an innovative method makes companies shy away from deploying the innovation. This findings coincides with the results of descriptive statistics that showed perceptions of construction practitioners regarding BIM in South Australian SMEs is one-sided and mostly points to difficulties of BIM. Cultural resistance to BIM adoption that is embedded in the typical resistance to change within construction organisations was found to be a problem in South Australian SMEs as a common barrier to BIM. Such resistance is so strong in the construction industry that according to Arayici et al. (2012, p. 77) "…BIM stakeholders are required to go through a comprehensive change management process which may require external assistance.". In common with the observations above, interviewees were all in agreement that barriers to BIM in South Australian SMEs mostly stemmed from a lack of awareness of stakeholders and particularly clients regarding the advantages and difficulties of using BIM on their projects. These findings reinforced the crucial role of clients and their perceptions regarding the advantages of BIM for their projects as the source of major barriers to widespread use of BIM within South Australian SMEs. Such an insight is supported by the statement by Na Lim (2014) maintaining that the main barrier to using an innovation is lack of demand and interest from influential stakeholders mainly clients in construction projects.

Conclusion

Lack of demand by clients and other members in the supply chain of construction is the main barrier to BIM adoption for SMEs. This largely stems from the lack of awareness among clients and construction practitioners of the benefits achievable for their businesses from using BIM on small projects, against the initial costs. As a result, the main focus of policy makers and major resources should be allocated to increasing the level of awareness of clients and influential stakeholders of the possible gains from using BIM on projects of all sizes. The study sheds some light into the nature of the barriers preventing widespread use of BIM in SMEs, yet the findings should be considered in light of the limitations of the study. Main limitations include the relatively small sample of the study alongside using experts merely based in South Australia with its specific socio-economic characteristic. Thus, further research is warranted to validate the findings in other locations using a wider range of experts as the respondents.

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AN INVESTIGATION INTO DESIGN-RELATED RISKS AFFECTING IRANIAN CONSTRUCTION PROJECTS

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Abstract

Managing risk effectively is central to the success of construction projects. In this context, the first step towards managing risks is to identify the most critical risks and allocate resources to deal with them accordingly. Evidence demonstrates that design-related risks and issues associated with the design stage play a crucial role in the failure of construction projects in the Iranian construction industry. Despite such a salience, to date no noteworthy effort has been made to investigate this area within the Iranian context. To address such a gap in the body of knowledge, this study intends to determine and rank the most crucial risks associated with design on construction projects in Iran. To this end, a survey questionnaire consisting of 14 design-related risks was administered to elucidate the perspectives of construction project managers in Iran, which resulted in 87 duly completed questionnaires. Statistical analysis of the data revealed the main design-related risks affecting Iranian construction projects. These were 1) design changes by the owner or other non-technical stakeholders during the construction; 2) errors in design documents; and 3) delays in updating and finalising design documents during construction. The findings of the present study contribute to the field through identifying the most critical design-related risks affecting Iranian construction projects. In practical terms, the findings will assist project managers and policy makers to allocate resources more effectively in dealing with potential design-related risks by targeting the risks with the most detrimental impact.

Keywords: *Construction Management, Risk Management, Risk Identification, Design-Related Risks, Iran*
JEL code: ***N65***

Introduction

The construction industry accounts for a high portion of the world's economy (Proverbs et al. 1999), it attracts enormous investments and is a major driver for evolution of other economically important industries such as mining (Assaf and Al-Hejji 2006). This contribution becomes even more critical (Altaf 1979) and flourishing (Sweis et al. 2008) in developing countries – such as Iran – compared with developed countries. Despite the vital input of the construction industry to the economy, due to its dynamic nature as well as involvement of a large numbers of stakeholders it is one of the riskiest and most fragile businesses (Mills 2001 and Ehsan et al. 2010). In essence, the construction industry is subject to more risks than any other industry. Therefore, appropriate action to manage all potential risks is central to success on construction projects. Despite the importance of managing risks in construction projects, Iranian construction firms have not been successful in managing risks. This has resulted in considerable economic loss and delays in completing projects (Samarghandi et al. 2016; Zadeh

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2010). A review of the literature highlights that previous inquiries on risk management within the Iranian construction context have been very rare and have paid scant attention to thorough examination of the nature of different influential risk factors.

To address this gap, the present study is aimed at providing a picture of the current state of risks in the Iranian construction context. Of particular interest is to determine and rank the most crucial risks associated with the design stage on construction projects in Iran. This is deemed necessary for promoting the risk management knowledge in the Iranian construction context. That is, the findings would support project managers and policy makers to assign resources more effectively in handling probable design-related risks by targeting risks with the most detrimental impact.

Background

Risk management is defined as using a set of methods and actions to lessen the disturbances which may occur during the life cycle of the project and threaten achieving the objectives of the project (Skorupka 2003). In other words, risk management is a systematic approach in identifying and quantifying all possible risks and accordingly taking an appropriate approach to deal with the risks identified (Gohar et al., 2012). Risk management is one of the most important procedures in the context of project management (Tadayon et al. 2012) and is strongly associated with the success of the project (Voetsch, et al. 2004). Poor risk management delays completion dates, affects the quality of projects and causes cost overruns.

Despite all the advantages of managing the risk in construction projects, it seems Iranian construction firms have not been successful in implementing risk management on projects. As implied by Samarghandi et al. (2016) the average delay per year in Iranian construction projects is 5.9 months and the average cost overrun is 15.4%. Even in the face of such a significant detriment, to date limited effort has been made to identify and manage the risks within the Iranian construction context.

Risks in construction projects are classified into internal and external risks. Internal risks are those created within the project and external risks are those generated by the external environment of the project. Due to the nature of internal risks they are more manageable than that of external ones (Aleshin 2001). Smith and Bohn (1999) asserted that design related risks are internal risks, hence returning to the focus of this study, a deep understanding of design related risks and identifying all the underwriting causes will facilitate controlling the risk more effectively.

Design-related risks and issues associated with the design stage have been identified in a number of previous studies. For instance, Nguyen and Chileshe (2015) asserted ‘poor design capacity and the frequent design changes’ as the most cited factor in the literature and the third most critical factor causing failure in Vietnam’s construction projects. In a similar study concocted by Le-Hoai et al. (2008) in Vietnam, ‘design inefficiencies’ ranked as the fourth risk factor that caused delay. Abdul-Kadir et al. (2005) identified and ranked the most important risk factors cause delay in Malaysian construction industry. They claimed that out of 50 delay factors, the ‘late issuance of construction drawing by consultants’ is the fourth risk factor. Similarly, Joshi and Khandekar (2015) asserted that a ‘delay due to receiving permissions for design drawing from government authorities’ is the fourth risk factor causing delay in construction projects in India. In another study, risk factors causing delay in construction projects in Saudi Arabia were examined by Assaf and Al-Hejji (2006). 73 different factors were

identified in the investigation by different stakeholders; the only factor which was cited by all groups of participants as a cause of delay was 'changing design by owner during construction phase'. Likewise, in Denmark, the biggest risk factors affecting the budget and the quality of the project in construction were identified as 'errors or omissions in consultant document' (Larsen et al. 2015). Tang et al. (2007) consider 'design related' risks as one of the five most significant risks in constriction industry in China. Perera et al. (2009) identified 'design related' risks including uncompleted drawings and design changes as the most critical risks in the construction industry of the Sri Lanka.

Referring to the aforementioned studies it appears that design-related factors play an important role in the success or failure of construction projects. However, taking into account the dynamic nature of the construction industry and its association to climate; social, cultural and economic context; and local laws, requirements and standards the results of the discussed studies cannot be extended to Iran. However, studies which have been completed in the context of risk management focusing on the Iranian construction industry also reveal that design-related risks play a crucial role in the accomplishment of projects. Ghahremanzade (2013) categorise the risks involved with construction management in Iran into 3 categories: critical, intermediate and not critical and categorises design-related risks as critical. Ghoddousi and Hosseini (2012) recognised design related issues as a main reason for re-work in Iranian construction; Pourrostam and Ismail (2011) asserted delays in producing design documents is one of seven most important factors causing delays in the construction industry. However, none of these studies thoroughly investigated the nature and importance of different factors shaping design-related risks. Consequently, there is a clear lack of research on design-related risks and the relevance in the Iranian construction context as the driving force behind conducting this study.

Research methods

The methodology employed in this research study consisted of a comprehensive literature review, a questionnaire survey to calculate the severity index of identified risks. The questionnaire survey was designed using plain language and included closed-ended questions. The first section of the questionnaire consisted of the overarching aims of the research projects and covered questions that targeted demographics of respondents. The second section included fourteen design-related risk factors extracted through e review of literature. Respondents were asked to rate their perceptions of the likelihood and severity of these risks based on a five-point Likert scale. The five-point Likert-scale was used to elicit the respondents' perceptions with regard to their level of agreement stated in five categories (1= strongly disagree, 2 = disagree, 3 =neutral, 4 = agree, and 5 = strongly agree).

Data analysis

The severity index method was used to analyse the collected data. Equations (1) and (2) were implemented to rank the importance of the risk factors. This is the approach that has been widely used in previous studies on risk management e.g. (Perera et al. 2014; Zou et al. 2007; Sun et al. 2008).

$$S^i_j = \alpha^i_j \beta^i_j \quad (1)$$

$$\mathrm{RS}^i = \frac{\sum_{j=1}^{n} S^i_j}{n} \quad (2)$$

The elements in Equations (1) and (2) represent the items below.
n = number of respondents,
S^i_j = evaluation of risk severity by the j^{th} respondent,
α^i_j = evaluation of frequency level of risk occurrence by the j^{th} respondent,
β^i_j = evaluation of significance of risk occurrence from the i^{th} factor by j^{th} respondent, and
RS^i_j = Risk Severity Index for the i^{th} risk factor." (Perera et al. 2014, p. 7)

Sample demographic attributes

The list of certified companies was downloaded from the data bank of licensed Iranian construction companies. This list was merged and sorted alphabetically and then a random selection was conducted by using a non-replacement random selection technique. A total of 494 invitations to participate in the research study were sent by post to the list of companies with an invitation to distribute the questionnaire among their employees. Follow up calls were conducted which resulted in receiving 87 duly completed questionnaires.

Table 1

Profile of the survey's respondents

Company's role		Experience in the Iranian construction industry (years)				Total
		Fewer than 5	5-10 years	11-15 Years	More than 15	
Client	Count	5	9	5	8	27
Consultant	Count	11	10	6	4	31
Contractor	Count	11	7	8	2	29
Total	Count	27	26	19	14	87
	% of Total	31.4%	30.2%	22.1%	16.3%	100%

Source: Authors' construction

As illustrated in Table 1, the proportion of respondents in terms of experience was: less than 5 years (31.4%); 5-10 years (30.2%); 11-15 years (22.1%); and more than 15 years (16.3%). The proportions of the respondents in terms of professional background (not shown in Table 1) were: 15.1 % (13) Project managers; 20.9% (18) design engineers; 33.7% (29) supervisors; 12.6% (11) site managers; and others 17.2% (15). The length of service and the position of respondents were regarded as evidence of the breadth of their knowledge regarding the strategic and operational levels in the Iranian construction industry. Thus, the sample was deemed adequately knowledgeable on the topic of the inquiry.

The breakdown of the final respondents according to their role in the construction industry (see Table 1) consisted of 31 consultants, 29 contractors and 27 clients. The contractor grouping also included 1 specialist sub-contractor and 1 operator, included in this 'contractor' grouping due to their limited numbers.

Results and discussion

As discussed, this study examined 14 design-related risk factors in the Iranian construction industry to determine the most influential factors. The result of statistical analysis of the data is summarized and presented in Table 2.

Table 2

Ranking the design-related risk factors

Risk factor	value	Rank
Design changes by the owner or other non-technical stakeholders during the construction	24.31	1
Errors in design documents	23.88	2
Delays in updating and finalising design documents during construction	22.72	3
Changes in specifications and documentation	20.39	4
Occurrence of unpredictable problems due to adapting to new technology	15.60	5
Delays in the approval of planning permit	15.31	6
Design or documentation changes after completion of the construction	15.05	7
Informal and verbal orders for design changes	14.74	8
Technical problems in design drawings	13.85	9
Design changes by non-experts	13.21	10
Inaccuracy of predicting the amount of work in the initial contract because of inaccuracy of design drawings	12.88	11
Subjective decision making on site because of inaccuracy of design drawings	10.93	12
Re-work due to inaccuracy of design drawings	10.51	13
Disputes between project team due to inaccuracy of design drawings	8.33	14

Source: Authors' construction

Results revealed that the most important design-related risk affecting Iranian construction projects is 'design changes by the owner or other non-technical stakeholders during the construction'. This was consistent with the findings of studies on risk identification in Saudi Arabia by Assaf and Al-Hejji (2006) where 'changing design by owner during construction phase' was identified by all categories of participants as one of the risk factors causing delay. Changing different accepts of the project by the owner is not uncommon in the construction industry (Suprapto et al. 2015). However, because construction companies in Iran – similar to other developing countries – do not have any 'change management system', any 'change' could make a considerable discrepancy in the project (Gharaee Moghaddam 2013). This would be more significant in the occurrence of design changes as it would affect a wide range of other aspects of the project. Additionally, if changes in design occur during the construction phase causing re-work, considering the documented low productivity in Iranian construction industry (Zakeri et al. 1996; Ghoddousi and Hosseini 2012), the effect would be adverse.

The second highest ranked design related risk factor was 'errors in design documents'. This resonates with observations made in Vietnam by other researchers (Nguyen and Chileshe

2015; Le-Hoai et al. 2008) denoting the crucial role of design-oriented risks in adversely affecting construction projects. Any errors in drawing or specification may cause re-work, which because of low labor productivity in the Iranian construction industry would result in serious delays. Such emphasize on design errors as risks could be attributed to two main factors adversely affecting the Iranian constriction industry. First, similar to other developing countries Iran suffers from a lack of skilled personnel within the construction industry. This has been well-documented in the literature as issues negatively affecting major aspects of success on construction projects (Tabassi et al., 2009). Second, the construction industry in Iran particulate contractors is under continuous pressure to start the construction phase. This ends up in contractors starting construction activities while drawings being far from complete (Ghoddousi et al., 2015).

'Delays in updating and finalizing design documents during construction' was ranked as the third risk factor. This finding echoes the observations by Abdul-Kadir et al. (2005) in Malaysia and Joshi and Khandekar (2015) in India implying the adverse impacts of delays in receiving or updating drawings on the success of projects. One of the main reasons behind delays in receiving updated drawings in an Iranian context is that the construction industry is dominated by traditional methods of project delivery (Ghoddousi and Hosseini, 2012). The industry has been resistant to adopting innovative methodologies and collaborative procurement methods such as building information modelling (BIM) (Hosseini et al., 2015). As such, the exchange of information is still linear and fragmented, thus culminating in delayed information and lack of collaboration among designers with other parties involved on construction projects.
Risks ranked as the 4^{th} to 10^{th} all were associated with the traditional nature of delivering construction projects in Iran and lack of attention to implementing a systematic project delivery system in projects as observed in the recent study by Hosseini et al. (2016) in Iran. In such a delivery method, roles and responsibilities associated with design are not clearly defined, which result in frequent changes enforced by influential non-technical stakeholders on construction projects as a major risk.

Conclusion

As the first study in its kind, this paper targets the risks associated with design aspects of construction projects within the Iranian construction industry. As indicated by the findings, the serious risks identified were almost entirely stemmed from the traditional delivery method of projects in Iran, which follows a linear and fragmented structure for design and subsequent delivery of construction projects. Moreover, low levels of adoption of innovative collaborative methodologies such as BIM were another cause for the design-oriented risks as identified in the present study. The findings also revealed another major issue prevalent in Iran namely lack of attention to strategic and systematic delivery of projects and vagueness of roles and responsibilities on projects as another reason for frequent changes and influences on the design procedure of projects.

The findings bring to light the main risks associated with design stage of construction projects in Iran. This contributes to the field by highlighting the main areas to focus on by future investigators and pointing to fertile grounds for research in the Iranian construction industry. Yet, the findings should be considered in view of the relatively small sample size of the study. This also defines another area for research through conducting broader studies in the Iranian context targeting the root causes of the risks identified in the present study.

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DEALING WITH UNCERTAINTY IN PROJECTS: WHAT PROJECT MANAGEMENT CAN LEARN FROM BUSINESS DEVELOPMENT

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Abstract

The paper reports a conceptual analysis of the management of uncertainty in the disciplines of business development and project management. And although these two disciplines share certain characteristics, they are considered, both in literature and in practice, different disciplines. The paper analyses the disciplines by looking at the process, the planning, uncertainty and risk and the measurement of success. Based on our analysis of these two disciplines, we conclude that they differ substantially in the perception and handling of uncertainty and how this is included in the overall process. We found that business development uses additional methods, for example scenario planning, to manage the uncertainty that is inherent to the business development process.

Keywords: *Project management, Risk management, Uncertainty, Business development, SCRUM.*
JEL code: *M1*

Introduction

Project management and business development have strong similarities. PMI defines a project as a "temporary endeavor undertaken to create a unique product, service or result" (Project Management Institute, 2013, p.3) and Blank defines the development of a new business as a "temporary organization in search for a scalable and repeatable business" (Blank and Dorf, 2012, p.xvii). Hence both can be seen as temporary and both have similar steps from initiation, planning, executing and closing. However, despite these similarities, business development and project management are considered as different disciplines in both research and practice.

One of the similarities between project management and business development is that both disciplines need to cope with uncertainty. Project is traditionally seen as structured activities aimed at realizing an in advance agreed objective. The uncertainties surrounding this objective, or the process of realizing it, are treated as risks and coped with in risk management processes which are a subset of project management (Perminova et al., 2008). However, with project being performed in an increasingly uncertain environment, the traditional project risk management methods and techniques are considered insufficient for coping with this increased uncertainty (Perminova et al., 2008; Cleden, 2012; Krane et al., 2014). Therefore, better methods and techniques are needed in order to manage today's level of uncertainty in projects. One of the disciplines that could provide new insights on how to cope with uncertainty is business development. When searching for, or developing, new products, services or business ventures, there is no certainty about the outcome of the process. Still, business development needs to make decisions in this process that is filled with uncertainties.

The study reported in this paper studied the way project management and business development cope with uncertainty in order to find methods or techniques that could be useful for project management?". The remainder of the paper is structured as follows. The next paragraph will discuss the disciplines of project management and business development along

the dimensions of 'process', 'planning methods', 'risk and uncertainty' and 'success'. The paragraph following this one will provide a comparison on the two disciplines in order to identify similarities and differences. In this paragraph we will also discuss SCRUM, as an approach to project management that has borrowed some concepts from business development. The final paragraph of the paper provides our conclusion and an outlook on further research.

The disciplines of project management and business development

This paragraph presents an overview of the disciplines project management and business development along the dimensions of 'process', 'planning methods', 'risk and uncertainty' and 'success'. This structure enables us to compare the two disciplines on the four dimensions in the paragraph following this one.

Project management

A project is defined by PMI as a "temporary endeavor undertaken to create a unique product, service or result" (Project Management Institute, 2013, p.3). Hence, project management is defined as "the application of knowledge, skills, tools and techniques to project activities in order to meet the project requirements" (Project Management Institute, 2013, p.5).

Project management process

A core-element of project management is stage-gate process (Kerzner, 2009). The stage-gate process was created because the traditional hierarchical command and control structures were not effective for temporary processes that imply a 'horizontal' work flow across organizational boundaries, such as projects. For this stage-gate process of project management, several standards have been developed that provide guidance on how to execute project management. A broadly used standard of project management processes is described in the Project Management Institute's project management body of knowledge (the PMBOK Guide). In this guide, five project management process groups are identified: initiation, planning, executing, monitoring & controlling and closing (Project Management Institute, 2013). Figure 1 presents these process groups.

Figure 1. **The project management process groups** (based on Project Management Institute, 2013).

The level of uncertainty for a project declines along the project process. Nevertheless uncertainty can be found in all stages. A project starts with an initial investigation into an idea (Zwikael and Smyrk, 2011). This phase is called conceptualization and aims to recognize the idea as a potential project and to define the idea as an investment opportunity. Hence the "conceptualization should be a short, simple and relatively spontaneous process" (Zwikael and Smyrk, 2011, p.138). One issue that arises is that often the output of the project is discussed in the conceptualization phase. The more important question is related to the outcome. "Why are we doing the project?" "Thinking of the 'why' will lay the foundation for a much more formal treatment of target outcomes." (Zwikael and Smyrk, 2011, p.139).

The project specification is often related to the development of a business case (for the project). The business case specifies if the expected outcome is worth the effort. Hence the business case must specify the target outcome of the project. "The target outcome will determine the outputs that are to be produced" (Zwikael and Smyrk, 2011, p.139) by the project. For the specification of the target outcome and the related outputs of the project it is necessary to specify scope, stakeholders, risks, issues, schedules, resources and governance for the project. These specifications will determine the effort necessary for the project. The definition of the target outcome will determine the worth of the project.

The developed business case is the foundation of the judgement whether to start the project or not. The judgement must answer the question "Do I believe that the project defined by the business case represents an appropriate investment?" (Zwikael and Smyrk, 2011, p.175). If the business case and hence the project specifications are accepted the project can shift further to the project planning where the detailed project plans are developed. If the business case is rejected no further afford will be spent on the initial project idea.

One potential issue in project management is that the output of the project is not utilized. Only by the utilization of the outputs of the project, the business case can be realized. The traditional perspective on projects, in which the project is a structured process that transforms inputs into outputs (Smyrk, 1995, p.2), often lacks this focus on the utilization the output. Without the utilization of the output the project cannot be beneficial for the underlying organization. Hence in the project, the transformation of input into outcomes (instead of output), should be considered. (Zwikael and Smyrk, 2011, p.23). The outcome of the project is "focusing on the end-effect generated as a consequence of the implementation of those outputs." (Zwikael and Smyrk, 2011, p.17), It logically focuses on the long term results and can be described as the purpose of the project. The purpose of a project is not only to develop a new product or service. The important question is. "Why do we produce this product or service?" and "What do we want to achieve with this product or service." The difference between the output and the outcome of a project is shown in Figure 2.

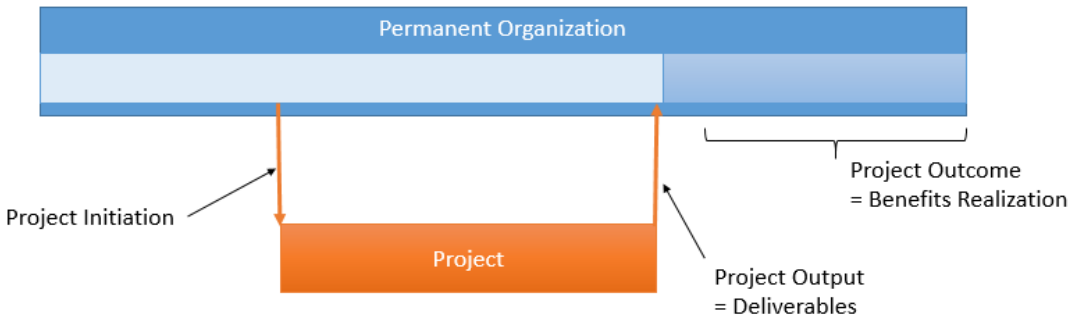

Figure 2: **Differentiation of output and outcome.**

Usually, the project manager is not responsible for the utilization of the output to generate the target outcome, as this logically takes place after the close down of the project. Hence the responsibility of the utilization is in other hands. But without integrating the project manager into the process of the utilization, the benefits of the output might not be realized.

Project planning

The execution of a project can be seen as a process. Hence there are tasks and activities that have to be done. Project planning describes "how that work is to be performed." (Zwikael and Smyrk, 2011, p.181). The areas of planning can be seen as the detailed description of the work, the environment in which the work should be performed and the underlying funding of the environment and work. A decent project planning can also be seen as a major success factor for projects, but "planning not necessary guarantees success" (Dvir et al., 2003, p.389). "Project managers who manage high-risk projects tend to make much more of an effort in performing the planning process" (Zwikael and Sadeh, 2007, p.760), but on the other hand "when uncertainty is significant planning is difficult and project plans are of somewhat limited value." (Zwikael and Smyrk, 2011, p.183) The output of the planning phase is the project plan. Together with the formulated business case it is the baseline for the implementation of the project. "Everything that is done on the project must be carried out in accordance with these documents." (Zwikael and Smyrk, 2011, p.184)

There are several areas where planning is necessary for a project. The areas not only contain the 'iron triangle' of scope, time and cost, but also the quality of the project, the communication, the human resources, the risks, the procurement and the stakeholder management. The PMBOK guide defines 10 'knowledge areas' and 23 planning processes to structure the actions that have to be done (Project Management Institute, 2013).

Key for the success of the project is to collect and define the requirements of the different stakeholders. The requirements that have to be collected must represent the following areas: business requirements, stakeholder requirements, solution requirements, transition requirements, project requirements, and quality requirements. With this defined scope the work breakdown schedule (WBS) can be created. The WBS represents the total scope in a hierarchical decomposition. Once the scope is defined, the activities to enable the realization must be defined. The activities are clustered in work packages. Hence, "the work packages are the quantitative and qualitative descriptions of the scope" (Gareis, 2005, p.211) and must be ordered to establish a sequence of work. After the resources and the time necessary for the performance of an activity is estimated the project schedule can be developed. The schedule defines when a specific activity should be started and at which point in time it should be finalized. It defines the overall timing of the project and includes also the overall project start and project end. The planned resource requirements enable to derive the estimated costs for each work package. The overall budget can be determined by the costs estimation. The total project budget determines the "funds necessary to execute the project." (Project Management Institute, 2013, p.209).

Uncertainty and risk in project management

One key aspect of project planning are the risks and their management. A risk is "an uncertain event or set of events that, should it occur, will have an effect on the achievement of objectives" (Office of Government Commerce, 2010). Risk is related to uncertain events and therefore often used synonymously to uncertainty. But there is a difference between uncertainty and risk. For a distinction between uncertainty and risk they are better described as "cause and consequences" (Perminova et al., 2008, p.74).

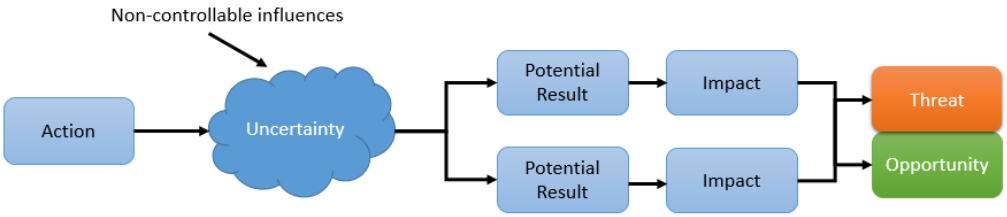

Figure 3: **Influence of uncertainty on projects.**

Figure 3 shows the influence of uncertainty on project risk, both opportunities and threats. The influences can be either from different sources or different types. Based on the sources, uncertainty in projects can be categorized into three categories: "Uncertainty from organizational complexity, uncertainty from environment and uncertainty form the individual project." (Martinsuo et al., 2014, p.734). Organizational uncertainty may be caused by uncertainty in resources (Engwall and Jerbrant, 2003), project governance (Müller et al., 2008) or changes in the organizational processes, structures, budget or strategy (Petit and Hobbs, 2010). Environmental sources for uncertainty can be seen in the technological environment (Petit, 2012) or changes in the overall market or supply chain (Petit and Hobbs, 2010). At the individual project level uncertainty deals with the uncertainty of the project planning and hence with uncertainty of scope, schedule and budget (Petit and Hobbs, 2010).

Besides the sources there are different types of uncertainty: technical, market, organizational and resource (Rice et al., 2008, p.55). Technical uncertainty "relates to the completeness and correctness of the underlying scientific knowledge." (Rice et al., 2008, p.55). The technical specification is question here. Is it possible to implement it? Another uncertainty comes from the market. Here it is asked if the customer is understood. Market uncertainty includes the uncertainty that the needs and wants of the customers are not clear. The third type of uncertainty is related to the organization. The organizational uncertainty describes the uncertainty that arises between the project and its included internal and external organizations. The fourth type deals with the uncertainty that lies within the resources. "Project teams continually struggled to attract the resources they required." (Rice et al., 2008, p.56) Resources are all resources a project needs for a successful performance. Examples for resources that can create uncertainty are competences, finance or infrastructure.

Creating something new always contains a portion of uncertainty and hence projects can be seen as risky. Risks in a project can be derived from all sources of uncertainty and therefore project risk can be included in all parts of the project starting from the scope, schedule and budget. But there is also a risk to achieve the projects objectives. Following the definition of PMI a risk can be seen not only negative like a threat but also positive. A positive risk is an opportunity that arises if the uncertain event happens. It has a positive impact on the project. Also risks can be categorized into two categories, the "risk in the project" and "the risk from the project." (Hillson, 2014, p.283). The major concerns of project management are about the risk in the project. How to handle individual risks within the project? The other question is more related to the underlying organization.

The different standards on project management and risk management, define project risk management in a sequence of different processes. These four project risk management processes are (Silvius, 2016):

(1) Identify risks (and opportunities)
(2) Analyze and assess risks (and opportunities)
(3) Develop risk response strategies and plan
(4) Implement the risk response plan and control the risks

As "it is not possible to address all risks with the same intensity" (Hillson, 2014, p.293), the process of analyzing and assessing risks is a crucial one in project risk management. The quantitative risk analysis typically assesses the identified risks on two dimensions, 'impact' and 'probability'. The impact describes the effect on the project objectives while the probability describes the likelihood that the effect arises. Figure 4 shows the resulting 'probability/impact matrix', that is the visualization of the project risk assessment.

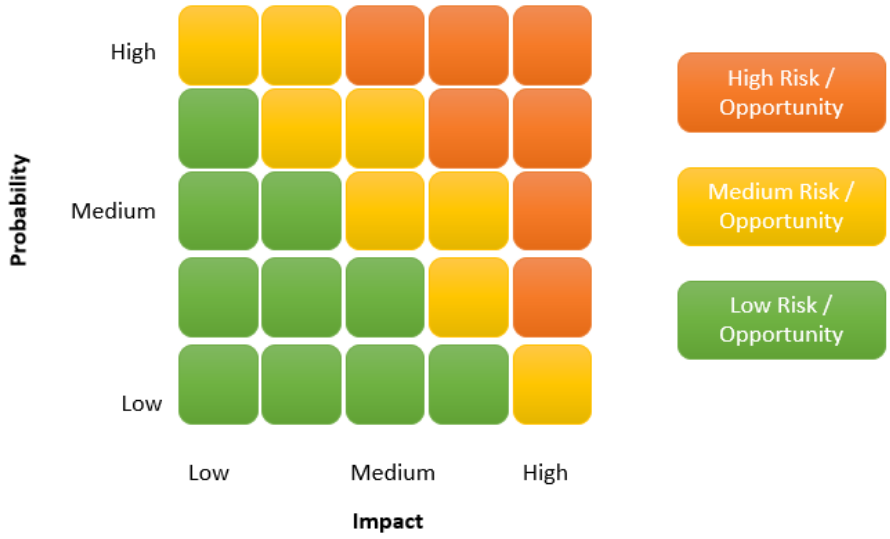

Figure 4: **Assessment of project risks.**

The quantitative risk assessment tries to "analyze the combined effect of risks on project outcomes." (Hillson, 2014, p.295). After the identification, categorization and analysis of the risks the next step is to plan responses for each of the risks. The strategy should be first developed for each individual risk and at the end summed up to an overall risk response strategy. Generally the responses can be categorized into four different strategies. Depending on the direction of the risk (negative or positive) the response strategies are, avoid/exploit, transfer/share, reduce/enhance and accept. After implementation of the risk response plan, the risks are being monitored during the project's execution and te risk response strategies managed. If the risk or opportunity is over, the review ensures that the taken actions have had the expected effect on the risk. As last step in the risk management process, after the finalization of the project the overall project risk management plan, the process of risk management and the risk responses in general should be reviewed.

It may be concluded that risk management is a major topic in project management that deals with the question of uncertainty in projects. "Risk arises from all sources of uncertainty." (Hillson, 2014, p.284). It can have positive or negative impact on the project and hence be either

a threat or an opportunity. In addition risk can be on the individual level of a task, activity or process or on the overall project level. The project management standards offer a sequence of processes as a framework for handling risks, but following these processes seems to be too little to be able to cover all sources of uncertainty.

Project and project management success

Projects are done because they are expected to have benefits for the organization or a stakeholder. A benefit can be defined as "an outcome of change which is perceived as positive by a stakeholder." (Bradley, 2010, p.23). The benefits should fill the value gap that is existing between the current situation and the target future situation (Kaplan and Norton, 2008; Serra and Kunc, 2015, p.55) hence benefit realization, starts with projects and ends with the achievement of business objectives. (Serra and Kunc, 2015, p.55).

To realize the benefits from a desired change an organization must establish a process for enabling it. Benefits realization management is "the process of organizing and managing so that potential benefits, arising from investment in change are actually achieved." (Bradley, 2010, p.29). Due to the fact that benefits realization management is a process it is not done only at one single point in time. Hence "benefits management is a process that runs throughout the project life cycle." (Jenner, 2009, p.10). The objectives of benefits realization management are to ensure that investment decisions are made on the basis of a robust and clear understanding of the potential benefits, to capture all forms of value created and to realize benefits and create value. (Jenner, 2009, p.11-12).

Overall project success is dependent on performance and success and a project can be defined as successful if "the project meets the technical performance specifications and/or mission to be performed, and if there is a high level of satisfaction concerning the project outcome among key people on the project team, and key users or clientele of the project effort." (Baker et al., 2008). The overall project success is usually measured on two dimension, *project management success* and *project success* (Baccarini, 1999, p.25). *Project management success* focuses on the process of project management while the focus of *project success* is on the output and outcome of the project. The distinction is important because "how success is to be defined for a project is a necessary precursor to the establishment of appropriate methods for managing the project life cycle and for the selection of suitable measurement techniques." (Bryde, 2005, p.120).

The three components of the measurement of the *project management success* are (1) Meeting the baseline, (2) Process performance and (3) Stakeholder satisfaction. The success on the baseline can be measured against the golden triangle of the initial project plans – scope, budget and schedule. How good is the project against the planned schedule? How good is the project against the planned costs? Is there an overrun of the budget? The measurement of the scope can be done against the initial technical specifications. Is the provided functionality in line with the planned functionality? These criteria can be categorized as objective and direct. The measurement can be done between a planned and a performed value. The second component on what the process management is judged is the process performance. It measures "how efficient the project has been managed." (Baccarini, 1999, p.28). The third component stakeholder satisfaction measures how satisfied the stakeholder was with the process of project management. It hence deals with the process of project management and not with the output or outcome of the project.

The project success is measured on three components: (1) Achieving the project goal, (2) Realizing the project purpose and (3) Stakeholder satisfaction (Baccarini, 1999, p.29). The project goal measures if the project and its outcome meets the strategic objectives of the organization that benefits from the project. Second, the project purpose is successful if it satisfies the user's needs. The stakeholder satisfaction - in this case - is related to the results of the project and hence to the output or outcome. Different to the stakeholder satisfaction as measurement on project management the question here is if the stakeholders are satisfied with the end result of the project.

Baccarini (1999) describes that the two dimensions of measuring success are not always related to each other. Even if the process is perceived as a success the product can be a failure, and vice-versa. More critical for the underlying organization is if the output and the outcome of the project is a failure. This indicates that the company cannot realize the expected benefits.

The measurement of success is also a matter of timing. Different success criteria are measured different at different time intervals. The shortest dimension is 'project efficiency' (scope, budget and schedule). It measures "What factors are critical to project management success" (Cooke-Davies, 2002, p.185) and it can be assessed immediately but does not include any information on the long-run benefits. The 'impact on the customer' can be seen as the second dimension. It indicates the satisfaction of the customer with the deliverables of the project. As the customer will utilize the deliverables on a period of time this measurement can be seen as medium-term. The 'business success' dimension measures "the immediate and direct impact the project may have on the organization." (Shenhar et al., 2001, p.715). It hence measures the impact of the project on the medium to long term business results. As a fourth dimension 'preparing for the future' can be seen. The fourth dimension is important because "projects at the higher end of uncertainty dimension build new capabilities and create opportunities for the future." (Shenhar et al., 2001, p.713). It hence relates the project to the future business of the underlying organization and therefore it is based on the long-term time frame.

Business development

In this section, the discipline of business development is described. Similar as for project management, the description focuses the process of business development, with the focus on the initiation phase, the planning of a new business, uncertainty and risk in business development and the criteria for the success of business development.

Business development process

Business development is the discipline that aims to develop 'new business'. New business development distinguishes itself from the development of a product or a service, by searching for "a scalable, repeatable, profitable business model." (Blank and Dorf, 2012, p.xvii). Whereas classical product development is done in a sequential approach, "uninterrupted by changes or new ideas no matter how good they might be for the business." (Blank and Dorf, 2012, p.5), this approach is most likely to fail in the case of new business development because "both the customer and the product are unknown" (Blank and Dorf, 2012, p.8). The development of a new business must be more iterative to include the high level of uncertainty. Blank and Dorf (2012, p.22) propose a four step model at which each step is an iterative process. As the development of a new business should focus on customers the four steps are customer oriented. It all starts with 'customer discovery' where the visions are turned into business model hypotheses and

these hypotheses tested on the customer reactions. The second cycle is the 'customer validation' "which tests whether the resulting business model is repeatable and scalable." (Blank and Dorf, 2012, p.22). The third step is the 'customer creation' where the end-user demand is created and the sales started. At the end of the process the 'company building' is located. It focuses on the transformation of the temporary organization that was in search for the repeatable, scalable and profitable business to a permanent organization that "executes the validated business model." (Blank and Dorf, 2012). Figure 5 shows the four steps of Blanks Customer development process for business development. The first two phases focus on the search and hence on the initiation of the new business idea, the latter two on the execution and therefore on the establishment of the new business.

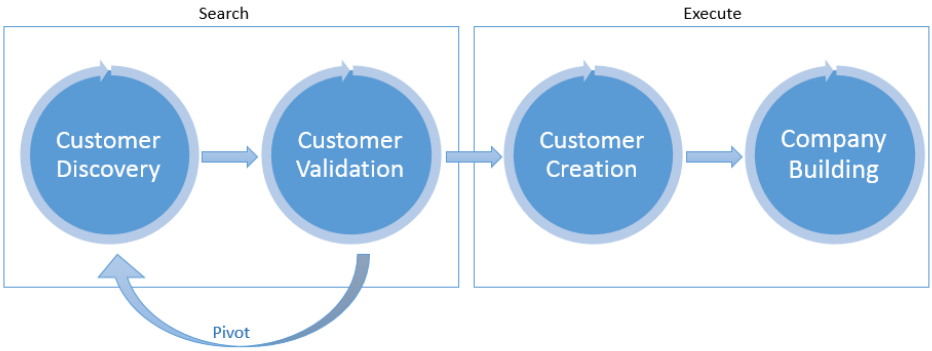

Figure 5: **The business development process**
Source: *Blank and Dorf, 2012, p.23*

Business plans are based on assumptions and hypothesis, but "hypothesis is just a fancy word for 'guess'" (Blank and Dorf, 2012, p.37). Key for the successful establishment of a new business is to turn the assumptions into facts. This can only be done by testing them. The testing of assumptions is done following an iterative cyclic approach. This approach starts with an initial hypotheses and the first draft of the business model. In this phase the vision of a new business is turned by assumptions into a business model. In the second phase experiments should test the 'problem' hypothesis. Is there really a problem or a need that can be solved by a new business? If the initial assumptions are wrong this is the first point where they can be adapted. If the assumptions are adapted the new assumptions must be tested again. After the problem is tested the solution must be tested. The goal is to ask if the value preposition will solve the problem. At this time "the goal is not to sell the product, but to validate how well you understood the problem in Phase 2." (Blank and Dorf, 2012,p.68). The fourth phase is to validate the results of the tests. It must be clear that the problem is understood, the problem can be solved by the value preposition and that there is a decent volume of customer base that is willing to pay for the new product or service. Only if the questions are verified the second phase of the business development can be started, otherwise the initial plans and assumption must be pivoted and adapted.

On the basis of the business model a business plan can be worked out in detail. "A business plan should justify and describe your business idea in a clear and adequate manner." (Schwetje and Vaseghi, 2007, p.1). It includes all relevant information of the new business. The business plan should include several other aspects like market analysis, organizational structure, management team, operational plans, critical milestones and funding. As in the early stage of a

business plan it contains a lot of assumptions, all the assumptions must be included in the plan. This enables to pivot the plan and model easier in the process of the establishment of the new business because "no business plan survives first contact with customers." (Blank and Dorf, 2012, p.35).

Uncertainty and risk in business development

Uncertainty and risk is one of the key topics in business development, as uncertainty can be seen as the justification for the profit of the new business. Hence uncertainty and different variation of uncertainties are important in business development and methods to cope with it exist. One of the tools to cope with uncertainty is "Scenario planning". At the beginning "scenarios have been used as tools for indirectly exploring the future of society and its institutions." (Bradfield et al., 2005, p.795) Hence the objective of scenario planning in business development is "to better prepare an organization for the future." (Garvin and Levesque, 2006, p.1). Scenario planning is not searching for the best fitting answer for a problem like strategic planning is doing, but for multiple possibilities. It hence "investigates in several uncertainties simultaneously." (Garvin and Levesque, 2006, p.1). The objective is to reduce the surprises of an incorrect assumption of the future by a broader planning of the business model and thinking about multiple futures.

Scenario planning is used in several areas. The areas can be categorized on two dimensions. First, the purpose of scenario planning can be divided either into a specific problem or an ongoing process. The second categorization is between the closing of a specific decision or the opening of an organization for future exploration. (Bradfield et al., 2005, p.806). Figure 6 shows the categorization of the scenario planning areas. By the combination of the two categorizations scenario planning can be clustered into four areas, "making sense of a particular puzzling situation, developing strategy, anticipation and adaptive organizational learning." (Bradfield et al., 2005, p.806)

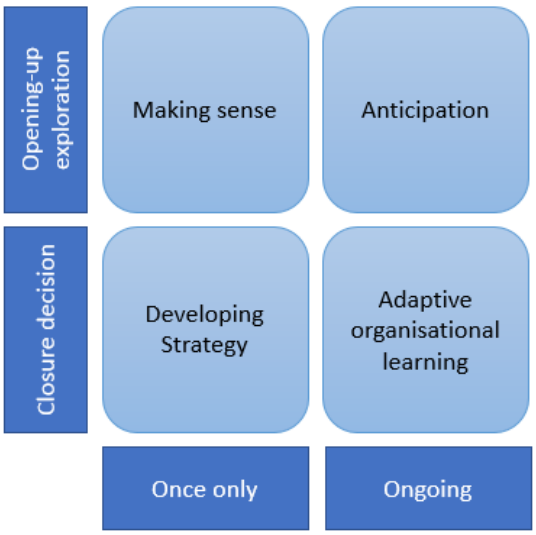

Figure 6: **Areas of scenario planning.**

The process of scenario planning starts with defining a key focal issue. This can either be a "significant, upcoming decision" (Garvin and Levesque, 2006, p.2) or "an issue that has

profound uncertainty but is particularly relevant to the business." (Cinquini et al., 2013, p.51). If a factor has an impact on the scenario it is a driving force. Hence this are themes that will affect the key focal issue. Sources for driving forces are "social systems, economics, political affairs and technology." (Garvin and Levesque, 2006, p.3). Due to a wild range of driving forces they must be simplified for a further analysis. The critical uncertainties are "the two most important variables" (Cinquini et al., 2013, p.52) for the issue. These two critical uncertainties should not correlate to each other and hence be classified as independent variables.

For each of the variables two counterpart definitions, each from an end of the possible range of values, are taken and the two dimensions intersect to each other. The result is a 2x2 matrix with four possible future scenarios. This matrix is the scenario framework. "The goal is to end up with a few, clearly contrasting environments." (Garvin and Levesque, 2006, p.3). These different futures are the scenarios that represent the alternative developments of the selected critical uncertainties and its interrelation to each other. After the definition of the scenarios each of the scenarios and its characteristic should be described in detail.

One of the key areas of scenario planning is that the hypothesis is tested against the key focal issue. Here each of the possible futures is applied on the organization and the issue and the impacts on the organization explored. This leads to the development of strategic options that can be taken to deal with a certain situation. At the end early warning signals must be identified. These signals indicate the "emergence of one scenario or another" (Garvin and Levesque, 2006, p.4) and hence if the world is "moving in a particular direction." (Garvin and Levesque, 2006, p.4). By this it is possible to optimize the business model in dependence on the given situation.

Success in business development

One of the issues is how the success and performance of a business development can be measured. "Performance measurement can be described as the acquisition and analysis of information about the actual attainment of company objectives and plans and about factors that may influence plan realization." (Kerssens-van Drongelen and Cooke, 1997, p.347). The measurement of success and performance is done on a performance metric and performance dimensions.

The performance metrics "provide a way of assessing the progress over time of specific activities, by quantifying key aspects of these activities." (Perkmann et al., 2011, p.207) Performance can be measured quantitatively and qualitatively. Based on the performance matrices, performance dimensions can be discovered. "Performance dimensions are evaluation criteria that identify those factors whose accomplishment is critical for success." (Chiesa and Frattini, 2009, p.20)

The performance measurements for the development of a new business differ from the once for an established and operating business. For established businesses the key success criteria are based on financial KPI's. For a new business "traditional financial measures may not be useful" (Frattini et al., 2006, p.432) and other indicators seem to be more relevant. Blank and Dorf (2012) suggest seven dimensions based on the business model to measure success. Each of the dimensions has one or more measurement indicators. The dimensions and metrics are:

- Value proposition: *What are product costs, market size, attainable market share, and customer impact of network effects?*
- Customer Relationship: *What are customer acquisition costs, prospect conversion rates, customer lifetime value, and customer switching costs?*
- Market Type: *What market is the business in?*

- Cost Structure: *What are the operating costs of the business?*
- Channel: *What are the costs of selling through the channel? Channel margin, promotion, shelf-space charges?*
- Revenue Streams: *What are the average selling price, total achievable revenue, and number of customer a year?*
- Burn Rate: *How much cash is the company "burning" (spending) a month? When will the company run out of cash?*

The measurements should be carried out for different time periods and compared over the process of the development of the business. The key question behind the numbers is not only if the business model is profitable, but also if it is scalable enough. If the numbers indicate that the probability to grow is not significant, it might be necessary to adopt or pivot the business model.

Project management and business development compared

One of the major research prepositions is that project management and business development have similarities. This paragraph compares the disciplines on project management and business development along the dimensions of 'process', 'planning methods', 'risk and uncertainty' and 'success' in order to analyze what the two disciplines have in common and what differences exist.

Comparison of characteristics

Process

One of the compared dimensions is the process the two disciplines follow. Both project management and business development aim to create and/or deliver something new. Compared to the literature of project management the 'newness' of what should be delivered is higher in business development than in project management. This 'newness' relates to the uncertainty at the start of the process. The objective of the business development is to search within this uncertainty for the new business. Hence the uncertainty must be reduced to one evolving future that is beneficial for the underlying organization. It can be seen that the assumptions made for the first business plan in the initiation phase will not hold till the end. A classical step-by-step approach will not be able to cover the level of uncertainty. Hence business development follows a cyclic approach. The objective of the cycle is to test the initial assumption on their correctness as fast as possible to become clearer about the area of development. The cyclic approach should be followed for all activities and assumptions over the business development process. The iterative steps are 'formulate the hypothesis', 'design experiments to test the hypothesis', 'test the hypothesis' and 'analyze the results by the insights got from the tests'. At the end the process starts at step one again. By this the uncertainty can be gradually removed and the initial hypotheses transformed to hard facts. The process is hence designed to remove uncertainty within the area of development. Lowering the level of uncertainty generates facts on which the new business can be based.

Planning

For both project management and business development, planning is a key component. However, the purpose and the approach differ. Planning for a project sets the baseline for the execution. "Everything that is done on the project must be carried out in accordance with these documents." (Zwikael and Smyrk, 2011, p.184). The assumption is that at the beginning of the project everything is clear. Hence the planning can follow a strict process starting with the

scope, the time and the budget and then all other areas, like risks and stakeholders. For project planning the assumption is that there will be no or only little deviations from the plan during the execution.

In business development, the overall mindset is different. Here the major assumption is that "no business plan survives first contact with customers" (Blank and Dorf, 2012, p.35). The business model is a living document based on the knowledge at this time of the business development. Minor and major changes of the business model and hence the business plan are normal for the area of business development. Therefore the plans, as seen in the processes, are also generated by a cyclic approach. From the initial plan with a lot of hypotheses the assumptions are turned into hard facts and hence the business plan changed.

One important tool for business development is scenario planning. Because it is not possible to forecast the future, plans and response strategies are made for different possible futures. Project management does not do this at all. The project planning assumes only one future, with some deviations that are handled as risks for which specific response strategies can be planned. The planning phase for a project is the basis for the performance of the project and deviations should be as little as possible to the plans. On the other hand for business development the plan is a living document that can be adopted along the full life-cycle of the business development to create a beneficial business for the organization.

Risk and uncertainty

One key difference between project management and business development is the perception of uncertainty. In project management literature uncertainty is often perceived as risk and hence as threat that should be avoided. On the other hand for business development uncertainty is an opportunity. Only in an uncertain situation a new business can be developed and hence more profit generated for the organization. The perception of uncertainty as an opportunity is relatively new in the literature of project management. But also in this concept the opportunity within the uncertainty will only help to be better than the planned values e.g. scope, time and budget but not pivot the project into a completely different direction.

Success

There are also differences in the measurement of performance and success. The major success criteria for the project management process is on the execution in accordance to the plans. It is a planned versus executed value analysis. Therefore the metric for measurement is around the golden triangle scope, time and budget and hence emphasis the process. It is done once, after the project is completed. The idea of measuring the overall process on a longer basis of the target outcome of a project and not only on the output is relatively new in literature. This indicates the need for a different point of view on project success.

The success and performance of business development is measured in two different ways. The new developed and established business can be measured, like any other business, by financial KPI's like 'return on investment' or 'sales'. This is done on a regularly basis, e.g. once a year. The performance of business development must be monitored over the whole process of the establishment of a new business. Here performance can be seen in the transformation of the initial assumptions into 'real' data. Next to this business development has financial KPI's that matter. The two most important are 'cash burn for period' and 'cash remaining'. (Blank and Dorf, 2012, p.445). This indicates two things. First, as 'per period' tells, the measurement of the performance and success is done on a regularly basis and not only once after the completion of

the process. Second 'cash burn for period' and 'cash remaining' indicate how much time is left to transform the business model into a sustainable, scalable and profitable business.

Compared to project management time and scope are very flexible in business development. The objective is not to deliver the initial business idea but to have a profitable business at the end. The emphasis is on the outcome.

Summary

Although both have similar topics and perceptions there can be seen major differences in the two disciplines. Table 1 shows the major differences in the compared areas between business development and project management.

Table 1

Summary of the comparison of project management and business development.

	Project Management	Business Development
Process	Linear	Cyclic, step-by-step
Planning	At the start	Re-planning over the life cycle
Risk and Uncertainty	Perceived as threat	Perceived as opportunity
Success	Measured on short-term dimensions Emphasis on the process and output	Measured on long-term dimensions Emphasis on outcome

Source: Authors' construction

The process of project management is a linear, step-by-step approach while business development follows a more cyclic approach. The planning for a project is done once, at the beginning of the project. On the other hand the plans for business development are living documents and hence re-planning is part of the overall process. Also the success is measured different. Project management success is measured once after the completion of the project and in accordance to the project plan. The measurement is on short-term dimensions. The emphasis is on the process. Business development is measured on the target outcome, the benefits the business is generating for the organization and hence on the long-term success of the business. In opposite to project management business development is also measured periodically. The comparison also highlights that the perception of uncertainty is different for the two disciplines. The common perception of uncertainty in project management is as a threat while for business development uncertainty includes the opportunity and hence is the source for the new business.

Outlook on scrum

One of the project management frameworks that uses elements of business development is SCRUM. SCRUM is an agile project management approach that is based on the operational model of Plan-Do-Check-Act (Gloger, 2010, p.196). Hence similar to business development the process is based on a cyclic approach.

Process

In SCRUM each of these PDCA Cycles is called a sprint. The overall product vision is tried to be developed by a continuous improvement of the solution. The improvements of the sprints are collected and prioritized in the product backlog. The product backlog is hence the list of functionality of the overall end product. Each of the sprints will have a planning phase in which the objectives for this sprint are set. A sprint is normally between 2 weeks and one

month. The planning must answer two major questions: "What has to be delivered in the upcoming spring?" and "How will the work be delivered?" (Sutherland and Schwaber, 2013, p.8). The result of the sprint planning is the sprint goal. It is the basis for the implementation of the sprint by the development team. At the end of a sprint a sprint review is held. At this stage it reviews what has been done in the sprint and what changes did occur in the overall product backlog or vision by the development that has been done in this sprint. "The result of the sprint review is a revised product backlog that defines the probable product backlog items for the next sprint" (Sutherland and Schwaber, 2013, p.11). Another element of the sprint cycle is the sprint retrospective. It is an opportunity for the scrum team for incremental improvements of the development process within the framework of SCRUM. Although improvements of the process are always possible "the sprint retrospective provides a formal opportunity" (Sutherland and Schwaber, 2013, p.12) for searching for improvements.

As described by Schwaber and Sutherland "SCRUM employs an iterative, incremental approach to optimize predictability and control risk" (Sutherland and Schwaber, 2013, p.3). As it is based on process control theory scrum focuses on the process. Comparing the process of scrum to the process of business development the two processes are similar. Both focus on a cyclic approach.

Planning

The SCRUM planning is done within the product vision. Within the product vision certain functionality should be provided. For each scrum sprint the functionality that should be implemented is defined and planned. The objective is an incremental improvement of the overall product to get closer and closer to the overall product vision. Hence also planning is done very often in the process of SCRUM. It emphasis a two way planning. On the one hand the overall product vision and the functionality is planned and on the other hand the next SCRUM sprint is planned in more detail.

Risk and uncertainty

There are two major ideas behind the short cycles of a SCRUM sprint, first to control the risk and second to optimize the predictability for future cycles. This indicates that there is a sense of uncertainty in the process but the perception of the uncertain is as risk and hence as a threat. What can also be seen is that the overall uncertainty within the process is not included in any plan, neither in the product vision nor in the plans for the sprint. The assumption is that by the incremental improvement the predictability of the future sprints and the development of the product vision is given.

Success

The success of scrum is based on delivering. Hence the success is measured on the process of the implementation. The major assumption is, that by the incremental improvement toward the product vision the long term objectives with the delivered product or service can be achieved. Hence the success criteria for SCRUM emphasis more on the output. The long term success in only assumed by the customer satisfaction by the end of the delivery period.

Summary

The process of SCRUM is structured in a cyclic way. This is similar to the process of business development. The motivation of the cyclic approach in business development can be seen in the testing of the different starting hypotheses. Within SCRUM the short cycles are used to reduce the risk in the future cycles of the development, hence the functionality of the cycles differs from each other. Uncertainty is also treated different. The short planning cycles try to

reduce the uncertainty in this development period and the following period. Overall scenarios for different futures are not prepared in the process of scrum.

Another difference can be seen in the success measurement. The underlying argumentation for SCRUM is that by the small development cycles a continuous improvement of the overall deliverable can be secured and hence the stakeholder will be satisfied with the output of the process. But similar to the other project management approaches the success criterion is set on the output of the process, hence they are short-term process driven. The overall – long-term – outcome that should be generated by the output of the process is not included in the measurement of the success of scrum. Table 2 shows the differences between traditional project management, SCRUM and business development.

Table 2

Summary of the comparison of project management and business development.

	Project Management	SCRUM	Business Development
Process	Linear	Cyclic-phases	Cyclic, step-by-step
Planning	At the start	Phase-wise-detailing, incremental	Re-planning over the life cycle
Risk and Uncertainty	Perceived as threat	Perceived as threat	Perceived as opportunity
Success	Measured on short-term dimensions Emphasis on the process and output	Measured on short-term dimensions Emphasis on output	Measured on long-term dimensions Emphasis on outcome

Source: Authors' construction

Conclusions

This paper reported a comparison of the disciplines of project management. The rationale of this comparison is the realization that these disciplines have strong similarities. Both are temporary, follow a structured process and are aimed at creating something new. However, despite these similarities, business development and project management are considered as different disciplines in both research and practice.

In our comparison, we described both disciplines along the dimensions of 'process', 'planning methods', 'risk and uncertainty' and 'success'. The comparison showed that in both disciplines, the dimension of uncertainty is an inseparable element. However, the disciplines differ in the way they handle uncertainty and the related risk/opportunity.

This difference in the handing of uncertainty influenced all of the four described dimensions: the process, the planning, the risk and uncertainty management and the success measurement. In project management literature uncertainty is often perceived as risk and hence as threat that should be avoided. In business development, uncertainty is considered an opportunity. It can be concluded that the perception and the handling of uncertainty is more developed in business development than in project management. The methods to handle uncertainty in project management are oriented towards finding the most probably scenario of the uncertainty, whereas business development handles uncertainty with methods, such as scenario analysis, that cover different possible outcomes of the uncertainty.

The project management of scrum uses some elements of business development but overall it can be seen that only using scrum is not sufficient enough to manage uncertainty in projects.

Based on our findings, we propose that further research is done in order to examine how scenario planning can be applied in project management, as a way to handle uncertainty.

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MICRO IT PROJECTS SUCCESS FACTORS – A SMALL SCALE SCIENTIFIC RESEARCH

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Abstract

A project is a temporary endeavour undertaken to create a unique product, service or result (PMBOK, 2013). The unique nature of projects and the fact that they are usually undertaken in a business environment makes the scientific approach to studying project success factors almost impossible.

In this paper a small scale scientific research on micro IT projects success factors is presented. Six teams of students who specialize in Game Development in B.Sc. "Information Technologies" programme, led by six students from M.Sc. "Information Technologies Project Management" programme at New Bulgarian University are assigned to work on comparable project in terms of both: organizational environment, stakeholders expectations, available information and existing communicational channels, and also in terms of project parameters as project scope, time and resources. The paper presents the research set-up and the monitoring processes. The projects' plans, progress, recovery activities, milestones and final outcomes are described in details. The project management challenges, risks and issues, the decision making process, and the success rate in decision implementation are analysed. Key factors for project success are identified.

The proposed method for scientific research of project success factors is critically examined and compared to alternative approaches. Scaling up of the research is discussed.

Key words: *project management, education in IT PM, project success factors*.
JEL code: *M15, I21, I23*

Introduction

Teamwork is an essential requirement to complement theoretical knowledge and practical engineering skills in computer science and informatics. In their article about teaching teamwork to software engineers, presented to IEEE's Frontiers in Education Conference – 2011, Lingard and Barkitaki quote Ben Amaba (Worldwide Executive of IBM since 2005): "Software engineers need good communication skills, both spoken and written. They need an analytical capability, and they need to be able to manage a project from end to end while working well with their colleagues." (Lingard and Barkataki, 2011).

Informatics department at New Bulgarian University undertook a large-scale research project "Preparation of IT specialists for the Knowledge Economy" (scheme: BG051PO001-3.1.07, contract: BG051PO001-3.1.07-0072) on the most recent world-class practices on ensuring synergy of academic knowledge and yet building professional skills demanded by the IT industry in a higher educational setting. As a result of the project, the individual assignments in the third year of the undergraduate programmes were redesigned into larger scale multidisciplinary students' group projects (micro IT projects). Using group projects as pedagogical tools raises some concerns, mainly based on scarcity of scientific evidence for or against the effectiveness of the method (Ashraf, 2004). Nevertheless, group projects are becoming an essential part of software engineering curricula (Mead, 2009, Sancho-Thomas et al., 2009, and van Vliet, 2006).

Recently the Bulgarian Industrial Association – Union of the Bulgarian Business (BIA) introduced a sector oriented competence framework. Each competence description includes both sector specific requirements and behavioural indicators. All competences in the ICT sector require strong teamwork skills (Competence Assessment Information System, 2015). Based on these structured industry requirements, on the recent good practices in software engineering curricula development (Mead, 2009), and considering the known drawbacks (Ashraf, 2004), Informatics department had selected micro IT group projects as the pedagogical tool for teaching teamwork in their academic setting.

Micro IT projects are considered an educational innovation in the context of undergraduate education at Informatics department. This paper presents a small scale research on the success factors of the micro IT projects implemented at Informatics department at NBU.

Research, results and recommendations

Piloting Micro IT Projects

Set-up: Pilot phase started in 2013/2014 academic year. Two micro IT projects were assigned to two students' groups.

Project characteristics:

- **team selection criteria** – self-selected teams; fixed size of three students;
- **year of study** – first and second year;
- **assignment** – based on a project charter, clearly defined project scope and time, measurable acceptance criteria;
- **management** – the PM is a faculty member; the teams were mentored by a field expert from the industry;
- **motivation of the team members** – commitment to the success of the micro IT project as a contribution to the success of the main project "Preparation of IT specialists for the Knowledge Economy".

The groups were self-selected teams of three. The students in the first group were in their second year of study, the students in the second – in their first year. The only criterion for participation was strong commitment. Both teams successfully completed their tasks during the experimental phase of the project. The size of the group predefined the complexity and the build-in interdependences of the project assignments. The projects were managed by a faculty member and the students were mentored by the CTO of one of the Bulgarian game development companies.

Results: Both teams completed their micro IT project successfully within time and scope. The success rate of the pilot was 100%. The insights from this phase of the project "Preparation of IT specialists for the Knowledge Economy" were used as a first step for institutionalization of the micro IT project management projects and the corresponding academic and professional practices in the department. Internal standards and templates for micro IT projects charter and requirements documentation, recommendations for project management, group evaluation guidelines, and pilot group project case-studies were developed according to known good practices (Swaray, 2012, CMU, 2015) and the specific finding on NBU case.

Outcomes: After the successful experimental phase, the micro IT projects were introduced in the third year of all undergraduate programmes at Informatics department. At that point of their study the students have enough theoretical knowledge and classroom practices to be able to

implement the assigned task individually. The challenge is to do it in a small team. Grounded on the positive pilot experience, the expected success rate was the same or higher than the success rate of individual projects.

First Year of Implementation

Set-up: Five small scale game development projects started during the first year of implementation of the micro IT projects as part of the compulsory activities within the standard programme of undergraduate education in Informatics.

Project characteristics:

- **team selection criteria** – self-selected teams; flexible size of two to five students;
- **year of study** – third year;
- **assignment** – based on students' ideas and consulted with the faculty; flexible scope, fixed time; measurable acceptance criteria;
- **management** – self-organized teams, supervised and consulted by a faculty member;
- **motivation of the team members** – the students have to do it as part of their undergraduate education.

The groups were self-selected teams of two to five. All students were in their third year of study. The assignments were developed by the students and approved by the faculty. The teams were self-organized, supervised and consulted by a faculty member.

Results: Only two teams successfully completed their tasks within scope and time. Both teams had members who had participated in the pilot phase during the previous year. Although the overall success rate is 40%, the success rate of 0% of the newly formed teams was disconcerning. Another 40% of the projects were implemented with significant delay. The outcome of the first year of implementation of the micro IT projects led to students' and faculty dissatisfaction both of the process and the results.

Feedback process: Project post-mortem interviews with students revealed that they were not able to utilize enough resources in a resource rich set-up and to benefit from the available support. Most of the students described team member behaviour as indifferent or passive, waiting for others to do the job (as signs of absenteeism and free-riding) or as aggressive and unwilling to discuss and compromise on technical issues, creating excuses instead of solutions.

Identified issues: The main conclusion after the first year of implementation was that students lack commitment and project management competences to overcome initial team dysfunctionality.

Overcoming initial team dysfunctionality

Literature review

Positive teamwork experience is a requirement for, not a result from success (Chapman et al, 2009).

Even though the group projects and the cooperative learning initiatives gain wider support as a vehicle to meet industry demand for team-savviness of the undergraduate students, the approach is challenging. Reported issues are: mismatch in students' conception of staff – student roles (Watson, 2002); problematic evaluation of group participation and member's free-riding (Swaray, 2012); dealing with the feeling of reduced responsibility manifested by social-loafing (Dommeyer, 2012); and resistance to teamwork (Smith et al, 2011). Students groups manifesting these and related issues are considered as dysfunctional teams.

Fixing dysfunctional teams is exhaustively discussed both in academic and in business publications. Based on a brief literature review we may differentiate the following approaches:

- Project management approach – applying sound project management knowledge, processes, skills, tools, and techniques (Project Management Institute, 2013), managing resource amalgamations, and process formalization through rules, procedures, and periodic reviews for project control and review (Tatikonda and Rosenthal, 2000);
- Micro-OB approach – building trust and team cohesiveness (Field, 2009), approaching with positive assumptions (Kruse, 2013), promoting mutual learning team members' mindset (Schwarz, 2013).

In addition, researchers discussing how to fix dysfunctional teams in an academic setting, utilize different evaluation schemes (Swaray, 2012) and peer-assessment techniques (Goldfinch, 1994).

The fact that student's dissatisfaction with the group projects affects negatively their attitudes about the benefits of teamwork (Aldridge and Swamidass, 1996) emphasizes the responsibilities of the faculty for micro IT projects set-up and implementation. The key role of the instructor in creating a positive group work experience is often underestimated. Instructors' positive and proactive approach to group projects, timely discussions on team dynamics, project processes and phases, clear rules that reduce tension on grade equity significantly impact the overall students' satisfaction of the group project and contribute to positive attitude towards teamwork and increase the perceived benefits (Chapman and Van Auken, 2001).

As part of "Simon Initiative" Eberly Center for Teaching Excellence and Educational Innovation had published recommendations for designing group projects based on CMU practices and the practices summarized in "Active learning: Cooperation in the college classroom" (Johnson et al, 1991). The recommendations include but are not limited to the following three areas: the instructors should design the project task for collaboration by creating complex task with built-in interdependencies; the instructors should devote time to teaching and promoting teamwork skills in students by facilitating the discussions within the group, the decision-making processes, and handling conflicts, mentoring planning, task delegation and the progress of monitoring and control; build individual accountability (CMU, 2015).

Approaches to overcoming team dysfunctionality

Project Management approach: Project management approach requires professional application of sound project management knowledge, processes, skills, tools, and techniques (Project Management Institute, 2013). The size of the project team, the complexity of the project and the academic organizational context reduce the required project management activities to the following main project knowledge areas: project integration, scope, time, quality, communication, and risk and stakeholder management.

Third year students in technological undergraduate programmes do not have knowledge about project management processes, do not possess the skills to use the appropriate management tools and techniques. In the first two years of their higher education they acquire enough theoretical knowledge and classroom skills to manage the scope of the project. Students are able to identify the quality of the developed software product but they do not benefit from

quality processes and do not use quality management techniques for building a quality product, such as design and code reviews and inspections.

The project management approach to fixing dysfunctional project teams requires introduction of the missing project management knowledge and experience. The team manager should be able to perform project integration management; should facilitate scope management by focusing the group effort on the main product features and guide the team out of scope creeps; should guide the team in building a project plan and scheduling project activities and in tracking progress against the current plan; should promote quality processes and quality assurance practices as early in the implementation of the software product as possible, and insist to measuring quality factors and monitoring of quality indicators; manage communication and information sharing; identify and discuss the risk with the team, mentor risk monitoring and mitigation; build awareness of the importance of stakeholder management and take care for stakeholders' expectations.

Faculty members responsible for group projects may introduce the missing knowledge and experience to students' teams. Tutoring sessions synchronized with the current project phase and team dynamics should guide the group project progress. The problem with the tutoring sessions is their scalability. Project management theory recommends fulltime project managers in industrial settings. The equivalent of this recommendation in academic settings would be each faculty member to lead just one group project but it is hardly implementable in an institution with standard student-faculty ratio of fifteen. Faculty should manage five to ten group projects bearing the consequences of split of focus and attention.

Faculty as instructors may use close guidance or micromanagement techniques to overcome interpersonal issues and technical obstacles but the instructor risks imprinting the team with dependencies from external decision-making that will deepen their dysfunctionalities. On the other hand, empowering students' teams may also lead to dysfunctionalities due to lack of management knowledge and experience.

Faculty may involve as team managers for undergraduate students' group project graduate students in "IT Project Management" programme who have the appropriate theoretical background, rich classroom and industrial experience and are able to manage projects but managing undergraduate group projects is not part of the curriculum.

Micro-OB approach: Micro organizational behaviour (micro-OB) approach studies individual and group behaviour and how they affect organizations. The Micro-OB approach to fixing dysfunctional teams recommends building trust and team cohesiveness (Field, 2009), approaching with positive assumptions (Kruse, 2013), promoting mutual learning team members' mindset (Schwarz, 2013).

From the micro-OB point of view faculty members could hardly be perceived as genuine team members. The authority of the faculty dominates the student's mindset and creative, collaborative, and cohesive team environment is in some aspects in contradiction with the traditional student-lecturer relations in the academia. The problem is multilevel – macro-OB level focuses the risk of negative consequences of disrupting the perception of academic hierarchical levels on the overall process in the university; micro-OB level emphasizes the need of close collaboration between students and group project managers for promoting teamwork and increasing the students' group projects success rate.

A micro-OB approach would require reducing the gap in the perception of the authority levels between the team members and the project manager – the first step in building team cohesiveness is strengthening the bonds between individual members (Field, 2009). A possible solution would be involvement of mediators between the faculty and the students' groups who could build strong bonds in both directions – with the faculty members and with the undergraduate students. Strong candidates for this specific role of mediators are graduate students who volunteer to lead undergraduate students' teams in their group projects. As volunteers, the graduate students are expected to approach the group project with positive assumptions, and to be proactive in emphasizing the benefits of teamwork, contributing to the overall positive perception of the project of the undergraduate students (Chapman and Van Auken, 2001). Lack of project management knowledge or lack of experience in the specific technical domain could be a drawback.

Recommended combined approach: The group projects organizational design is faculty leading team of graduate students who are project managers of undergraduate students' group projects. Based on micro-OB approach the recommended organization design promotes mutual learning team members' mind-set – an important prerequisite for team success (Schwarz, 2013).

The role of the faculty is recontextualized in the terms of micro-OB from manager of group projects to management team leader. In this setting the faculty role is to lead by example the team of graduates – to follow organizational policies and best practices, to create environment of trust, to promote open communication, facilitate constructive discussions, knowledge and experience sharing; to employ coaching principles and empower graduate students to maximize their efficiency as project managers in their day to day work with undergraduate teams.

The challenge to the approach is the required behavioural transformation of the faculty members from lecturers and micromanagement professionals to leaders, facilitators and coaches.

Combining both project management approach and micro-OB approach may compensate the negative and increase the positive outcomes of the recommended changes. The recommended amalgamation is achieved by recruiting graduate students from IT Project Management programme as project managers and team leaders of undergraduate students' group projects. The faculty effort should be targeted on leading by example and coaching this group of graduate volunteers. Creating a positive experience for the project management team is likely to propagate and have a multiplicative effect as a positive experience for the development team members and impact the overall students' group projects success rate.

The recommended mixed approach is backed by sound management knowledge, processes, skills, tools, and techniques, in addition, it focuses on trust and team cohesiveness, promotes mutual learning by group projects organizational design, and utilizes coaching as empowering strategy.

Second Year of Micro IT Projects

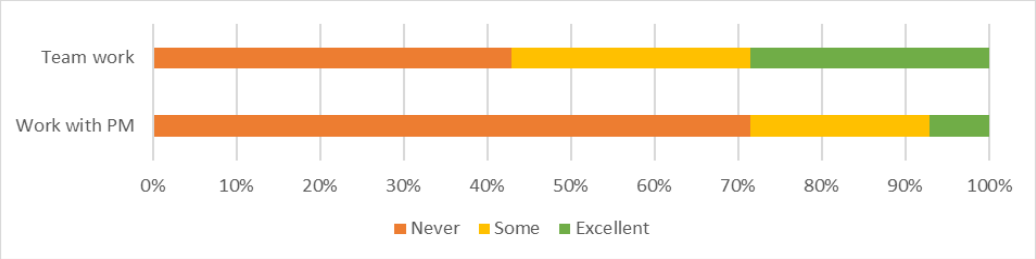
Set-up: Six small scale game development projects started during the second year of implementation of the micro IT projects. The project organization used the combined project management and micro-OB approach to overcoming team dysfunctionality. The micro IT

project assignments were part of the compulsory activities within the standard programme of undergraduate education in Informatics.

Project characteristics:

- **team selection criteria** – self-selected teams; fixed size of three students;
- **year of study** – third year;
- **assignment** – based on a pproject charter, clearly defined project scope and time, measurable acceptance criteria;
- **management** – graduate students from IT Project Management programme; the PM was coached by a faculty member;
- **motivation of the team members** – the students have to do it as part of their education; the team members depend on each other and relay on each other, they share the responsibilities for the project success.

The groups were fixed size self-selected teams of three undergraduate students and a project manager from the graduate programme IT PM. All undergraduate students were in their third year of study. The graduate students were in their final term of study. Each team had a PM, and the PM team was lead and coached by a faculty member – certified PMP.



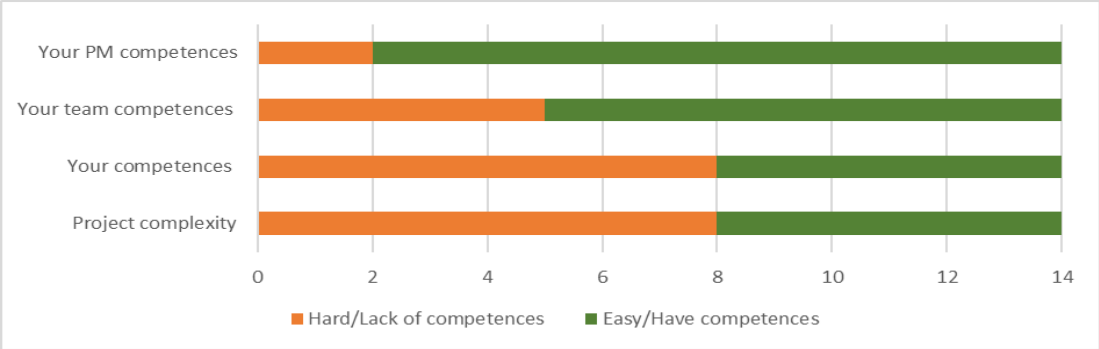
Source: author's construction based on new data

Fig. 1. **Prior Experience of the Team Members**

The magority of the students had no or negligable prior teamwork experience. The majority of them had never worked with a project manager.

The assigned micro IT projects were comparable both in terms of: organizational environment, stakeholders' expectations, available information and existing communicational channels, and also in terms of project parameters as project scope, time and resources. They were developed the faculty members as project charters – structured, clearly specified the scope, the time and the acceptance criteria. The time estimation was 90 task hours per team member, 120 management hours, and 30 hours of communication per team member (incl. PM).

The micro IT projects were designed to have a core functionality, that had to be developed in close collaboration between all participants, and three interdependent tracks that build upon the core. The students had to learn to use a new graphics API (SDL). The API was implemented in a programming language they had studied during the previous two years in 90 lecture hours and 90 lab hours. At that point of their study the students are supposed to have enough theoretical knowledge and classroom practices to be able to implement the assigned task individually.



Source: author's construction based on new data

Fig. 2. **Self-Assessment of the Complexity of the Project and the Competences of the Team and of the PM at the Start of the Micro IT Project**

The majority of the undergraduate students considered the assignment micro IT projects as difficult to implement. They assessed their competences at the project start as not sufficient.

More than 85% of the undergraduate students were convinced from the very beginning that their project managers from the master degree programme had the required competences to lead the project.

The subset of the management processes was selected to correspond to the micro IT projects scope complexity, the available management time and the size of the project team. The responsibility for the execution of the management processes, and the selection of the supporting tools and techniques was delegated to the graduate students - the project managers.

Project communication was considered as a major ongoing prevention activity of team dysfunctionality. It included:

- kick-off meeting – once in the beginning of the project;
- work progress – daily from the team members to the PM;
- scope status, schedule status – weekly from the team members to the PM;
- scope status, schedule status, risk status, stakeholder engagement status, communication status – biweekly from the PMs to the project management team leader (faculty member);
- emergency status related to risks, need of additional information, discussions of urgent issues – ad hoc (24/7) from all participants to the project management team leader;
- presentation of project results – once at the end of the project; date and time fixed at project kick-off meeting.

Table 1

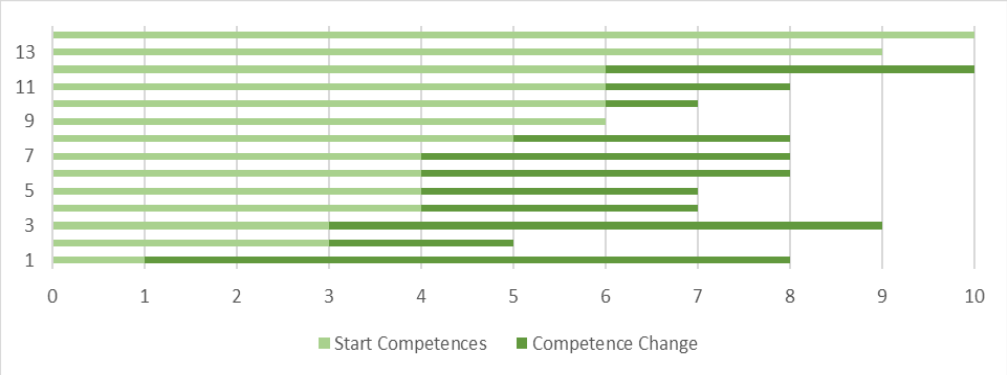
Subset of the PMBoK Processes used for the Micro IT Project Management

	Initiating	**Planning**	**Executing**	**Monitoring & Controlling**	**Closing**
Project Integration Management			Direct and Manage Project Work	Monitor and Control Work	Close
Project Scope Management		Create WBS		Validate Scope Control Scope	
Project Time Management		Define Activities Sequence Activities Estimate Activity Resources Estimate Activity Duration Develop Schedule		Control Schedule	
Project Cost Management					
Project Quality Management					
Project Human Resource Management			Develop Project Team Manage Project Team		
Project Communication Management		Plan Communication Management	Manage Communications	Control Communications	
Project Risk Management		Identify Risks Plan Risk Responses		Control Risks	
Project Procurement Management					
Project Stakeholders Management			Manage Stakeholders Engagement		

Source: author's construction based on (PMBOK, 2013)

Results: Five of the six teams completed their micro IT project successfully within time and scope. The success rate of 83% is two times better than the success rate of the previous year. The sixth micro IT project was rescheduled and it is under implementation at the moment when this article is written. Although it may be closed within the newly defined deadlines, it will be considered as unsuccessful for the purpose of the current study.

Feedback process and conclusion: As part of the project's closure phase all participants filled in a survey. The analyses of some of the insights from the survey are presented below.



Source: author's construction based on new data

Fig. 3. **Self-Assessment of the Technical Competences Before and After the Micro IT Project**

The self-assessment of the competences of the undergraduate students changed from 3.64 points to 7.86 points on a 10 points scale where one indicates lack of competences, and ten indicates student's confidence that they have the required competences to fulfil all project related tasks. Although the data is not sufficient to draw conclusions, we may suggest that these results show two important processes:

- learning by doing – building on the existing knowledge and learning new APIs based on known technologies;
- building self-confidence – some of the students lack experience and overestimate the complexity of the assignment; successful execution of the project is an important feedback that shows to the students what they can do using the knowledge and the training from the first two years of their undergraduate study.

The vast majority of the undergraduate students (83%) report high satisfaction with the micro IT project administration, management and process. The rest (17%) give positive feedback but express some discontent. These results are a major improvement in comparison to the overall negative feedback from the previous year.

All graduate students give positive feedback about their experience as micro IT project managers. Ability to explore new PM practices and to work to improve specific PM skills are outlined as major advantages of project management activities in a learning environment. Even the project manager of the team that missed its deadline considers the experience as enriching, positive, and very useful.

Identified issues: Only one of the teams was not able to finalize the project in time. The data is not sufficient to identify significant differences with the successful teams. The team members and the project manager report issues very similar to the issues reported by all teams during the first year – lack of commitment, free-riding, absenteeism, not enough time, etc. Based on the feedback we may conclude that the team did not overcome its initial dysfunctionality despite the changes in the micro IT projects management.

Table 2

Communication Activities vs. Success

Activity type	Periods	Team1	Team2	Team3	Team4	Team5	Team6
Kick-off meeting	**once**	yes	yes	yes	yes	yes	yes
Work progress	**daily**	yes	yes	**no**	yes	yes	yes
Scope, schedule status	**weekly**	yes	yes	yes	yes	yes	yes
Scope, schedule, risk, stakeholder engagement, communication status	**biweekly**	yes	yes	yes	yes	yes	yes
Emergency status related to risks, need of additional information, discussions of urgent issues	**ad hoc (24/7)**	yes	yes	yes	yes	yes	yes
Presentation of project results	**once**	yes	yes	yes	yes	yes	yes
Success (scope/time)		yes	yes	**no**	yes	yes	yes

Source: author's construction based on new data

Most of the teams communicated on daily bases in the project execution phase. Team3 reports difficulties in establishing communication routines, absenteeism, and long periods without successful communication. They failed to reach the execution phase because they could not negotiate team members' responsibilities and the project manager was not able to get the team's commitment.

Conclusions

The scale of the current research does not allow us to draw conclusions but the analysis of the data could be used to make suggestions about some of the success factors of micro IT projects.

- Overcoming initial team dysfunctionalities is a prerequirement for the success of micro IT projects.
- Commitment to the project and the team success should be established as early as possible.
- Long periods without communication between the PM and the team may lead to project failure.

The research on the success factors of micro IT projects is work in progress. Further research will build upon the suggestions identified in this article.

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IMPROVING THE EX-POST EVALUATION OF NGOS' PROJECTS BY INVOLVING THE INDIVIDUAL ASSESSMENT OF SOCIAL AND ECONOMIC EFFECTIVENESS

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Abstract

Due to the lack of private and public financial support, a major part of an average Lithuanian non-governmental organisation (NGO) annual budget is based on the financial resources from European Social Fund (ESF). NGOs are obliged to present evaluation reports in a 5-year period after the completion of a project funded by ESF.

Nevertheless, there are several issues regarding current evaluations. Firstly, the reports of ex-post evaluation do not include a sufficient number of perspectives and opinions of stakeholders. Secondly, NGOs work with vulnerable target groups; however, the social effectiveness of the project is not the main focus.

The article is based on the research carried out in the manuscript "Evaluation of Social and Economic Effectiveness of Projects, Executed by NGOs" by Keleckaite (2015). The scientific literature in this context was analysed and an alternative model was proposed. Its validity was checked by conducting a survey of project participants, followed by mathematical calculations and statistical analysis.

The application of the alternative model has been successful and the findings are relevant at several levels. To begin with, the participants have an opportunity for a self-assessment and deeper understanding of the real changes brought about by a particular project. In addition, the executing organization can use the gathered data and analysis for the formation of future social project portfolio. Finally, the local Government and ESFA can employ the findings in the process of designing a regional policy.

Key words ***NGOs; project management; ex-post evaluation; social effectiveness; economic effectiveness***
JEL code: *L3*

Introduction

The European Commission encourages Member States to carry out their own ex post evaluations. For this reason, European Social Fund Agency (ESFA) obliges the executing NGOs to perform evaluation reports in a 5-year period after the completion of a project. Nevertheless, there are several issues, regarding current evaluations. To begin with, the reports of ex-post evaluation do not include a sufficient number of perspectives and opinions of stakeholders – the only internal evaluator is the project manager. Moreover, NGOs work with a sensitive target group, but the social effectiveness of the project is not in the main focus of reports.

This article seeks firstly to introduce the reader with the essential principles of project assessment, models and frameworks used for the evaluation of social and economic effects.

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Secondly, to suggest an alternative model which includes the individual assessment of projects, executed by NGOs. Lastly, to present the main findings obtained with the mentioned model.
In order to achieve research objectives, the author used analysis of scientific literature and legal documents (statistical data/other information sources), semi-structured interview, survey and statistical analysis of secondary data.

The problematics of social projects' evaluation

According to Keleckaite, Meiliene (2015), NGOs face a lot of challenges, such as an unstable financial situation, lack of competences and employees, high level of bureaucracy. Nevertheless, every day's confrontation with persons who belong to socially excluded groups still remains as one of the biggest challenge. Social exclusion is an issue that affects many strata of society; the poor, the disabled, the unemployed, black and ethnic minorities, the young and old, the educationally and culturally deprived, the disadvantaged in inner cities and rural areas (Hicken, 2004). It has been defined as an individual's inability to participate effectively in economic, social, political and cultural life, resulting in alienation and distance from the mainstream, or more simply, the loss of access to the most important life chances.

NGOs create social benefits for the society by implementing projects. Due to the lack of private and public financial support, around 50% of an average Lithuanian NGO annual budget is based on the financial resources from European Funds (Official statistics portal, 2015). In a period from 2007 to 2014, Lithuania's NGOs mostly used the aid of European Social Fund and European Economic Area (EEA) financial mechanism. The main goals raised by ESF were full employment, quality and productivity at work, social cohesion and inclusion whereas EEA grants promoted human and social development, justice, environmental protection and partnerships. The programmes were implemented through individual projects run by executing organizations (beneficiaries). Over the entire mentioned period of funding, approximately 170 million EUR were granted to the participating NGOs.

Each beneficiary is obliged to present evaluation report after the completion of a project (evaluation which focuses on the outcomes is called ex-post evaluation). According to EC (2015), it aims to account for the use of resources, the achievement of expected and unexpected effects and for the efficiency of interventions. Also, ex-post evaluation strives to understand the factors of success or failure, as well as the sustainability of impacts.

The analysis of ESFA and EEA grants report forms and evaluation criteria has revealed that ESF is more oriented to the assessment of the application of the project and its'relevance to the common EU policy rather than ex-post evaluation of the project effectiveness. The most important part of the final report is a financial justification of costs and achieved project results. Differently, EEA financial mechanism requires a much deeper analysis of social aspects as it focuses on influencing factors, quality, effectiveness and the impact. Furthermore, project managers are asked to explain success and failure reasons, provide a situation analysis.

Nevertheless, in both of funds' ex-post evaluation forms, a project manager is the only responsible person who evaluates the project internally. Therefore, it can be stated that if main stakeholders of the project (the target group) do not perform self-evaluation and general evaluation of the project in the end of the period, neither the effectiveness nor the impact can be assessed properly.

To sum up, the results show that in comparison with EEA grants, European Social Fund has a greater focus on the pay off the investments, even though NGOs mostly work with

vulnerable target groups and social effects should matter the most. Moreover, as it was mentioned before, the ex-post evaluation does not include a sufficient number of perspectives and opinions of stakeholders.

Hence, there is a demand on a specific evaluation model for socio-economic effectiveness of NGOs projects.

Research methodology for ex-post evaluation of project social and economic effectiveness

The use of evaluation results is at the core of evaluation theory and practice. Major debates in the field have emphasized the importance of both the evaluator's role and the evaluation process itself (Contandriopoulos, Brousselle, 2012). Over the years, authors (Trochim, 2006, Ramirez, Broadhead, 2013) offered various definitions of evaluation which can eventually be determined as a systematic process of data collection for a judgment about merit, worth or value. Keleckaite (2015) introduced a specific model for ex – post evaluation of social and economic effectiveness of projects executed by NGOs. The background and the logic of the model are explained later in the text.

To begin with the visual explanation, bigger rectangles depict spheres an evaluator shall analyse. Circles mean additional influencing factors/levels an evaluator should pay attention to. Smaller rectangles illustrate the suggested tool of research: PD – analysis of Project Documents; SD – analysis of Statistical Data; SDA – Analysis of Secondary Data; IN – Interview and SU – Survey.

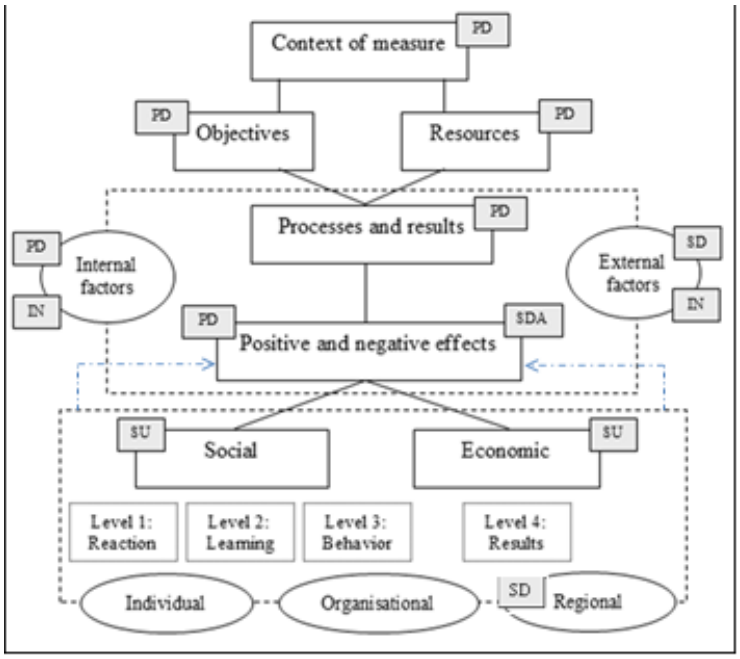

Figure 1: **Model for ex – post evaluation of social and economic effectiveness of projects executed by NGOs**

Source: Keleckaite (2015)

As it can be seen in Figure 1, firstly, the characteristics of the project are represented (the context, objectives, resources and achieved results). According to Katsikaris, Parcharidis (2010), every evaluator has to involve a sufficient number of stakeholders' perspectives.

Therefore, Piwowar-Sulej (2011) proposes that a model for evaluation shall contain regional, organisational and individual levels. Hence, considering the scientific input of the mentioned authors as well as research performed by Russ-Eft and Preskill (2005) and Christie, Alkin (2008), a method, illustrated in Figure 2, was used as a baseline.

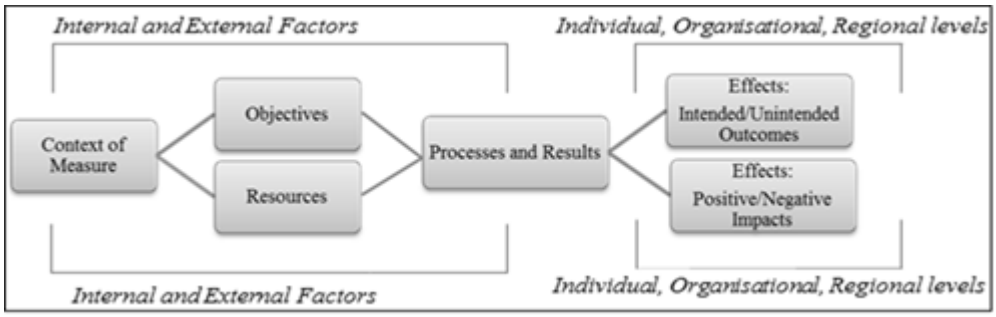

Figure 2: **Method for evaluation of project socio-economic effectiveness**
Source: Russ-Eft and Preskill (2005), Christie, Alkin (2008), adapted by author

In order to accurately evaluate the internal and external factors which might influence the effectiveness of a project, analysis of project documents and statistical data is proposed. Also, an interview with a project manager and a representative from an administering institution is suggested.

Finally, positive/negative social and economic effects can be evaluated by employing a survey method, followed by secondary data analysis and interpretation of internal and external factors. Survey method is chosen because it covers a lot of information in a simpler format and allows anonymity, which is especially important aspect while communicating with a sensitive target group. Finally, by employing primary and secondary data, effects are distributed to individuals (project participants), organizations (project executors) and regions (either country or local Government).

Ex-post evaluation of social effectiveness

Due to the specifics of social projects, researched by Kylindri, Blanas, Henriksen, Stoyan (2012), Moghadam, Dinpanah, Zand (2013), Szot-Garbys (2013), Kruger, Alvarez, Czismadia, Duch, Garcia, Hamburg, (2014) a specific concentration on indicators, related to human dimensions, such as creativity, satisfaction, social connectivity, knowledge, competences and skills should be held. Keleckaite (2015), therefore, analysed limitations of different methods which are widely applied for the evaluation of social effects (see Table 1).

Table 1

Limitations of methods used for evaluation of project's social effects

Method	Limitations
Social impact assessment	• Does not include the perspective of an individual and organization, therefore, identification of channels and groups affected can be complicated.
Balanced Scorecard	• Has a disadvantage for non-quantifiable data; • Is not able to measure the actual value changes in the results delivered if required data for the current period is insufficiently available; • Does not include the perspective of an individual.
Social Return on Investment	• There can be a tendency to misunderstand the numbers, specifically the SROI ratio, which is value, not money; • Little evidence of application in an NGO sector; • Very complex analysis (with a need to assess social benefits in monetary units, which is not always possible).
Atkisson Compass	• Is used to screen potential investments and to assess their ongoing progress towards sustainability, but rarely used for ex post evaluation.
Poverty Social Impact Assessment	• Findings rarely identify specific effects on different groups of people; • It is not a tool for impact assessment of itself, but rather a process for developing a systematic impact assessment for a given project.
Case Study Evaluations	• Case study evaluator may not collect sufficient judgmental information to permit a broad-based assessment of a program's merit and worth.
Counterfactual analysis	• Comparison of participants and non-participants provides useful additional information on likely impacts but in a form difficult to quantify; • In many cases monitoring and data are excessive which limits the use of advanced statistical/econometric techniques; • If there is no primary data about project participants, it is impossible to perform.
Kirkpatrick's model for evaluation	• Conceptual linkages between levels of a model are weak; • It does not involve the regional perception.

Source: Clark et al. (2004), Maas, Liket (2011), adapted by author

It can be noticed that most of the frameworks tend to be input, rather than output, oriented. Also, the majority of them are designed to include only short-term social effects and moreover, the quantification of these effects is problematic. Furthermore, almost every method has a clear orientation towards evaluation of the profit of (social) enterprises. In addition to this, it is relevant to remember that the effectiveness on the level of the individual can be not the same as effectiveness at organization or regional level, so a method should contain evaluation forms for all levels.

Due to these reasons, Keleckaite (2015) suggests adapting Kirkpatrick's model for the assessment of social effects of projects, executed by NGOs. Donald L. Kirkpatrick first published his ideas in 1959, in a series of articles in the Journal of American Society of Training Directors. According to Frye, Hemmer (2012), Kirkpatrick's four-level approach (Reaction, Learning, Behavior and Results) has enjoyed wide-spread popularity as a model for evaluating learner outcomes in training programs.

Projects executed by NGOs usually contain a variety of trainings or seminars; therefore, Kirkpatrick's model with educational background fits well. Moreover, this model is not directly

oriented to the profit of (social) enterprises and it has a focus on individual. Thirdly, with a little adaptation, it can be applied to all three levels: individual, organizational and regional and ensure that there is a sufficient number of perspectives and opinions to take into consideration (Table 2).

Table 2

Questions for the evaluation of social effects in different levels

Level	Indicators and possible questions
1st level (Reaction) Individual	*Level of satisfaction and valuation of particular project activities* • Had the project fulfilled the expectations? • What real difference has the activities made? How people have been affected? • In what ways and to what degrees do various stakeholders value the project?
2nd level (Learning) Individual, Organisational	*Level of increase of knowledge or skills* • Did the participants experience any changes in their skills, knowledge, attitudes? • Could more effects be obtained by using different instruments? • What were the most important reasons for the project's successes and failures? • To what extent did the program effectively meet beneficiaries' needs? • What are the positive and negative side effects? • What are the effects of the project to organization?
3rd level (Behavior) Individual, Organisational	*Level of motivation; Changes in behavior* • Did the project have effects on quality of life or reduction of social risks? • Did the project contribute to common strategy? • Was the project effective in terms of expected impact? • What are the program's most important unresolved issues?
4th level (Results) Individual, Organisational, Regional	*Costs and benefits; the influence of external and internal factors* • What were the costs and benefits of the project (not only in monetary terms)? • What internal and external factors could possibly make influence on the effectiveness of a project?

Source: Stuffelbaum (2001), EC (2015), McQuaid, Lindsay (2005), Neverauskiene, Slekiene (2008), Kirkpatrick (2013), adapted by author

On individual level, it is important to find out whether the expectations were fulfilled, what was the real change. On organizational level, it is relevant to remark the importance of internal factors. Lastly, answers to the questions related with a regional level contribute to the formation of common strategy.

There is evidence in various scientific studies that the magnitude of project effects can be influenced by or depend on the socio-demographic background of a project participant. Moghadam, Dinpanah, Zand (2013) stress the variables of social participation (e.g. membership of union), social status, modernity level, attitude towards the participation. Szot-Garbys (2013) notes that even child care and family stress can influence the extent of final social effect of the project. Lastly, McQuaid et al. (2005), Kruger, Alvarez, Czismadia, Duch, Garcia, Hamburg (2014) summarize the variables, which can be related with a participant's profile, including gender, age, health, ethnicity, income, personal competencies, professional qualifications and marital status (see Table 3).

Table 3

Socio-demographic profile of a project participant

Purpose	Indicators
To form a socio-demographic profile of project participant	Gender, Age, Marital status, Education, Work experience and Professional Qualifications, Social exclusion group, Health, Number of under-age children, Ethnicity, Income, Addictions

Source: Keleckaite (2015)

To sum up, during all stages of the evaluation process of social projects, it is very important not to get stuck in a simple accumulation of output indicators (e.g. projects organized, training courses provided). Due to diverse needs, values and vulnerabilities of a sensitive target group, the effectiveness of the activities carried out should be measured in the light of the objectives and their relevance to the individual, organizational and regional problems.

Ex-post evaluation of economic effectiveness

It is important to note that even social projects which produce "soft" outcomes can develop economic changes. As Torche (2003), EC (2015) considers the range of limitations (see Table 4) of different methods, multi-criteria analysis has to be performed while evaluating.

Table 4

Limitations of methods used for evaluation of project's economic effects

Method	Limitations
Cost – benefit analysis (CBA)	• Costs and benefits are not always tangible or can be expressed in monetary terms; • CBA measures costs and benefits on the subjective basis; also it has insensitivity to the distribution of cost and benefits over different individuals.
Cost – effectiveness (CEA)	• Cost-effectiveness analysis focuses on the main direct outcome of the intervention. The data collection for the unexpected costs and impacts is difficult.
Return on investment (ROI)	• ROI fail to describe the intangible aspects; • This method does not tell anything about program's or project's effectiveness.
With or without project situation analysis (WWP)	• There are potential pitfalls with survey techniques. First, those who choose to respond may be those who feel most strongly about it. Secondly, responses may not be truthful; • It is not possible to determine participants behavior in the "without project situation", after they received the effects of the project. This is called the missing data problem; • People who have not received the benefits of the project are not necessarily identical to the ones that participated in it; • It is difficult to decide, whether the project is actually responsible for the changes observed in the beneficiaries.

Source: Torche (2003), EC (2015), adapted by author

An author of this paper puts attention to the main focus of each analysis: for CBA it is profit, for CEA and WWP – effectiveness and for ROI – investment return. From the viewpoint of NGOs, which are non-profit organisations seeking for the benefits to society; the most suitable methods to evaluate economic effects are analysis of cost effectiveness and method

"with or without project situation". Furthermore, an author notes that it is possible to avoid the mentioned limitations by applying a few approaches already used in other studies.
Firstly, to overcome the difficulties of data collection for the unexpected costs and impacts in CEA, it is necessary to include assessment characteristics from various viewpoints as it was done in the "Economic and social assessment of community irrigation projects" by Ford and Butcher in 2002. These authors have identified four important viewpoints and assessment parameters (Ford, Butcher, 2002):

- Farmer viewpoint (interested in project's commercial viability);
- Promoter viewpoint (interested in project's commercial viability);
- Central and local government viewpoint (interested in project's economic and social impacts).
- Community/stakeholder viewpoint (interested in project's economic and social impacts).

The indicators for commercial viability included profitability, return on capital and asset value, while for the analysis of economic contribution authors determined output, employment, value added, and location of impacts and distribution of income. Income distribution as an indicator for evaluation of project's economic effectiveness is also mentioned in the study of European Commission. It is stated that regardless of the financing method, even projects with non-tangible products create jobs and distribute income:

- Directly, by means of jobs created within the entities managing the project, which can be an important project objective;
- Indirectly, by means of the intermediate goods and services they use (EC, 2015).

Costs and benefits to other sectors, social groups, participants and employees of organisation are controversial and the evaluation can become problematic. For this reason, Table 5 illustrates separated indicators of project economic effectiveness which were mentioned in the studies of Ford, Butcher (2002) and Foster (2010) and could be used for evaluation of projects, executed by NGOs.

Table 5

Indicators for the evaluation of economic effects in different levels

Level	Indicators (Benefits and Costs)
Individual	• Income distribution; • Social benefits.
Organizational	• Assets value; • Costs for employees' qualification development.
Region	• Government tax revenues; • Units/Costs for services (hospitals, police, social services); • Avoided costs for social benefits; • Subsidies.

Source: Ford, Butcher (2002), Foster (2010), adapted by author

As it can be seen from the Table 5, each of the level is equally important. For example, if the project creates skills that lead to higher earnings, then even the additional earnings of those benefiting under the project can be used as an estimate of project returns/benefits. Also, if the project results in significant internal efficiency gains then the cost savings may be a good measure of project benefits.

Generally, it can be stated that social projects can also modify the economic situation of an individual, executing organisation and surrounding society/state. For the further analysis, it is relevant to note that the degree of effects might depend not only on individual factors (as mentioned in Table 3) but also a variety of external factors. Passani, Monacciani, Van Der Graaf, et. Al. (2014), mention the importance of socioeconomic trends as age structure of society or the dynamics in household structure, also, employment tendencies and changes in government policy (e.g. laws, public services, system of social benefits, institutional support). Due to the mentioned determinants, target groups of even similar-type projects can be affected differently.

Research findings: ex-post evaluation of social and economic effectiveness of the project "Social inclusion"

The reader has been already introduced with an alternative model for ex – post evaluation of social and economic effectiveness of projects executed by NGOs (Figure 1). Research methodology was applied for a specific case analysis (the further names and titles are changed due to the confidentiality).

First of all, the context of measure, objectives, resources and results of the project are introduced.

Title of the project: Social Inclusion (abbreviation - PSI).
Period of time: February, 2012 – May, 2014.
Funding: ~400.000 Euros.
Aim: To include socially excluded groups into society by employing them or motivating to study.
Target groups (in total – 170, see Figure 3). The majority (84) of Project participants belongs to families at social risk, 34 are former orphans, 27 are long-term unemployed persons, 18 persons have disabilities and 7 are single parents.

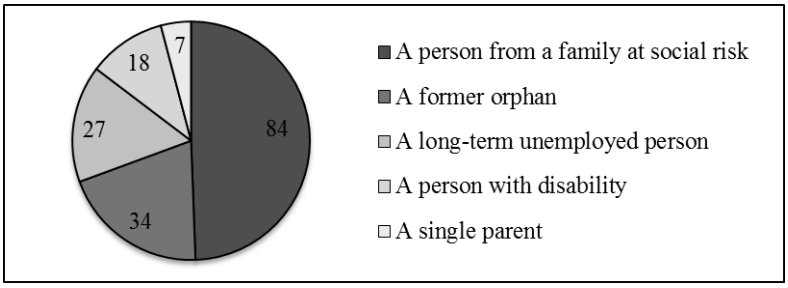

Figure 3. **Project's Target groups**
Source: Keleckaite (2015)

Project activities: individual psychological consultations, self-help groups, professional trainings at educational institutions and partner companies (e.g. accountant, vendor, nurse, cook), development of skills for successful job search, trainings for computer literacy skills, trainings for foreign language knowledge, trainings for economic independence and individual support for the project participants during recruitment process and first months of employment.
Results: As the results of project activities, 25% of disabled participants and 30% of all socially excluded participants had to be employed or led to study. The project managed to achieve only the first indicator.

In order to get more information about internal and external factors, an interview with a project manager and a representative from ESFA has been held. The interviewees were asked about the terms of social and economic effectiveness of a project, the importance of individual ex-post evaluation and the outcomes of a particular project PSI.

It can be remarked that the perception about the social and economic effectiveness of a project is similar. The only difference is that the PSI manager is more oriented into micro-level effects (e.g. concrete benefits for a target group) while the representative from ESFA perceive it rather in a macro-level (e.g. contribution to country's development). While answering to the second question, both of the interviewees agreed that individual ex-post evaluation would be useful for the designing process of future interventions. Nevertheless, there were no requirements for project participants to perform such an assessment. Finally, PSI manager and a representative from ESFA were asked to describe project's social and economic effects on organizational and regional level. The manager mentioned opportunities for staff development, also a fact that computer class was updated and general office was reconstructed. The representative gave a general overview that the project was effective in a matter of influential reduction of social exclusion.

Yet, for a deeper analysis of social, economic effects and internal influencing factors, survey of project participants was held. The socio-demographic profile is presented in Table 6.

Table 6

Socio-demographic profile of PSI participants

Indicator	Results
Age	6% of the participants are less than 25 years old, 31% are within the age group of 26-35, 33% within 36-45, 27% within 46-55 and 4% are more than 55 years old.
Education	The majority of survey participants have secondary or vocational education - accordingly 37% and 33%. One fifth (23%) of them acquired higher education and 8% have primary education level.
Social exclusion group	The biggest share of respondents (58%) belong to families at social risk (families with multiple and complex problems such as joblessness, poor mental health or addictions). 17% of survey participants are single parents, 13% of them are long-term unemployed persons, 8% have a disability and 4% are former orphans.
Number of under-age children	17% of respondents do not have children under the age of 18, half of them (52%) have 1 child, 13% have 2, 6% have 3, 10% are still raising 4 under-age children and 2% have 5 kids.
Work experience	62% have zero or up to 5 years of work experience. 29% of survey participants have 6-10 years of experience and 33% have been working for longer than 10 years.
Economic activity	8% of them are now studying, 46 % have a legal job, almost one third – 29% work illegally and 17% neither study nor work (although a presumption can be made that a part of them is also working illegally).
Addiction	35% of respondents have an addiction, 27% of them admitted to no longer having an addiction and 38% claimed that they do not have any addiction at all.

Source: Keleckaite (2015)

To sum up a general profile, the majority of respondents belong to the age group of 26-55, have vocational or secondary education, live in the families at social risk, have at least one under-age child, have job experience from 0 to 10 years and one third of them admit having an addiction.

The participants were also asked in how many other projects they participated during the same period of time. For 67% of respondents PSI was the only project, 27% participated in several projects at the same time and 6% of participants managed to be involved in total of 3 projects.

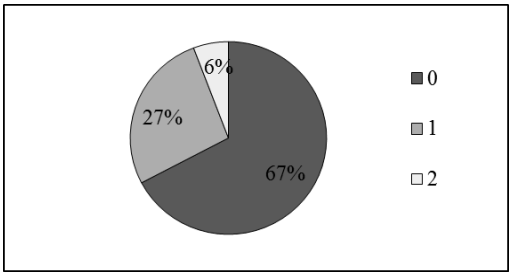

Figure *4.* **Number of additional projects a participant participated in the period of 2012-2014**
Source: Keleckaite (2015)

The evaluation of social effects proved that the majority (67%) of the participants who were involved in project activities were happy about the fulfillment of their expectations. A correlation analysis revealed that it depends on the level of education and work experience. According to the respondents, project activities such as individual psychological consultations and trainings for successful job search were the most effective ones. The participants also mentioned that they got a strong knowledge about self-representation to employer, career planning, professional and computer literacy skills. It is important to remark that time planning skills which were not expected to appear while executing the project activities, were acquired in a higher level than the foreign language or entrepreneurship skills which were the direct part of project. An analysis has also shown that there is a negative relationship between participant‘s education and the level of gained skills and knowledge. Lastly, the respondents admitted that after the project completion, they feel more self-confident, motivated to work or learn and socially active. It was found out that the participants can experience social change differently depending on the circumstances and factors – the biggest changes in behavior were felt by the participants with disabilities and single parents.

The evaluation of economic effects provided a worthwhile data in terms of economic benefits and costs for the participant and the Government. The survey showed that 46% of respondents have a legal job – and this is a good indicator for a project result. Nevertheless, almost one third (29%) of project participants work illegally and hide taxes. An author of this paper assumes that this situation is led mostly by the mentality of people and the extent of shadow economy which formed 25% of Gross Domestic Product in 2014. Furthermore, for the participants with low level of education and work experience, it is more convenient to use the social benefits and additionally get wage “in envelope”. An analysis has shown that total sums of 3.300 euros (illegally) and 12.600 euros (legally) are gained by respondents monthly. After the implementation of project activities, number of those receiving social benefits reduced from 36 to 28, amount of unemployment benefits were diminished from 28 to 7 and there are 9 people out of 15 left who still get compensations.

Respondents were analysed according to their current economic activity – students, legal workers, illegal workers, inactive citizens. There were periods “before the project” and “after

the project" compared and the information about financial inflows of respondents provided. (Figure 5).

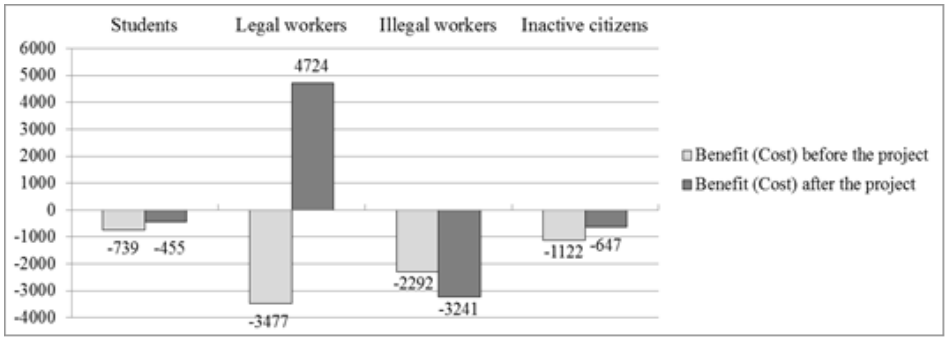

Figure 5. ***Monthly benefits and costs for the Government before and after the project, Eur***
Source: Keleckaite (2015)

For students and inactive respondents the sum of financial benefits decreased while for the legal workers income increased almost threefold. The monthly inflow of illegal workers also became bigger because differently from the legal ones, they do not pay taxes and the majority continues getting unemployment benefits, social benefits and compensations. This position leads to the situation when the Government of a region is not able to collect taxes and need to waste money on social benefits for people who do not need them anymore. It can be stated that project participants, who have a legal job, are the only ones bringing economic benefit for the society.

To sum up, it can be claimed that an individual ex-post assessment provides a lot of valuable information which can be used both in organizational or regional evaluations and the design process of future interventions.

Research limitations

Firstly, as it was already mentioned before, people who belong to a sensitive target group tend to be dishonest even in anonymous surveys. The majority may trust the survey compiler but the presumption must be made. Secondly, the side effects, especially related with the changes in participant's behavior should be evaluated by a participant himself/herself before, during and after the implementation of project activities. The same evaluation can be made by the psychologist (if a psychologist works in an NGO). Unfortunately, there was a lack of such data. Lastly, 33% of respondents were involved in the activities of more than 1 project at the same time, so the analysis of short-term effects can only partially distinguish the real effectiveness of a particular project.

Conclusions

1. Due to the lack of support from the Government, Lithuania's NGOs tend to be project – driven organizations. The major sources of funding are EEA financial mechanism and European Social Fund. A comparative analysis of the current methods of evaluation of social projects has shown that ESF, differently from EEA financial mechanism, is more oriented to the ex-ante assessment of the project and its macro-level relevance to the common union policy rather than the real ex-post effectiveness. Furthermore, the ESF forms

of the required final reports focuses on a financial justification of costs and achieved expected project results and only a little attention is paid to influencing factors, quality and effects.

2. Evaluation of social effects is necessary to assure high quality and satisfaction of key stakeholders. The assessment process might be complex because social effects cover a large range of features which can be influenced by a participant's socio-demographic profile, including gender, age, health, marital, social and economic status, personal competencies, and professional qualifications. Analysis has shown that there are no generally adopted methods for evaluation of the social effectiveness of projects, which have proved its reliability in practice and which have been approved by the majority of researchers. Therefore, after the investigation of a number of methods and their limitations, a supplemented Kirkpatrick's model for evaluation is proposed.
3. For donors and beneficiaries even "soft" projects must be effective in terms of the financial perspective; otherwise, the investment does not pay off. Usually, project participants also expect that a project will bring miscellaneous benefits in individual level. The degree of effects might depend on various factors as government policy – laws, public services, system of social benefits, institutional support, and socioeconomic aspects as age or employment. It is important to note that the procedures proposed for evaluation of economic effectiveness of projects with non-tangible products is not so complete and advanced as for the ones with tangible products. Thus, after the analysis of the limitations, it is proposed that the most suitable method to evaluate economic effects of projects, executed by non-profit organizations is an applied cost-effectiveness analysis and "with or without project situation" approach. Indicators used should contain income, social benefits, assets value or tax revenues.
4. Insights gathered from the theoretical solutions were applied in constructing an alternative model for the evaluation of social and economic effectiveness of projects, executed by NGOs. In the beginning, the context, objectives and resources of a specific measure (project) are presented. Later on, processes and achieved results have to be analyzed. The third part of this model involves determination of economic and social effects which might be both positive and negative. Social and economic effects are analyzed in three levels: reaction, learning, behavior and results. There shall also determining internal and external factors be emphasized. Finally, by employing primary and secondary data, effects are distributed to individuals (project participants), organizations (project executors) and regions (either country or local Government).
5. An application of an alternative model was successful and the findings are relevant in several levels. Participants had an opportunity for a self-assessment and deeper understanding of the real changes influenced by a particular project. The results of survey show that the majority of the respondents are happy about the fulfillment of their expectations and a correlation analysis revealed that it depends on the level of education and work experience. According to the respondents, the most effective activities were psychological and individual consultation as well as training for the successful job search. It was found out that the biggest changes in behavior were felt by the participants with disabilities and the participants who are single parents. From the economic point of view, a survey revealed relevant data that one third of participants have an illegal job. It was assumed that this situation was led mostly by the extent of shadow economy. Furthermore,

for the participants with low level of education and work experience, it is more convenient to use the social benefits and additionally get wage "in envelope". Yet, after the implementation of project activities, number of those receiving social benefits reduced from 36 to 28, amount of unemployment benefits were diminished from 28 to 7 and there are 9 people out of 15 left who still get compensations. Therefore, the local Government and ESFA can employ the findings about intended/unintended outcomes and real effects in the designing process of regional policy while an executing organization can use the gathered data and analysis for the formation of future social projects portfolio which could bring the maximum benefit for the society.

Recommendations

1. For the NGO E-Center. If the final evaluation does not contain the part of an individual assessment of social and economic effects, the provided reports are not accurate. Therefore, it is proposed to use ex-ante, mid-term and ex-post evaluation based on the insights of a participant of the project.
2. For the European Social Fund Agency. Firstly, due to the fact that micro level individual evaluation can reveal more details of the real project effects, it is offered to make a requirement for executing organisations to perform surveys of project participants. Secondly, research findings provide the information that one third of respondents were involved in the activities of more than 1 project at the same time. Therefore, distinguishing the effectiveness of a particular intervention is complicated. It is proposed to cooperate with other Funds to ensure even higher control of participation in several projects with similar outcomes.
3. For the Local Government. An analysis has shown that 29% of respondents work illegally. It is suggested to cooperate with executing organisations in order to tackle the problem of shadow economy by investigating particular cases.

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PROJECT STRATEGY AND STRATEGIC PROJECT MANAGEMENT: THE UNDERSTANDING AND THE PERCEPTION OF RELEVANCE AMONG POLISH PROJECT MANAGEMENT PRACTITIONERS

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Abstract

In the last years the issues of strategy and strategic management have been addressed frequently in the literature on project management. The notion about the role of project management in achieving business success is accepted broadly (Shenhar et al., 2001), and the search for more deep understanding of key elements of strategic project management is gradually becoming an important subject of research (Anderson and Merna, 2003). However, although the discussions on the significance of strategic orientation in project management are extended, there is still lack of a clear definition and common understanding of project strategy as well as of a coherent framework of strategic project management (Artto et al., 2008, Patanakul and Shenhar, 2012). Moreover, it seems that there is a disparity in the level of the theoretical development and practical understanding of the mentioned terms: project strategy or strategic project management.

The aim of this paper is to demonstrate and discuss the results of empirical research conducted among Polish project management practitioners and oriented towards recognizing their viewpoints. The research questions were related to the understanding of mentioned concepts – project strategy, strategic project, strategic project management as well as the interpretation of the difference between strategic and operational project management. Not only the opinions, but also the differences in perceptions as well as the sources of such dissimilarities were investigated.

As research results indicate, although the concept of project strategy is seen as very important, it is still ambiguous. There is a vast variety of opinions as to the most important components of project strategy and strategic management processes, as well as to the role of project managers in strategic processes. The influence of knowledge and experience along with social impact are observed.

Key words: *project management*, *strategic orientation*, *project strategy*, *strategic project*
JEL code: *M10*

Introduction

Even the brief literature analysis reveals that in the recent years the matters of strategy and strategic management were discussed frequently in the project management publications. The opinion about the significance of project management in organization's success is legitimate, as well as the pursuit of better understanding the essential elements of strategic project management process create an interesting research topic. Despite numerous discussions about the role of strategic orientation in project management, still there is no theoretical unification whatsoever. The definitions of project strategy, strategic project management or strategic project are still unclear and the differences between strategic and operational project management have not been exhaustively explained so far. Similar problems with the proper understanding of those concepts and their application in the business practice are common for managers which are working in everyday project implementation.

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The aim of the article is to present the perception of the importance and understanding of such concepts as project strategy and strategic project management. In the first part of the article, on the base of the literature review, the fundamental ideas of project success, project strategy and strategic project as well as strategic project management are characterized briefly. In the second, empirical part of the article, the results of the research are presented and discussed. The discussion is focused not only on the explanation of the level of interest and acquaintance of the analyzed issues, but also on the determinants of perception and beliefs of Polish project management practitioners.

Literature review

The deliberations about the project strategy and the strategic project management should begin with the analysis of the importance of projects in contemporary strategic management. With no doubt, this is an important tool in the process of value initiation and creation and, what is more, in achieving competitive advantage (e.g., Jamieson and Morris, 2004, Anderson and Merna, 2003, Artto et al., 2007). In traditional, simplified approach, a successful project is implemented in planned time, with scheduled budget and with achievement of all intended goals. Nowadays, multidimensional approach in analyzing the sources of project's success – with the consideration of dynamics, complexity and uncertainty of the environment, implies the necessity of effectiveness of the project, the significant influence of the client, business and organizational success and its further relevance (Shenhar et al., 2001).

According to various authors (e.g., Milosevic, 1989, Grundy, 2000, Shenhar, 2004, Srivannaboon, 2006) identification of the strategic projects is essential for achieving and supporting long-term goals of the organization. Strategic projects are the basis of the company's development, attaining profits and effective implementation of changes; they are often connected with a considerable uncertainty, but their success is a source of attainable profits and long-term incomes. According to Asrilhant et al. (2004) strategic project has to possess particular characteristics, such as ability to a practical application and full supervision, the best reflection of business realities and the accordance with company's mission and vision. In terms of foregoing assumptions, strategic project could be demonstrated as a theoretical and practical description of mechanisms which are providing the realization of the strategy.

Strategic project management is a complex process focused on efficient usage of business opportunities and their translation into the feasible activities oriented towards value creation with reference to achieving long-term success of the organization. In this interdisciplinary approach, the main goal is to achieve the competitive advantage through differentiation and concentration on strategic goals by using project management strategy (DyReyes, 2008). Heerkens (2007) defines strategic project management as a sequence of patterns, mechanisms, processes, tools and behaviors which, together, help to determinate the scope in which the organization establishes effective relations between good practices in project management process and good practices in process of strategic goals implementation. According to Amram and Kulatilak (1999), the strategic project management is a two-stages process: the development and the control stage. If both stages are successfully implemented, the planned goals can be executed. Strategic project is properly managed when both phases are accomplished and as the result, the financial success is achieved (Asrilhant et al., 2004). After Stanleigh (2006), the important assignment for the organization is to conciliate the key information which could be used to identify and quickly implement those projects which do not have particular strategic

significance. Those type of projects do not demand specific attention, are not fundamental for the chosen business strategy, however they may generate costs, absorb resources and discourage the company's client. Strategic project management should be based on the specific methodology which includes selecting projects from the strategic plan level through the analysis of possible significance of a particular project resulting from the evaluation of its influence on strategic goals and tasks. The methodology also includes the analysis in terms of implementing projects on various organizational levels in relation to the strategy as well as the integration of the leadership in project management, the competences and knowledge in organizational context (Jamieson and Morris, 2004).

Although it could be presumed that not every project has a strategic importance for an enterprise, every project could be connected with the concept of the strategy. Project strategy might be defined as a specific perspective, position or a compendium of a directions regard to the project, which enable the indication and concentration on the main purposes of the organization and the ways of successfully and effectively achieving those objectives (Patanakul and Shenhar, 2012). According to the mentioned concept, project strategy should be considered in three main directions: the „why'' perspective (e.g. business background, business goals, strategic concept), „what'' position (e.g. product definition, value/competitive advantage, potential success/ failure criteria) and „how'' instructions (e.g. project definition, strategic concentration). Anderson and Merna (2003) claim that project strategy is an advanced and complex plan which enables achieving project's goals. Project strategy could also be understood as a project's direction, which election provides the success of the project (Artto et al., 2008). This approach helps to analyze the strategy of a project in terms of the position which every project could achieve in the environment. Based on his analyses, Morris (2004) pointed at the important elements in the process of creating project's strategy: processes of planning and integration, implementation of those plans and effective utilization of possessed knowledge and expertise. Project strategy is a missing component in project's creation and implementation. Every project has its own, individual strategy that is a perspective, position and activities absolutely essential in defining what and how it should be done, to achieve competitive advantage and the best results of all the actions (Longman and Mullins, 2004). Project strategy should include following components: business perspective, assumptions, product, value, success and failure criteria, project definition and main strategic goals (Shenhar et al., 2007).

As far as there were several attempts to unambiguously define the project strategy (Artto et al., 2008, Patanakul and Shenhar, 2012), the discussion about strategic project management is multi-dimensional: they are about success, value creation or competitive advantage and they are quite generally focused on the successful implementation of project's strategy. According to Green (2005), the implementation of strategic project management needs an interdisciplinary approach which would provide the success of the whole process through its accurate and understandable definition, the alignment of project strategy and business strategy, the proper project portfolio management oriented towards the maximization of project value, and the achievement of leadership in project management. As a result of those referred activities, organization could achieve the balanced development and its competitive advantage. In the traditional approach to project management focused on operational perspective, the crucial issue was associated with the effectiveness of realization of goals; it was presumed that project could be described as a set of necessary activities which have to be done. In the new concepts, for instance Strategic Project Leadership based on adaptive approach, there is a clear concentration

not only on efficacy but also on effectuality (Shenhar, 2004). While applying Strategic Project Leadership concept in the practice, there are seven rules to be followed: leadership, strategic portfolio management, strategic project definition, creating vision and substance of a project, integration and knowledge.

Similar approach towards the rising role of strategic project management was represented by numerous project management researchers. Meskendahl (2010) emphasizes the mutual influence of strategy on project management success and project management on the organization's success. Anderson and Merna (2003) indicate a marked research gap in explaining how business strategy should be translated into projects. They also recognize the tendency to comprehend the strategic project management as a specific process linked to the project strategy concept which usually refers to the higher-level plan for achieving project's goals. In this opinion strategic project management (selection, management and maintenance for many projects) enables the company's development through the strengthen of its market position and the maximization of shareholders' value.

Summing up, the development and the evolution of strategy-focused approach to projects as well as strategy-oriented approach to project management allows to confirm the point that long-term success of the organization depends on the project's success. Projects and strategic goals of an enterprise are mutually connected–projects and the basis of the changes in the organization associated with its strategic objectives. Therefore, strategic objectives need to be successfully translated into projects' goals.

Research method

The study presented below is based on the results of empirical research conducted periodically in five consecutive years 2011-2015. The research sample comprised project managers or members of project teams, as well as people regarding them as working for project-oriented companies. It means that the participants of the survey defined themselves as 'project management practitioners'. The discussion about the project strategy was conducted online by the usage of a tool which allows the effective communication, i.e. a dedicated discussion board. The selection of the sample was based on a simple assumption–the participation in the discussion was possible for every interested person, which on their own and voluntarily declared their will to participate and to share their observations and comments. In total, in the research participated 53 project management practitioners. The discussion on the online forum was moderated by one of the Authors of this paper, however her main role was more likely to watch over and to disallow moving away from the discussion's subject or to encourage participants to continue the discussion. The moderator never suggested any given answers or has not shared her own beliefs about the subject.

The aim of the empirical research was to learn about the interest and familiarity with the analyzed issues, as well as about the perception and beliefs of Polish project management practitioners. The set of opinions of project management practitioners which were gathered as the result of formulated questions concerned their understanding of such concepts as project strategy and strategic project management. The question was about: do project management practitioners notice the necessity of understanding the strategy and identifying strategic problems? Does every project have a strategy? What is a project strategy? What components do make a project strategy? What is the difference between strategic and operational project management? What is the role of project manager in strategic project management? Which

domain is the strategic project management – the manager's or the other stakeholders (the sponsor of the project or the PMO)?

The recognition and the systematization of the collected options allowed to recognize some parts of the project management practice as well as to identify the plurality of the views, their determinants and the possible gap between theoretical deliberations conducted in literature of the subject and the opinions of project management practitioners.

Research results

In the first part of the inquiry, project management practitioners were asked about the necessity of understanding the project strategy and about the importance of the identification of strategic matters. It has to be underlined, that many of the debaters at the beginning of their statements emphasized the importance and the meaning of strategic issues in project management (*In my opinion there is the lack of discussions on such important issue …*)[10] and recognized this topic as very inspiring for studying (*I have read the opinions above and I have to admit some of them need my rethinking*.). While trying to answer these questions, respondents emphasized the fact that they could not give the unambiguously respond (*I do not know how to be clear in what I would like to express …*), or when trying and explaining the matter, they tend to move away from the subject. Moreover, they often presented even contradictory arguments in their opinions. Summing up, in those parts of the discussion which were related to the main issue: 'does the project have a strategy?' three main plots could be recognized:

1. Many participants have emphasized the fact that every project has its objectives, so it also requires having the main idea of implementing these objectives, in other words: it requires the strategy;
2. Not every project has its own strategy; it is conditioned by the size and the scope of the project; large projects should have the strategy, but there are also smaller and less significant projects, (for instance the repair of the engine), here the term of project strategy is an overstatement;
3. The term 'project strategy' is often overused, for instance when the external stakeholders are considered, it does not create a sufficient condition to use the term 'strategy' properly.

It should be underlined however, that many interlocutors were very easily mixing and confusing two terms: project strategy and strategic project, they used them jointly, regardless of the context.

It seems to be interesting that in the discussions, many different ways of defining project strategy were applied. Table 1 includes the comparison of the most important definitions, as well as some illustrative opinions connected with these types of interpretation of the strategy.

[10] Quotations from online discussion in italic.

Table 1

Project strategy definitions according to the interviewees

No.	The nature of the project strategy according to the interviewees	Illustrative opinions
1.	The goal – the strategy is an idea, way of achieving the project's objectives.	*Strategy always means a plan to achieve goals. Each project manager has to know the direction – without the strategy it would not be possible to define goals and to find the way how they could be achieved.*
2.	The environment (project's environment) and the need to form the relations between the project and the environment.	*The strategy must be about stakeholders and about their satisfaction, otherwise it would not be possible to think of business goals. There is a need to listen and react to the changes in the environment.*
3.	Success – strategy includes defining what is a project's success and the ways of achieving it.	*We need a strategy to know our goals and when we achieve the goals we can celebrate project success.*
4.	The necessity of adaptation to the environment's conditions – implementing the project in the environment's changing conditions requires adaptive activities, the scope and the methods of the adaptation needs the rules of reaction: the project strategy.	*We have to be flexible nowadays, but we need to know the limits of our elasticity. Each project, when it starts, never has all the needed information, it is based on assumptions. And in order to minimize the risks the strategy should be followed.*
5.	The set of the key decision – strategy is a set of important, long-term settlements, such as: choosing the suppliers or the technology.	*The role of project manager is to take decisions. Some of them are operational, but there are important matters, such as choosing the proper, eco-friendly, socially responsible supplier we can cooperate on long-term conditions.*

Source: authors' construction

The participant of the discussion emphasized the fact, that it is easier to discuss about the project strategy in the case of large projects (strategic projects) – it these cases they could perceive the project strategy more clearly. The similar situation could be seen in the case of the organizations which are even established for implementing only one project (project finance) or for one particular large project (for example: Linux system).

The discussion about the project strategy frequently included the answers related to the issue of the components of a strategy. The review of presented opinions and the brief analysis of its contents is provided by the following list:

1. Defining the project's goals, performance objectives or performance targets,
2. Defining the success of the project on a different way than traditional understanding of the success: time, budget and scope,
3. The scope of the project's changes, including the principles of permitting the initiation of the whole project or its consecutive stages,
4. Fundamental decisions about the scope and the quality, including the decisions as to technologies used or suppliers selected,
5. The set of project's implementation scenarios.

It should be emphasized that both: in defining strategy and justifying individual definition of strategy – including the most important components of the project strategy – interviewees hardly ever referred to any definition quoted from the subject's literature. The main reason of this behavior seems to be rather unofficial nature of the discussion and no judgment (appraisal) of the statements. Generally, the most dominant trend to refer to the individual and gathered experience or to some previous statements, rather than the publications.

The next issue discussed during the research was about the strategic project management: do the strategic and operational project management should be distinguished? In respond to this question, in most cases the answer was positive, i.e. confirming the existence and importance of the strategic project management. In further part of the discussion, the interviewees pointed at the substantial activities (elements, stages) of building the strategic project management. The most important references are presented in the Table 2.

Table 2

The essence of strategic project management according to the interviewees

No.	The most important actions or their context	Exemplary statements (citations)
1.	Making the strategic decisions – the phase of conducting project's decisions, analyzing different scenarios or variants of the decisions.	*Always there are possible variants of the project execution; it is not difficult to formulate scenarios, however – from my experience – much more difficult to choose the proper one.*
2.	Determining the rules of cooperation with the project's stakeholders.	*There are various expectations from the customers, suppliers, team members etc., and it is a part of strategic management to balance them properly.*
3.	Decision making in the conditions of the limited resources and with the restricted decision's making margin.	*All the time we have to choose, to estimate, to select, and to make our choices understood.*
4.	Superior phase in project management which is connected with decision making process from the control units.	*There are various levels of decision making in the company. The higher level takes the strategic decisions and then controls if they are implemented by project managers.*
5.	Maximizing the performance – initiating the activities which would provide the highest profits from the project, stakeholder's satisfaction, better organizational image, etc.	*We could not forget about the most important thing, i.e. about money (!). The shareholders (owners) expectations have to be fulfilled.*
6.	Choosing the right project to implement.	*In my company each project is verified from the point of company's business goals and only the projects that are aligned are further considered for implementation.* *Strategic project management is about making choices as to the scope of project portfolio.*

Source: authors' construction

It has to be underlined that in this part of the discussion, references to the role of the project manager were observed quite frequently. The possibility of his/her independent key decisions or the role of other stakeholders in the process of creating project strategy was deliberated. According to the participants, the following points of view should be indicated:

- strategic decisions are made by project managers; the decisions have very complex nature; and they need the consideration of various determinants, not only economical but social as well,
- project manager does not have the own self-reliance in making strategic decisions, moreover some of the respondents declare that '*the project manager should not make those decisions on his/her own*',
- strategic decisions belong to the Project Management Office or to the superiors of project managers.

According to the quoted opinions, the points of view as to the project managers' role are fairly diverse: from the total independency of the manager to the main role of PMO or the other stakeholders. One of the reasons of this variety of declarations might be the difference in the experience of the interviewees: their formal or informal position, years of working experience, or their role in the organization (employee, manager, PMO executive).

Research conclusions and discussion

The research results allows for many interesting conclusions. First, according to Author's predictions, those participants who decided to take part in the study willingly, emphasized the importance of the project strategy and strategic project management and depicted them as interesting and inspiring matter. Simultaneously, they described these topics as a quite ambiguous and hard to produce straightforward or clear notions, sometimes even (according to the interviewees' opinions) inclining them to modify their previous opinions. In every asked question there is a significant variety of answers and opinions, what is more, some misunderstandings or misconceptions are quite common, e.g. the concepts of project strategy and strategic project are often confused. Obviously, the mistakes in understanding those concepts were not common for everybody; sometimes the interviewees, even on purpose, differentiated those notions while focusing on the need of creating the clear, straightforward definitions.

The interviewees indicated the important components which could be useful in defining project strategy: the scope, success, relations with the organization's environment (adaptation, stakeholders' expectations), the importance and long-term scope of the decisions. Likewise, the opinions about strategic project management could be summarized as follows: analyzing the options or the scenarios, making decisions about not only the projects as such but also about the possible alternatives of its realization, suppliers or technology, creating and maintaining the relations with the stakeholders, orientation on achieving project's success criteria, including intangible criteria, such as for instance, the reputation of the organization.

As it was mentioned before, in the collected opinions, the references to the literature were scarce; in the statements of discussion's participants the typical vocabulary, such as e.g. competitive advantage, value creation etc. were uncommon. The main reason of those circumstances might be an informal character of the online forum. However, the important point is that the participants delivered very interesting points of views and very often, their opinions were in accordance to the definitions and views presented in the subject literature. There were gathered some significant observations about the relation between project strategy and the strategy of the organization, implementation of the strategy as the result of the projects and even the interpretation of the creation of organization strategy as a specific, peculiar project. On the

other hand, in the interviewees' opinion, there were many clichés, unclear judgments such as '*temporary strategy*' or '*the person, who controls if the manager makes the right decisions'*.

Taking into consideration the determinants of participants' judgments and opinions, it should be strongly emphasized that this type of the online research does not include the typical demographics part or the interviewees' characteristics. According to the declared opinions and examples, the information about the represented sector was quite clear, especially in those opinions which concerned construction industry or IT. However, at this stage of the research it would be difficult to recognize and conclude about the influence of the sector, in other words, to determine the influence resulting from the specificity of the project the interviewees took part in. It should also be underlined that in the gathered comments, the fact that the opinions are based on the individual experiences was emphasized strongly and frequently – it could be seen as a peculiar assurance from considering personal views and beliefs as an unquestionable or general truth.

In this study, more noticeable was the influence of the professional background and certification. Especially the knowledge of a particular project management methodology (for instance PRINCE2)–apparent references to some specific methodological concepts– were to be noticed. What is more, in those cases, the common practice was to use the rhetoric, which could be described as 'an expert's rhetoric': someone who knows all the answers and who does not hesitate to announce it at any point.

Conclusions

Project strategy and strategic project management seem to be an interesting and inspiring subject, not only for research oriented towards theoretical investigations, but also based on surveys or case studies revealing the perception of these concepts by the practitioners of project management. The research presented in this paper, offers an inside into the opinions and declarations of Polish practitioners who willingly participated in the online survey. The variety of their opinions indicates the possibility of further research oriented towards recognizing the contingencies or determinants of their perception as well as the changes resulting from the development and popularization of project management knowledge.

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PROJECTS AND PROCESSES: STRANGERS OR COUSINS?

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Abstract

This paper (work in progress) is intended to explore potential linkages between two fields of research and practice: on the one hand, project management and temporary organizations, and on the other hand, business process management. In practice, projects and processes are interrelated but surprisingly or not, both research fields have developed quite separately. As practice fields, both could be considered to be 'ancient' but as academic fields both are relatively young. However, both fields are emerging and promising. Thus, there are potential research links to be exploited. The rationale for this paper is that in knowledge building, the fragmentation and separation of the two fields that has developed is detrimental and should be overcome. The paper contains a review of the existing literature, based on a loosely structured method, attempting to detect and demonstrate potential synergies. The main findings are that at some points the two fields have already come quite close and the next step(s) could be taken in the near future. Finally, an idea for research and development – to develop a methodology for integrated process and project management for small and medium-sized organizations (particularly in the field of services) – is proposed and argumented. Further developments may lead to the formation of a common body of knowledge for the two fields, and even for related fields, such as business analysis. In turn, this may lead to integration of several management systems and standards.

Key words: *project management, temporary organization, business process management*.
JEL code: *M10*

Introduction

Academic knowledge building has involved (and still does) a typical separation of research fields – researchers tend to remain in their 'silos' and publish their work mostly in highly specialized journals. This has caused separation of communities and damaging fragmentation of knowledge. On the practice side the situation seems to be somewhat better but yet, similar fragmenting mechanisms can also be noticed.

This paper aims to explore potential linkages and synergies between the two academic fields – project management (and temporary organization) and business process management. This will be done via comparative analysis of the two academic fields, and also through connecting academic research to practice. The underlying assumption is that in practice these two fields are essentially related and linked much better and therefore, both academic fields can learn from practice, and not just from their 'own' field but also from the other fields practice.

The paper will provide a comparative overview of the two academic fields and relate the main conceptual approaches to practice. Starting from an overview of the existing academic literature, it will reveal significant existing linkages and subsequently suggest further possible linkages for mutual enrichment. The review of existing literature is based on a loosely structured method, starting with keyword searches in academic databases and followed by examination of the content of relevant publications. Then a 'bottom-up 'approach, following the references of examined articles, is adopted and again the contents of publications have been

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examined. Some sources have been used from the author's previous research and some (especially non-academic) have been found using general internet search engines.

A brief comparative overview of the fields

Project management is an 'ancient' phenomenon but a comparatively young yet developing academic discipline[12]. Up to now the scholars in the field have no solid understanding about the notions of project and project management. This paper will proceed from Artto, Martinsuo, and Kujala (2006) who distinguished three viewpoints on a project: (1) tasks or phases in a process, (2) product or work breakdown structures, and (3) temporary organisations. The first two encompass most 'classical' aspects appearing in understandings of a project where normative approaches (guiding what is appropriate management for the project) are emphasised. Also, the first two comprise the notion of '***project work***' (or **project processes** – this aspect will be explicated later). The third – ***temporary organisations*** – is more recent, focusing on behavioural aspects and treating projects as organisations (Lundin & Söderholm, 1995). This paper will treat both **projects** and **temporary organizations**, hereinafter labelled as **PM**.

Also, there are several definitions of project management but again, this paper will proceed from afore-cited Artto et al. (2006) who distinguished three aspects: (1) tools and documentation, (2) competences and characteristics (of the project manager), and (3) knowledge areas or (sub-)processes. It is worth to notice that the keyword "process" appears in both specifications by Artto et al. (2006) and several widely renowned definitions are 'process-based'. For instance, APM BOK (2006: 2) states: ''*Project management is the process by which projects are defined, planned, monitored, controlled and delivered ... Projects bring about change and project management is recognised as the most efficient way of managing such change.*'' This definition emphasises a process[13], another innovation that is very essential. Moreover, international standard on project management (ISO 21500: 2012) constitutes: "*A project consists of a unique set of processes…*" and another standard (related, providing guidelines for quality management in projects) determines project as "*… unique process, consisting of a set of coordinated and controlled activities…*" (ISO 10006: 2003).

Project management is not considered to be a mature field yet but significant developments have taken place during recent decades. Turner, Huemann, Anbari, and Bredillet (2010) discern nine schools in project management and show that the field is more developed and diverse than it is used to be in 'classical' understandings, characterised by the 'iron' or 'golden' triangle (time, cost and scope/quality). These schools can support scholars in the development of theory, as well as help practitioners to gain wider understanding of the key issues on their projects. Here it is worth to mention that one of the nine schools is labelled as **process school**. Yet, process school is just one amongst nine and this leads to the conclusion that the discipline of project management is not entirely process-oriented. The relatedness on

[12] For a more comprehensive overview look at Kuura, Blackburn and Lundin (2014), publication data are in bibliography.

[13] It should be mentioned that the more recent edition of APM BOK (2012: 12) provides a different definition: "*Project management is the application of processes, methods, knowledge, skills and experience to achieve the project objectives*". It also denotes processes (and in the first place among methods, knowledge, etc.) but stresses on the application of all these.

projects and processes (and their management) will be examined later in this paper. To conclude here, just mention that the past 50-60 years (that is considered to be the age of modern project management) can be characterized by the increasing use of projects and project management, notably for achieving the strategic objectives of organisations and for dealing with increasing complexity, uncertainty and ambiguity in the contemporary socio-economic environment (Bredillet, 2010).

Business process management (hereinafter **BPM**) has gradually developed as a discipline amidst management and information systems and computer sciences (Recker & Mendling, 2015). Because of having roots in both management and computer science, it is difficult to follow the history of BPM but the roots of the discipline can be dated back to the industrial revolution. The focal topic in BPM – productivity – has been increasing due of technical and organizational innovations, and since the 1950s also due to the use of information and communication technology (van der Aalst, 2013).

All organizations – enterprises, governmental bodies and non-profit organizations – have to manage a number of processes. Therefore, they need BPM – the art and science to ensure consistent outcomes and to exploit improvement opportunities. Improvements (typical examples are reducing costs, execution times and error rates, etc.) may be one-off or have more continuous nature. Even BPM can be used for improving individual processes; it is rather about managing entire chains of events, activities and decisions that add value to the organization and its customers. These "chains of events, activities and decisions" are called ***processes*** (Dumas, La Rosa, Mendling & Reijers, 2013). A ***business process*** is defined as "*a collection of inter-related events, activities and decision points that involve a number of actors and objects, and that collectively lead to an outcome that is of value to at least one customer*". Following this definition they define BPM as "*a body of methods, techniques and tools to discover, analyze, redesign, execute and monitor business processes*" (ibid: 5). The definition stresses that business processes are focal in BPM but also points out different phases and activities in the lifecycle of business processes.

Exploring the origins and history of BPM, Dumas et al (2013) date back to the pre-historic and ancient times and the Middle Ages. It means that BPM has its roots much deeper than in the industrial era. In the prehistoric times, the consumers and producers overlapped and humans had knowledge of how to produce all goods they needed, thus they were generalists. In the ancient times, people started to specialize, this widespread development led to the guilds of the craftsmen during the Middle Ages and shifted further towards pure specialization during the Second Industrial Revolution (from the second half of the 19th century up to the First World War). In management (both practice and theory) this is reflected in Taylor's approach (known as *scientific management*) where the key element is the division of labour together with emergence of a new class of professionals – managers, responsible for setting goals for individual workers and ensuring that the goals were met. As a result, most organizations became structured along the principles of labour division (called functional organization).

Although BPM has quite protracted history, the most important developments have occurred comparatively lately. Exploring the development of BPM, Lusk, Paley and Spanyi (2005) distinguished two main phases: *Industrial Age* (up to the 1960s) and *Information Age* (since the 1970s); the later (ongoing) phase has three "waves": the 1st (the 1970s -80s) labelled as *Process Improvement*; the 2nd (the 1990s) labelled as *Process Reengineering*, and the 3rd (since 2000) labelled as *BPM*. Exploring the trends in BPM during the past decade, Harmon

(2015) stated that "process work" (as it is understood today) began about a hundred years ago with Taylor's Scientific Management, which generated the first process improvement movement.

Because its usefulness in increasing productivity, achieving operational excellence and/or saving costs, the recent decades have seen a growing interest in BPM on the practice side. Concurrent developments on the research side have resulted in a plethora of models, methods, tools, etc., helping the practitioners in (re)design, management and analysis of business processes (Recker & Mendling 2015). Like in other academic disciplines (including PM – the author) there are debates about the maturity level of the field. Some scholars are quite sceptical questioning not only the level of maturity of BPM discipline but even if the research is relevant at all (Recker & Mendling 2015; van der Aalst 2013; Recker 2014). At the same time, it is possible to judge that BPM is a mature discipline and several scholars (e.g., van der Aalst 2013) have claimed this. During the past decades, BPM research has been presented at different forums and published in the top journals of various fields (mainly information systems and management science), and there is also a special journal[14] for BPM research. During the recent years, many premium research conferences in various fields have had tracks on BPM. In 2003, the BPM discipline started its own annual conference series (Recker & Mendling 2015).

Concerning coeval developments on the practice side of BPM, it should be mentioned that a professional body[15] was established in 2003. In some respect this was a response to the IT vendor community who was trying to "take over" or redefine BPM as a technology layer, which would come problematic for practitioners. The founders of the professional association for BPM practitioners got inspiration from similar professional societies, including PMI. Moreover, in December 2004 the ABPMP Board formed an Education Committee and its main task was to develop the BPM-BOK[16] and *Professional Certification Program* in BPM (Lusk et al 2005).

Summing up this brief overview it is possible to note that similar developments have taken place in both fields, and both in practice and theory. The main difference can be observed on the time axis – significant developments in the BPM field took place much (some decades) later than in the PM field. The next sections of the paper will continue pointing out similarities and discrepancies between these fields, examining existing literature.

Existing linkages between the fields

The presented brief overview already gives some insight into possible linkages between the examined fields of practice and research. One obvious sign is the existence of ***process***

[14] ***Business Process Management Journal*** (started on 1995, until 1997 as *Business Process Re-engineering & Management Journal*), for more information see http://www.emeraldinsight.com/journal/bpmj. Information about the International Conferences on BPM can be found at http://www.bpm-conference.org.

[15] Association of Business Process Management Professionals – more information is available at http://www.abpmp.org/.

[16] BOK (Body of Knowledge) is a well-known abbreviation in project management, introduced by professional body PMI (Project Management Institute – see http://www.pmi.org/). PM BOK is also used for certification.

school of thought (one of the nine[17] schools) in the PM field. The process school emerged in the late 1980s, particularly in Europe; its main premise is to define structured processes from the start of the project to achieving the end objectives. This school views project management as converting a vision into reality – as a structured process (or road map) which leads from the start to the desired end state (Turner, Anbari & Bredillet 2013). The greatest proponent of the process school seems to be Rodney Turner. In his book (Turner 2009) he defines specific processes for managing scope, organization, quality, cost, time, risk, covering project life-cycle and its management life-cycle. An important point he made is that project management approach has to be aligned horizontally with the project, not vertically with the functions. In this approach the "project" equals "project processes", thus this is labelled process approach. Turner (ibid) also pays attention to development patterns – at the beginning of the "project era" (in the 1950s) the managers tried to adopt the familiar classical functional approach and started to face problems – and relatedness to the quality management approach (quality procedures following the ISO 9000 series standards) which is essentially process-based. Finally, it is worth to note that Turner (ibid) quotes a piece[18] of BPM literature and the quoted item is about Business Process Reengineering. This is noteworthy because reengineering (which is more or less a change) of business processes are seen as projects and this is an important linking point.

Afore-cited Turner (2009) also hints at another process-based approach in the PM field – the PMBOK (Project Management Body of Knowledge), elaborated by a world-leading professional organization PMI (Project Management Institute). The latest (5th, 2013) version of PMBOK defines 47 project management processes, divided into five process groups (Initiating, Planning, Executing, Monitoring and Controlling, and Closing). Combined with 10 PM Knowledge Areas it represents a matrix which follows the process logic – output of one process becomes an input to another process, or is a deliverable of the project, subproject, or project phase. Processes are shown in groups in which most of certain activities take place – project management is usually iterative and processes from any group may be used throughout the project life cycle. (PMI 2013) When a process takes place in one and will be re-used or updated in another process group, it is not considered a new process. This principle is widely recognized in BPM.

Another confirmation of diffusion of process approach in PM is the international standard on project management (ISO 21500: 2012), as well as cognate standard for quality management in projects (ISO 10006: 2003). As it was mentioned in the overview, both standards represent the process-based view. For ISO 21500, this is accruing from the PMBOK which is the main (or almost sole[19]) basis for the international standard (Reusch, Löhr & Khushnood 2012). For ISO 10006, the same is accruing from the ISO 9000 family of standards (on general quality

[17] The nine schools are: Optimization, Modelling, Governance, Behaviour, Success, Decision, Process, Contingency, and Marketing. All distinguished schools have metaphoric counterparts for the project, for the process school the metaphor is an algorithm.

[18] Johansson, H.J., McHugh, P., Pendlebury, A.J., & Wheeler, W.A., 1993. Business Process Reengineering, Chichester: Wiley.

[19] As ISO 21500 is based mainly upon PMBOK, it does not have significant links to other concepts (such as IPMA, APM, etc. widely used in the project management community) and this may cause problems in global recognition of this standard (Reusch et al 2012).

management) which serve as its basis. One (out of eight) principles of quality management[20] in ISO 9000-series is "Process approach" (ibid).

It may seem that "project" processes distinguished in PMI PMBOK (and in ISO 21500 as these are almost the same) cover everything that is important in the management of projects but yet, in some respect there are uncovered areas. For instance, Reusch (2015) proposed several extensions to the 'standard' process, particularly for the management of sustainability in projects. Reusch, Khushnood and Olaso (2012) also proposed a new approach for the management of projects, using *Object Role Modeling* (ORM). Suggested approach should be able to clarify fundamental concepts in project management and support all management levels: operational, managing and controlling, and auditing processes. As they claim, ORM *"... is well established in information analysis and systems design*", it is supported by several tools and "*can contribute to develop ... architecture for future standards in project management*" (ibid: 144). The main asset of ORM is its aptitude to assign different tasks and roles to team members. As ORM[21] and BPM are inherently linked, an attempt to link ORM and PM is an obvious step towards linking PM and BPM. Yet, there seem to be a shortcoming as well – deficient attention was paid to the impact of time, whereat Halpin (2008) published a paper, discussing various emerging temporal issues at the conceptual level. However, even Halpin was far away from the application of conceptual approaches already existing in the PM field, particularly the seminal work of Lundin and Söderholm (1995).

A recent academic contribution, discovering the global trends in project management (Alvarez-Dionisi, Turner & Mittra 2015) also points to some connections between PM and BPM fields. In addition to 'mainstream' approaches in PM (referred before PMI and APM bodies of knowledge, also PRINCE2, not alluded in this paper) they point to several other linking matters. Speaking about certification systems and bodies, they refer to International Institute of Business Analysis (IIBA[22]) which has developed certifications of *Certified Business Analysis Professional* (CBAP) and *Certification of Competency in Business Analysis* (CCBA), based on specific body of knowledge BABOK. Although Alvarez-Dionisi et al (2015) do not exhibit the connection to BPM, there is an obvious connection and this is also manifested in academic literature (for one, see Mathiesen, Bandara, Delavari, Harmon & Brennan 2011). Furthermore, Alvarez-Dionisi et al (2015) point out several aspects with linking potential, such as agile methods (including SCRUM), comprising different frameworks, particularly the rational unified process (RUP), which is quite common in BPM and can be easily modelled using BPMN[23] (for one, see Delgado, Ruiz, de Guzman & Piattini 2010). Moreover, Alvarez-Dionisi et al (2015) declare another linking concept – *green project management* (GPM), which is defined as "inclusion of SUSTAINABLE methods to the process by which projects are defined, planned, monitored, controlled and delivered" (ibid: 22). Green (or sustainable) does not include only environmental but also social and economic aspects. And finally, a remarkable

[20] By all rights, it is possible to claim that modern quality management is (almost) entirely process-based and this could be one of the biggest reasons of proliferation of process approach and BPM in general – but as this aspect leads outside of the topic of this paper it will be not discussed any more.
[21] More information about ORM is available at website http://www.orm.net/.
[22] More information about IIBA is available at website https://www.iiba.org/.
[23] BPMN stands for ***Business Process Model and Notation***, more information is available at website http://www.bpmn.org/.

linkage propounded by Alvarez-Dionisi et al (2015) is project governance. This is the linking project management and corporate governance and (especially if defined as a "*process-driven system ...*") also BPM – through the governance of BPM or process in organizations (Hernaus, Bosilj Vuksic & Indihar Štemberger 2016).

Looking at the same matter for the BPM side an important linkage can be noticed. As Hernaus et al (2016) insist, within an organization BPM is usually introduced through a (pilot) project. Understandably, such one-time effort cannot lead to the organization-wide institutionalization of BPM practices – the business environment, customer's needs, etc. tend to change and thus business processes should be changed time to time. Thus, it is important to note that redesign (and/or reengineering, or improvement, or just change – many phrases are used for nearly similar matters) of processes (called also BPM initiatives) are carried out via organizational projects and/or programs. Such projects / programs are aimed to enhance both efficiency and effectiveness of business processes, and thereby competitive advantage. Therefore, all "*BPM initiatives should be properly developed, adequately measured and strategically aligned*" (ibid: 175). Thus, it is understandable why BPM (or process) governance is recognized as an important BPM success factor. As they define governance as the use of rules to manage BPM programs and/or projects, the cited authors (ibid) were very close to the PM field but did not cross the line. Yet, suggesting possible directions for further research they point to a connection with a topic which is quite common in the PM filed – the role of ***project management office*** (PMO). Here it is worth to mention that this particular issue has already deserved some attention in the literature. On the BPM side "*BPM Center of Excellence*"[24] (CoE) is dominating, standing for an organizational mechanism for institutionalizing BPM initiatives, using a more centralized approach. Thus, there is an essential linkage between a PMO and a BPM CoE (Jesus, Macieira, Karrer & Rosemann 2009). Even PMO-topic is quite common in the PM field, the existing literature tends to be limited with the aspects related project (including program and project portfolio) management but there is exclusion – a paper by Hubbard and Bolles (2012). Taking stock of nearly 15-year history of PMO-related research they present an updated model of PMO – representing "*a beneficial change agent and a unifying force within the enterprise*" (or organization – the author) which "*can be a way of representing what is being called Business Process Management (BPM)*" (ibid: 7). Obviously, such references may lead to an idea to merge a PMO and a BPM CoE. As it might be anticipated, there is already at least one successful example – in the US, at the National Board of Medical Examiners (Burns 2012).

Another linkage seems to exist in competences (knowledge, experience, etc.). This can be noticed while searching for the term "Body of Knowledge" which (as mentioned in Section 1) is used both in PM and BPM. Proper examination and collation of defined competences need more work and space (thus do not fit the scope of this conference article) but even sketchy look will bring out significant links. For instance, in BPM CBOK (ABPMP 2013) the term "*project*" appears 376 times and in PMBOK (PMI 2013) the term "*process*" 1713 times – which should be considered significant. On top of that there seems to be a real linking competence – in business analysis, having a specific body of knowledge called BABOK. As mentioned also before, this competence and qualification is expanding in the PM field and is now recognized by PMI as the "*PMI Professional in Business Analysis* (PMI-PBA)" (PMI 2016), as well as in the

[24] This source uses abbreviation BPM CoE and notes that labels *BPM Group*, *Process Team* or *BPM (Support) Office* are also used.

BPM field (Mathiesen et al 2011). Moreover, Rosemann and vom Brocke (2015) point out ***six core elements of BPM*** and in each of these six elements (or factors) provide further level of detail called ***capability areas*** (all together 30 areas, forming a matrix with six columns and five rows). Even (just) two capability areas include "Program & Project Management" one can note that nearly all defined capability areas actually have (at least some) relation to capabilities recognized in project (and program) management field. Furthermore, the cited authors (ibid: 109) claimed: "*Based on this demand for a BPM framework that can be used for project and program management … and strategy management, we propose a framework that can guide BPM decision makers in all of these challenges.*" The authors (ibid: 117) show great respect for project and program management methods stating that these methods "*… are used for the overall enterprise-wide management of BPM and for specific BPM projects. The latter requires a sound integration of BPM methods with specific project management approaches (e.g., PMBOK, PRINCE2)*". It is certainly easy to agree with this statement.

In addition to (treated before) individual competences, also collective and organizational (level of) competences can be discerned. The last represents the organization's strengths or capabilities (Loufrani-Fedida & Missonier 2015). Organizational competences are related to the organizational maturity and this seems to be another linking stream. In the PM literature, maturity has been an engaging topic during the two past decades. An intriguing fact is that in quite an early stage the project management maturity was related to processes, using a label "*Project Management Process Maturity (PM)*^{2} *Model*" (Kwak & Ibbs 2002). They recognized that (already in 2002!) various PM maturity models existed and most of them were inspired by the CMM (capability maturity model) developed by the Software Engineering Institute (Carnegie Mellon University) in order to assess the maturity of software development processes. Looking at congruous developments in the BPM field one can observe quite similar evolution (for one, Röglinger, Pöppelbuß & Becker 2012: esp. Table 1) but with one significant difference: upturn of maturity models in the BPM field started in the middle of the first decade of the 21st century – about a decade later than in the PM field. Yet, the conceptual basis of the plethora of maturity models in the BPM field seems to be the same as in the PM field (ibid: esp. Table 2). Examining the rate of coherence with project-related aspects it is easy to notice its presence at BPR (business process reengineering – or just change) projects.

As already mentioned, organizational maturity is related to the organizational competences. Looking at appropriate models in the PM field, a recent and significant development is IPMA[25] *Organisational Competence Baseline* (OCB) (IPMA 2013). Here it is good to mention that IPMA's OCB has quite a visible process orientation – just one example: "*Organisational competence ... builds on people and all resources involved and integrates necessary processes, structures and cultures …*" (ibid: 9). The role of organizational competences is recognised also on the BPM side. For instance, Sobreiro, Morgado, Bento, and Vivas (2015) show (on the case of sport tourism) those (dynamic) organizational competences, especially when operationalized with BPM strategies, work for achieving efficiency and effectiveness.

[25] IPMA (International Project Management Association – see http://www.ipma.world/) is a leading professional organisation in the PM field, targeting mainly on development of project management competencies. IPMA has also *Individual Competence Baseline* (ICB) latest version (4.0) was published in 2015.

Summing up this (brief and preliminary) comparison of the two fields, it is good to refer to an interview by M. La Rosa (2016) with Michael Rosemann on "The Role of Business Process Management in Modern Organizations". In the first question the interviewer particularly asked: "*So, Michael … why hasn't BPM become a structural organizational management discipline, alongside disciplines such as project management, risk management …*"? Michael Rosemann replied: "*That's a very good question, Marcello, and I think it goes to the core of our discipline. I believe there are three reasons … and they could be related to: a lack of mandate; a lack in terms of comprehensiveness of the approach; and potentially, but maybe most importantly, a lack in the benefits that we deliver*". (ibid: 89) Considering afore-cited (as well as statement by Rosemann and vom Brocke (2015) cited beforehand) it seems that leading researchers in the BPM field give recognition to the PM discipline. This is obviously amiable for people (researchers, also practitioners) in the PM field. Even if the overall situation in the PM discipline is a bit better, it is not as good as it could be. Despite significant furtherance within the last decades, the PM discipline is still accused of lacking a solid theoretical basis or being immature (Kuura, Blackburn & Lundin 2014).

The presented brief comparison of the fields of practice and two academic disciplines is abridged in Table 1. On the practice side there are several similarities – history and origin, significance and value (for exploiters and other stakeholders). Concerning the development support and status of profession, there are similar patterns but shift on the time axis – the BPM field is lacking behind. Concerning academic disciplines, there are even more similarities but also some shift on the time axis and again, the BPM field is lacking a bit behind.

Table 1

Comparison of the state of project management (PM) and business process management (BPM)

Aspects compared	Project Management (PM)	Process Management (BPM)
A) As practice fields		
- history (origin)	ancient, as old as mankind	ancient, as old as mankind
- significance (value)	'getting things done' – tangible value often declared but not quantified, in-tangible value mostly declared, depend on situation in organisations	contributing to productivity, operational excellence, saving costs, flexibility and customer orientation, measurement and continuous improvement (of processes)
- development support	active professional organizations support development of appropriate techniques, etc. since 1960s	various organizations develop appropriate techniques, tools, etc. since 1980s, and a professional body active since 2003
- profession	up to mid-1970s amateurism, after-wards professionalism, rapidly growing number of (certified) professionals, who seek support for professional procedures	up to the end of 20th century amateurism and/or professionalism in other field (IT, etc.), since the beginning of 21st century developing towards professionalism
***B)* As academic disciplines**		
- history (origin)	having roots in other (general) disciplines (mainly management sciences) emerged as discipline in the middle of 20th century	having roots in management, IT/computer science, emerged during the 20th century, grounded as discipline in the 21st century
- nature	inter-/multi-disciplinary field	inter-/multi-disciplinary field
- main linkage (via)	business analysis	business analysis

- state of theory	still accused of lacking a solid theoretical basis or being immature **but** significantly evolving within the last decades	accused / conceded lacking of mandate, comprehensiveness of the approach, and in the benefits it delivers **but** appreciably evolving within the last decade

Sources: PM column – adapted from Kuura et al (2014); BPM column – author's constructions based on cited sources.

The next section will take stock of the comparative analysis and try to sketch possibilities for further development of the examined fields, using potential synergies.

Some possibilities for further linkages between the fields

Tightening of linkages between the two fields and further consolidation is probably easier solving practical issues, which are in the agenda on both sides. Thus, there is a need to find out the issues where emersion of potential synergies is most probable. It should be mentioned that one befitting issues was fetched out by Michael Rosemann in the (cited also before) interview (La Rosa 2016). The interviewer stated that BPM initiatives tended to associate with large organizations and asked: "*... is there a role for BPM also in small and medium enterprises"*? Rosemann replied: "*No doubt!*" (ibid: 90) and pointed out three (main) reasons. First, small and medium size enterprises (SMEs) have no buffer; their demand for cost efficiency is brutal. Second, they want to grow and thus need to understand how to scale up processes, avoiding 'bottlenecks'. Third (and possibly the most interesting) is that they need to understand the processes not just within a SME but within ecosystem, because most SMEs contribute to cross-organizational value chains. Understanding of the processes they participate will help SMEs to increase their value propositions (ibid).

Rosemann (La Rosa 2016) asserted that nowadays also SMEs implement BPM, following its rigor but not having the same comprehensiveness and scope (when it comes to process governance, etc.) as it is usual in larger organizations. Following this it is worth to mention a recent initiative – to elaborate *Lightweight Process Modelling* methodology, targeting on the needs of "*non-IT-savvy*" business users, including SMEs and public sector (Schnabel 2012).

On the BPM side there is already more to build on. For instance, Dallas and Wynn (2014) carried out a case study, inquiring the applicability of 'mainstream' BPM tools and techniques in a SME. Their main finding was that in general, the 'mainstream' BPM tools (including BPMN, workflow systems, etc.) in SMEs are as useful as in larger businesses. However, because of lower investment capabilities, the availability of necessary BPM tools on a low or no-cost basis is potentially more important for SMEs. Thus, the main limiters for the adoption of BPM in SMEs are resources, including skills, and (in many SMEs) also the culture could create resistance. The cited authors rely on a number of earlier works on this topic. An example is Chong (2007) who explored and structured the major issues of BPM implementation for SMEs in the wine industry in Western Australia. The main findings were that factors inhibiting BPM implementation SMEs (in ranked order) are the lack of financial resources, time, support from senior management, IT expertise and finally, poor knowledge of process-oriented approaches.

Hereby it is good to note that similar ideas thrive on the PM side. Turner, Ledwith and Kelly (2010) inquired project management in SMEs and came to conclusion that SMEs need a "lite" version of project management. Yet, they see differences. The medium-sized companies

have specialists whose work needs coordination and therefore they need more formalistic processes than micro-sized and small companies. In turn, the micro-sized and small companies need a "micro-lite" version, supporting generalists who work in small project teams, and more *laissez-faire* type management.

As seen, specific needs of SMEs have been recognised and something has been done in both BPM and PM fields. In order to examine the level of connectedness between research approaches is useful to look at the representation of project (or temporary) aspects on the BPM side and process-related aspects on the PM side. Looking at the afore-cited publications in the BPM field (Dallas & Wynn 2014; Chong 2007) one can notice that they mention projects[26] but just on the traditional level – the "BPM projects" (or BPM initiatives, as treated in Section 2). BPM projects are obviously projects in full extent but the overwhelming majority of SMEs have also many projects of other kinds. Looking at the same matter on the PM side (Turner et al 2010) it is possible to say that process-related aspects deserved more attention – there is even a keyword "Levels of process". This keyword represents a concept or a model, meaning that different companies and different projects require certain (different) amounts of project management methodology. Appropriate levels of process depend on five parameters: size and complexity of project, skill of project team, skill of customer, and willingness of customer to pay (ibid).

Aforesaid contains an interesting point which is worth to discuss and develop further. For better understanding the underlying idea, the parameters which determine the levels of processes (by Turner et al 2010) are placed on Table 2.

Table 2

Parameters positing the levels of processes

PROJECT in permanent organization(s)			Internal CLIENT	
PROJECT WORK (PROCESSES)		TEMPORARY ORGANIZATION		External CLIENT
SIZE	COMPLEXITY	SKILLS	SKILLS	WILLINGNESS TO PAY

Source: Turner et al 2010

As seen, the first three parameters match the understanding of a project as a combination of 'project work' (or project processes) and a temporary organisation (as firmed up in Section 1). Skills are certainly not the only attribute of a temporary organization but skills are probably important.

Skills are also important attribute of a client. Turner et al (2010) had in mind external client but the client may be also inside the focal organisation. Such understanding has emerged and is widespread in the service management field and has gained ground also in the PM field (Burström, Jacobsson & Wilson 2013). This understanding is recognised in the marketing school of PM (see Bredillet 2010; the nine schools are listed in footnote 6).

[26] There is a notable exclusion: Chong (2007) quotes a paper which is explicitly related to PM: "Murphy, A. and Ledwith, A. (2006) Project management tools and techniques in high-tech SMEs in Ireland. 14th Annual High Technology Small Firms Conference, 11-13 May, Enschede, The Netherlands." It is remarkable that the second author Ann Ledwith is a co-author of quoted PM publication (Turner et al 2010). Thus there is an 'early linkage' between the two fields.

The extension of the client's side (the upper right on Table 2) draws on a recent contribution by Lundin et al (2015) who distinguished three types of organizations, adduced in Table 2.

Table 3

Types of organizations and relations to business process management (BPM)

Types of organizations	Explanations (examples)	Relations to BPM
(a) Project Based Organizations (**PBOs**)	revenue is based on projects (some examples: design, fashion, architecture, film, IT, publishing)	core processes are organised by projects
(b) Project Supported Organizations (**PSOs**),	the project activities (such as R&D, design) support core activities (such as production, servicing) to cope with innovation-based competition	support processes are organised by projects
(c) Projects Networks (**PNWs**)	networking between different actors is dominating (some examples: TV production, special types of construction, also community based projects, serving a societal purpose)	both core and support processes are organised by projects and the projects (or processes) cross the boundaries of focal organisation

Sources: Types of organizations and explanations (examples) – Lundin et al (2015); relations to BPM – author's suggestions.

Modern approaches in PM and in BPM recognise that there is always a client – for PBOs outside, for PSOs inside and for PNWs inside and/or outside of the focal organisation. The last (PNWs) seem to be the most all-embracing and thus the most interesting notion. Moreover, it seems to have perfect fit with the ***service-dominant logic*** (SDL), its four axioms (Vargo & Lusch 2014). The first axiom (service is the fundamental basis of exchange) and the fourth (value is always uniquely determined by the beneficiary) are more general but the second (the customer is always a co-creator of value) and the third (all economic and social actors are resource integrators) are apparently related to process approach. For instance, Harmon (2015) pointed out ten BPM trends in ten years and one (7.) of ten trends is "customer processes". The idea behind this is quite simple – when drawing process diagrams (following BPMN rules) a pool or a lane for the customer processes are included. This leads to thinking what a customer goes through when interacting with processes of a service provider and thereby allows to design better processes, and in turn better services.

Running total, it comes to an idea for research and development – to ***develop a methodology for integrated process and project management for (service) SMEs***. I put service into brackets deliberately: most SMEs are nowadays active in service sector but certainly not all – some act in manufacturing and some in primary sector. Nevertheless, applying service approach or service (dominant) logic on SMEs in other sectors might be useful anyway, this is coming from the current paradigm, characterised as servitization, shift to services, etc.

Besides, one more apologia for the service approach can be found in the literature. Rosemann (2010) proposed an interesting view on BPM as an *Enterprise Service*, basing on an idea that an organization has several (internal) services and to solve problems they need the services blended (or "*loosely coupled*"). And, surprisingly or not – the two services that Rosemann (ibid) considered to be blended were BPM and PM. It should be noted that Rosemann's "*service-based view*" of the organization has roots in *Service-Oriented Architecture* (SOA), which comes from IT-landscapes. To avoid confusing with software entities is the reason why Harmon (2014) used "*Domains of Practice*" instead of "*services*" but kept the overall idea. Harmon's (2014) paper is remarkable also because it discusses the relations of

BPM to other domains of practice, such as Business Analysis, Operational Management, Enterprise Architecture, IT Development, etc. But (again, surprisingly or not) he pays most attention on Project Management.

Conclusions

Proposed idea for further research and development – to develop a methodology for integrated process and project management for SMEs – is obviously something that needs concerted effort form researchers in both BPM and PM fields, and to seek synergies. Working together on the same or similar empirical cases would certainly be beneficial, particularly considering the closeness of the two areas from a practical point of view. It means that researchers in both fields have to look out of their 'silos'. This will be a challenge but also a risk – to fall into eclecticism – but it should be possible to avoid such risk. Cooperation assumes that researchers in both fields perceive major developments in other fields, and apply appropriate research questions, methods, paradigms etc. to their studies. Entering uncommon field is not easy, especially for established researchers. Thus, there are some specific recommendations. For researchers in BPM field is recommended to consider more 'temporary' perspectives and recognize that an intrinsic part of processes (not just BPM projects or initiatives) have temporary nature and therefore should be treated as projects or programs. Researchers in the PM field should look more beyond projects or programs and to consider their context, in terms of organizational boundaries, resource ties etc.

This should occur between the BPM and PM fields and even wider. For instance, development of a methodology for integrated process and project management for SMEs needs also integration of SME-related topics – small business management and entrepreneurship; adding service-specific aspects also assumes involvement of service researchers, etc. Such developments will probably lead to further convergence of domains of research and practice. It needs that the people (both researchers and practitioners) become so-called ***T-shaped*** – having wide general competences, covering also related areas, and deeper competences in one (or two, called π-shaped) sub-fields. This concept is already spread in HRM literature and appeared in BPM literature (Müller, Schmiedel, Gorbacheva & vom Brocke 2016). In turn, this may lead to the development of a common body of knowledge (BOK). Carried out comparison of developments in two examined fields leads to deduction that fusion of PM BOK and BPM CBOK may occur in not far future. Furthermore, the new integrated BOK may comprise also business analysis (BA BOK). As competence models are accompanied by management (systems) models or standards, such developments may open a way to the integrated use of management standards, or even to the elaboration of a universal management standard. Integration of several individual management systems and standards is already a topic in the academic literature (see e.g. Rebelo, Santos & Silva 2014). Thus, maybe such imagination of future is not pure fantasy.

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BUILDING INFORMATION MODELLING (BIM) IN CONSTRUCTION PROJECT MANAGEMENTIN RUSSIA

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Abstract

Construction industry is one of the main and the most conventional economic drivers which explain the participants or construction project teams' strong resistance to innovation tools and techniques. One of such widespread IT techniques is the process of generating, storing, managing, exchanging, and sharing building information in an interoperable and reusable way, known as building information modelling. The importance of BIM for construction project sustainability during a project life cycle is acknowledged by architectural, engineering, construction (AEC) companies worldwide. However, the efforts of implementing BIM in Russia had hardly been successful till they gained governmental support.

The aim of the present research is to investigate BIM application in Russian construction projects by different project participants during a project life cycle and analyse its first evident results.

Based on real case studies and state roadmap analysis, peculiarities of BIM implementation in Russian construction market sector were identified and the impact of BIM on construction project sustainability and providing value provided for client were revealed. In particular benefits of governmental support for the success of BIM spread in industry are defined and possible pitfalls AEC companies may encounter in construction project management processes are revealed.

Analysis of the findings proves that BIM application allows companies to enhance their performance and competitiveness on the market. As for the key pitfalls, they are rooted in the lack of unified standards for dealing with building information modelling.

Key words: *BIM, lean construction, construction project management* construction project sustainability, project life cycle
JEL code: *M00,O22*

Introduction

According to McGraw Hill Construction the level of BIM usage in the USA is 71%, in the UK – 54% (Smart Market Report, 2012). The interest of the state organizations, the existing program and road map of BIM implementation show that the Russian government understands the use of BIM can bring many benefits and increase the efficiency at different stages of a project life cycle.

The paper seeks to identify the peculiarities of BIM implementation in Russian architecture, engineering and construction (AEC) companies and its impact on the construction project sustainability and value provided for client and other stakeholders.

BIM is most frequently perceived as a tool for visualizing and coordinating AEC work, avoiding errors and omissions, improving productivity, and supporting scheduling, safety, cost and quality management on construction projects. It incorporates all the building components, including geometry, spatial relationships, properties and quantities

The knowledge of BIM implementation and past experience of other countries provides a solid ground for further investigation and comparative analysis.

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The government policy of BIM extension shows the understanding of the extra edges of project time, cost savings provided by this technology at the strategical level. It becomes topical in the context of economic downturn and the necessity to reduce the budgets of state construction projects.

The case studies demonstrate the current status of BIM application and its acceptance by AEC companies. The pitfalls and first benefits were revealed on the basis of pilot projects.

The purpose of this paper is to analyse the current status of BIM implementation in the Russian construction sector and to propose a roadmap of improvements for further effective spread of BIM technology in business processes of project realization.

Literature review of current BIM status in the construction industry

The concept of BIM was developed from the working prototype "building description systems" introduced by Eastman in the 1970s (Eastman, 1976). On the list of countries BIM has become a widely used tool in the realization of construction projects. The leader in BIM implementation is Finland (TEKES, 2008). The other countries occupying the advanced positions are Denmark, Norway, the USA, the UK (Wong, Wong and Nadeem, 2010). Besides Hong Kong, Singapore, South Korea demonstrates a considerable progress of BIM maturity (Wong, Wong and Nadeem, 2010). It is necessary to emphasise the implementation of BIM in the construction field was supported by the governments of these countries and a lot of actions were taken at the operational and state levels.

First attempts to promote BIM technologies in Russia were taken at the end of 2000s by a Working Group of BIM Implementation. Till the 2015th the great work was performed by different participants of Russian construction market. Now Russian AEC companies are at the beginning of the discovering BIM benefits. In this case the big advantage for BIM application is the support gained provided by government.

Different stages of the construction life cycle using BIM are currently at the heart of numerous discussions in the extant literature: design (Azhar, Khalfan and Maqsood, 2012; Azharand Brown, 2009; Ham et al, 2008), detail designand tender documentation (Azhar, Khalfan and Maqsood, 2012; Azhar and Brown, 2009; Cheung et al, 2012;Giel, Issa and Olbina, 2010), construction (Azhar, Khalfan and Maqsood, 2012; Grilo and Jardim-Goncalves, 2010; Ibrahim, Krawczyk and Schipporeit, 2004; Yan and Damian, 2008), operation and management (Azhar, Hein and Sketo,2008, Ibrahim, Krawczyk and Schipporeit, 2004).

The SmartMarket survey in 2010 shows that in some developed countries in Western Europe engineers and contractors are less frequently involved in BIM use while architects are the primary adopters of BIM and many BIM practices are limited to the design stage (Bernstein et al., 2010). It would be interesting issue to investigate the stages of a construction project life cycle with BIM technologies application by AEC companies in Russia and to compare the results with the international trends.

The benefits BIM usage include close collaboration between the different project participants throughout the project life cycle and value provided for client by reducing of defects and mistakes in design as well as decrease time for correction (Bynum, Issa and Olbina, 2013).

The researchers and practitioners note the improvement of quality of design documentation in the following:

- decrease in mistakes due to better coordination between design documents (Cheng B., Wang Y., 2010);

- automatic generation of documentation with additional information (Cheng B., Wang Y., 2010);
- increase in efficiency (Xin Q., 2011).

The interest of the research is to analyse the first results of BIM application by Russian AEC companies and to define observed benefits getting through BIM.

Research methodology

The aim of this paper is to analyse BIM application by different AEC companies in Russian construction industry during a project life cycle and evaluate its first evident results.

The research pursues to consider existing knowledge and practices of BIM implementation in the leading countries and proposes an approach to further distribution and successful integration of BIM in construction project management processes.

A case study approach was used to gather qualitative and quantitative data about the real status of BIM implementation in the Russian construction sector. 12 case studies of projects with BIM application and BIM implementation in AEC companies (see Table 1) were examined in order to identify the peculiarities of BIM extension in Russia and to reveal the impact of BIM on the construction project sustainability and value provided for client. The case studies were chosen from Autodesk Section «Experience of effective application of BIM» (Autodesk, 2015), from official web-sites of companies, which projects were included in the governmental list of pilot projects. The selection of the case studies was justified by the following criteria: the detailed description of the project aims, problems and the ways of BIM usage as well as the availability of information about the achieved results of BIM implementation or application;

The road map analysis was conducted to investigate of the governmental support of BIM implementation in the Russian construction area. A comparative interpretation and diagnosis of BIM implementation roadmaps with other countries were carried out with the aim to reveal necessary actions, possible omissions, problems and mistakes. These findings provide the opportunity to propose the enhanced roadmap for BIM implementation in Russia.

Table 1

List of case studies

Case	Project description	Project stage with BIM
Case study 1 (Spectrum,2013)	A New terminal of international airport with the total area 41 700 sq.m. A complicated architectural and engineering project.	Design documentation, Tender documentation
Case study 2 (Sodis, 2013)	Olympic objects- (Fisht Olympic Stadium;Iceberg skating Palace). The aim of the project is to develop a system for monitoring the structure elements and engineering systems during maintenance of the buildings. Structural Health Monitoring system; Building services monitoring system	Monitoring of structures
Case study 3 (Spbgipro, 2013)	A concentrating factory. A pilot project of BIM implementation in company.	Design documentation
Case study 4 (Werfau Medical Engineering,2013)	State clinic with the total area 150 000 sq.m. The requirement for BIM from the client.	Design documentation
Case study 5	Reconstruction of shopping center.	Working

(Sibtechproekt, 2013)		documentation
Case study 6 (EtalonGroup, 2015)	Residential complex (Etalon)	Design documentation, Construction monitoring and control
Case study 7 (Morton, 2013)	School for 500 pupils. A typical project without controversial elements with the aim to reveal the pros and cons of BIM platform.	Design documentation
Case study 8 (Mushits, 2013)	Reconstruction of clinic	Design documentation
Case study 9 (SpbRenovaciya, 2014)	Residential building	Design documentation
Case study 10 (Akademstroyproekt, 2013)	BIM implementation in design company A.	Design documentation
Case study 11 (Barnaulgrazhdanproekt, 2013)	BIM implementation in design company B. The specialization of company are typical panel residential buildings	Design documentation
Case study 12 (Kb vips,2013)	BIM implementation in design company C.	Design documentation

Source: Author construction

Status of BIM implementation in Russia

Governmental BIM Policy

In March 2015 The Working Group of BIM implementation was established by Ministry of Construction Industry, Housing and Utilities Sector (Minstroy, 2015). The major target of the Working Group is support of the realization of governmental phased plan of Building Information Modelling implementation in civil and industrial construction design field (Minstroy, 2014).

Main players

In the process of BIM implementation involved several significant players:

- *Ministry of Construction Industry, Housing and Utilities Sector (Minstroy)* performs development and realization of governmental policy and norms and law regulation in the field of construction, architecture, urban development and housing and utilities sector, performs state services and manage the governmental property in this sphere.
- *The Working Group of BIM implementation* is aimed at solving the issues related to the performance of the plan for BIM implementation in Russian Federation;
- *Federal Agency on Technical Regulating and Metrology* is rendering state services in the sphere of standardization, technical regulation and metrology. Due to this function The *Agency* is developing national standards regarding BIM application during the whole project life cycle in civil and industrial construction field;
- *Autodesk* is promoting BIM through a regular BIM-breakfasts and master classes to present AEC companies the opportunities and advantages of BIM.

Governmental road-map of BIM implementation

In *December 2014*Ministry of Construction Industry, Housing and Utilities Sector issued a decree “About the approval of phased plan of Building Information Modelling implementation in civil and industrial construction design field”(Minstroy, 2014). (see Table 2)

Table 2

Phased plan of Building Information Modelling implementation in civil and industrial construction design field

Date	**March 2015**	**April-November 2015**	**December 2015**	**December 2016**	**January 2017**	**December 2017**
Task	Selecting of pilot projects designed with BIM application and its transfer to the Expert Organization	State expertise and obtain its favorable opinion of pilot projects designed with BIM application	Analysing BIM pilot project results and identifying the list of regulatory and normative-technical acts, educational standards	Making amendments in the regulatory and normative-technical acts, educational standards	A part of public projects should be carried out with BIM technologies application	Providing training for industrial and civil construction specialists and experts
Status	Done	Done	Done	**First drafts of standards are available for professional discussion to approve till the end of the year**	In progress	In progress

Source: Author construction

24 December 2014 The first project with BIM model accepted and approved by the state expert organization was a clinic for 550 persons in New Vatutinki district, Moscow (See Figure 1). The design documentation was developed by GRADPROEKT Company.

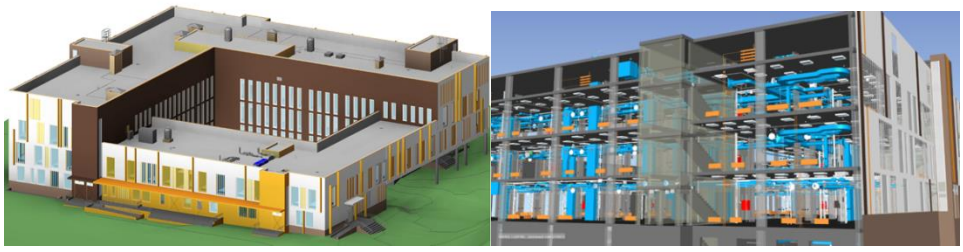

Fig. 1. **A first project with BIM in expert organization**

In *March 2015* Minstroy and the Working group announced the criteria for the pilot project selection:

- company experience in project design based on BIM technologies. At least 2 projects designed with BIM;

- availability of BIM-technologies specialists;
- internal regulation standards for application building information modelling;
- usage of unified information model of main project components (architecture, structure, budget, etc.) by specialists of design company (minimum 3 components);
- availability of valid 3D-environment with the enclosed data and tools for coordinated consolidation of the project.

On 22nd April 2015 the list of pilot projects for getting approval of State Expert Organization with BIM model was determined. The list includes 22 projects: reconstruction projects – 6, new construction - 16. The functionality and the size of the projects are different. There are residential projects, medical centers, schools, shopping centers, sports buildings (stadiums, swimming pool), and industrial plants.

According to Russian norms and regulations the design documentation is to be submitted to the expert organization only in the traditional 2D paper format. Nowadays there is a gap in law and requirements for submitting design documentation in information model format. For the pilot projects was taken an exception.

The expert of pilot projects reveals the existing problems of BIM applications by AEC companies (Mosgosexpertiza, 2015):

- the base of pilot project was reduced due to economic uncertainty;
- design companies manually refined the design documentation to the traditional layout without providing informational model;
- not all expert organizations are ready to perform appraisal at of the pilot projects;
- major AEC companies and construction sector stakeholders were out of the process at this stage.

Now the results of the expertise with BIM model are available and from the governmental point of view (Mosgosexpertiza, 2015, Stroyorbita, 2015) the benefits of BIM implementation in construction sector are as follows:

- increase in the efficiency and accuracy of construction project cost estimation and the effectiveness of public budget resources expenditure;
- optimization of construction process due to the quality of project planning and management;
- decrease in the time of construction
- optimization of the object maintenance.

BIM technology provides:

- creation of unitary data base with the information about the city (electronic data base of urban development plans, project documentation about the buildings, surveys data, repair works);
- multi-scenario modelling of urban development and visual representation for its evaluation; increase in the design quality due to the complex approach to the city development;
- increase in the cost transparency of public budgets during the whole project life cycle.

5.1. Development of BIM standards

On 19th January 2016 first drafts of national standards regarding BIM application during the whole project life cycle in civil and industrial construction field were introduced for public discussion and further improvement with the aim to approve of the final versions till the end of 2016.

Data analysis

This section presents and interprets the findings obtained from the case studies of BIM application in Russian AEC companies in a qualitative manner. Each case study was analysed in several ways:

1) project stage of BIM application;
2) project components used in BIM;
3) faced problems;
4) noted benefits.

BIM application in Russian construction field

The examined cases demonstrate the domination of BIM application by architecture and design companies for the preparation of design documentation, working documentation and tender documentation. (Table 3)

Table 3

Project stages and components with BIM application

Case study	Project life cycle stages						Project components			
	Concept Design	Design Documentation	Working Documentation	Tender Documentation	Construction Planning &Monitoring	Facility Management	Architecture	Structure	MEP	Cost estimation
Case study 1	-	+	-	+	-	-	+	+	+	-
Case study 2	-	-	-	-	-	+	-	+	+	-
Case study 3	-	+	-	-	-	-	+	+	+	-
Case study 4	-	+	-	-	-	-	+	+	+	+
Case study 5	-	-	+	-	-	-	+	+	+	+
Case study 6	-	+	+	-	+	-	+	+	+	+
Case study 7	-	+	-	-	-	-	+	+	+	-
Case study 8	-	+	-	-	-	-	+	+	-	-
Case study 9	-	+	+	+	+	-	+	+	+	+
Case study 10	-	+	-	-	-	-	+	+	+	+
Case study 11	-	+	-	-	-	-	+	+	-	-
Case study 12	-	+	+	-	-	-	+	+	+	-

Source: Author construction

Only in 2 cases from 12 the companies use BIM for the whole project life cycle. It confirms the problems of the other companies revealed from the survey. The key one is that there is a small number of AEC companies on construction market using BIM, that hinders the use of the model in full capacity at all stages of a project life cycle.

Most of the companies carry out all project components in the model such as architecture, structure and MEP systems. But unfortunately it is necessary to note that some of them use

design architectural and structure components in model applying 2D for MEP systems. Moreover only 4 companies make cost estimation with BIM technologies.

A small number of AEC players using BIM for construction planning and control shows the lack of understanding of BIM value for construction cost and time reduction.

In Russia design companies with governmental support become drivers of BIM spread. The BIM technologies application allows them to get a competitive advantage in comparison with 2D designers. The first noted benefits of BIM application are described in Table 4.

The following challenges of implementation BIM in the Russian construction practice were identified:

- overcoming the staff resistance to changes in the existing practice and spreading the understanding of BIM potential and value ;
- adapting the existing business processes to BIM;
- training people in BIM, recruiting the employees understanding BIM
- providing a more close collaboration and integration between architect, structural and MEP engineers;
- clear understanding of different stakeholders' responsibilities in the new process by all participants, including construction lawyers and insurers

Table 2

Problems and benefits of BIM application

Case study	Revealed problems	Noted benefits
Case study 1	▪ lack of BIM educated specialists ▪ fragmentary (architecture, structure) use of BIM at the beginning of implementation	▪ decrease in the number of conflicts and mistakes in design ▪ interconnection with interrelated components ▪ availability of wide data required by client ▪ accuracy of material and equipment calculations ▪ concurrent transfer of changes in all drawings ▪ significant time-saving tender documentation preparation ▪ decrease in the time for the design stage in 1.5-2 times (3 months saved at the design documentation stage, 2 months- at the tender documentation stage)
Case study 2	▪ necessity to create a model based on 2D drawings	▪ better coordination and development management ▪ material management, planning and optimization ▪ clash detection between different components ▪ interconnection between different design disciplines ▪ direct link between 3D models and 2D plans ▪ visualization and rendering ▪ complex geometry design & manufacturing ▪ automatic schedule generation
Case study	▪ inertness ▪ mistakes in resource download; ▪ insufficient knowledge ▪ BIM perception by specialists	▪ significant improvement of design process due to quick clash checking ▪ simplified process of approval by client ▪ quick modification
Case study	▪ resistance of construction companies ▪ usage of model for inner tasks ▪ small number of companies using BIM throughout the project life cycle and value provided for client	▪ 20 % design time-saving ▪ 6 times decrease in the time for checking model, revealing the mistakes and their correction numerous data base of equipment allowing to avoid the preparation of items ▪ more user-friendly intellectual models of equipment . ▪ 25-30% labor productivity increase
Case study	▪ creation of model on the basis of 2D pdf files ▪ organization of effective collaboration between architects, structure and MEP engineers ▪ creation of elements data base ▪ lack of models from equipment manufacturers ▪ difficulties with isometric schemes and sections during file printing from Revit.	▪ more quality design documentation ▪ accurate cost estimation documentation ▪ opportunity of quick changing of working documentation

	▪ using Excel for the creation of schedule of materials and equipment to decrease time	
Case study 6	not described	▪ decrease in mistakes in construction budget planning to 5-7% instead of 20% which is usual for the design stage ▪ using BIM as an argument for getting bank project financing due to the transparency of construction status control
Case study 7	▪ changes in norms and regulations related to design	▪ decrease in time for model modification caused by the changes in norms and regulations ▪ 10 times Decrease in time for the preparation of schedules of materials and equipment in ▪ decision to implement BIM at all stages of building life cycle including the operation and utilization ones
Case study 8	▪ use of Autocad at the beginning of BIM implementation	▪ decrease in time for the preparation of schedules of materials and equipment ▪ increase in the accuracy of calculations due to automated preparation of structure schedules for demolition
Case study 9	not described	▪ opportunity to get construction budget at the beginning of design stage ▪ accurate schedule calculations ▪ accurate estimation of equipment ▪ project schedule control for management approval ▪ control *as built* ▪ automatic generation of apartment area and mix schedule
Case study 10	▪ use of 2d design in 50% of components during the first years of BIM application ▪ nowadays time spent on BIM and 2D design is equal, but the outcome differs in terms of volume delivery	▪ faster decision making ▪ improved design quality due to the decrease in mistakes ▪ 10-30% decrease in project budget at the construction stage ▪ 40-70% decrease in change cost in comparison with 2D design ▪ existing opportunity to decrease design time
Case study 11	▪ different model for architect and for structure engineer ▪ need to draw walls for architect ▪ creation of element data base	▪ 30 mistakes were revealed in structure elements detail ▪ 1,5-2 weeks for preparation drawings per section (include several blocks) what early was needed per block ▪ 5 times time increase in layout changes in ▪ the quality control of schedules of materials doesn't require. Early it took 1 day.
Case study 12	not described	▪ increase in the efficiency and accuracy of design documentation ▪ decrease in the number of mistakes and clashes ▪ decrease in time for correction

Source: Author construction

Conclusions

Based on 12 case studies of BIM application by AEC companies this article provides an overview of current BIM practices in construction project management in Russia. The governmental contribution and its significance in BIM technologies universal distribution are described. The study confirmed the important role of state support in development of new technologies in industries. The research is limited by the number of cases but allows making the following conclusions:

1. The predominate area of BIM application by AEC companies in Russia is design stage- design documentation, working documentation and tender documentation. It correlates with the international tendencies of BIM implementation.
2. The noted time saving of BIM use in the cases reaches 1.5-2 times in comparison with the traditional design. It also includes a shorter time for the correction of mistakes and clashes easily identified with BIM technologies and increased labor productivity because of more efficient collaboration of all involved participants.
3. The accuracy of design, working and tender documentation is increased what allows to decrease the mistakes in construction budget planning to 5-7% and to cut project budget at the construction stage by 10-30%.
4. The requirement to submit 2D design documentation for expert approvals needs extra work from designer to generate 2D drawing therefore it is still difficult for software to do it automatically in accordance with the local normative and regulatory acts.
5. There is a need to deal with local legal norms and regulations that should be adopted to use BIM for the state approvals, design and construction contracts.
6. Research results show that faced problems of BIM implementation and application roots to the lack of trained specialists as well as lack of unified library of elements and BIM standards.

There is a great potential of getting benefits through BIM use over the whole construction life cycle by all project participants.

Further investigation of BIM use by AEC participants at each stage of a project life cycle needs to follow this work. Moreover it is important to scrutinize the feedback from experts of design documentation for a better analysis of changes in the expertise process and achieved improvements.

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ANALYSIS CHECKLIST FOR RESEARCH PROJECT MANAGEMENT: ASPECTS FROM EUROPEAN RESEARCH

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Abstract

In the field of project management, research projects are atypical in many senses and possess special attributes. Whether it is the exhaustive process of obtaining funds for the project or the difficulty of measuring project progress and defining its impact and success criteria, the particularities of research projects require special attention in order to be fulfilled.

In Europe, this special attention is provided when it comes to dedicating funds for academic research and cooperative research between academia and the industry in order to ensure that Europe produces world-class science, removes barriers to innovation and makes it easier for the public and private sectors to work together in delivering innovation (European Commission, 2015; RWTH Aachen University, 2015; EU Research Funding and University of Oslo, 2015. EU Research Funding: Programmes and Opportunities). Nevertheless, project management methodology for academic research projects is hardly available and/or suffers deficits in handling certain aspects of the project (Lynn Meek, V. 2003, Powers, L., & Kerr, G., 2009 andSchützenmeister, F. (2010).

The aim of this paper is to propose a checklist that can be used by educational and research organisations (which include HEIs and pure research institutes) for managing academic research projects. Such a checklist should include a variety of projects and funding sources in order to cover the differences between projects in terms of size, complexity, internationality of consortium, degree of innovation and requirements of funding organization. For this purpose, this paper would consider two variations: interregional EU-funded research projects and German locally funded research projects.

Key words: *Research Project Management, European Research, Horizon 2020, Checklist*
JEL code: *I2, O3*

Overview

A research project has a defined goal, timeframe, cost and quality requirements, making it at the first glimpse similar to any other project. However, research projects are much more complex in the sense that there is no known path to achieve the research goal. The problem is known and over a period of time new methods will be applied to generate solutions, which makes the ability to commit to the desired timeframe and cost estimation very difficult (Mishra, N. (2013).

Research and development together with new methods of production are the basis of future technological developments. However, „high level research is complex, costly and interdisciplinary. Individual organizations often need partners to be able to respond to these challenges" (EC. 2015, Why European Research?).

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Research projects implemented within one country differ in terms of challenges to those extending to larger regions. An example country that ranks among the top in Europe in terms of scientific research, innovation and public funding allocated to academic research projects is Germany.

The German Federal Ministry of Education and Research (BMBF) developed a strategic instrument called "BMBF Foresight", which provides technology foresight and the determination of future societal needs in terms of research and development (BMBF., 2016). Due to this strategy the BMBF supports innovative projects and ideas in the field of research and technology with selective support programs for academia and academic extra-faculty research institutes within the research funding. The purpose of this research funding is to fund the development of new ideas and technologies.

On behalf of the BMBF project executing organizations, which are also research institutes, e.g. the Research Centre Jülich or the KIT (Karlsruher Institute for Technology), have the task to support and provide consultation to the funded research organisation during the term of the project. Next to them there are more institutions, like the DAAD (German Academic Exchange Service) or the DFG (German Research Community), which are partly funded by the BMBF but which also function as a project executing organisation and support the research organisation with its research transactions.

Project proposals are evaluated based on specific criteria such as the degree of innovation, the prospects of success and exploitation of technological developments as well as lack of other sources of funding. The necessity and importance of research funding for academia and research institutes increased constantly in the past few years. In 2013 BMBF's budget for research and development for academia amounted to €1.6 billion and for other academic research institutes €7.5 billion. In addition, the federal government raised the expenditure for research and development by 65% between 2005 and 2015 (BMBF, 2015. Bildung und Forschung in Zahlen).

The tight competition among institutes, the high requirements for writing the proposals, the thorough knowledge in the specific subject area and the expertise in project management together make obtaining the funding a great challenge. This challenge increases several-fold in cross-regional research projects in Europe. The largest funding for cross-regional research projects in Europe is the European Commission, which due to the many challenges of implementing research projects, has jointly worked with member states, the European Parliament, the scientific community and industry towards the creation of a "European Research Area" (ERA) (EC, 2015. Why European Research?).

According to the European Commission, European research is now high on the policy agenda in Europe. Conducting research policies and implementing its programs is a legal and political obligation (EC. 2015. Why European Research?). Between 2007 and 2013, the 7th EU Framework Program (FP7) provided more than 32 billion Euros in research funding. FP7 is now succeeded by the EU Research and Innovation program "Horizon 2020", which has a funding budget of almost 80 billion Euros for the period between 2014 and 2020. It is the most recent research and innovation programme, where the EU emphasizes on excellent science, industrial leadership and tackling societal challenges (European Commission, 2015).

Project proposals are prepared in two phases: initial project proposal and full project proposal. There are certain criteria defined by the European Commission for grading the initial project proposal, which sum up to a total of 15 points. Initial proposals should not exceed 15

pages. Only the proposals that receive 15 (or 14 at the least) out of 15 points have good chances to continue to the full project proposal phase and be considered for funding. The grades are divided as follows (Lynn Meek, V. 2003):

Table 1

Structure of the Proposal for Research and Innovation Actions in Horizon 2020

<table>
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Source: Authors' construction adopted by (Villacorta, N. 2014)

In 2014, the first year of Horizon 2020, 14% of all submitted full proposals made to the first 100 calls were selected for funding (European Commission, 2015). In such multiregional projects, the challenges of managing a research project intensifies due to the more difficult requirements, the size of the project and the need to connect with partners across several countries. This will be discussed further in the next section.

Challenges of academic research projects?

The challenges in a research project are faced before the project is started, e.g. to obtain funding and to build consortium. Further challenges appear throughout the different phases of project planning, implementation and closing. The most painful of them can be summarized in these points:

1. Partners & Consortium Management

When a research project is done in a single country, it can be often the case as in Germany, that one organization itself or one host institution is initiating the project in cooperation with academic or industry partners; while most EU funding opportunities require some level of collaboration with partners in other EU countries. Often, finding these potential collaborators is the first hurdle which needs to be cleared in order to access funding (University of Leicester, 2015). This poses another challenge to the research organisation initiating the project which is its network base. Only well-established, well-connected organisations on a multi-regional level would in this case be eligible to apply for EU funding.

Joint funding proposal development in a cross border team is in itself a challenge that needs to be addressed (Wolff, C., 2012). European research projects are done by several independent partners, not by one monolithic organization. Managing such projects is rather managing a network of partners than a well-established team. Stakeholder management (Kerzner, H., 2009) has to be considered in a much more sophisticated way. In this case, cultural differences, virtual team meetings, the burden of mobility costs for major project events (especially unpleasant for institutes when the project is in the project proposal phase and has not yet received any funding) and the need for sophisticated strategies to conflict resolution add to the complication of partner management.

However, when it comes to consortium agreements, most funding organisations offer tools, guidelines and templates in order to clarify the most important issues and decrease the emergence of conflicts as much as possible

2. Funding

National funding can solve a lot of open questions in scientific research, develop technologies and innovate in a particular field or discipline. However, to tackle major societal and global challenges, research implemented within national borders only cannot provide solutions. As already emphasized, "high level research is complex, costly and interdisciplinary" (EC, 2015). No research team or company or in some cases even country can reasonably claim to be able to respond to these challenges. Therefore, dedicated budget allocation for cross-border cooperation is inevitably needed (European Commission, 2012) - a role which the European Commission has well-played in Europe.

This creates a great challenge to obtain funding. The high competition among institutes and consortia coming from several countries in different scientific fields competing to the relatively limited funding obliges the EC to set high requirements, complicated pre-requisites and exhaustive procedures in order to obtain funding. During the phase of project proposal writing, the team should have already been built, major project events planned, budget plans written and roles described and justified. This usually happens under major time pressure and with high uncertainty to the probability of receiving the funding in order to proceed with the actual project.

3. Knowledge

Research cannot contribute to substantial economic, societal changes, innovation, development of new services and products and further research without the knowledge transfer between universities, public research organisations and industry.

Internet and electronic publishing has resulted in unprecedented possibilities for the dissemination and exchange of information. Unfortunately scientific information generated by public funding, in whole or in part, is not always available for free (European Commission, 2012). This creates a challenge to obtaining and re-using existing knowledge in the field without previous connections to leading research organisations. This has been addressed by requiring an elaboration on knowledge sharing as part of the dissemination strategy of a project proposal.

4. Innovation and Excellence

To be able to compete, projects have a high degree of innovation and uncertainty. A certain degree of (academic) freedom is needed, according to the technology readiness level (TRL) of the project (European Commission, 2015). The management of highly innovative projects is a challenge in itself. Funding applications should be excellent in terms of technical achievement, business impact and socio-economic change. Therefore, the funding application has to address a combination of technical excellence, business impact and execution excellence. Usually, scientists have difficulties to cover all three areas with the same expertise. Straight-forward tools (e.g. business model canvas (Osterwalder, A., 2004) can help achieve such results, but a research-project-specific project management methodology is needed. It should in this case be a combination of project management, technical innovation management, business development, and the management of the socio-economic change process. Again, this is a challenge for scientists.

5. Project Impact and Sustainability

After the project proposal phase is successful and actual funds are received to implement the research project, the largest challenge is achieving concrete and measurable results. It is often the case that projects revolve around research and over the course of time the aspired project result gradually sinks. It should be possible not only to create a usable outcome, but also to be able to bind this result to the dissemination and exploitation strategies of the project. To add to the complication, this all should take place within the relatively short time allowed for the research project and has to be planned already at the project funding application phase.

In the next section, the different phases of research projects will be dissected, in order to have a closer look at the tasks during each of them and attempt to simplify the management of each of these phases.

Research Project Management Checklist

Universities and research institutions often have departments that are dedicated to analysing and offering consultation for research projects. However, applying for and receiving funding for a research project is not the sole responsibility of the consultants in the mentioned departments, it is largely dependent on the project proposal and the project team. Therefore, it becomes important to observe and assess the needed criteria to make a project proposal successful in its early phases and then continue to fulfil the expectations and requirements laid out by the funding organisation during its implementation phase until it eventually produces results that can be measured and developed into a concrete product that could be marketed for use.

The suggested solution would be in the form of a simplified project management method and a checklist that would consider the challenges faced in the application phase, the implementation phase and in the post-project phase. The checklist is a combination of the challenges and requirements tailored for the kinds of publicly funded research projects discussed in this paper; those responding to specific national or European-wide programmes and calls for proposals. The checklist goes beyond basic research and research aimed at gaining a doctoral degree.

The suggested method would incorporate a pre-project phase, a project phase and a post-project phase. The project phase here will be based on PMI's methodology of planning, executing and closing (PMI, 2008). However, here is no need for the initiation phase, as it would have already been covered in the pre-project phase.

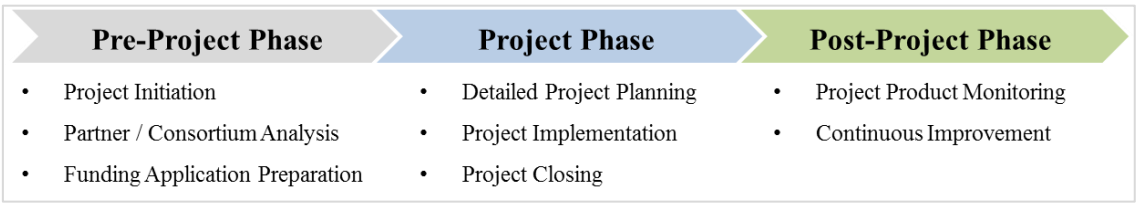

Fig. 2. **Simplified Research Project Management Phases (own drawing)**

In the suggested solution, the project management methodology would cover the following questions in the different phases:

Table 2

Phase	**Questions** to be answered in the developed methodology for each phase
Pre-project Phase	• What are the criteria for deciding whether to implement the project or not? Do they include criteria such as feasibility, excellence, sustainability, financial outcomes, etc.? • Does the host institution (in H2020 terms: the project coordinator) have the minimum maturity model and project management infrastructure? What improvements are needed? • Does the project proposal contain a problem statement? What is the problem? What are the research questions? What is already covered by the State-of-the-Art (SotA)? What innovations will be achieved compared to SotA? • Is the consortium/group of partners defined? Do they form a complete market value chain and technology value chain? Is there a template for the consortium agreement required by the funding organisation? Have the terms of agreement been discussed? • Have partnership agreements been signed? • Who is involved in the different local project teams, especially that of the host institution? Have the roles been clearly distributed and responsibilities clarified? Is the decision-making process clear? • Have the major project work packages and events been planned, described and justified? Is it clear which organisation would be responsible for each of the major work packages? Is it clear which organisations would be involved in each of the work packages? • Has the initial implementation plan been laid down? Are the initial costs estimated? • Have resource distribution been planned and agreed upon? • Have contingency plans and conflict resolution plans been taken into consideration? • Have country-specific risks, legal and institutional requirements, needs and constraints been taken into consideration? • How will project results be organised and managed? How will access rights, joint ownership and economic conditions be handled? Should experts be consulted? How is the management structure? • How will research results be disseminated on national and, if valid, regional level? • Project impact and exploitation opportunities: can the project outcome be used: ○ as background of future collaborative research projects ○ or in developing, creating and marketing a product/process ○ or exploited by other organisations through out-licensing or transfer of ownership ○ or used as background of a joint venture or spin-off ○ or even for the image (especially in the civil service) ○ or for the achievement of goals within internal strategic concepts • How will the experiences in this phase be documented for future learning? ***Decision Point: Based on the questions above, can a successful project funding application be written? Is the project ready to move from the pre-project phase to the actual project phase, if funding is received?***
Project Phase	• Is the needs analysis still valid? • Are proper project management tools being used? • Are the initial plans, e.g. budget planning, resource distribution, project work packages still valid or need adaptation? Have the detailed plans been made? • In the detailed phase of project planning, is the work split between partners clear? Have milestones and deliverables been identified?

	• How will funds be allocated between partners and along the project phases? How is financial transparency ensured? • Have cost-cutting strategies been implemented, especially when it comes to meetings? Have electronic alternatives been used? • Have tendering procedures been planned? Do they consider country-specific conditions and legal requirements? • Is project organization clear? Are there clear communication and reporting lines? What tools are used to coordinate the work between national and international teams? • Are the reporting lines clear? Are informative reports submitted in due time? • Are continuous monitoring and controlling tools being used? What tools are being used for this purpose? • How is quality being ensured? • Have the indicators been monitored and deliverables reached? • Are milestones and project progress synchronized between partners? • Is risk management effective? Have any risks turned into issues? • Is conflict resolution strategy effective? How are conflicts being solved? • Are involved stakeholders satisfied with project progress and research content? • How are innovation and creativity ensured? • How innovative are the publications and academic contributions resulting from the research? • Are dissemination lines successful? • Is impact being assessed properly? • Which project management methodology would be used / methodologies would be combined in order to implement the project? • How will the intermediate deliverables, milestones and final results be delivered, assessed and reported among partners and to the funding organisation? • How will the experiences in this phase be documented for future learning? ***Decision Point: Based on the questions above, has research been implemented as planned and have the results been achieved? Is the research project ready to be closed? How to ensure smooth transfer to planned exploitation plan?***
Post-project Phase	• Is further research in the area needed? Have further research streams been defined? • Which information from the research be further developed and further published? • Have the project succeeded in moving into the exploitation plan? • How will auditing and monitoring of the project outcome go on after project has been closed? • How will impact be assessed on the long-term? • How can impact be multiplied? • How is sustainability of the project results being ensured? • What would happen to the consortium? Would there be a follow-up project? • How will the experiences in this phase be documented for future learning? ***Decision point: Was the project successful? How can future research projects be improved?***

Source: Authors' construction.

Conclusions

Technological advance, societal and economic change and solutions to global environmental and health issues can only solved through research and innovation. The methodology, implementation and results of any research project differ depending on many

considerations, such as type of project, the scientific research in which it is implemented, the major players in the project, its funding sources and the different aspects of the project players.

There is a need for a well-defined step-by-step project management methodology for publicly funded research projects. This methodology should be customized according to the field of research, the type of funding and the specific conditions of the project and consortium set-up. This contribution will help to pave the path towards such a methodology.

The proposed method and checklist are the result of preliminary research and are open for further research and improvements. It would be interesting to apply to different research projects that are being initiated in different fields or sizes to test its validity and how much guidance it offers to the project team.

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THE IMPACT OF PERSONAL CHARACTERISTICS ON PROJECT MANAGEMENT

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Abstract

The aim of every organization is to achieve the organizational strategy. In order to achieve the organizational strategy and objectives, the organizations use project management. In the Project Management Institute's view, the project management is defined as "the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements." (PMBOK, 2013, p.5). Ten knowledge areas and five process groups are defined in the Guide to the Project Management Body of Knowledge (PMBOK), published by Project Management Institute (PMI). The knowledge areas are Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resources Management, Project Communication Management, Project Risk Management and Project Procurement Management. The project management process groups are Initiating, Planning, Executing, Monitoring & Controlling and Closing.

Most of organizations have adopted the Project Management Institute's approach and developed their own project management methodology and standard based on PMBOK. During developing the organizational project management standard, the organizations should consider the impact of personal characteristics. Developing and following a defined project management standard, which contains the effects of personal characteristics, increase the success rate of projects.

This paper will explain the impact of personal characteristics on project management in systematic way. In order to realize that the author will explain the fundamental concepts of this subject. After that, the systematic way will be detailed. This systematic way consists of six steps:

- Develop an Organizational Personal Characteristic Map
- The Impact of Personal Characteristics on Project Human Resources Management
- The Impact of Personal Characteristics on Project Communications Management
- The Impact of Personal Characteristics on Project Risk Management
- The Impact of Personal Characteristics on Project Stakeholder Management
- The Impact of Personal Characteristics on Project Procurement Management

Key words: *Personal Characteristics*, *Project Management*,
JEL code: *Z00*

Introduction

The main aim of establishing an organization is to make profit. Richard Lambert, who is the Director General of the Confederation of British Industry, wrote in 2010 as "Business in some ways quite simple. It has clearly defined aims. The aim is to make money. So you have a measure against which to judge all subsidiary actions which add up to the overall result." (Zsolnai, 2011, p.175) In order to make profit and survive in the competitive environment, every organization should set its own strategy. According to the PMBOK, "effective organizational strategy provides defined directions for development and growth, in addition to performance metrics for success. In order to bridge the gap between organizational strategy and successful

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business value realization, the use of portfolio, program, and project management techniques is essential." (PMBOK, 2013, p.14)

To bridge the gap between organizational strategy and successful business value realizations, the organizations develop their own organizational project management standard based on industry standard such as PMBOK or Projects in Controlled Environment Version 2 (PRINCE2) or the International Organization for Standardization (ISO). During developing their own organizational project management standard and following it, the organizations should consider an important factor. Personal Characteristics. Personal is defined as "of or relating to a particular person" and characteristic is defined as "being a feature that helps to distinguish a personal or thing" in the American Heritage Dictionary of the English language (2014). However, the PMBOK mentions the characteristics of project- related (project life cycle, project), of product related and of organizational, the terminology "personal characteristics" is mentioned only once as "refers to how the project manager behaves when performing the project or related activity. Personal effectiveness encompasses attitudes, core personality characteristics, and leadership, which provides the ability to guide the project team while achieving project objectives and balancing the project constraints." (PMBO, 2013, p.17) Taylor listed the most important personal characteristics needed by a success project manager as "flexible and adaptable, possessing and exhibiting initiative and leadership, confident and persuasive, possessing verbal fluency, able to balance technical and human components of a project, problem- solving and decision- making capability, good time manager, a sense of humor." (Taylor, 2006, p.150)

The aim of this paper is to explain the impact of personal characteristics on project management. The paper will start by definition of fundamental concepts in order to develop a common understanding. The purpose behind developing a common understanding is to ensure that the readers understand the main topic, and numerous details related to the main topic. What is a project? What is project management? What is project management process? What is a team? How could we define communications? What is a risk? Who is a stakeholder? Which type of stakeholder is existed? What is a personal characteristic? Afterwards, the authors will suggest a systematic way for considering the impact of personal characteristics on project management based on PMBOK. The systematic way consists of six steps:

- Develop an Organizational Personal Characteristic Map
- The Impact of Personal Characteristics on Project Human Resources Management
- The Impact of Personal Characteristics on Project Communications Management
- The Impact of Personal Characteristics on Project Risk Management
- The Impact of Personal Characteristics on Project Stakeholder Management
- The Impact of Personal Characteristics on Project Procurement Management

Background

Before explaining the systematic way of considering the impact of personal characteristics, the fundamental concepts have to be clarified. The fundamental concepts are: a project, project management, project management process, a team, communications, a risk, a stakeholder, personal characteristic.

The first concept is a project. The definition of a project, stated in PMBOK, is "a temporary endeavor undertaken to create a unique product, service, or result. (PMBOK, 2013, p.3).

The next concept is project management. Project management is defined as "the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements". There are five process groups: Initiating, Planning, Executing, Monitoring and Controlling, and Closing and the knowledge areas: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resource Management, Project Communications Management, Project Risk Management, Project Procurement Management, Project Stakeholder Management. (PMBOK, 2013, p.5).

Another concept is project management process. According to the PMBOK, a process is stated as "a set of interrelated actions and activities performed to create a pre-specified product, service, or result. Each process is characterized by its inputs, the tools and techniques." (PMBOK, 2013, p.47) And continued that "these processes ensure the effective flow of the project throughout its life cycle." (PMBOK, 2013, p.47).

The fourth concept is a team. PMBOK indicates that "Project Human Resource Management includes the processes that organize, manage, and lead the project team." (PMBOK, 2013, p.255) The definition of a project team is "a set of individual who support the project manager in performing the work of the project to achieve its objectives. "(PMBOK, 2013, p.556).

Communications is another concept. In Ron Arp' s view, communications are "as character expression. It is a process of helping people understand who you are, what you stand for, and why you do the things you do. Character is anchored in honesty, integrity and trust." (McKee & Richardson &Hinton & Lamp, 2010, p.8) Another definition of communications is "the flow or exchange of information and ideas from one person to another." (U.S. Army Board Study Guide, 2006, p.90) Newell & Grashina emphasize communications as "the art of transmitting an idea from the mind of one person to the mind of another, with understanding." (Newell & Grashina, 2004, p.236) Dow and Taylor stated that "Project communications is the most important aspect of project management." (Dow & Taylor, 2010, p.311) They argued that "Project communication is a two-way effort and both parties are responsible for ensuring that their messages are clear and concise. Without that, project failure is inevitable." (Dow & Taylor, 2010, p. xxviii) Other author Kliem stated that "communications is about information rather than data." (Kliem, 2007, p.5) The definition of communications, in the Effective Communications for Project Management book, is "an integrated and interdependent process between two or more people. To communication effectively, two or more people must be involved, one to send something and the other to receive it." (Kliem, 2007, p.5) Kerzner & Saladis categorized project communication as formal, informal, verbal, or written and argued that "Approximately 80% of communications is nonverbal".

The next concept is a risk. The definition of a risk is "a random event that may occur and, if it did occur would have a negative impact on the goals of the organization. Thus, a risk is composed of three elements: the scenario; its probability of occurrence; and the size of its impact if it did occur." (Vose,2008, p.3) According to the PMBOK, the identification of a risk is "an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives." (PMBOK, 2013, p.559).

Another concept is a stakeholder. A stakeholder is defined as "any individual or group who can affect or is affected by the actions, decisions, policies, practices, or goals of the organization." (Freeman, 1984). Weiss categorized stakeholders into two groups: The primary stakeholders, the secondary stakeholders. In Weiss' s view, the primary stakeholders are owners, customers, employees and suppliers. The secondary stakeholders are all other interested groups, such as media, consumers, lobbyists, courts, governments, competitors, the public, and society, (Weiss, 2014) The PMBOK defined a stakeholder as "an individual, group, or organization who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project." (PMBOK, 2013, p.563).

The last concept is personal characteristic. Abraham Lincoln said: "Character is like a tree and reputation like its shadow. The shadow is what we think of it; the tree is the real think." (McKee & Richardson &Hinton & Lamp, 2010, p.8) Segil argued under the title Management Processes: Horizontal Project Management that "many management processes are related to this personal characteristic of ability to complete." (Segil, 2002, p.62) and defined The Larraine Segil Matrix. In this matrix, there are three columns: Personal characteristic, organizational environment needed and example of a management process for implementation. For example, fearlessness is personal characteristic, "permits failure" is organizational environment needed and "shared learning and shared power" is an example of a management process for implementation. (Segil, 2002, p.70) The other personal characteristics are completion, commitment, inspiration, assuredness, penetration, intelligence, energy, integrity, perception. (Segil, 2002, p.216) Rottwell and Sullivan argued that "there are two types of personal characteristics, each of which contains different measures. First, there are biographical characteristics that are considered hard measured and are usually found in most personnel files. Biographical characteristics include such things as age, race, gender, tenure, and function. The second type of personal characteristic is personality. Personality refers to more stable behavioral traits that people exhibit. For example, there are a variety of personality models, such as the Myers- Briggs Type Indicator (MBTI), the Big Five (extraversion, emotional stability, agreeableness, conscientiousness, and openness to experience), and other non-dimensional measures, such as locus-of control and pessimism." (Rothwell & Sullivan, 2005, p.336) Russell Archibald defines desired personal characteristic as following: flexibility and adaptability, preference for significant initiative and leadership, aggressiveness, confidence, persuasiveness, verbal fluency, ambition, activity, forcefulness, effectiveness as a communicator and integrator, broad scope of personal interests, poise, enthusiasm, imagination, spontaneity, able to balance technical solution with time, cost, and human factors, well organized and disciplined, a generalist rather than a specialist, able and willing to devote most of his time to planning and controlling, able to identify problems, willing to make decisions, able to maintain proper balance in the use of time. (Archibald, 1976, p.55) It is stated that "In China, Jin Zhang established competence model of enterprise project management from three dimensional structures, namely management skills, interpersonal relationship and personal qualities. Guozheng Chen put forward dimensions of knowledge and skill, attitude, values, competency model of project manager which is composed by leadership traits. Huiling Xu put the idea that competency model of international construction project is composed by four dimensions and 22 competence model structures, the four dimensions are personal characteristics, management

skills, interpersonal relationship and basic knowledge. (Briscope and Hall 1999)" in the International Asia Conference. "(Qi & Shen & Dou, 2013, p.911).

The Systematic Way

To follow a systematic way when developing an organizational project management standard is affected the efficiency of the standard. In this paper, the authors will explain how an organization could develop their own project management standard based on PMBOK as considering the impact of personal characteristics. The personal characteristics are related to six knowledge areas. The knowledge areas are Project Integration Management, Project Human Resource Management, Project Communications Management, Project Risk Management, Project Stakeholder Management, Project Procurement Management and Project Integration Management.

First of all, every organization should develop their own personal characteristic map. In order to realize that, every employee should be taken the personality test, prepared by Human Resource Management department. Durai defined the personality as "the sum of the characteristics of a personal which reflect on his/her response to a particular situation. The characteristics may include, among other things, introversion, inter- personal skills, motivation, stability, self-belief, courage, attitude and temperament. A personality test proposes to assess and predict these basic characteristics of a person." (Durai, 2010, p.157) After assessing the personal characteristics of the employee, the human resource should analyze the data and develop an organizational personal characteristic map. This map could be used by project manager during project human resource management process.

Then, the systematic way will be followed. As stated before, the systematic way contains six steps: Develop an Organizational Personal Characteristic Map, The Impact of Personal Characteristics on Project Human Resources Management, The Impact of Personal Characteristics on Project Communications Management, The Impact of Personal Characteristics on Project Risk Management, The Impact of Personal Characteristics on Project Stakeholder Management, The Impact of Personal Characteristics on Project Procurement Management. The figure 1 shows the systematic way.

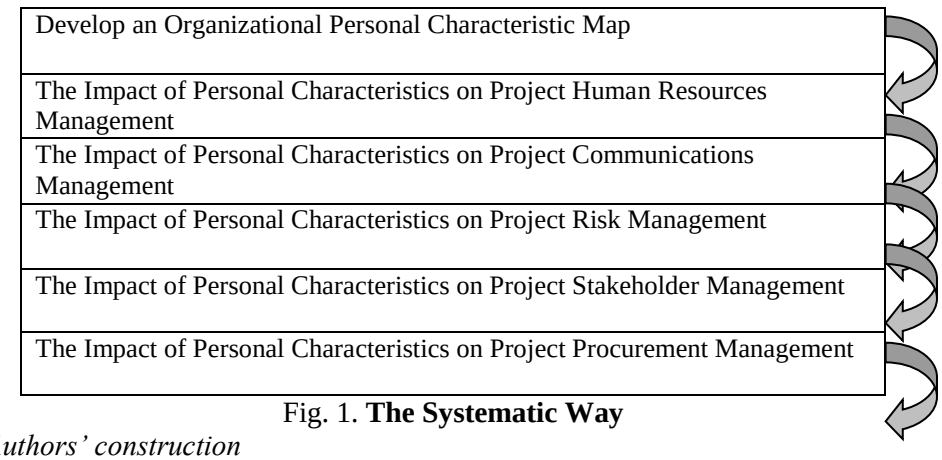

Fig. 1. **The Systematic Way**

Source: Authors' construction

The Impact of Personal Characteristics on Project Human Resources Management

"Project Human Resource Management includes the processes that organize, manage and lead the project team"(PMBOK, 2013, p.255.) The processes are: Plan Human Resource Management, Acquire Project Team, Develop Project Team, Manage Project Team. All the project team members are assigned specific roles and responsibilities on each project. In reality, all the project managers do project management in different environments, cultures and nations. That means that the project manager is working with different project team members that have their own beliefs, habits, behaviours, communication needs and personal characteristics in the projects. The Project manager needs to be aware of these differences while creating Human Resource Management Plan.

The key personal characteristics, necessary for project success, during acquiring project team should be defined by project manager. For example, " a risk champion will have a combination of technical skills (including the ability to understand and manage different types of individuals and groups). These latter soft skills are very useful for keeping energy levels high during the risk process, and a high degree of emotional literacy can be particularly helpful." (Hillson, 2009, p.87) It is important to make the involvement of all team members in project is beneficial. Bee & Bee stated that "In addition to selecting for the requisite professional skills and informal team roles, there are certain personal skills and qualities that make for effective project team members." and continued "The type of person selected for project work needs to be resilient and capable of coping with change; want greater personal interdependence than those in the traditional, functional role. Because of these required characteristics there needs to be greater care in the selection of project team members." (Bee& Bee, 1997, p.30)

Since 1980, many academics and practitioners have agreed that human resource management (HRM) is one of the most crucial elements of an organization's success. It is known that, Human Resource Management benefits from successful networking by improving knowledge and access to human resource assets such as strong competencies, specialized experience, and external partnership opportunities. (PMBOK, 2013, p.262) So, the processes that the project manager should apply on the projects require making the most effective use of the people involved with the project. To make the most effective use, project peoples' characteristics and communication needs should be analysed carefully and a common language for the all project team should be created. In order to supply this, it is necessary for each project manager to work like an orchestra maestro. It is important that collecting project team members' data to manage this orchestra effectively. Finally, all these things regarding to evaluation of personnel characteristics need to be follow up on all processes of Human Resource Management. During this step, the project manager could use the following checklist.

Questions	Answer (Yes / No)
Are the personal characteristics of project team defined accurately?	
Are the factors for the common employee attitudes in the country analyzed carefully?	
Are the working habits of persons analyzed accurately? (Collectivist or Individualist)	
Are the personal characteristics considered during planning human resource management?	
Are the personal characteristics considered during acquiring project team process?	
Are the personal characteristics considered during development of project team?	
Are the personal characteristics considered during management of project team?	

Fig. 2. **The Checklist for Project Human Resource Management**
Source: Authors' construction.

The Impact of Personal Characteristics on Project Communications Management

Project managers spend most of their time communicating with team members, stakeholders and internal or external project resources to make them sting together for the effective project communication. According to the PMBOK communication defined as "Effective communication creates a bridge between diverse stakeholders who may have different culture, organizational backgrounds, different perspective and interests, which impact or have an influence upon the project execution or outcome." (PMBOK, 2013, p.287) Processes for the Project Communication Management are: Plan Communication Management, Manage Communications and Control Communications.

Depending on that situation all stakeholders already have different personal characteristics according to their nations, beliefs or family life. Project manager need to be aware of that differences while developing communication management plan. For example; Stakeholders from different cultures or nations at the executive level, for example, have communication preferences and needs that are different form the others in project. So, horizontal and vertical communication must be clarified and adopted to the needs of whoever is receiving the data and information. On that point it is important to classify characteristics of project team members come from diverse cultures within the context of project. Some of the project team members may come from individualist cultures while others come from collectivist ones. "Individual interests take priority over group interests in individualist cultures. Conversely, people respect and adhere to the norms of the group to which they belong in a collectivist culture." (Spolander & Martin, 2012,p.154) On that point, these interests should be identified in the planning phase of communications and proper communication models & methods are need to be analyzed according to the stakeholder's needs, requirements, competency and experiences.

For example; Muller indicates that "the personal characteristic or competence that determines the communication preferences of project sponsors is their number of years with project management experience. Contents-wise sponsors prefer quantitative project analysis

data and forward looking information like trends and issues over that of project managers. Analytic data, such as quality metrics or earned value results, are preferred because they are perceived more credible than qualitative statements in status reports about recent achievements." (Müller, 2003, p.168)

In summary, project managers' typical practices for communication with their stakeholders' are not wrong, but it is better to think about personnel characteristics while occurring relationship between all project team. Project managers' can use following checklist for project communication management.

Questions	Answer (Yes / No)
Are the personal characteristics of project team, project stakeholders defined accurately?	
Are the personal characteristics considered during planning process of communications management?	
Are the personal characteristics considered during management of communications?	
Are the personal characteristics considered during control communications process?	

Fig. 3. **The Checklist for Project Communications Management**

Source: Authors' construction.

The Impact of Personal Characteristics on Project Risk Management

According to the PMBOK, "the project risk management includes the processes of conducting risk management planning, identification, analysis, response planning, and controlling risk on a project." (PMBOK, 2013, p. 309) The processes are: Plan Risk Management, Identify Risks, Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis, Plan Risk Responses, Control Risks.

Firstly, the project manager should define the personal characteristics of the project team, project stakeholders and supplier or vendors. When developing project risk management plan, subsidiary plan of project management plan, the project manager should define how the risk management activities related to personal characteristics are conducted for the project. The inputs of this process are project management plan, project charter, and stakeholder register and enterprise environmental factors. The project manager should ensure that the inputs include the detail of personal characteristics. For example, the project manager could define personal characteristics as a risk category and create a risk breakdown structure (RBS). In the PMI' s view, "RBS helps the project team to look at many sources from which project risk may arise in a risk identification exercise." (PMBOK, 2013, p.317)

After that, the project manager identifies which personal characteristics of the team, stakeholders, supplier and vendors may affect the project and will document them in the risk register. For example, finding the right personal characteristics qualification is not an easy task and the project manager should define this risk in the risk register. In the third step, the project manager performs risk analysis and updates the risk register. Then, the risk responses are planned and the project manager develops options and actions in order to enhance the

opportunities and reduce threats. During monitoring and controlling process groups, the project manager implements the risk response plans, tracks identified risks according to the personal characteristics, monitors residual risks, and identifies new risks. During this step, the project manager could use the following checklist:

Questions	Answer (Yes / No)
Are the personal characteristic of the project team, project stakeholders, suppliers or vendors defined accurately?	
Are the personal characteristics considered during planning risk management and developing project risk management plan?	
Are the personal characteristics considered during identifying risks and producing the risk register?	
Are the personal characteristics considered during performing risk analysis?	
Are the personal characteristics considered during planning risk responses?	
Are the project manager control the risks related to the personal characteristics during monitoring and controlling process groups?	

Fig. 4. **The Checklist for Project Risk Management.**
Source: Authors' construction.

The Impact of Personal Characteristics on Project Stakeholder Management

In addition to project communication, the project manager should define the personal characteristics of the project stakeholders. According to the PMBOK, "Project Stakeholder Management includes the processes required to identify the people, groups or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution" (PMBOK, 2013, p.391) The processes for Project Stakeholder Management are: Identify Stakeholders, Plan Stakeholder Management, Manage Stakeholder Engagement and Control Stakeholder Engagement. In order to manage communication with stakeholders beneficially, the project manager again work on the identification of stakeholders, groups and their characteristics.

Firstly, project manager should make stakeholder characteristic analyzes for each stakeholder. By this way stakeholder characteristic map, their relation to the project, impacts and positions may be demonstrated. Each stakeholder has their own has their own working habits and express their own opinions about how a project should be managed. For example, in Middle East customers push their project owners to obey their rules, make a lot of meetings and ask to be part of the project. It is very important for the project manager to understand expectations and handle these stakeholders, develop strategies and engage in active communication where appropriate. In some cases, "the project manager might have his or her hands tied, depending on who the stakeholder is and how much power or influence the stakeholder has on the project manager" (Wilson, 2014,230) When developing stakeholder management plan, the project manager should define how the stake holders have influence on the project, develop a strategy on communication needs and carry out the project according to

this environment. In some cases, stakeholders can be unaware of project details and its impacts, however they would like to lead the project and ask to be involved in the decision making steps. All these details needs to be identified carefully and included in the stakeholder register and also in the stakeholder management plan which then allows the project manager to develop various ways to engage stakeholders in the project, to manage their expectations, and to achieve the project objectives more effectively.

After that on the planning stakeholder phase, the project manager should also use these environmental characteristics while running the project. All these information probably help the project manager to identify interrelationships and communication requirements for the project.

Finally, the key benefit of this identification is that it allows "the project manager to increase support and minimize resistance from stakeholders, significantly increasing the chance to achieve project success" (PMBOK, 2013, 404).

During this step, the project manager could use the following checklist.

Questions	Answer (Yes / No)
Are the personal characteristics of project stakeholders defined accurately?	
Are the personal characteristics considered during identification process of stakeholders?	
Are the personal characteristics considered during planning process of stakeholder management?	
Are the personal characteristics considered during management of stakeholder engagement process?	
Are the personal characteristics considered during controlling of stakeholder engagement process?	

Fig. 5. **The Checklist for Project Stakeholder Management.**

Source: Authors' construction.

The Impact of Personal Characteristics on Project Procurement Management

The procurement management is defined as "the processes necessary to purchase or acquire products, services or results needed from outside the project team. The organization can be either the buyer or seller of the products, services, or results of a project." (PMBOK, 2013, p.355) The processes are: Plan Procurement Management, Conduct Procurements, Control Procurements, and Close Procurements.

In the first step, Plan Procurement Management, the project manager determines project procurement decisions, specifies the procurement approach, and identifies potential seller. In the PMI' s view, "The Plan Procurement Management process also includes evaluating potential sellers, particularly if the buyer wishes to exercise some degree of influence or control over acquisition decisions." (PMBOK, 2013, p.360) During this process, the project manager should determine how to manage the personal characteristics of potential suppliers and vendors and define them in the Procurement Management Plan. In addition, the project manager should describe which personal characteristics should have the potential suppliers and vendors in the Source Selection Criteria. According to the PMBOK, "Source selection criteria are often

included as part of the procurement documents. Such criteria are developed and used to rate or score seller proposals, and can be objective or subjective." (PMBOK, 2013, p.368) The next step is "Conduct Procurements". When selecting a seller and awarding a contract, the project manager should use the defined selection criteria, which includes personal characteristics. When monitoring and controlling, the project manager should manage the procurement relationships as considering the personal characteristics of buyers and sellers. Considering the personal characteristics of buyers and sellers helps to ensure that the performance of sellers and buyers meets the procurement requirements.

During this process, the project manager should describe which personal characteristics should have the potential suppliers and vendors. In addition, the project manager should include managing the personal characteristics of potential suppliers and vendors. The next step is "Conduct Procurements." When selecting a seller and awarding a contract, the project manager should use the defined selection criteria, which includes personal characteristics. The work performance information, the output of the process "Conduct Procurements", should define the current or potential problems regarding to the personal characteristics to support later claims or new procurements. Finally, the project manager completes each procurement. The project manager archives the personal characteristics information of potential suppliers and vendors for future and updates lessons learned documentation.

Questions	Answer (Yes / No)
Is how to manage the personal characteristic of the potential suppliers and vendors defined in the Procurement Management Plan?	
Are the required personal characteristics of potential suppliers and vendors defined in the Source Selection Criteria?	
Are the defined selection criteria used during selecting a seller and awarding a contract?	
Is the work performance information produced as an output?	
Is the lessons learned documentation during closing procurement process?	

Fig. 6. **The Checklist for Project Procurement Management.**
Source: Authors' construction.

Conclusions

To consider the impact of personal characteristic during developing organizational project management standard will help to increase the successful completion rate of project. So, the organizations make profit and survive in the competitive environment. The authors define a systematic way which has six steps. This steps are according to the project management knowledge areas: Human Resource Management, Communications Management, Risk Management, Stakeholder Management and Procurement Management.

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EFFECTIVE KNOWLEDGE MANAGEMENT IN AGILE PROJECT TEAMS - IMPACT AND ENABLERS

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Abstract

Nowadays, rapid response capacity of organization is a very important in business due to the strong market competition. Large-sized enterprises are providing advanced business services and products to their customers through complex, innovative and unique projects and programs. One of the key challenges in the project and program management is the right knowledge management. The appropriate selection and effective application of the most valuable knowledge is the essential concern in project management.

The main goal of this article is to present the impact of knowledge management on Agile project teams. The article identifies also key enablers for effective knowledge management processes in Agile project teams.

Empirical research studies were conducted in large ICT and IT organizations based on triangulation of research methods: a questionnaire survey, own observations and observations of other Agile project team members' and interviews with Agile experts'.

Primarily, effective application of knowledge management solutions in Agile project teams is important for collaboration of project teams; moreover it is important to the whole level of an organization. The research results showed four key effectiveness enablers of the knowledge management processes: a learning organization, an organizational strategy, an organizational structure and an organizational culture, with the latter indicated as the key success factor of Agile project teams and Agile organizations deployment.

Key words: *project management, knowledge management, process enablers, agile, organizational culture*.
JEL code: *D83, M14, O22.*

Introduction

Contemporary organizations are delivering increasingly complex and advanced products and services to their stakeholders and customers. Complexity, communication and operation scalability are driving them towards project- and task-oriented enterprises. Following this approach, several project management methods were developed in the last few years. A number of Agile project management methods has attracted attention very recently (Medinilla, 2012; Goodpasture, 2015; Maximini, 2015) as they work towards increasing effectiveness and speed up delivery of customer products and services.

On the other hand, a strong market competition has raised a lot of challenges to the effective knowledge management in the large-scale organizations. Digitization and pervasive Internet access highly increased the volume of data, information and knowledge shared within organization and within its business environment to the unconceivable order of magnitude, causing an increased impact of the effective knowledge management on large-scale project organizations (Mueller, 2015; Santos et al., 2015; Wyrozębski, 2014). The just-in-time and fast

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application of the most valuable knowledge in customer products and services is a key competence of the large project organizations needed in order to gain a competitive advantage.

The main goal of this article is to present the impact of knowledge management to the Agile project teams. The article also indentifies the key enablers for the effective knowledge management processes in the Agile project teams. The empirical research results have revealed a significant impact and importance of the knowledge management to the Agile project teams, to the collaboration between project teams and to the whole organization and its stakeholders as well. The research results showed four key effectiveness enablers of the knowledge management processes: a learning organization, an organizational strategy, an organizational structure and an organizational culture. The author's empirical research results are confirmed by and complemented with a review of the existing literature in the field presented in this paper. The aim of this paper is not to focus on improvements and enhancements in these four key identified enablement areas; still some interesting examples of practical solutions may be found in the unpublished author's MBA thesis (Paterek, 2014).

The empirical research study was conducted in large ICT and IT organizations with triangulation of the research methods applied: a questionnaire survey, own observations and observations of other Agile project team members and interviews with Agile experts. The sampling frame limited only to large ICT and IT organizations is potentially one of the key limitations of this research. Another limitation may be the number of responses; nevertheless, it was mitigated by the number of valuable observations and expert's interviews. At the same time, these limitations indicate some potential directions for the future research in the field.

The structure of the paper is as follows: the first part discusses the research results; the second part contains conclusions, proposals and recommendations. The first main part is also divided to subchapters; with chapter one presenting a review of the existing literature, chapter two - the methodology approach, chapter three – the research results and finally, chapter four discusses the research results.

Research results and discussion

Knowledge management impact and enablers

The strong competition on the market and the information and communication technology (ICT) development have raised a lot of challenges to the project based organizations (Kozarkiewicz, 2012 : 36), especially to work organization methods used by project teams. The knowledge management impact to the project organizations is one of the key identified challenge in the highly advanced IT and telecommunication sector. These organizations are flooded by information sources and, at the same time, struggle with the issue of selecting and applying the most valuable knowledge. This causes entropy in work organization methods, both on the level of project teams and on the level of the enterprise. New, contemporary project organizations should be: "agile[31], adaptive, self-regulating, self-optimizing, with fuzzy borders, mesh-like structure, self-aware, aware of the markets, able to learn from market, adapt to the market and able to morph into new and better forms" (Delic and Dayal, 2002 : 3-4).

The agile organization approach and the agile project management approach are presented by many experienced practitioners in their guidebooks (Highsmith, 2009;

[31] Agility as an organization feature means the ability to respond rapidly and intentionally to a changing demand whilst controlling the risk, efficiently adapt and innovate as well as shrinking the feedback loop.

Goodpasture, 2015; Medinilla, 2012), as well as by the project management researchers (Fernandez and Fernandez, 2008; Vazquez-Bustelo et al., 2007). The Scrum method (Chrapko, 2013; Maximini, 2015) is indicated as the most widespread and recognized Agile implementation in the industry reports (VersionOne, 2015). Innovation and a relatively new concept of the Agile approach have risen a new demand for standardization and certification in the project management world. The Professional Scrum Master, the Professional Product Owner or the Agile Project Management Certification are just examples of a growing demand for the professional project management certification and standardization in the PM world (Ilmete et al., 2011 : 145-152).

The knowledge management processes namely, knowledge creation/acquisition, knowledge storage, knowledge dissemination and knowledge application are those mentioned in many knowledge management anatomy publications (Kowalczyk, Nogalski, 2007 : 80). Knowledge acquisition is understood mainly through the external knowledge sources, i.e.: a business environment, customers, stakeholders and competitors. The two types of knowledge: explicit knowledge (described with numbers, science or manuals) and tacit knowledge (the emotional, difficult-to-describe and hidden) are coupled with four creation processes (Nonaka, Takeuchi, 1995):

- Socialization - Tacit to Tacit,
- Externalization - Tacit to Explicit,
- Combination - Explicit to Explicit,
- Internalization - Explicit to Tacit.

Knowledge sharing in the Agile environment is less formal and more fuzzy as this is basically a tacit type of sharing. In Agile methods, knowledge sharing is embedded in several activities: release and iteration planning, pair programming and pair rotation, daily Scrum meetings, cross-functional teams and retrospectives (Sivanantham, 2011).

The effectiveness of the knowledge management processes is a derivative of number of different enablers in the project organizations and in the project teams. The most relevant theoretical studies in the knowledge management in the project environments with the focus on the Agile project management, as well as the brief findings and its conclusions are presented in Table 1.

Figure 1 presents a summary of the literature review detailing the number of publications related to a knowledge management effectiveness enabler, both directly and indirectly mentioned in the text. The literature review presents enablers, where organizational structure, learning organization, organizational strategy and organizational culture are mentioned the most frequently in the literature.

Table 1

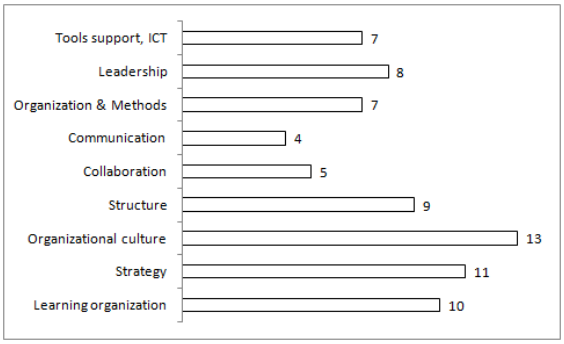
Knowledge management enablers in project organizations and in the project teams

Studies the most relevant to the knowledge management (KM) impact in project management (PM) with the focus on the Agile project management. Brief findings and conclusions .	The key knowledge management processes enablers for the project teams: X – directly mentioned in research or s study, (X) – indirectly derived from research or a study.								
	Learning organization	Strategy	Organizational culture	Structure	Collaboration	Communication	Organization & Methods	Leadership	Tools support, ICT
Hanish et al. (2009) - factors critical for successful project knowledge management, organizational culture as a critical factor.	(X)		X			X	X	(X)	X
Santos et al. (2015) – knowledge sharing between Agile project teams.	(X)	X	X	X		X	X	X	
Lee and Choi (2003) – KM enablers for the organizational creativity and performance.	X	(X)	X	X	X				X
Oliver and Kandadi (2006) – factors affecting KM culture in large organizations.	X	(X)	X	X	(X)		(X)	X	X
Pérez-Bustamante (1999) – KM culture in the Agile innovative organizations.	X	(X)	X	X					
Wyrozębski (2014) – state of project KM, conditions and business impact (in Poland).		X	X				X	X	
Kamhawi (2012) – critical success factors to reach organizational performance and agility.	X	X	X	X				X	X
Oliveira (2012) – KM implementation enablers.	X	X	X	X		X		X	(X)
Misra et al. (2010) – Agile adoption enablers.		X	X				X		
Dove (1999) – KM in the agile enterprise.	X	X	X						
Nerur et al. (2005) – Agile migrating issues.			X	X	X		X	X	X
Vazquez-Bustelo et al. (2007) - Agility drivers, enablers and outcomes, including KM.	X	(X)		X	X				X
Fong and Kwok (2009), Mueller (2015), Panasiewicz (2013: 73), Wiewiora et al. (2014) – organizational culture as key KM processes enabler in the project teams and organization.			X						
Kozarkiewicz (2012: 183-190), Paterek (2013: 37) – continuous learning and KM in the project organization and in the project teams.	X								
VersionOne (2015) – a report presenting barriers to effective Agile deployment in project teams.		(X)	X	(X)	(X)	X	(X)	X	

Source: author's structure

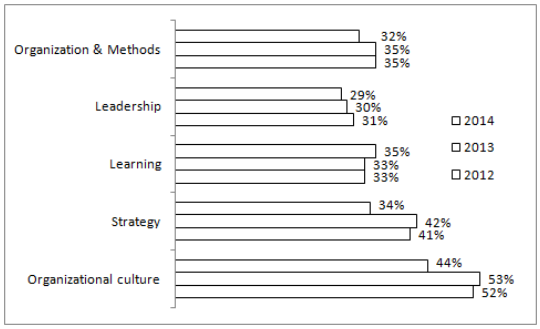
Figure 2 presents the top five barriers to further Agile adoption according to V1 enterprise report (VersionOne, 2015). The respondents can check more than one barrier to adopting the Agile approach. The classification of the barriers is the author's concept based on the best match. All the barriers used in the classification are related to knowledge management in the Agile environment as well.

Fig. 1. **The number of the KM enablers – desk analysis**



Source: author's structure

Fig. 2. **Top 5 barriers to Agile adoption – V1 reports**



Source: author's structure based on VersionOne (2015)

The V1 results analysis and author's classification revealed the following barriers to adopting the Agile approach: organization and methods (waterfall project methodology), leadership (management support), learning (lack of skills), strategy (resistance to change) and organizational culture (complex change). The last three years' trend showed that the impact of all the barriers was slowly going down, except for the learning area which demonstrated the opposite trend (VersionOne, 2015).

Methodology approach

The main goal of the empirical research presented in the paper is to confirm the importance of knowledge management to task and project teams which use the Agile method in their work organization. Another goal was to to identify the key effectiveness enablers of the knowledge management processes in Agile project teams. The investigated organizations are characterised by the large complexity of customer products and services they deliver; therefore, they face many issues in the area of cooperation and communication in and between project teams.

The research population is being defined as a task and project team members in the ICT (information and communication technology) and the IT (information technology) organizations with the Agile methods or its adaptations applied to their work organization. The following sampling frame was used by the author to select respondents for the research sample:

- a former or a present employee in a large national or multinational ICT and IT industry organization based in Poland,
- a former or a present team member applying Scrum method or its adaptation to their team work organization,

- a former or a present team member with Agile methods experience in the field, assessed by the author of this research, and therefore respondent whose answer is very likely relevant to received research results.

The author chose an intentional and non-random selection of respondents as the research sample method in order to create research sample closer to the representative one. The arbitrary selection of respondents was made by the author, who is a project manager in one of the investigated organization and, for this reason, he has sufficient expert' knowledge about the investigated population. Indefinite probability of representativeness is a drawback of the method. Another potential disadvantage of the empirical research may be a relatively small size of the sample (70 respondents) but, hopefully, it was mitigated by high probability of reliable answers from respondents with experience in the field. A questionnaire survey was used as a research method to measure observations in the pre-defined respondent sample. More than 90% of the questionnaires were returned. The analysis is potentially limited because of the non-returned questionnaires which could not be analysed in the study. However, from the other hand, the applied triangulation of the research methods may be accepted as the imputation of the missing responses. The triangulation of the research methods included: the questionnaire survey, own observations and observations of other project team members and interviews with experts. In particular, the latter i.e. the experts' interviews was meticulously conducted, involving experienced and independent experts. They were invited both internally from the investigated organizations and from the outside e.g. from the nationally recognised experts in the field. The maximum absolute error value was estimated at 10-12%[32] with the 95% confidence level, the population size reached approximately 50,000 and the research sample consisted of 70 respondents. At the same time, all the above mentioned limitations may be explored as directions for the future research in this area.

The questionnaire survey was structured to intersect the Agile method plane (in our research the Scrum method or its adaptation) with the concept of the knowledge management plane. Each component of the Scrum method (Chrapko, 2013): the assumptions, the roles, the activities and the artefacts was matched with different levels of the knowledge management concept (Kowalczyk, Nogalski, 2007: 81): tools, processes, structure and integration. The single choice questionnaire survey consisted of 40 questions divided into 4 parts: the respondent's personal details and three parts each for one Scrum method component. The respondents were asked to express their opinion whether a Scrum method component was supported ("Very Good", "Good") or was not supported ("Insufficiently", "Poorly") at the level of the knowledge management concept (Paterek, 2014 : 32-33).

Empirical research results

The research results presented in the paper are an extraction of unpublished empirical author's research analyzing the correlation between the Scrum method applied to the project team work organization and the knowledge management concept in order to identify potential practical improvements of the Scrum method. The identified improvements, together with the synergy of the Scrum method and the knowledge management concept, were aimed to increase the effectiveness and the innovation level of the task and project team work organization (Paterek, 2014 : 31). The research results related to the key indentified effectiveness enablers of

[32] The estimation based on the PBS website calculator: http://pbs.pl/x.php/1,139/dobor-proby.html [Accessed 3 January 2016].

the knowledge management processes presented in this paper have not been published in other papers. The more detailed research results associated with the organizational culture that are not presented in this paper can be found in other linked author's paper (Paterek, 2016).
63 filled out questionnaires were returned by respondents. The respondents' details regarding their Scrum professional knowledge and experience were matched with the author's research assumptions and with the defined sampling frame. Table 2 presents the research results about the respondents' details.

Table 2

The Scrum professional knowledge and experience of respondents

Question		**Answer**					
1	I have been using Scrum on a daily basis..	Less than 1year		1-3 years		More than 3years	
		20	32%	27	**43%**	16	**25%**
2	My role is..	Team Member		Scrum Master		Product Owner	
		29	46%	23	**37%**	11	**17%**
3	My Scrum professional experience comes from..	1 company		2 or 3 companies		More than 3 companies	
		46	73%	14	**22%**	3	**5%**
4	I participated in the Scrum training events..	0 times		1-3 times		More than 3 times	
		15	24%	36	**57%**	12	**19%**
5	I am a certificated Scrum expert..	Yes		No		Planned	
		11	**17%**	45	71%	7	**11%**

Source: Paterek (2014 : 34).

The response analysis for all remaining 35 questions resulted with a selection of 15 questions with the sum of "Insufficiently" and "Poorly" answers greater than or equal to the author's criterion – 1/3 of all the answers. A further analysis of some selected questions and its synthesis with the concept of the knowledge management levels allowed identifying four key areas, which are subsequently referred to as the enablers. The identified effectiveness enablers of the knowledge management processes in the investigated project teams were: a learning organization, an organizational strategy, an organizational structure and an organizational culture (Paterek, 2014 : 35-40). Almost each of 15 selected questions can be interpreted from a different perspective of the investigated problem and classified to one of the four identified effectiveness enablers of the knowledge management processes. The assignment of the question to only one enabler theoretically indicates the best match according to the analysis done by research author (Paterek, 2014 : 38). Nevertheless, for the majority of the analysed questions, the holistic approach to assign all of identified enablers is probably the best approach. The summary of the research analysis results as well as the summary of question synthesis and their classification to areas identified in the research is presented in Table 3.

Table 3

The key identified effectiveness enablers of knowledge management processes

The effectiveness enabler of the knowledge management processes	The number of questions for which the sum of "Insufficiently" and "Poorly" answers is greater than or equal to 33% of all answers	The number of questions assigned each level of the knowledge management concept[33]			
		Tools	Processes	Structure	Integration
The learning organization – includes all knowledge management processes existing within the project teams, between the project teams, within the organization and even beyond the organization. It is related to both internal and external knowledge sources.	9	2	7	2	1
The organization strategy – covering all aspects of the utilization processes of the most valuable knowledge from the mission, vision and organization goals perspective, as well as the knowledge value protection.	2		2	1	1
The organizational culture – covering the creation and the formation of the core values system that is supporting all the knowledge management processes, both on the project teams' level and on the level of the organization.	2			1	2
The organization structure – covering all aspects of the organization structure adaptation to core values system that supports all the knowledge management processes, both on the project teams level and on the level of the organization	2			2	
The total number of questions matched to the identified enablers	**15**	**2**	**9**	**6**	**4**

Source: author's calculations based on Paterek (2014: 38-40).

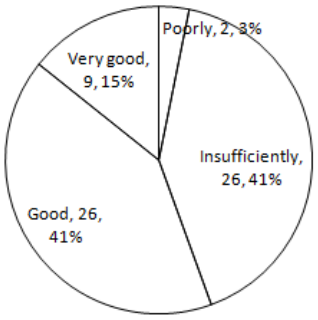
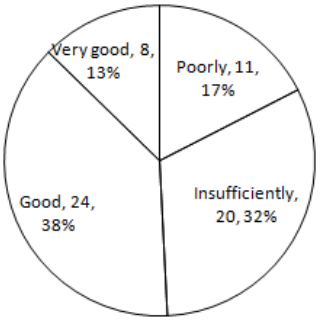
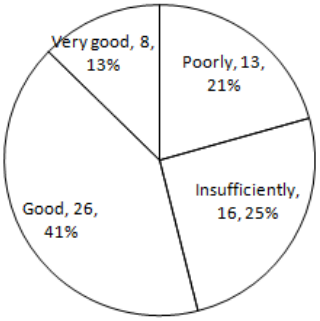
The impact of the key identified enablers on the effectiveness of the knowledge management processes in the Agile project teams was shown in the detailed questionnaire survey results presented in Table 4. The vast majority of responses in the "Insufficiently" and "Poorly" categories indicated a significant impact of the all identified enablers on the effectiveness of the knowledge management processes in the Agile project teams. From the practical point of view as well as for the purpose of the further theoretical analysis note that effectiveness of the

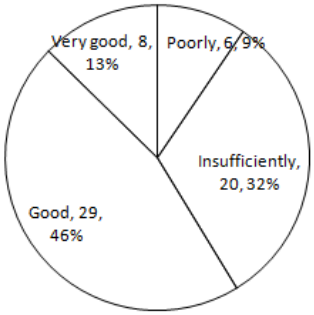
[33] One-to-many relation as the agile method component can be associated with the one or more levels of the knowledge management concept.

knowledge management processes in the Agile project teams is also dependent on the synergy of all identified enablers. The identified enablers show a strong correlation. As a result, any improvement changes or solutions introduced in the one of the enabler are likely to show in the other three enablers. Moreover, the impact of all identified enablers and its synergy on the effectiveness of the knowledge management processes will be visible on different levels of the organizational operation.

Table 4

The questionnaire survey results

Representative questions demonstrating correlation between effectiveness enabler of the knowledge management processes and the Agile manifesto / the Scrum method assumptions	**The effectiveness enabler of the knowledge management processes**	**The questionnaire survey results**
Question 19. The Agile manifesto and the Scrum method assumptions support the organization management with the effective management of the knowledge transfer processes and with the effective application of the most valuable knowledge (data, information, its context and experiences) in the organization and its products delivered to the customers.	The learning organization	
Question 15. The Agile manifesto and the Scrum method assumptions allow to create and develop a long-term strategy for the effective application of the most valuable knowledge (data, information, its context and experiences) and securing the most valuable knowledge.	The organizational strategy	
Question 20. The Agile manifesto and the Scrum method assumptions allow for creating a motivation system and forming an organizational culture associated with the processes of the effective knowledge transfer and with the effective application of the most valuable knowledge (data, information, its context and experiences) in the organization and its products delivered to the customers.	The organizational culture	

Question 17. The Agile manifesto and the Scrum method assumptions allow for creating the organizational structure supporting processes of the effective knowledge transfer and effective application of the most valuable knowledge (data, information, its context and experiences) in the organization and its products delivered to the customers.	The organizational structure	

Source: author's structure based on Paterek (2014).

The following own observations and observations made by other project team members indicated many other conditions and effectiveness enablers in the knowledge management processes, e.g.: the opportunity to learn through the real work assignments based on the successes and failures, an openness to experiments and innovation, continuous development and upskilling opportunities, budget allocated to training and conference participation, uncertainty perceived as a source of inspiration and innovation, expanding the scope of the people decision-making competences and responsibilities, a well-defined and predictable organizational strategy, a knowledge management strategy coupled with the working action plan, an evolutionary and conscious change management, the common vision, mission and strategy fair from people perspective, a clear motivation and payroll system, job satisfaction, the organizational trust as a core system value, the core system values allowing to form and to support the organizational culture, the direct and effective communication, the appropriate leadership, the organizational structure supporting collaboration and reducing bureaucracy (Paterek, 2014 : 52-57).

The knowledge management impact on the agile project teams as well as the organizational culture as one of the key enabler of the knowledge management processes effectiveness is confirmed by the questionnaire survey results and the above-listed observations. Moreover, it is confirmed by interviews with external and independent experts as the following example:

"The Scrum method is based on a very different mental model, which is often called "a paradigm". It strongly enforces changes in thinking model of the organizational operation. However, the Scrum method deployment is not a simple delivery of the key problem solution. I work with large organizations and every time the process looks very similarly – the need for changes in the organizational system is identified through the Scrum method implementation. I realize this stronger during each new one implementation. The Scrum and Kanban method are "applications" that need to be installed on the right application platform. It is the organization's responsibility to provide it. The organizational culture, the core system value, the leadership, the language and communication are the components of this application platform. These components are assumed in the Scrum method, but without detailed solution implemented within. What is more, implementations in large organizations show that most issues to address are exactly there. Unfortunately, most organizations are focused on techniques, roles, artefacts, ceremonies... These tools allow for achieving fantastic results, but

they have to be installed on the right application platform. Otherwise, there may often appear "culture shock" A. Toffler's effect." - Mariusz Chrapko[34] (Paterek, 2014, s. 69).

Results discussion

The questionnaire survey results, author's own observations, other team members' observations and expert's interviews revealed a significant impact of the knowledge management and, in particular, a significant impact of the knowledge management processes on the Agile project teams and organizations. Such similar and comparable impact is recognised by a number of other research papers devoted to the knowledge management in the project environments (Hanish et al., 2009; Mueller, 2015; Wiewiora et al., 2014; Wyrozębski, 2014) as well as knowledge management in the Agile project environments (Dove, 1999; Pérez-Bustamante, 1999; Santos et al., 2015; Sivanantham, 2011). According to the main research result presented in Wyrozębski (2014), most respondent (80%) pointed out many of lost business opportunities due to difficulties with the efficient knowledge management.

The following author's research results (see Table 3 and Table 4) have indentified four key effectiveness enablers of the knowledge management processes shown in the Agile project organizations and, specifically, in the Agile project teams. These are, respectively: the learning organization, the organizational strategy, the organizational structure and the organizational culture. Based on the author's expert interviews and on papers and publications published by other researchers (Hanish et al., 2009; Mueller, 2015; Wyrozębski, 2014), the latter seems the most critical enabler for the successful knowledge management in the Agile project teams. The literature review (Table 1) and its graphical summary (Figure 1) were confirmed by the results of the empirical research (Table 3 and Table 4) and its four factors, which are critical to the effective knowledge management processes. Other top ranking factors and enablers in the literature review are: the leadership support, the tools & ICT support and the organization & methods. All of them and, in particular the last one – the organization and methods, which is specifically the Agile project management method, are also indirectly recognised as enablers in the author's empirical research. Collaboration and communication are less frequently pointed factors in the literature review (Figure 1); nevertheless they are also embedded in the organizational culture factor presented by the author's empirical research results.

The above theoretical and empirical research results are confirmed by the trend of the past three years shown in the industry reports with the following Agile adoption barriers identified in the areas of: organization and methods, leadership, learning, strategy and organizational culture (VersionOne, 2015). The leading causes of the failed Agile projects are also correlated to theoretical and empirical research results, respectively, most of the respondents pointed to knowledge as the key cause – "lack of experience with Agile methods" (44%) and two of the top five causes of failure were associated with the company culture – "company philosophy or culture at odds with core agile values" at 42% and "lack of support for cultural transition" at 36% (VersionOne, 2015).

Conclusions

The knowledge management paradigm is relatively new and its importance to for new contemporary and intelligent project organizations has even gone up. These project organizations stimulate continuous research and development to find the most effective project

[34] Mariusz Chrapko: http://mariuszchrapko.com/ [Accessed 4 January 2016].

and knowledge management methods in their strive to become market leaders or, at least, one of the leading competitor. Note that not all success factors from the past must be continued to guarantee a present and future success of an organization.

The following key conclusions are the main research findings:

1. The research results proved a significant impact of knowledge management on Agile project teams. Agile methods can support knowledge management in project teams very well on the tools and processes levels, while the impact of structural and integration levels is not equally powerful.
2. Four key effectiveness enablers of the knowledge management processes in the Agile project teams were identified. These are: a learning organization, the organizational strategy, the organizational structure and the organizational culture. The right work organization methods like the Agile project management methods are indicated indirectly as another key effectiveness enabler of the knowledge management processes.
3. The most important cognitive conclusion of the paper is the impact of the knowledge management as an antecedent of the effective knowledge management processes in the Agile project teams. The knowledge management processes in project teams are well supported by Agile methods whilst the organization-related context emerges as essential, and, in particular, the organizational culture.
4. The key to success of the Agile method implementation is not only related to changes in the project team level, but it is primarily related to changes on the level of the entire organization and its functional operability. The primary focus is to create and form the right organizational culture supporting implementation of Agile methods across the entire organization. This way, both project teams and organizations will benefit from more effective knowledge management processes. In the author's opinion, this is also the main, valuable conclusion from the practical perspective.

The key proposals and recommendations are as follows:

1. The Agile methods require some adaptation and potential enhancements at the structural and integration levels of the knowledge management concept, in particular in order to increase effectiveness of the knowledge management processes between project teams.
2. As all the identified enablers apply to the organization as a whole, the best proposal might be to use a holistic approach: the learning organization, the organizational strategy, the organizational structure and the organizational culture enablers and its synergy to create one comprehensive solution for effective knowledge management in the Agile environment.
3. Effective project team's collaboration, right communication and appropriate organizational culture that support sharing and application of knowledge management processes are challenges faced the Agile Project Manager.
4. The main limitation of the empirical research discussed in the paper might be the sampling frame which only includes large ICT and IT organizations. The number of responses may be considered another limitation; nevertheless, it was mitigated by a number of valuable observations and expert's interviews. The sampling frame and the population changes offer interesting directions for the new research opportunities. Project method, organization method as well as organizational culture in the large organizations environment seem to be important enablers for the effective knowledge management processes and, at the same time, the ones that require further studies and research.

The digital future, rising entrepreneurship and global marketplace have been introduced a lot of challenges to the contemporary project ICT and IT organizations. Furthermore, the knowledge management impact has increased in these organizations. The diversity of complexity and communication issues together with strong competition market stimulates the project organization development, in particular its methods and organization. The Agile project management and the Agile organization concept is proposed as a solution addressing the above issues in the project management area. In order to increase effectiveness of the knowledge management processes in the Agile organization environment, several potential improvements and enhancements are needed, mainly to the learning organization, the organizational strategy, the organizational structure and the organizational culture areas. The continuous, long-term and evolutionary changes need to be carefully introduced in all these areas, in particular in the organizational culture, which is relatively the most difficult one. In addition, further comprehensive studies as well as empirical research is needed in this area.

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INTERORGANIZATIONAL COOPERATION IN IT PROJECT MANAGEMENT – COLLABORATIVE PROJECT MANAGEMENT

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Abstract

The IT sector is very demanding because of the dynamics of change or technological shape. Projects are getting larger and more complex. Hence, they are more often carried out by external resources, such as subcontracting or worldsourcing, as well as in more complex organizations of many partners within consortia. Partners from different fields use their experience and skills and their representatives from various centres and geographical locations find a place in the project board, which controls and monitors the workflow. Such projects require collaboration and sometimes immediate decisions of all involved partners. Often this causes different sort of difficulties, partners may have another perspective, other priorities or just their own work specification (Mariona T. et al., 2015).

The authors decided to explore the relationships between the partners at various stages of implementing IT projects, identify ways of cooperation, exchange opinions and seek common consensus that enables efficient and effective IT project management.

The aim of the article is to analyse the problems of project management in carrying out joint projects with particular emphasis on the impact of exogenous factors (among others such as competitor's actions, regulations or technology development) and endogenous factors (e.g. business strategy or access to resources) to start and develop interorganizational cooperation. Additionally, analysis conducted will cover models and forms of cooperation, as well as the dynamics of the relationship between the organizations.

Key words: *project management, interorganizational collaboration, interorganizational cooperation, collaborative project management,*
JEL code: *L14, L22, M15,M54, O30*

Introduction

In any area of business enterprises enter into some forms of mutual relations. From the simplest purchase - sale relationships, up to highly specialized technological projects or projects of a global reach. The implementation of such projects requires cooperation between various entities such as companies or institutions and public organizations. This is particularly true for IT projects, which due to the rapid development of technology and the dynamics of change become increasingly complex and complicated. Therefore, quite commonly these are carried out with the participation of many partners using external support, or through joint complex formal or informal organisms. This approach enables the parties involved, inter alia, to share their knowledge, skills and unique competencies, (Kozminski, Latusek-Jurczak, 2014). The joint action also entails a number of risks connected with the coordination of work, different priorities or differences related to the specifics of the work, or organizational culture of each partner. However, the consequence of the cooperation is not only achieving greater efficiency,

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but also a chance for the execution of tasks that are beyond the capacity of a single company (Cropper et al., 2008).

The aim of this study is to analyse issues related to management of shared projects i.e. projects implemented by cooperating entities, particularly the impact of external and internal factors on the establishment of inter-organizational cooperation and development, as well as analysis of models and forms of cooperation, considering the dynamics of mutual relationship. Besides, the study covers methods of cooperation, exchange of opinions and seeking a consensus which could enable efficient and effective management of shared IT projects.

IT projects jointly implemented and interorganizational cooperation.

According to the definition set out in PMBoK "project is a temporary endeavor undertaken to create unique product, service, or result" (PMBOK - Fifth Edition, p.2). This wide definition also covers IT projects, or – from a more system- oriented perspective - ICT (information and communication technologies) projects. IT projects have their own specific character arising from the variability of technology, as well as their multiplicity and heterogeneity. In addition to the need of having indispensable knowledge and experience in the field of computer science, design teams have to face in their work changeable and often vague expectations of customers, as well as diversity of software and hardware or system security issues. The report of The Royal Academy of Engineering (The Royal Academy of Engineering, 2004) pointed to several features of IT projects which make them stand out from other projects. These are:

- lack of constraints - IT projects do not have limitations as other engineering projects and sometimes expectations of the customer are much higher than the capability of the supplier to deliver.
- visualization - software products are physically invisible and immaterial.
- flexibility - the intangible nature of software results in excessive requests for new features and potentially increases project failure.
- complexity - IT projects are multi-dimensional, scalable, diverse and heterogeneous, so that it is difficult to assess their feasibility.
- uncertainty - lack of clear specifications for the projects software/products, ,which can exceed technical capabilities and may cause failure in implementation.
- software and failure - in every piece of software there is an infinite number of assumptions ~~are~~, therefore small changes can bring about failure of the project.
- supporting change - there is a need for suppliers to understand business processes and mistakes in this field, which may result in slowing down of the IT.

Such a highly complicated nature of projects means that usually it is not possible to implement the project within a single organizational structure. Businesses, organizations or enterprises, in order to cope with technical challenges and expectations enter into commercial cooperation. But what is interorganizational cooperation? Interorganizational cooperation means a configuration in which at least two or more independent organizations combine their resources to jointly create added value (Gulati, 1998). A slightly different definition (Niemczyk et al., 2012) sees cooperation as a joint activity, where at least two parties have mutually complementary goals. The bases of interorganizational cooperation are interorganizational relationships, or relationships which are result of the interactions of entities. Interorganizational relationships (IOR) are understood as the relationships between organizations, be it public, business-related

or non-profit ones. The relationships can be bilateral and multilateral, and may also cover networks of many organizations (Cropper et al., 2008. p4).

The concept of IOR is ambiguous and such terms as partnership, alliance or network are often used interchangeably. At least three reasons why organizations enter into cooperation can be pointed out (Doz, Hamel, 1998). The first one is to join forces so that potential rivals turn into allies, each providing the missing products or services. The second one is a combination of competence aimed at creating value through synergies. The third reason is the acquisition of knowledge in cooperation with a partner, which being an extremely valuable resource is not offered for sale. The first of these reasons - joining forces - is the source of creation and functioning of coopetitive relationships, which are based on simultaneous competition and cooperation between two or more business partners (Brandenburger, Nalebuff, 2011). Table 1 below shows the classification of the interorganizational relations as regards origin, objectives and strategy of the organization.

Table 1

The classification of interorganizational relationships

Relations from the perspective of their source	**Relations from the perspective of goals**	**Relations from the perspective of organizational strategy**
Administrative – commands, standards, procedures.	Focused on sharing resources - joint use of resources, learning from others and sharing knowledge, lending and replenishment of resources and competences.	The relationship of cooperation or collaboration.
Economic – material and/or financial transactions.		
Operational – joint decision making and action taking, using the same resources.	Focused on integration activities - synergy by coupling value chains, creating targeted links.	Relationships of competition or rivalry between the entities.
Cultural – shared norms and values, community of opportunities and threats.	Aimed at aligning positions - coordinating actions to strengthen market position, mutual support of partners and joint market activities.	Relations of coopetition, i.e. cooperation and simultaneous competition between entities.
Informational – accessibility of information, information exchange and sharing.		

Source: author's construction based on: Sroka, 2012; De Wit, Meyer, 2007; Kozarkiewicz, 2014.

Currently, in management science, one of the fundamental concepts that relate to interorganizational cooperation are business networks. They are seen as new structures created as a result of interaction between organizations, in other words - forms, or complex types of organizational architecture or specific forms of cooperation, integration and coordination resulting from cooperation agreements between multiple parties (Kozarkiewicz, 2014). Interorganizational networks are defined in various ways, as a result of differences in perception of the network (selected definitions):

- Interorganizational network is a system of two or more organizations involved in a long-term relationship (Thorelli, 1986).
- Interorganizational network is a group of companies entering into relative contacts with each other (Kay, 1996).

- Network is the institutional form of coordination, supervision, exchange of economic and other relations between the actors (Ebers 1999).

Cooperation between organizations can take many forms, and its scope and intensity are subject to change. Some of the most common forms and models of cooperation are outsourcing, consortia, clusters, strategic alliances and holdings.

Outsourcing is contracted use of resources, assets and skills of third parties with guaranteed level of quality, flexibility and value (Bravard, Morgan, 2010). Outsourcing can take the form of ongoing cooperation, or individual orders for the performance of a specific task. This concept comprises terms such as subcontracting - delegating tasks and worldsourcing - use of IT resources throughout the world. The predominant types of outsourcing is BPO (the Business Process Outsourcing) which is the sector of business services such as financial, accounting or legal services, call centres, etc. and SSC (shared services centres), performing specialist tasks for multiple partners.

In turn, consortium is relationship of several entities, aimed at carrying out large projects, mainly infrastructure and technology-related, requiring significant financial investments and bearing high risk. In practice, they are created to apply for public procurement and joint participation in tenders. A consortium has no legal personality. It is an agreement between the parties involved.

Clusters, according to M. Porter (Porter, 2001) are geographic concentrations of interconnected companies, specialized suppliers, service providers, businesses operating in related industries and associated institutions in particular fields, competing, but also cooperating. According to the OECD clusters are geographic concentrations of interconnected companies and institutions specializing in a particular area of economic activity (Niemczyk et al., 2012). There is a multitude of definitions of clusters, but they always emphasise regional links, the community of cooperating entities and the creation of formal and informal relationships.

Strategic alliances can be of diverse character, from informal agreements between partners to contractual and capital dependencies. They also take different organizational and legal forms, eg. joint projects, joint ventures, etc. Characteristic features of alliances are (Sroka, 2012):

- independence of strategic partners,
- common specific goals,
- fragmentation - an alliance covers only a part of the activities of each of the allies,
- long-term character.

In the case of long-term strategic cooperation an equity alliance in the form of a joint venture is most often chosen.

Holding is a corporation that owns a sufficient amount of another company's stock to influence its board of directors and control its management and policies. A holding company may own companies in its industry or in non-related industries (Webster's New World Finance and Investment Dictionary, 2010). It is one of which single-handedly controls the others, or uses its opportunity to impose its will. In a holding company there is a parent and a subsidiary. The parent company has the ability to influence the decisions taken by its subsidiaries. The main features of the holding company are separate legal personalities of its constituent parties, and the fact that the parent company frequently resigns from business activity.

Research results and discussion

The main objective of empirical research was to investigate the perceptions of employees in technological companies regarding the identification of factors encouraging establishing cooperation between companies for the implementation of IT projects. The studies involved over twenty-five middle and high level employees from the IT sector companies implementing initiatives for global customers. All respondents of the survey sample enjoy regular management level positions in medium and large organizations in Poland and have direct knowledge of ongoing initiatives in their companies. The adopted research model was based on research preceded by analysis of the literature in order to identify the factors determining the establishment of cooperation in the implementation of IT projects. The research itself was carried out using semi-structured interviews (Hove S.E. et al., 2005) due to the high extent of respondents' openness and their frequent use of examples from business practice. The research also allowed gathering wide range of information about practical approach in the field of specific areas in project management – such as: risk management or change management in interorganizational cooperation.

It should be noted that the respondents have very good background knowledge of project management as well as widely understood process of procurement and cooperation, as indicated by the analysis of linguistic aspects (phrases typical of the industry, jargon). The discourse analysis allows exploring the context of action and decision-taking process in cooperation with an external partner. The only selected results of the research divided into two main categories are presented below in a very synthetic way. The first subchapter depicts the main aspects of the determinants establishing cooperation. The second one presents specific activities in the IT initiatives carried out jointly in the layer of project management.

Determinants of establishing cooperation with other entities in the implementation of IT projects.

The first part of the interview concerned the survey respondents' perception of the factors encouraging entering into cooperation with other entities in the implementation of IT projects. Most of the respondents demonstrate the belief that in the current circumstances it is very difficult to carry out projects independently. It is regardless of whether they are IT companies or companies from outside of the IT sector. The respondents indicate that there is always shortage of the domain knowledge or technological expertise thus the absolute necessity of entering into cooperation nowadays. During the interviews, it was pointed out that the conditions and principles of cooperation largely depend on the economic situation of a company that is looking for a technological partner. The form and the manner of cooperation were often considered in the light of economy - sharing the costs and optimizing expenditure. Analysing the responses, it was often pointed out that companies with greater financial background and those with foreign capital look for partners not only from the domestic market.

The following characteristics were dominant and often repeated in the respondents' opinions about the factors determining establishment of cooperation with other entities:

- lack of competence, skills, knowledge of IT in one of the companies,
- recognizable branding and other contacts, partner's business relations making it possible for the technological partner to explore a new area,

- no required credentials and experience on the market - this factor was mainly pointed out in the area of procurement and auctions in which the company participated.

- optimization of costs at the stage of manufacturing by delegating to the partner representing the IT business all work related to the widely understood IT, including the purchase of equipment, licenses and other software.

- complete lack or very few available own resources in the IT area - especially as indicated by the respondents - the project commencement time under current circumstances must be very short - hence especially smaller subcontractors of simpler and flatter structures are highly desirable. Several respondents also indicated that they could not imagine the possibility to react quickly to changes resulting from directives and regulations introduced by the sector specific regulators without a partner company.

It should be finally stressed that respondents pointed to the need to have at least a few subject matter experts in the field in which they work with a partner to achieve an efficient and effective communication and collaboration. They also very often mentioned a takeover of their employees by the partner (by offering more attractive working conditions such as better salaries and broader development opportunities). That was underlined as a certain sort of risk, which was mitigated by legal provisions in the partnership agreements.

The indicated factors influencing the willingness to establish cooperation with other partners in the implementation of IT projects were classified into two separate categories – endo- and exogenous for the company.

Table 2

Factors influencing the propensity to establish cooperation with other partners in the implementation of IT projects

Internal factors (IF)	External factors (EF)
1. High potential of human resources (opportunity to demonstrate one's competence). 2. Lack of specific competence in the team (the lack of a possibility of execution). 3. Lack of specific technology, licenses, available to the partner company. 4. Increasing the scale of operation (in terms of scope and time of the services provided). 5. Pressure on reducing investment costs (cooperation as a form of savings). 6. Experience and confidence (sometimes misjudged) that one is unable to implement the project with one's own resources. 7. Tight schedule of the project, making it impossible to implement the project with one's own resources. 8. Lack of know-how to implement the project. 9. The ability to take the initiative on a larger scale and the higher level of complexity.	1. Introduction of new technology to the market. 2. New legal regulations. 3. The remaining expenditure budget - the possibility to reallocate funds from one year to the shared implementation of tasks with a partner in the following years. 4. The company database, experience of another company and history of cooperation. 5. Strong competition in the industry. Partners have a similar organizational structure and aim at a similar target group of customers , which facilitates networking and cooperation. 6. The ability to obtain financing from outside. 7. Lack of sufficient competence, experience, licenses in one of the companies involved in the project implementation. 8. One company has a better business relationship with the end customer or is obliged, for some other reason, to supply the product. 9. Recognized and respected brand of at least one of the partners.

Source: author's own research

During the interviews, the majority of respondents, as presented in Table 2, indicate the major internal factors as those that focus on areas of competence and knowledge of organization's personnel (IF1, IF 2, IF 6, IF 8). Interestingly, both lack of competence or skills and high potential of the personnel is a catalyst, a stimulator of partnerships. This is due to the inertia of large organizations, where ambitious, talented individuals are not able to take full advantage of their talent and the skills - "working in the IT factories, not high-tech startups" - hence their bottom-up attempt at finding self-fulfilment in collaboration with external entities. In the area of external factors, it is clear that companies look for support in cooperation with other companies with respect to new customer acquisition, market entry (EF4, EF5, EF8, EF9) and use the existing, well-known partner company brand as leverage in the market.

The forms of cooperation indicated in the interviews include: outsourcing, subcontracting, joint ventures, cosourcing. Analysis of the perception of respondents in the area of the most effective forms of cooperation shows that it is a desirable situation when one partner has a leading and dominant role in the project. This allows for quick decisions and reactions to changes without involving the decision makers of each partner. However, this model does not work at high-cost projects, where partners bear a big risk. Then, according to the respondents, an effective form of cooperation is the establishment of a dedicated joint-venture company with a legal personality. "It is an effective form of cooperation as partners engage their resources in the execution of a specific project. They can share costs and exchange know-how. "Another approach used especially in the area of public procurement is a model of cooperation based on the consortium. However, it is outsourcing and subcontracting that was most often indicated as the most popular and predominant type of cooperation. This is due to the relatively simple and not very absorbing formal prerequisites of cooperation. It is worth noting that the respondents demonstrated high level of awareness of the models and forms of cooperation, trade restrictions and the legal and financial capabilities of their organizations. They realized that there was no golden or universally applicable form of cooperation. Often despite awareness that in a particular case, the project could have been implemented (in their opinion) within a different model - they had to adjust to the cooperation strategy of the organization or fixed procedures for selecting partners and establishing cooperation.

Project team form, project management.

Most respondents did not indicate significant differences regarding constitution of the project team and project management in projects carried out jointly. In the course of research they indicated that the use of mature methodologies of project management (eg. Prince2, PMBoK) entirely cover the aspects related to project management, risk, change and so on. They pointed out, however, that the effective cooperation (as described in the sub-chapter 1) requires, depending on the form of cooperation, selection of the lead, dominant partner. According to the respondents the main obstacle is the lack of autonomy in decision-making, any changes must be agreed with partners, which takes time. During the collaboration, there are conflicts between the partners regarding the implementation of projects, most often related to the financing of tasks. Thus, the project steering team, the steering committee must include representatives of all the partners, and the project manager should, according to the respondents, come from the lead partner - which will further legitimize their actions. The few identified specific practices or processes occurring in the management of IT projects carried out jointly with a partner are:

- a clear definition of roles and responsibilities – at the level of manufacturing and the level of management,

- policy of knowledge transferring and sharing - despite sometimes very close cooperation, the companies need to protect their "know-how" and some knowledge - hence it is essential to determine the scope, procedures for the acquisition and transfer of knowledge between partners,

- the escalation path - in a multi-vendor environment it is necessary to establish a clear and fair escalation path within a manufacturing layer and a management one; an interesting practice indicated by the respondents was the use in large, complex projects involving many partners, „a body of appeal" acting as an impartial mediator. When one of the partners felt cheated on the path of escalation, it could appeal against the decision,

- specifying a minimum number of personal meetings – despite the geographical dispersion, it is crucial to teams to have the opportunity to of cycling work in a direct way,

- specifying leading technology stack and solution architecture at the stage of partner selection or at the beginning of cooperation; even the preliminary outline of an approach will enable the IT initiative to recognize the scale of the project and allocate adequate resources,

- access management - cooperation of many partners require access to different resources for different people at certain times. For IT projects carried out jointly respondents indicated a very large time overhead associated with the creation of an appropriate working environment.

Regarding IT projects carried out jointly at the level of management, the respondents discussing in a natural way the specific processes pointed to the limitations and barriers to collaboration.

Table 3

Obstacles, threats in cooperation on IT project implementation

No	name	description
1	Communication problems	Multitude of partners requires a complex, multi-level communication and reporting, which is often insufficient and / or absorbent for each partner
2	Difficulties in supervision	The lead partner usually has limited information about the actual progress and problems of each partner.
3	Organizational culture	Every company has its own work style, its own worked out internal culture of organization and task performing and that may be, in extreme cases, conflicting with other partners.
4	Lack of independence	Partners - especially smaller –do not look for solutions themselves while having problems but escalate them in the simplest way.
5	Different objectives of partners	Each partner may want to achieve different, sometimes contradictory goal (depending on incentives and factors stimulating the establishing of cooperation) – Table 2.
6	Technical culture	It is important aspect as IT projects are very demanding. Different methods, approaches to their implementation may be problematic in the phase of integration of the various components of the solution.
7	Lack of confidence	The fear of losing markets and losses resulting from the transfer of knowledge and unique practices to a partner that can use them only for its own purposes (and sometimes against the partner with whom it currently works).

Source: author's own research

The study results presented in Table 3 help to identify the problems which, according to the respondents, are the most important. While analyzing the data in Table 3 it may be noticed that problems in the area of organization, management, stakeholders or barriers of cooperation of the partners distributed are the main obstacles. The technical domain, a core challenge in IT projects, is only one and it is not the dominant area of obstacles specified in the study.

Conclusions

The article presents selected findings of the empirical research on aspects of interorganizational cooperation of companies implementing shared IT projects. The study is based on the data collected by the use of the semi-structured interview. It focuses on three groups of questions: the identification of factors tending to establish cooperation, adopted models of cooperation and the impact of cooperation on a project management. The study was of pilot character and for this reason it has a number of restrictions on their representativeness. The findings may provide an interesting insight into the real problems of the teams implementing IT projects in cooperation with partners.

Polish companies are aware of cooperation issues. They move in this area in a responsible way owing to their competence and the use of well-known and recognized project management approaches. In many cases they are obliged to cooperate in a less appropriate model but being aware of restrictions and obstacles they look for their place in the IT market.

The study also shows the huge potential for expansion of its scope. It seems that interesting conclusions can be achieved by expanding the research on companies outside the IT industry as well as on others - a narrower field of IT – such as software production or telecommunication projects.

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MICROECONOMICAL IMPACT FACTOR IN PROJECT MANAGEMENT - PROFESSIONAL LIABILITY (INDEMNITY) INSURANCE FOR PROJECT MANAGERS

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Abstract

Project managers have a great deal of responsibilities, whether it's overseeing production, ensuring key objectives are met or working to complete projects on time and on budget. A project manager, however, could also be held responsible for any errors or omissions that a client feels you may have made during the course of your duties.

Many project managers and companies have Commercial General Liability Insurance in place. Unfortunately, these types of policies typically don't cover professional services or advice. As a result, project oriented organisations and project managers' could face legal action and be held personally responsible for any financial damages to the client.

Paper analyse professional liability (indemnity) insurance types and impact factors in project management as risk cost reduction as well as insurance environment in the European Union member state – Latvia. Empirical research and insurance companies' survey shows that there is still different approach of defining project management practices and project managers' responsibility giving their professional services. That leads also to problems what causes by lack of regulatory framework of project management recognition as professional service.

Key words: *Project management, project manager, professional liability insurance, risk management.*
JEL code: *D80, G2, G32, O22.*

Introduction

Risk management is one aspect of project management and like quality management, environmental management and safety management it is about the project or the service we deliver to our clients. Liability management on the other hand is about managing the impact of claims for loss on our business. Project management is described also as activities what implemented in risk environment, what requires to take appropriate management steps to reduce risks at micro-economical level in each project.

Paper analyse project management micro-economical aspects as risk limitation factor choosing professional indemnity insurance for project managers. As a case study author analysed professional liability insurance environment in EU member state – Latvia.

Relevant provisions depend on the nature of the project. However they are usually governed by the conditions specified by the forms of 'model' contracts/agreements issued by professional bodies or those in common use in the construction industry. Typical examples of insurances applicable to construction projects include:

- Contractors' all-risk (CAR) policies, usually covering loss or damage to the works and the materials for incorporation in the works; the contractor's plant and equipment's including temporary site accommodation; the contractor's personal property and that of his employees (e.g. tools and equipment). The CAR policy is normally taken out by the

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contractor but should insure in the joint names of the contractor and the client (employer). The subcontractors may or may not be jointly insured under the CAR policy.

- Public liability policy – this insures the contractor against the legal liability to pay damages or compensation or other costs to anyone who suffers death, bodily injury or other loss or damage to their property by the activities of the contractor.
- Employers' liability policy – every contractor will have this either on a companywide basis, covering both staff and labour, or on a separate basis for the head office and for each site separately.

Professional indemnity (PI) – the purpose of this is to cover the liabilities arising out of 'duty of care'. Typically, the consultants (including the project manager) will require this policy to cover their design or similar liabilities and liabilities for negligence in undertaking supervision duties. In the case of a design and build contract, the contractor has to take out a separate PI policy, as designing is not covered by the normal CAR policy (Code of Practice for Project Management for Construction and Development).

Insurance types and projects

General liability insurance is designed to provide coverage for the insured's legal liability for bodily injury and property damage. Such claims are usually the result of accidents or other fortuitous events. These are commonly referred to as "occurrences." Coverage under these general liability policies are triggered at the time the occurrence takes place. Any resulting claim from the "occurrence" for bodily injury and property damage will likely be subject to coverage under the policy that is in force at the time of the "occurrence" and frequently respond to claims for "economic damages" where there has been neither bodily injury nor property damage. General liability policies usually have exclusions for any bodily injury or property damage that arise from specific activities and services which the underwriter may view as being professional in nature. These exclusions can vary from policy to policy depending on the underwriter. However, the broadest often exclude coverage for not only engineering, architectural and land surveying as a service for others, but can also exclude specifically as a professional service the preparing, approving, or failing to prepare or approve maps, shop drawings, opinions, reports, surveys, field orders, change orders, drawings, or specifications. The most frequent exception to this exclusion is services within construction means: methods, techniques, sequences, and procedures employed by the insured in connection with the insured's operations in their capacity as a construction contractor. There is another exclusion that may be included under some general liability policies called Construction Management Errors and Omissions. This exclusion often applies to claims arising from inspections, supervision and quality control services when then construction work is performed by someone other than the insured or one of their subcontractors.

Professional liability

Professionals are people who, through specific training, education, and experience are recognized as experts in their field. Certain professionals, such as architects, are required to be licensed or registered in order to practice their profession. However, registration or licensing is not a prerequisite for one to be recognized as a professional in all fields. Anyone or any firm that holds themselves out as experts in a particular field can be held responsible for the work,

advice, and counsel provided to others in a professional capacity. A professional is expected to perform their services with a degree of knowledge, care, and skill of an average professional peer, in good standing, and under similar circumstances. This is a frequently referred to as the "Standard of care." A failure to perform to this standard constitutes inegligence. Any damages incurred by the professional's client and potentially others that result from such negligence may be deemed to arise from professional liability.

Professional liability insurance

Commonly known as errors and omissions insurance, professional liability insurance is designed to provide coverage for claims for damages alleged to be the result of the negligent performance of professional services for others defined in the policy. These "claims made" policies can provide extremely broad coverage that may be triggered simply by a demand for money or services alleging a negligent act, error or omission in the performance of professional services. Professional liability policies are usually designed to provide coverage to the insured for both the cost of defending the claim as well as the alleged damages. Claims for professional liability frequently involve an "economic loss" without the existence of any accident or occurrence causing injury or physical damage.

- Covers any liability, whether in contract or through a civil code, that arises out of the professional services of the organisation insured under the policy, including consequential losses.
- Policy triggered by Professional Negligence - Reasonable Skill & Care is the usual standard used to determine whether a professional firm/individual has been negligent.
- Losses claimed could include:
  - –Cost of Redesign (in construction industries).
  - –Cost of Repair/Rectification.
  - –Direct Losses.
  - –Indirect Losses such as financial, consequential and economic losses.

Certain **financial, consequential and economic losses** can only be insured under Professional Indemnity Insurance, and there are other areas where Professional Indemnity Insurance would be the sole policy for certain losses after the construction and maintenance period. It should be noted that Professional Indemnity insurance limits can be eroded by the **legal costs and expenses** often necessary in order to prove that professional negligence has occurred and these expenses can be for significant amounts. For these reasons author believes that a broad form Professional Indemnity Insurance has an important part to play in the **risk financing armoury of any Project oriented organisation.**

Research
Professional insurance environment in Latvia

Table 1

Insurance market in the EU member state - Latvia

Item	4 quarters 2014	1 quarter 2015	2 quarters 2015	3 quarters 2015	4 quarters 2015
Number of insurance companies	7	7	8	8	8
Number of non-life insurance companies	5	5	6	6	6
Number of foreign insurance companies' branches	14	14	14	14	14
Number of foreign non-life insurance companies' branches at end of period from	9	9	9	9	10
Sweden	1	1	1	1	1
Estonia	4	4	4	4	4
France	2	2	2	2	2
Poland	1	1	1	1	2
Lithuania	1	1	1	1	1
Estonia	3	3	3	3	3
Poland	1	1	1	1	0
Lithuania	1	1	1	1	1

Source: Author construction based on The Financial and Capital Market Commission (2016) available data

As we can see in the Table 1 insurance market in the Latvia is considered as small. Market share in Latvia is small as overall business environment in comparison of other EU shows moderate activity of business sector. Meanwhile insurance as risk limitation tool in any economy field just recently increased its significance. Main players by the beginning of 2016 are only 6 non-life insurance companies following by 10 international company branches.

Table 2

Insurance gross premium written and gross claims paid in Latvia (*in thousands of euro*)

Item	4 quarters 2014	1 quarter 2015	2 quarters 2015	3 quarters 2015	4 quarters 2015
Broken Down by Class of Insurance					
Gross premiums written, incl.	**326 915**	**102 129**	**179 207**	**256 864**	**331 960**
• accident insurance	6 773	2 524	4 111	5 762	7 538
• health insurance	32 147	15 608	23 064	31 594	37 254
• land vehicle insurance	65 518	17 311	34 186	51 961	70 152
• railway rolling stock insurance	344	87	122	313	367
• aircraft insurance	202	58	84	84	88
• ship insurance	603	271	445	742	946
• goods in transit insurance	1 973	690	1 054	1 392	1 866
• property insurance, incl.	66 607	26 611	40 160	52 177	66 088

• against fire and natural elements	41 366	19 695	29 407	37 701	48 004
• against other losses	25 242	6 916	10 753	14 476	18 084
• transport ownership liability insurance	84 180	20 625	39 474	58 093	74 174
• aircraft ownership liability insurance	423	101	375	517	614
• ship ownership liability insurance	95	20	33	52	88
• general liability insurance	15 211	4 802	8 706	11 910	15 520
• credit insurance	426	126	275	355	409
• suretyship insurance	8 227	2 223	4 696	7 128	9 907
• insurance against miscellaneous financial losses	518	243	335	467	590
• legal expenses insurance	22	6	14	21	26
• assistance insurance	9 011	1 972	4 399	7 310	9 535
• motor vehicle third party liability compulsory insurance	34 472	8 817	17 596	26 896	36 689
• accepted reinsurance	163	33	80	90	108
Gross claims paid, incl.	**183 589**	**48 855**	**96 453**	**146 834**	**197 997**
• accident insurance	2 262	608	1 292	2 023	2 636
• health insurance	22 268	6 754	13 891	20 010	27 087
• land vehicle insurance	46 232	12 318	23 192	36 071	48 553
• railway rolling stock insurance	107	0	0	0	1
• aircraft insurance	21	0	6	6	17
• ship insurance	1 004	83	81	114	164
• goods in transit insurance	1 773	440	553	624	739
• property insurance, incl.	23 040	5 088	13 484	22 791	31 059
○ against fire and natural elements	17 221	3 303	9 344	16 215	21 566
○ against other losses	5 819	1 785	4 140	6 576	9 493
• transport ownership liability insurance	54 478	13 683	26 881	40 294	54 602
• aircraft ownership liability insurance	0	0	0	0	0
• ship ownership liability insurance	0	0	0	1	1
• general liability insurance	2 238	409	1 125	1 780	2 352
• credit insurance	573	252	262	310	382
• surety ship insurance	869	572	731	1 489	1 354
• insurance against miscellaneous financial losses	68	35	75	90	134
• legal expenses insurance	0	0	0	0	0
• assistance insurance	1 765	610	1 111	1 658	2 169
• motor vehicle third party liability compulsory insurance	26 827	7 982	13 727	19 530	26 697
• accepted reinsurance	65	22	42	42	50
Broken Down by Type of Contract					
Contracts concluded with legal persons					
Gross premiums written	**185 347**	**68 708**	**114 766**	**172 587**	**210 300**
Gross claims paid	**112 471**	**27 525**	**59 021**	**89 706**	**114 050**
Contracts concluded with natural					

persons					
Gross premiums written	**141 568**	**33 421**	**64 442**	**84 277**	**121 660**
Gross claims paid	**71 118**	**21 329**	**37 433**	**57 128**	**83 947**

Source: Author construction based on The Financial and Capital Market Commission (2016) available data

Table 2 shows insurance market share for 2015. As we can see the total premium written in Latvia in 2015 was 331 960 000 EUR. And claims paid was 197 997 000 EUR what describes overall insurance market as profitable. Meanwhile if analysing liability insurance we can see that mostly it's described by law regulated insurances for different professional services. Most project management insurances (mostly construction project management) is issued under general professional liability insurance were premium written in year 2015 was 15 520 000 EUR following by claims paid – 2 352 000 EUR.

Author analysed professional indemnity insurance environment in Latvia approaching insurance companies who manage professional indemnity insurances for different field. Currently there is 16 non-life insurance companies in Latvia what also issues professional liability insurance. According to empirical research results in 40% professional liability insurance for project managers is not an object for insurance. In 27.7% companies can issue a professional liability insurance based on individual evaluation case by case and insurance rules elaborated individually for each insurance case. Meanwhile 33.33% applies general rules for professional liability insurance (Fig.1).

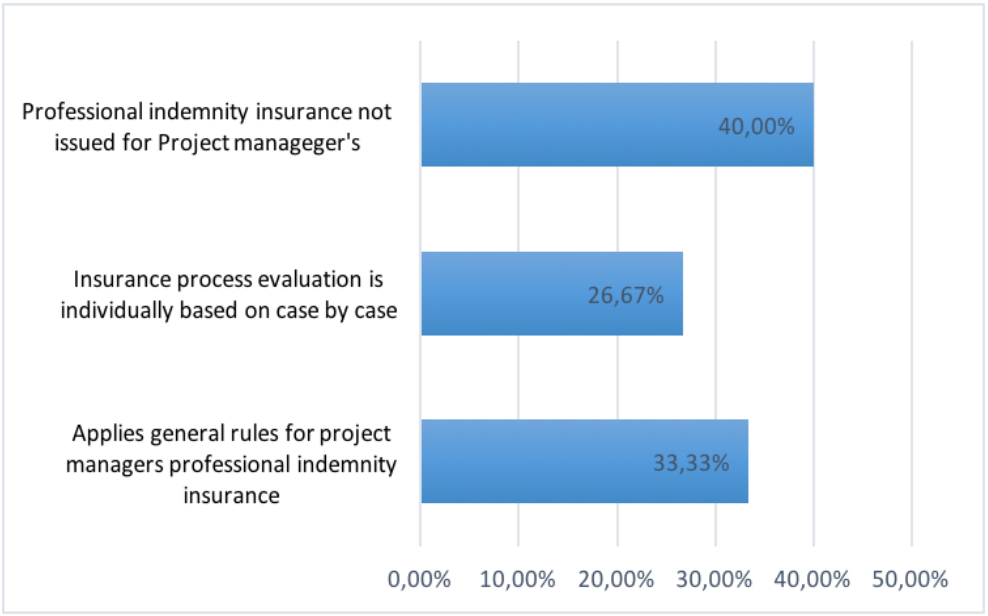

Fig.1. **Project managers' professional indemnity insurance environment in Latvia (n=15)**
Source: Authors construction based on empirical research

To analyse above mentioned figures author concludes that in most cases there is lack of understanding of professional indemnity also in insurance industry. According to expert interviews only in view cases was referred that insurance is issued for project managers outside

construction industry and most of professional liability insurance cases (33%) is related to the construction projects).

This leads to deeper analysis of legislative framework and practical application of professional liability insurance as a micro-economical tool and aspect for a risk limitation activity in the project implementation. Common aspect is that professional liability insurance applies to professional services and there is still no common understanding and regulation whether project management is professional service or not.

In this case there is no problem for construction industry as that is defined as professional service and recognised by the laws and regulations:

- On the Regulated Professions and the Recognition of Professional Qualifications
- Construction law
- Regulation on construction specialists and constructors' professional liability insurance

Construction Law section 20 regulates insurance according such rules:

- A performer of construction work has a duty to insure its civil legal liability for harm caused to the life or health of a third party or losses caused to the property as a result of its activity or failure to act. If a construction permit is necessary for the performance of construction work, the civil legal liability of the performer of construction work shall be insured for the whole term of performance of construction work.
- A contract regarding insuring civil legal liability shall be entered into either in relation to all construction objects and renewed each year, or anew, or also in relation to each individual construction object.
- Losses caused to the property of the third party are evaluated in conformity with the laws and regulations regarding insurance. The amount of the insurance compensation shall be determined by agreement of the parties.
- The issuer of the construction permit shall verify existence of the mandatory insurance of the civil legal liability of the performer of construction work.

Meanwhile law On the Regulated Professions and the Recognition of Professional Qualifications regulates overall requirements for regulated professions (also those - defined as a professional service).

The following additional requirements may be put forward in the law or Cabinet regulations for the commencement of work, independent activities in a profession or for activities in the status of a self-employed person for individual regulated professions:

1) the giving of an oath or solemn declaration;

2) the observation of the professional code of ethics;

3) an appropriate reputation, a person does not have a criminal record, he or she has not been imposed administrative fines or disciplinary measures in relation to violations of the norms of the relevant professional activities;

4) adequate health;

5) insurance against civil legal liability or financial risk;

6) an appropriate level of knowledge of the official language;

7) regular repeated professional certification (re-certification) or attestation, which is performed after a specific period of time; or

8) additional provisions for activities in the status of a self-employed person, including the necessity of a special licence for separate types of activities.

Also if temporary professional services in the regulated profession in the Republic of Latvia are provided, using the professional title or the title of the professional qualification of the home country, the provider of the temporary professional services has a duty to provide the following information to the recipient of services:

- the registration number of the service provider or an equivalent means of identification in the Commercial Register of the home country or equivalent state register, indicating the title of this register;
- the title and address of the supervisory authority of the service provider in the home country;
- the title of the professional association or register, in which the service provider is registered;
- the professional title or the title of the professional qualification of the service provider;
- the registration number of the service provider in the register of persons subject to value added tax in the home country, if the service provider is a payer of value added tax; and
- professional liability insurance or equivalent guarantee of professional liability.

These cases highlight the difficulties with classification of work as professional or general services when the negligent act in question does not definitively involve damages or injuries resulting directly from engineering, design, or management work, but instead involves damages arising from other tasks performed by a professional that may (or may not) have a connection to its design, engineering, or management functions. Conversely, as the prevalence of "professional services" exclusions in general liability policies issued to contractors' attests, parties not formally charged with the project's design or engineering responsibility often face serious "professional services" risks, which are exacerbated by newer delivery systems. So, how should the prudent insured address these risks? A key starting point is to understand how "professional services" and "wrongful acts" can be defined in policies available to insureds, as discussed next.

As project manager profession is not regulated by laws or regulation also Latvian court has difficulties in their cases recognize project management as professional service even if there is law regulated standard of project manager profession. As a conclusion of analysis of professional liability insurance application for project managers author elaborated impact environment model for project management.

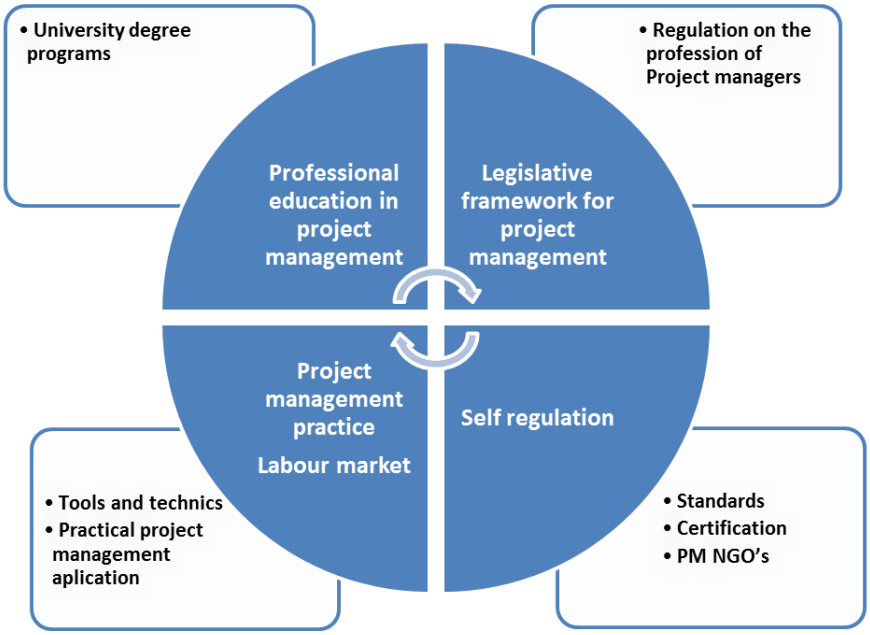

Fig.2. **Project management as a professional service recognition impact environment**
Source: Author constructed model

As author analysed before (Pulmanis 2011, 2013) one of the impact factor for professional liability insurance usage is whether project management is defined as professional service. To fully develop professional project management system in any country there is several conditions and rules what should be implemented to meet all criterions for further project management recognition as professional service.

First there should be well development educational system for project management – university degree programs in project management. Currently in Latvia project management studies are linked with profession standard of project managers making project management studies as 5th level higher education – professional master degree in project management.

Second professional organisations, social partners and responsible government organisations should develop legislative framework for project management and/or project manager's profession. As author analysed in his earlier publications one of approach could be inclusions of project manager's profession in the Law on the Regulated Professions and the Recognition of Professional Qualifications. As above mentioned law initially was aimed only to fulfill European Union common regulation on the labour market free mobility within EU and nowadays approach is to decreases limitation for labour mobility this law can't be a tool of project managers' profession recognition. Following development activities of different industries and their recognition processes one of solution could be elaboration of special law for project management, like "Law on professional activity of project managers" where would be described all project management services and professional aspects of project managers' work. At the moment by the laws and regulations in Latvia is regulated professional standard of project managers' profession and project management specialists in the construction industry (construction law, Cabinet of Ministers regulation on construction specialists' professional

liability insurance requirements).

Third, as project management still considered as self-regulated profession and project management professional organizations has elaborated many standards, developed trainings programs and certification systems, professional community of project managers should also make a step forward to recognize our services as professional. This could lead to serious lobby actions in public discussion with governmental entities.

Fourth is practical application of project management tools and methods as well as understanding raise in employers'. Very often many business entities use project manager profession name for the positions what actually is not close to what normally project manager do. This problem especially arises in marketing industry. Project managers' profession name is attractive to many employers' and sometimes its sounds better than marketing specialist, PR specialists or etc.

Professional liability insurance is specifically intended to protect against liability from errors and omissions that are committed while carrying out "professional services," including, depending on the policy definitions, those identified above. Certain policies define these errors and omissions as "wrongful acts," others classify the conduct as "professional negligence," and others contain no particular definition for conduct that is outside the realm of acceptable work other than to call it a negligent act, error, or omission in the performance of professional services. "Professional services" may be defined as any services performed in certain capacities, including:

1. Architect
2. Engineer
3. Land surveyor
4. Landscape architect
5. Construction manager
6. Scientist

Recognizing the limit in availability and lack of certainty for principals in relation to the insurance contract terms of the consultants, the principal may wish to consider initiating insurance policies themselves. These policies may cover either all consultants involved in an individual project or those involved in a program of projects. In these models, the principal has control over the determination of the scope, excess, etc. of the insurance policy. Such a system may relieve the principal from the requirement to check the currency and policy cover of individual consultants except where a basic level of insurance is provided by the consultant. As public sector principals are believed to have a lower level of events leading to claims on consultants' PI policies compared with commercial sector clients, this should be reflected over time in the premium cost for such policies. The lower level of events reflects the other risk management processes that public sector contract principals have in place such as pre-qualification of suppliers and well established contract procedures (Australian Procurement and Construction Council).

Even if there is still market and companies what offers professional liability insurance for project managers, there is no increasing demand sign from industries which implements projects and programs. That could be described because of additional expenses what insurance costs, but not always project owners and managing staff understand that insurance could be as factor for risk cost reduction.

The use of the titles of the regulated professions specified in the Law and the specialties, sub-specialties or additional specialties thereof is only permitted in cases where the relevant

person has an adequate evidence of education and formal qualifications specified by law. As a project managers' profession is not regulated and considered as self-regulated there is no any protection of using project managers' title in positions what actually is far away from that what really project manager shall do.

Conclusions

The liabilities facing contractors are ever-changing with new and evolving project delivery methods, technologies, regulations, and customer needs and expectation. It is now extremely difficult for a contractor to avoid exposures to professional liability that may or may not have been anticipated. It is also likely that yesterday's risk management and insurance programs may not adequately address the exposures in today's environment. Accordingly, it is imperative that a contractor seek advice from a team of risk management and insurance needs. Expert knowledge of the contractors business and industry is essential in order to craft risk management and insurance solutions that include professional liability.

Meanwhile there is big discussion regarding whether project management is considered as professional service as it's not regulated by laws or regulations. To increase professional liability insurance usage in project management we should first recognize "professional service" aspects in the project management.

This leads also to general application of project management tools and methods, as well as wide usage of project managers' profession title in sectors and positions what is far related to project management or to duties what project managers shall do according to professional project management standards. Also project management field should increase their demand for professional indemnity insurance as it could be tool for risk cost reduction.

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THE TOOLS OF CONTROLLING IN THE CONTROL SYSTEM OF PROJECT MANAGEMENT

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Abstract

Controlling is a tool to support effectiveness of business management. Under objective conditions, markets are becoming more global with new competitors, product life cycles are shortening, customers are more demanding and the complexity of technology is increasing. In order to increase the effectiveness of an enterprise's activity in the present economic conditions new methods of supervision are necessary corresponding to the complexity of external and internal environments of enterprises. Controlling is an integral aspect of management. The purpose of this paper is to study application of the controlling in project management of small enterprises. Contemporary organizations are increasingly using the project approach for development of their business, where the project control and the controlling are playing significant role in the success of the project.

Key words: *controlling, financial controlling, project management, project control*
JEL code: *M10, M20*

Introduction

The globalization of economic communications, information technology development, technological progress, competition and market requirements are processes which characterize the present stage of the world economy development. For the survival and development of the enterprises, especially small ones, they must adapt not only to rapidly changing environment conditions, but also to the speed of the changes. Tasks that enterprises tackle are associated with strategic changes and renewal of production, finding new markets and good sales channels, cost management and cost reduction, development of alternative strategies, and improvement of competitiveness. Solving these problems requires strategic vision and competences of the business managers. Therefore, the management of enterprises must pay attention to the modern concepts and approaches of business management where the controlling plays a key role. Consequently, the balance between control and flexibility becomes the main point in the modern controlling process. Controlling is a tool of support for the effectiveness of project and business management.

In spite of the existence of a broad range of research covering the problem of controlling development and implementation, published by international authors, the problem is the still low level of interest both among the Latvian industry and scientific society. No complex view on progressive controlling implementation in management of the Latvian industry has formed, even though it could become the tool transforming the industrial map of Latvia and increasing industrial effectiveness in a modern economy based on knowledge.

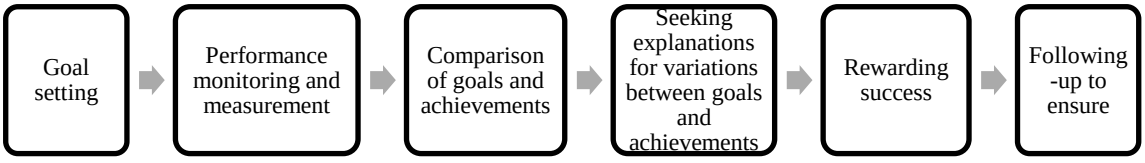
The purpose of this paper is to study the issues of application of the controlling approach in project control and cost management. The subject of the study relates to the project management control system. The subject of the research is the use of financial controlling tools in project management. The methodological basis for the article is made up of scientific literature analysis of foreign authors and research carried out by the authors of this paper. The listing of literature provides references to works of Latvian and international authors, and sources of publicly available information.

The control and controlling models

The stages of controlling process

The modern enterprise is a complex system that has developed on the basis of scientific and technical progress, the rapid changes in the external environment and highly competitive environment. In these conditions achievement of their strategic targets is not a simple task. For the operative decision-making, every manager needs timely and relevant information about the changes occurring both in external and internal environment of the enterprise, therefore enterprise management system must be constantly improved. Consequently, according to goals formulated, time span and measure of tasks to be solved, operative or strategic controlling could be chosen. Both strategic and operative controlling have similar goals, but they differ in the modeling used for said purposes. Controlling could carry out the control process over achieving both strategic and operative goals of enterprise activities. They also differ in tasks and applied tools. Strategic controlling is a management activity that comprises the planning, testing, implementation and monitoring of strategies analyzing the following: internal and external environment; competition policy, main factors (clues) of success, strategic portfolio creation, analysis of strategic plans and parameters of performance assessment available, analysis of chain of values, analysis of strategic statement, analysis of costs, connecting with basic factors. Operative controlling is a management activity that comprises the fixing of objectives, budgeting and controlling in the medium-term, its goal is the creation of an adequate management system and it tries to optimize the proportion of costs/profit. Operative controlling leads to short-term effectiveness, it controls profit margin, costs, liquidity and productiveness. (Horvath P., 2006) Controlling involves the action designed to ensure that an entity is successful in achieving its objectives. In an organization, this usually involves managing people in such a way as to elicit their best efforts on behalf of the organization.

In each company, there are four hierarchical levels of management: material, operative, strategic and intellectual. These levels of management are responsible for tasks connected with running the enterprise. The first two levels (material and operative) are concerned with operative controlling and the last two levels (strategic and intellectual) are concerned with strategic controlling. Therefore, the controlling hierarchical perspective includes the levels of strategic planning, managerial control and operational control. The controlling process consists of various stages (Fig.1). Controlling is also viewed as an integral part of managerial responsibilities and activities. Thus, controlling is not something performed after the fact, but a continuous function performed along with other functions (planning, organizing and directing) necessary for the success of the organization. It is widely recognized that management's functions include planning, organizing, staffing, directing and leading, controlling, and coordinating. It is the management's responsibility to put enterprise resources to use, sometimes taking risks, to achieve the goals of the organization, be it to earn a profit (in the private sector) or to provide a social service (in the public sector).



Source: prepared by authors based on the classification

Fig.1. **The main stages of the controlling process**

Management sets goals and formulates policies, develops plans to achieve goals within the framework of the entity's policy guidelines, implements programs of action designed in accordance with the plans, maintains information systems to report progress towards achieving the specified targets, and reviews the results of all of these activities, identifying needed changes to goals, policies and plans. (Garrison, R., Noreen, E. Seal, W., 2003)

Robert Mautz and James Winjum describe various concepts of control from a historical perspective and distinguish between accountants' views about control and management's views. (Mautz, R., 1981) They point out that management's concept of control is much broader than that traditionally espoused by accountants. Most current definitions of control refer to the strategy process in the same way. Roberty Anthony defines management control as "the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's objectives" and later as "the process by which managers influence other members of the organization to implement the organization's strategies". (Anthony, R., 1964)

Management controls benefit rather than encumber management and must make sense within each organization's unique operating structure and environment. Managers are responsible and accountable for the quality and timeliness of program performance, increasing productivity, controlling costs, protecting resources, mitigating adverse aspects of operations, and assuring programs and functions are managed with integrity and in compliance with laws. Control is concerned with ensuring that the plan is followed. Notably, the accounting function plays a major role in the control phase. Accountants maintain the databases and prepare the reports that provide feedback to managers. The feedback can be used to reward particularly successful employees, but more importantly, the feedback can be used to identify potential problems and opportunities that were not anticipated in the plan. Based on feedback, it may be desirable to modify the plan. The feedback can be also used to identify parts of the organization that need help and those parts that can provide advice and assistance to others. Anthony defines "managed costs" in making a distinction between management control and technical control. Management control involves the whole organization and includes those parts of the organization where managed costs are significant. (Anthony, R., 1964)

Technical control involves only activities where there are no significant managed costs. Management control covers the whole organization, where technical control relates to subunits, or activities of subunits. The focus of management control has changed over the years. Historically, the focus of management control was accounting, based on financial information. Factory accounting, budgeting and cost accounting were the main activities performed. Management accountants provided support in areas of planning and control using financial data. Non-financial data was used only in providing financial advice. The term "control" is used in a wide variety of situations to describe many different phenomena. Consequently, different disciplines use the term differently.

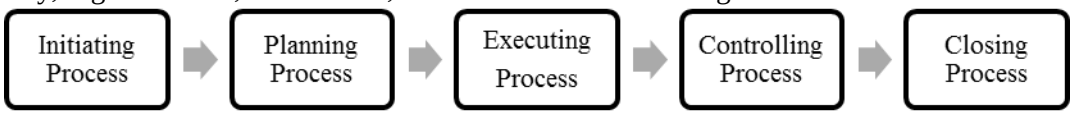
There are two concepts of controlling – German and American. The German concept is based on the internal aspect, and the American concept includes the external accounting systems, such as financial accounting. In U.S.A, the record is limited to operational information to the management of the company through the accounting system. The American model of controlling focused on external users, and so it is based on the audit and the audit approach. In German-speaking countries the controlling function is seen as a service function – support for managers in the strategic and operational management processes. The German controlling is

first and foremost a set of tasks related to the planning, the integrated information management system for tracking data. Controlling is the whole process of defining objectives, of planning and controlling (in the sense of steering and regulating) and includes all relevant financial and commercial aspects, in the words of Peter Horvath. The German definition is close to Anthony's concept of management control. Controlling involves monitoring, evaluating departmental, and staff activities on an ongoing basis, and taking appropriate corrective action when necessary. It is impossible to control departmental and staff activities without having a set of plans, standards and guidelines against which to compare actual performance. Senior management's monitoring activities are designed to monitor adherence to information systems policies, standards and procedures.

Stages of project management process

The project management approach is relatively modern. It is characterized by methods of restructuring management and adapting special management techniques, with the purpose of obtaining better control and use of existing resources. The rapid rate of change in both technology and the market has created enormous strains on existing organizational forms. Project management has long been discussed by corporate executives and academics as one of several workable possibilities for organizational forms of the future that could integrate complex efforts and reduce bureaucracy of the traditional business organizational form.

Projects and project management processes vary from industry to industry; however, there are more traditional elements of a project. The overarching goal is typically to offer a product, change a process or to solve a problem in order to benefit the organization. Project Controls encompass the people, processes and tools used to plan, manage and mitigate cost and schedule issues and any risk events that may impact a project. Project control is substantially equivalent to the project management process stripped of its facilitating subprocesses for safety, quality, organizational, behavioural, and communications management.



Source: authors construction based on literature analysis

Fig.2. **The main stages of project management process**

Project Management Institute, Inc. (PMI) defines project management as "the application of knowledge, skills, tools and techniques to a broad range of activities in order to meet the requirements of a particular project." The process of directing and controlling a project from start to finish may be further divided into basic phases:

1. Project conception and initiation. An idea for a project will be carefully examined to determine whether or not it benefits the organization. During this phase, a decision making team will identify if the project can realistically be completed.
2. Project definition and planning. A project plan, project charter and/or project scope may be put in writing, outlining the work to be performed. During this phase, a team should prioritize the project, calculate a budget and schedule, and determine what resources are needed.
3. Project launch or execution. Resources' tasks are distributed and teams are informed of responsibilities. This is a good time to bring up important project related information.

4. Project performance and control. Project managers will compare project status and progress to the actual plan, as resources perform the scheduled work. During this phase, project managers may need to adjust schedules or do what is necessary to keep the project on track.
5. Project close. After project tasks are completed and the client has approved the outcome, an evaluation is necessary to highlight project success and/or learn from project history.

Table 1

Main activities of project management process stages

Stages	Main activities
Project initiation	• Selection of the best project given resource limits • Recognizing the benefits of the project • Preparation of the documents to sanction the project • Assigning of the project manager
Project planning	• Definition of the work requirements • Definition of the quality and quantity of work • Definition of the resources needed • Scheduling the activities • Evaluation of the various risks
Project execution	• Negotiating for the project team members • Directing and managing the work • Working with the team members to help them improve
Project monitoring and control	• Tracking progress • Comparing actual outcome to predicted outcome • Analyzing variances and impacts • Making adjustments
Project closure	• Verifying that all of the work has been accomplished • Contractual closure of the contract • Financial closure of the charge numbers • Administrative closure of the paperwork

Source: A Guide to the Project Management Body of Knowledge (PMBOK® Guide)—Fifth Edition

Classical management is usually considered to have five functions or principles: Planning, Organizing, Staffing, Controlling, Directing. Project management is the planning, organizing, directing, and controlling of company resources for a relatively short-term objective that has been established to complete specific goals and objectives. Furthermore, project management utilizes the systems approach to management by having functional personnel (the vertical hierarchy) assigned to a specific project (the horizontal hierarchy). The project manager does not staff the project. Staffing is a line responsibility. The project manager has the right to request specific resources, but the final decision of what resources will be committed rests with the line managers. Moreover, not all industries have the same definition for a short-term project. Long-term projects, which consume resources full-time, are usually set up as a separate division or simply as a line organization.

The project management is designed to manage or control company resources on a given activity, within time, within cost, and within performance. Time, cost, and performance are the

constraints on the project. If the project is to be accomplished for an outside customer, then the project has a fourth constraint: good customer relations. (Kerzner, H. R., 2013)

Project controls are the data gathering, management and analytical processes used to predict, understand and constructively influence the time and cost outcomes of a project or program, through the communication of information in formats that assist effective management and decision-making. In general, the basic elements and directions of activities of the project costs control are cost management, project budgeting, project cost estimating and analysis, life cycle cost analysis, cost reporting and analysis, cost performance index, analysis of resource management.

Project controlling activities

Project Monitoring and Control activities take place in parallel with project execution process group activities. The project is observed and measured regularly against the project plan to ensure that the project is within acceptable variances of cost, schedule and scope, and those risks and issues are continually monitored and corrected as needed. According to the Project Management Body of Knowledge (PMBOK), "the Monitoring and Control Process Group consists of those processes performed to observe project execution so that potential problems can be identified in a timely manner and corrective action can be taken, when necessary, to control the execution of the project."

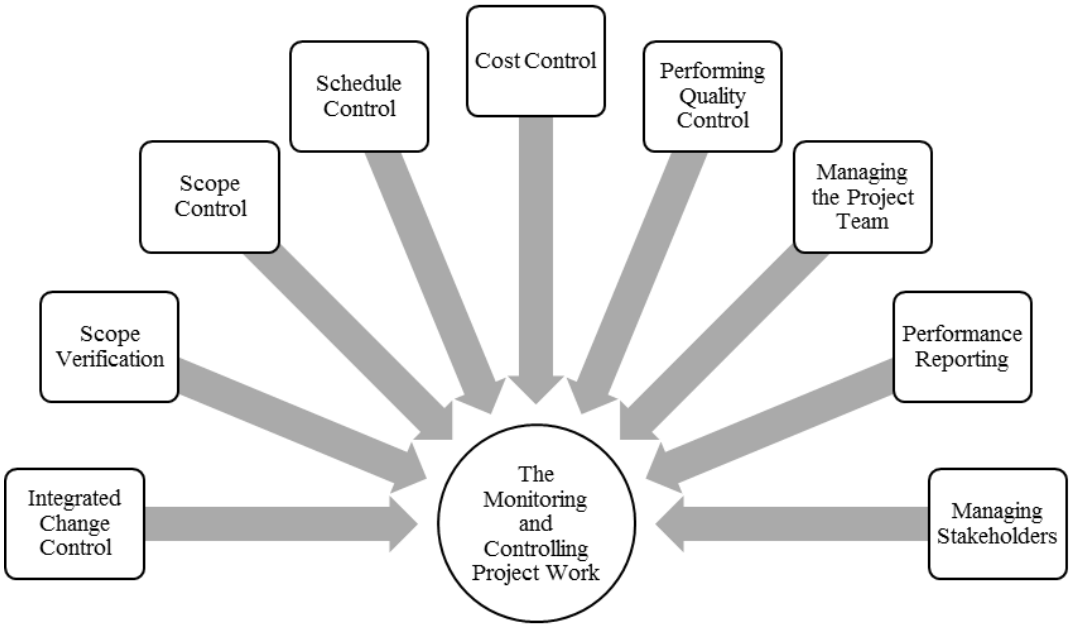


Fig. 3. **Monitoring and Controlling Project Work process**

The monitoring and controlling project work process collects measures and disseminates performance information, and assesses measures and trends to forecast potential items requiring corrective action. This includes monitoring project risks and ensuring that they are being managed according to the project's risk plans. The integrated change control process ensures that changes because of project corrective actions and other controlling factors are managed across the project knowledge areas. Integrated change control takes place throughout the

project, from project initiation through project closure. The scope verification process ensures that project deliverables are formally accepted. The scope control process ensures that changes to project scope are controlled. The schedule control process monitors and controls changes to the project schedule.

The cost control process monitors and controls costs and changes to the project budget. The quality control performance process measures specific project results to determine whether the project is meeting quality standards. This process tracks team member performance, provides feedback, resolves issues and coordinates changes to maintain and improve project performance. The performance reporting process collects and distributes performance information - including status reports, progress reports and forecasts. This process manages stakeholder communications and works with stakeholders to ensure that requirements are satisfied and issues are proactively resolved. The function of controlling is maintained by the management control system.

Table 2

Objectives, tasks and tools of controlling and project management control

	Controlling	**Project Management Control**
Objectives	• Systematic determination and creation of objectives • Development of strategies • Management consulting in economic, legal and tax matters • Creation of planning, control and information supply systems • Quick adjustment to changing environmental conditions • Systematic coverage of information • Systematic creation and increase of scope, acquisition and provision of information	• To measure the performance of the project and address change requests, recommended corrective and preventive actions, and implement defect repairs.

Tasks	• Planning and control of strategic or operational objectives • Financial planning and supervision • Planning and control of resources or material • Management consulting • Definition of planning period, planning instruments and methods • Organization of the planning sequence, documentation of planning activities • Success-oriented plans assessment • Consolidation of partial plans to company plan • Determination of information sources, definition of information instruments and methods • Supervision of realization, analyses of demand on information • Supervision of realization, planning and coordination of partial budgets • Supervision and checking of keeping the budgets • Development of an internal discrepancy analysis coverage	• Performance measuring • Performance reporting • Identify and control changes • Verify and control scope • Control schedule • Control cost • Control quality • Risk monitoring and control • Take corrective action • Update PM plan • Update actions and changes • Inspections • Accept/Reject work • Identify & analyze trends • Look for new risks • Assess variances for change or corrective action • Manage Stakeholders • Contract administration • Use quality control tools • Project performance appraisals • Perform earned value calculations
Tools	• Management accounting • ABC costing • Target -costing • Budgeting • Planning of the income statement • Profit analyses • Long-term planning cash-flow calculations tentative balance sheets • Flowcharts • The financial plan break-even analyse • Gap -analyse • CVP -analyse • Cost calculations and analyse	• Performance measurement and tracking techniques (e.g. PERT, EV, CPM) • Project control limits and thresholds • Project performance metrics • Cost analysis techniques • Project plan management techniques • Change management techniques • Integrated change control processes • Risk identification and analysis techniques • Risk response techniques • Problem solving techniques (e.g. root cause analysis) • Reporting procedures

Source: authors construction

The main purpose of monitoring and controlling activities is to be proactive in finding issues ahead of time and taking corrective action. Corrective action can require revisiting planning process group and updating the project management plan as needed with the ultimate goal of bringing the project back in line with project objectives and constraints and improving future execution to avoid repeating the same issues.

There are many definitions of project controls user across industries and indeed across companies within industries. By APM definition, the field of project controls is defined as follows: Project controls are the data gathering, management and analytical processes used to predict, understand and constructively influence the time and cost outcomes of a project or

program; through the communication of information in formats that assist effective management and decision-making. Project controls encompass the people, processes and tools used to plan, manage and mitigate cost and schedule issues and any risk events that may influence a project. The execution of a project is based on a robust project plan and can only be achieved through an effective schedule control methodology. Furthermore, it is widely recognized by executives and scientists that planning and monitoring plays a major role as the cause of project failures. The project performance can be improved if dedicated project controls systems are in place. An IBC 2000 project control best practice study carried out by IPA identified that good project control practices reduce execution schedule slip by 15%. Project controls cost range from 0.5% to 3% of total project, (including cost accounting), therefore, to break even, project control needs to improve cost effectiveness by around 2%. (Stephen, J., 2015**)**

Costing methods in costs management

Cost accounting can be defined as the collection, assignment, and interpretation of cost. With specific order costing methods, each separate piece of work is a cost unit.

Table 3

The costing methods in costs management

Costing methods	Feature of costing methods
Absorption (Full) Costing Method	• Financial accounting uses full or absorption costing to value stocks. In other words all manufacturing or production cost is charged to work in progress, then to finished goods before entering the profit and loss account as cost of goods sold. This definition of stock values complies with most financial accounting guidelines and tax regulations. Absorption costing in a modern standard cost system tends to produce a multitude of false alarm signals and adjustment items, whenever actual volumes differ from plan.
Variable Costing Method	• For management accounting purposes, however, many companies use only variable costs to value stocks. (Kaplan R., Atkinson A.,1998) In this technique fixed manufacturing cost, which usually includes much of manufacturing overhead and may include even such items as direct labour, is charged as a period expense directly to the profit and loss account. In most circumstances, variable costing produces more relevant information for decision-making and for planning and control.
Marginal/Direct costing	• The disadvantages of the traditional full cost approach have been long understood in theory. The growth in indirect cost as a proportion of total manufacturing cost in the last forty years gradually made the resulting errors unacceptable in practice. This led initially to the growth of marginal or direct costing in which only variable or direct product costs were traced to individual products. Marginal/direct costing still has a role in deciding how to allocate scarce company resources among products and, under special circumstances, in pricing decisions.
Multi-level Contribution Costing	• Multi-level contribution costing attempts to push product, product group or business area information as close as possible to individual products without arbitrary allocation. This method combines a double approach. • If cost cannot be allocated to individual products, it allocates them to the smallest relevant groups of products. • It divides overheads into two categories: directly allocable or non-directly applicable. It then allocates them with a traditional direct cost based method

Cost Attribution by Activity Based Costing (ABC)	• Activity Based Costing (ABC) defines categories of activity in overhead departments, which on the one hand are recognisable to overhead department managers but, on the other hand, are driven by factors (cost drivers) which are characteristic of products and other cost objects. This has allowed a much higher proportion of total company cost to be allocated to products more strictly according to causation. ABC is a two-step process with variety of cost drivers from which to choose when explaining the costs of an activity.
Standard costing	• The majority of the International companies use some sort of standard cost system. It is even accepted for external reporting to tax authorities and shareholders. Standard costing is both a simplification and an analytical tool. Pure actual cost systems become impossibly complicated and produce less relevant information for planning and control. (Martin, J.,2001)

Source: authors construction

This is the case in job costing and in contract costing. With continuous operation costing methods, however, costs are identified with continuous work over time (rather than with a specific piece of work), and then averaged over all units of output in the particular time period. This is the case with process costing and with operation/service costing. A manager will need to understand different theories or concepts about costing (Table 3). Two major accounting developments, used by controlling in Germany are the following: the first concept, called Einzelkostenrechnung, was highly influential in the academic field and involved assigning all expenses directly to cost objects; the second concept, called Grenzplankostenrechnung (GPK), is still in use today. The main idea behind GPK is the responsibility centre. Responsibility centres play a key role in manufacturing firms when it comes to managing cost. GPK helps keep the cost centres in check in areas such as cost planning and cost control, while measuring efficiency.

Interaction of financial system of controlling and cost management in project management control system

The financial controlling comprises the main processes such as cost accounting, budgeting, project investment assessment, cost recovery, where each process contains a number of subprocesses.

Table 4

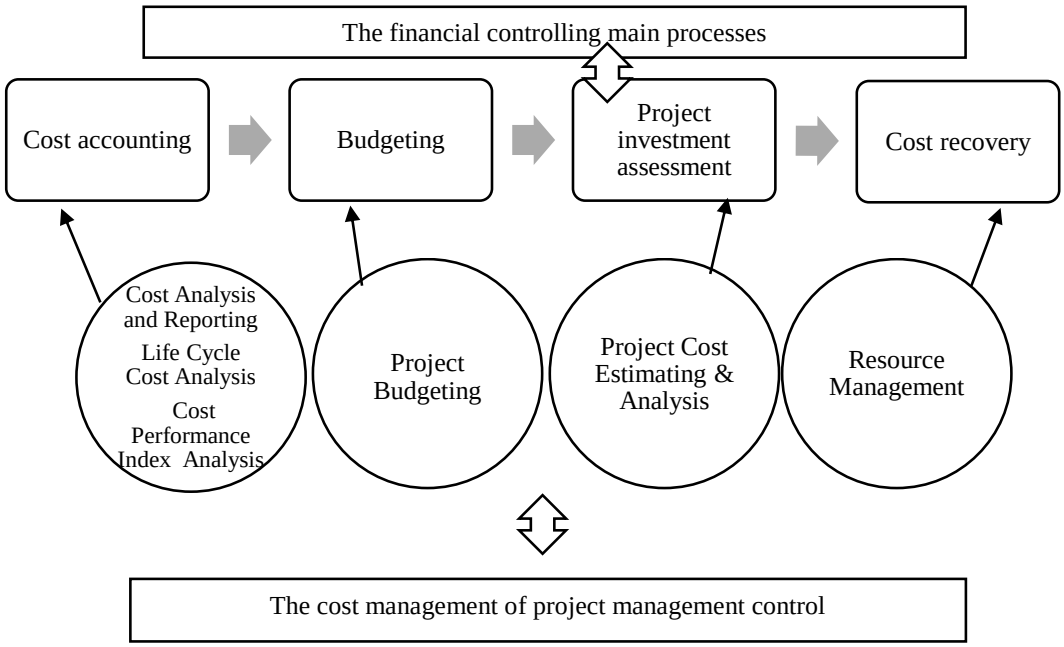
Process	Subprocesses	Process	Subprocesses
Cost Accounting	• The choice of costing system • Cost classification • Cost categorization • Cost units • Cost accounting methods • Stock valuation methods	Budgeting	• Budgeting benefits • Budgeting inputs • Budgeting types • Budget review
Cost recovery	• Transfer pricing methods • Billing	Project Investment assessment	• Net present value • Payback period • Return on investment • Total cost of ownership

Source: authors construction

Data collection and information processing capacity in financial accounting module are largely driven by external reporting requirements and financial management needs. Information technology and staff capacity are generally sufficient for current billing and accounting purposes, but would likely require enhancement to be able to support the additional tasks associated with decision support analysis.

Current revenue and cost data represent potential building blocks for expanding cost accounting analysis. The current service and outcome data represent a greater challenge for the project. Successful implementation of a decision support software system of controlling requires further extending on the existing incentives and capacity in information technology, data development, and staff capacity.

The main processes of the financial controlling and cost management of project management control are shown in Fig.4. Interaction of the controlling and cost management in project management control is carried out via a system of financial controlling.



Source: authors construction

Fig.4. **Main processes of financial controlling and cost management of project management control**

Conclusion

The wide range of challenges such as market globalisation, increasing focus on core competences, greater customer-orientation in terms of products and services, as well as advances in information and communications technology have set new requirements for management and controlling. In other words, controlling now fulfils an essential service function with regard to the management of an organisation.

In today's world the traditional boundaries between management and controlling are slowly disappearing, and as a result controlling plays an increasingly important part in all executive tasks. Controllers and managers now form a symbiosis, thus controlling largely

depends on cooperation between these two groups. The traditional tasks of a controller are as follows - project controllers manage the financial aspects of projects for clients and organizations in a wide range of industries. They are financial managers who oversee project revenues and expenditures to verify that projects are completed on time and within budgetary guidelines. Typical work duties may include preparing and presenting financial statements, creating annual project budgets and forecasts, and supervising employees in finance departments. Project controllers may manage the financial services for designated clients or projects. They may perform project monitoring and data collection to determine if a project is progressing according to budget. This may include conducting project audits, managing project schedules, and overseeing regulatory compliance issues. Project controllers may also be authorized to make or approve project expenditures. In large organizations, project controllers may act as consultants to project management teams or manage accounting departments. They may also serve as liaisons between management and clients or between the finance department and project managers. Project controllers may also perform financial research, manage a project's general ledger, and/or monitor a project's cash flow.

The main purpose of monitoring and controlling activities is to be proactive in finding issues ahead of time and taking corrective action. Corrective action can require revisiting planning process and updating the project management plan as needed with the ultimate goal of bringing the project back in line with project objectives and constraints and improving future execution to avoid repeating the same issues. Project Controls encompass the people, processes and tools used to plan, manage and mitigate cost and schedule issues and any risk events that may impact a project. Project control is essentially equivalent to the project management process divided on its facilitating subprocesses for safety, quality, organizational, behavioral, and communications management.

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ON COMPETENCES IN PROJECT MANAGEMENT AND LIFE-LONG LEARNING – EU STANDARDS - APPROACHES WITH THESAURI AND COMPETENCE MODELS

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Abstract

There is a long tradition to shape project management by developing selected competences of project team members using standards like ICB (IPMA 2015: IPMA Individual Competence Baseline). Today such standards are confronted with strong competence models pushed by the EU to stimulate employment and open job markets – the scope of these models includes all kinds of life-long learning. Here the new DISCO competence thesaurus (DISCO, 2016) already offers about core 10.000 competence terms in 11 languages. DISCO and ICB are overlapping – and bridges are to be discussed. The thesaurus concept can also improve ICB. For all these approaches we need additional models to describe competence development.

Key words: *project management, competence management, competence thesaurus, ICB, DISCO*
JEL code: *O22*

Introduction

In ICB 4 there are 29 selected competences to shape project, program, and portfolio management. The ICBs of IPMA are focused to support the IPMA certification. There are more competence models in project management PMCD (PMCD 2007). These very narrow competence models are now confronted with competence models pushed by the EU. Part of the strategy of the program Europe2020 is included in the following statement:
"*Member States should promote productivity and employability through an appropriate supply of relevant knowledge and skills. Member States should make the necessary investments in education and vocational training systems while improving their effectiveness and efficiency to raise the skill level of the workforce, allowing it to better anticipate and meet the rapidly changing needs of dynamic labour markets in an increasingly digital economy. Member States should step up efforts to improve access to quality adult learning for all and implement active ageing strategies to enable longer working lives*." (EU Commission 2010 COMMUNICATION FROM THE COMMISSION: EUROPE 2020. A strategy for smart, sustainable and inclusive growth).

To support this strategy the EU launched the ESCO program on European Skills, Competences, Qualifications and Occupations. The ESCO classification identifies and categorizes skills, competences, qualifications and occupations relevant for the EU labor market and education and training (ESCO, 2016).

In addition the EU launched the DISCO program that goes some steps further (DISCO, 2016).

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DISCO is a Dictionary of Skills and Competences – it is a thesaurus that currently covers more than 100,000 skills and competence terms and approximately 36,000 example phrases in total and is available in eleven European languages. DISCO is one of the largest collections of its kind in the education and labor market. DISCO is compatible with ESCO and EQF, and supports competence matching, and qualification and learning outcome descriptions (Müller-Riedlhuber, Heidemarie; Ziegler, Petra 2012).

Compared to the big and universal competence thesaurus DISCO the ICBs of IPMA are very small. Nevertheless they are quite similar in some aspects. And in the project management community it will be more and more important to take a look at DISCO in future because the number of job descriptions and CVs based on DISCO will grow rapidly.

In the following sections we give a short overview over the content and structure of ICB4 and DISCO and compare both concepts.

After the classification and description of competence that next step is a concept for modeling competence development. Here we look at an approach that leads to further research.

ICB4 Content and Structure

In ICB 4 there are 29 selected competences in following areas:

- People competences defining personal and interpersonal competences
- Perspective competences defining contextual competences
- Practice defining technical aspects of managing projects

There is the flat hierarchy of competences:

ICB4 Competences

People

Self-reflection and self-management
Personal integrity
Personal communication
Relations and engagement
Leadership
Teamwork
Conflict and crisis
Resourcefulness
Negotiation
Result orientation

Perspective

Strategy
…

Practice

Design
…

For all these competences there are descriptions in ICB4 and for all these competences key competence indicators are introduced – like:

Personal communication

Provide clear and structured information to others and verify their understanding
Facilitate and promote open communication

Choose communication styles and channels to meet the needs of the audience,
Situation and management level
Communicate effectively with virtual teams
Employ humor and sense of perspective when appropriate

In the competence *personal communication* there the following links to related competence elements:

All other people competence elements
Perspective 4: Power and interest
Perspectives 5: Culture and values
Practice 5: Organization and information
Practice 12: Stakeholders

In the competence *negotiation* following indicators are defined:

- Identify and analyses the interest of all parties involved in the negotiation
- Develop and evaluate options and alternatives with the potential to meet the needs of all parties
- Define a negotiation strategy in line with own objectives that is acceptable to all
- parties involved
- Reach negotiation agreements with other parties that are in line with own objectives
- Detect and exploit additional selling and acquisition possibilities

These competence indicators are new in ICB4 and different from the approaches in former ICBs. These indicators are based on concepts that are similar to DISCO and can help to build bridges between DISCO and ICB4.

DISCO Competence Thesaurus

"DISCO, the European Dictionary of Skills and Competences, is an online thesaurus that currently covers more than 104,000 skills and competence terms and approximately 36,000 example phrases. Available in eleven European languages, DISCO is one of the largest collections of its kind in education and labor markets.

The DISCO Thesaurus offers a multilingual and peer-reviewed terminology for the classification, description and translation of skills and competences. It is compatible with European tools such as Europass, ESCO, EQF, and ECVET, and supports the international comparability of skills and competences in applications such as personal CVs and e-portfolios, job advertisements and matching, and qualification and learning outcome descriptions." (DISCO, 2016).

DISCO has a web portal to use the thesaurus and navigate along the thesaurus relations. Further-more subsets of DISCO can be selected and exported for customized applications.

DISCO is a thesaurus with 2 main segments

- non domain specific skills and competences
- domain specific skills and competences

DISCO is a multi-level hierarchy, here just a case
Non domain specific skills and competencies
personal skills and competences
cognitive skills and problem solving ability
problem solving ability

problem identification

With the multi-level hierarchy and the corresponding links to narrower terms and broader terms, with synonyms and related terms DISCO is a real thesaurus according to ISO 25964. [6]

DISCO also includes indicators for competences like ICB4 – in some cases really very similar to ICB4.

A typical competence dealing with management is the management of personal resource with the subsequent indicators:

Management of personnel resources

- evaluate performance of employees and contract personnel
- hire and discharge workers
- manage human resources
- manage training interventions
- orient new employees
- record and evaluate existing capabilities
- schedule employee work hours
- transfer and promote workers

Management of work activities

- assign work to employees
- organize activities for various services
- organize distribution of tasks
- organize the work of trainees
- organize work activities
- plan and organize work
- plan work activities
- plan workload and related activities

Some of these aspects go beyond ICB4 like hiring workers, but many of the reaming aspects are also mentioned in ICB4.

Corresponding to the ICB4 competence in personal communication there is the competence in professional communication in ICB4 with the subsequent indicators

Competence in professional communication

- answer customer and public inquiries
- communicate efficiently with colleagues
- communicate with future system users
- communicate with suppliers
- communicate with the front line staff
- communicate work related ideas and concepts
- confer with engineering and technical personnel
- confer with manufacturing personnel
- confer with other departmental heads
- confer with research personnel
- confer with scientists
- consult with colleagues
- consult with experts
- consult with managerial and supervisory personnel
- use professional communication language when performing work activities

And corresponding to the ICB4 competence in negotiation there is the competence in negotiation skills in ICB4 with the subsequent indicators

Negotiation skills

- ability to find a compromise
- ability to handle conflict situations
- ability to reach consensus
- conflict avoidance
- conflict resolution
- diplomatic skills
- persuasiveness
- sales talent

ICB4-DISCO Comparison

The ICBs of IPMA are focused to support the IPMA certification. Project management in higher education for example – university courses on project management, or study programs at bachelor, master, or ph.d. level - must apply competence models according to EQF for example to meet the requirement for the accreditation. Integration of both approaches will be more and more important in the future because teaching and training in project management is growing to meet the requirements of more projectized companies.

Table 1

ICB4-DISCO Comparison

	ICB4	DISCO
Content	29 competences About 5-6 indicators for each competence at project, program, and portfolio level	7000 preferred competence terms, 3000 synonyms, indicators not yet fully developed
Scope	Project management, supporting IPMA certification	Life-long learning, supporting all kinds of learning and education, includes learning outcomes and EQF concepts
Structure	Flat hierarchy: Competence areas, competences	Thesaurus: Multi-level hierarchy, no yet fully developed
Thesaurus features	Implicit links to related competences	Hierarchical aspects: Narrower term, broader term. Synonyms, related terms
Languages	In 2015 only English, translations will follow	11 languages
Availability	Download pdf from IPMA	Web portal Browser supporting thesaurus features and access to indicators, and also customizing of the thesaurus and export of the thesaurus
Development	Fixed over years	Dynamically growing
Supporter	IPMA and national project management associations	EU with strategic programs, EU units working with DISCO, National labor organizations

Source: Authors' construction

Competence development model

A general approach for the evaluation of competences can be developed the following way:

The evaluation of competences is based upon competence indicators. A competences indicator can cover several aspect of a competence. For all aspects an evaluation must be introduced with defined ranges and values.

In the case of the ICB4 competence personal communication we could do it like that:

Competence: Personal communication

Subunit: Facilitate and promote open communication

Indicator: Communicate effectively with virtual teams

Aspects of this kind of communication: training, experience, feedback from teams, …

Range or levels of these aspects:

Training in number of days for example

Experience in months or years for example

Feedback – no, poor, good, excellent – for example.

Competence development can be described based on these aspects, like: Initiate additional training regarding this competence indicator by 2 days.

For many competence indicators of ICB4 and DISCO it is not so easy to shape the evaluation like in the case mentioned above. Indicators must be analyzed and reconsidered to find an appropriate approach for the evaluation.

The ISO Conceptual Reference Model for Competencies and Related Objects can also help to concepts here (ISO/IEC JTC 1 SC 36 WG3 N0244 2008).

Conclusion and further steps

ICB4 and DISCO are young and unfinished. Both models do not have a competence evaluation so far. Without a concept for the evaluation of competences IPMA cannot even use ICB4 in the certification process.

In DISCO there is just an initial set of competence indicators. Thesaurus relations could also be extended here.

DISCO will have a growing impact on ICB4 and other isolated competence models.

The master thesis of Sylvie Reusch (Reusch, Sylvie 2013) includes a PROLOG-based thesaurus with PROLOG rules to navigate through the thesaurus following the thesaurus relations and going up to transitive closures. This approach is used now to test the thesaurus of competences. It will also be extended to test bridges between different competence models like ICB4 and DISCO. Here also linguistical features can help to reduce the number of links to be defined explicitly. (Reusch, Sylvie 2011)

We propose further research in the context of the competence thesaurus regarding special kinds of education like e-learning. Additional aspects of competences and competence development must be considered here.

Further aspects of ICB4 are discussed in (Reusch, Sylvie 2011 and Reusch, Peter J.A.; Reusch, S. Pascal, 2016).

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HOW TO SHAPE COMPETENCES IN PROJECT MANAGEMENT?

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Abstract

Project management standards like ICB or PMBOK® shape competences and competence development since the 1990th – mainly starting with the 2nd edition of PMBOK® (Caupin, G.; Knöpfel, H.; Morris, P.; Motzel, E.; Pannenbäcker, 1999) of PMI® and IPMA´s ICB2 (PMI, 2000) – and with a strong focus on the certification of project management competences. Today new standards like ICB4 (IPMA 2015: IPMA Individual Competence Baseline – ICB 4, 2015) are much broader – and they go beyond the limits of the classical standards. That is a major challenge for the implementation. Core changes are discussed in this paper and perspectives regarding the implementation. And even in the extended standards there are gaps that must be taken into account.

Key words: *project management, competence management, ICB, PMBOK®*
JEL code: *O21, O22*

Introduction

Competences in project management are developed in study courses, in seminars and workshops, and through practical experience. Competence areas are shaped by standards like ICB or PMBOK®. Such standards are used for the certification of competences in the 4-level approach of IPMA or in the PMP® approach of PMI® for example. Competence assessment is important for the selection of personnel and for the organization of competence development.

While ICB2 and ICB3 are mainly shaped for the certification processes of IPMA, now the new ICB4 has a much broader perspective – more on the competence development of the individual:

"The IPMA Individual Competence Baseline 4th Version (ICB4) delivers a comprehensive inventory of competences for individuals to use in career development, certification, training, education, consulting, research, and more." (IPMA, 2015)

When project management associations started with standards like ICB2 or PMBOK´s second edition in the 1990th project management was underdeveloped compared to the situation today. Today organizations have much more project experience and are often shaped as projectized organizations. Study programs in many faculties include modules on project management – full study programs on project management are available. The requirements for the development of project management competences change – and the standards follow. ICB4 extends the scope of the competences and goes much deeper into critical aspects of competences.

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ICB4

In October 2015 the 4th edition of the IPMA Competence Baseline of the International Project Management Association was published. This ICB 4 is not a simple extension of ICB 3. In ICB 4 we find another set of competences and another strategy. Even the title of ICB changed – now it´s IPMA **Individual** Competence Baseline.

ICB 4 has 29 competence elements (ICB 3 has 46, ICB2 had 42) in 3 competence areas:

Perspective

dealing with strategies, governance, values and further important aspects, with following elements:

1. Strategy
2. Governance, structures and processes
3. Compliance, standards and regulations
4. Power and interest
5. Culture and values

People

dealing with personal and interpersonal competences, with following elements:

1. Self-reflection and self-management
2. Personal integrity and reliability
3. Personal communication
4. Relations and engagement
5. Leadership
6. Teamwork
7. Conflict and crisis
8. Resourcefulness
9. Negotiation
10. Results orientation

Practice

dealing with technical aspects of managing projects, programs, and portfolios, with following elements:

1. Design
2. Requirements, objectives and benefits
3. Scope
4. Time
5. Organization and Information
6. Quality
7. Finance
8. Resources
9. Procurement and partnership
10. Plan and control
11. Risk and opportunities
12. Stakeholders
13. Change and transformation
14. Select and balance.

For each competence element the contributions to manage projects, programs and portfolios are separated in ICB 4 (in contrast to ICB 3). That is good to improve competence development within these 3 levels. With the competence area on **perspectives** the strategical aspects of project management will be strengthened – that was a weak point in ICB 3.

ICB4 on Personal Communication

With a focus on the ICB4 competence 4.4.3 on **Personal Communication** we want to explain the approach of competence descriptions in ICB4. All competence descriptions in ICB4 start with short text elements dealing with the definition, the purpose and the description of the competence – here for example

"**Definition**

Personal communication includes the exchange of proper information, delivered accurately and consistently to all relevant parties.

Purpose

The purpose of this competence element is to enable the individual to communicate efficiently and effectively in a variety of situations, to different audiences and across different cultures.

Description

Personal communication describes the essential aspects of effective communication. Both the content and the means of communication (tone of voice, channel, and amount of information) have to be clear and appropriate for the target audience. The individual has to verify the understanding of messages by actively listening to the target audience and seeking feedback. The individual promotes open and sincere communication and is able to use various means for communication (presentations, meetings, written forms, etc.) and acknowledges their value and limitations."

After that there are lists of knowledge and skill items:

"Knowledge

- Differences between information and message
- Different methods of communication
- Different questioning techniques
- Feedback rules
- Facilitation
- Presentation techniques
- Communication channels and styles
- Rhetoric
- Characteristics of body language
- Communication technologies

Skills

- Use different ways of communication and different styles for effective communication
- Active listening
- Questioning techniques
- Empathy
- Presentation and moderation techniques
- Effective use of body language".

The main parts of the competence descriptions deal with key competence indicators. For personal communication there are 5 indicators in ICB4:

1. Provide clear and structured information to others and verify their understanding
2. Facilitate and promote open communication
3. Choose communication styles and channels to meet the needs of the audience, situation and management level
4. Communicate effectively with virtual teams
5. Employ humor and sense of perspective when appropriate.

Besides general descriptions on these indicators there are strong hints to promote personal competence development – here for example:

- Obtain confirmation that the receiver of information has understood the message as intended.
- Focus on the receiver, not on the information itself, and ask for validation when needed.
- Change the communication channels and style depending on the situation.

Each of these competences in ICB4 is described 3 times – once with the focus on projects, then with the focus on programs and finally with the focus on portfolios. The 3 corresponding descriptions are mainly identical! – "project" is replaced by "program" and then "program" is replaced by "portfolio" – and a few more changes.

Despite the extension of competence descriptions in ICB4 there are significant gaps. Competence indicators for example must change esp. with growing project maturity. Well developed and experienced teams need other guidelines than beginners.

On the scope of Project Management Standards

PMBOK® and ICB are the leading standards in the project management community as verified in many surveys, for example in IPMA survey report.

These standards are totally different – ICB with the strong competence approach – PMBOK® with the process approach – so they are complementary and one can support the other.

Considerations on the scope of such standards must deal with the question **how far** they should extend the scope (how many knowledge areas, how many processes, how many competences, …) and **how deep** they should develop the concepts in these standards.

What is the main focus of the standards (harmonizing terminology and concepts, personal development and training of project management competences, certification of project management competences, …)?

Going from ICB2 through ICB 3 to ICB4 we have a scope creep. ICB2 has about 30 pages – most people use the version in 3 languages with 90 pages in total (IPMA). ICB3 has a bit more than 200 pages, ICB4 has even more than 400 pages.

Compared to the significant changes in ICB4 we have a smooth evolution on the PMBOK® side – with the additional knowledge area on stakeholder management in PMBOK5 for example separated from the project communication area in PMBOK4 and some changes in descriptions.

With the "big" ICB4 we have appropriate guidelines for development and evaluation of competences. But that´s not enough to teach and train competences. For individual communication we have for example the figure below with many more aspects not mentioned in ICB4.

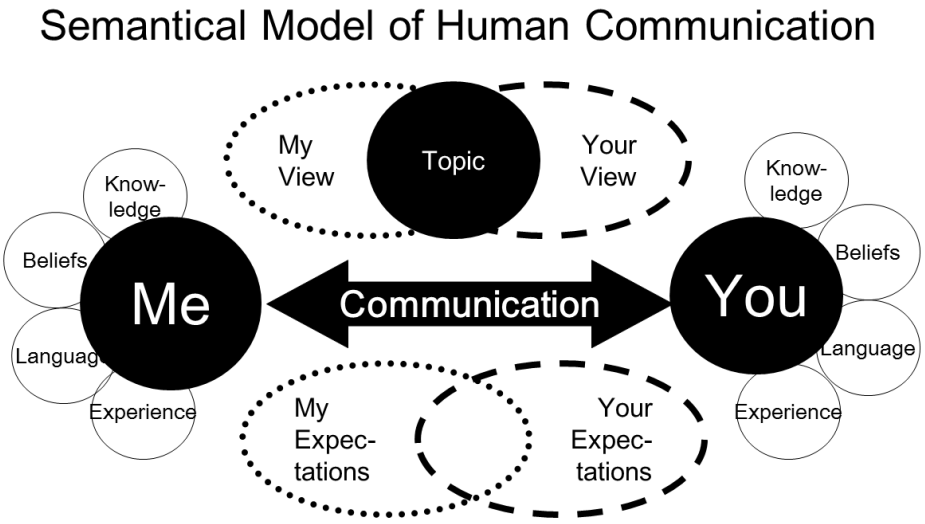

Figure 1: **Semantical Model of Human Communication**
Source: Reusch, Peter J.A. 2000

To support project communication management in the context of PMBOK® there is an additional Project Management Communications Bible (Dow, William; Taylor Bruce 2008). To support education and training in the context of ICB there are handbooks like (Hermarij, John 2013) and (Gessler, Michael, 2012). Such sources are not yet available for ICB4. And when we start to develop such sources it is not only the question how far and how deep we want to go. It´s also the question how to integrate new concepts like sustainability (Reusch, Peter J. A.; Reusch, S. 2016).

On competence development and assessment

Contributions on the evaluation and development of competences are not fully developed in ICB4. In ICB4 there is annex D with the competence levels:

- "**Knowledge**: Exhibit memory of learned materials by recalling facts, terms, basic concepts and answers
- **Comprehension**: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating the main ideas.

- **Application**: Using acquired knowledge to solve problems in new situations by applying acquired knowledge, facts, techniques and rules
- **Analysis**: Examine and break information into parts by identifying motives or causes, make inferences and find evidence to support generalizations
- **Synthesis**: Build a structure or pattern from diverse elements and act of putting parts together to form a whole; compile information together in a different way by combining elements in a new pattern or proposing alternative solutions
- **Evaluation**: Present and defend opinions by making judgements about information, validity of ideas or quality of work based on a set of criteria."

This approach is much more complex than the evaluation of competences according to former ICBs. The application of such measures for competences has a long tradition in pedagogics and education with contributions of Benjamin Bloom and others. For project management such measures must be developed. When the evaluation of competences in project management come closer to the evaluation of competences in education in general it will be easier to build bridges between higher education in project management and training of projects management associations and project management consultants.

Conclusions

The changes in ICB 4 compared to ICB 3 are so strong that all those who apply ICB 3 will have a lot of work to adapt their concepts to ICB 4. The redesign of the certification according to ICB 4 will take years.

ICB4 is an open standard that will lead to different kind of implementations, depending of the way and the level in which competences are developed. Many aspects of ICB4 will remain mainly for individual competence development, while others can be harmonized and applied for broad certification procedures.

For each implementation of ICB4 we must fix the scope: how far and how deep we will go in our competence descriptions.

ICB4 has separate chapters for the same competences – project management, program management, and portfolio management are separated. That is appropriate if competences in these areas are developed separately. For this kind of separate development in many cases there will not be enough time. We need compact guidelines covering all three areas.

ICB4 can help to harmonize all kinds of education and competence development – competence development in higher education and in practical work in projects. But this harmonization can only succeed when experts from all areas give support. It´s a hard job, but when we succeed all people working in projects will have the advantages of easier recruitment, easier personal development, etc. Finally companies can save money and labor markets emerge.

With the new ICB4 the Conceptual Reference Model for Competencies and Related Objects and further general standards on competences can be used (ISO 2009).

Even in the context of IPMA standards we must develop bridges to other standards like IPMA´s Organizational Competence Baseline – OCB (IPMA).

We should come back the question ""What Can Standards Standardize in International Project Management?" (Reusch, Peter J. A.; Löhr, Katrin, 2012; Reusch, Peter J. A.; Khushnood, Muhammad; Vasquez Kaufmann, Sergio, 2011).

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SUSTAINABILITY IN PROJECT MANAGEMENT STANDARDS

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Abstract

There is a growing demand for a good implementation of sustainability in project management standards. With the new IPMA Individual Competence Baseline ICB4 (IPMA 2015) we have a significant improvement on contributions regarding sustainability project management compared to ICB3 (IPMA 2006) – and also a significant improvement compared to standards like PMBOK® (PMI 2013). These contributions are discussed here. The implementation of ICB4 is open and a challenge for the future.

Key words: *project management, project management standards, competence baseline, ICB, PMBOK®, sustainability*
JEL code: *O22*

Introduction

Sustainability is one of the most important challenges of our time. How can we develop prosperity, without compromising the life of future generations? We are looking for a balance among economic, environmental, and social and human issues – a long term balance. The integration of sustainability in project management is very important because projects initiate changes – and changes must be shaped by sustainability criteria (Reusch, Peter J.A. 2015).

With the publication of ICB4 in 2015 we have a significant improvement of contributions on sustainability in the project management standards – compared to ICB3 published in 2006 and compared to other standards.

In ICB3 in chapter 3 on the introduction of certification there is just a hint on sustainability related to the contextual competence 3.09 on 'Health, security, safety & environment' (IPMA 2006, page 32).

And the next and final hint on sustainability we find in the description of the competence 2.04 on ´Assertiveness´ in a list of possible process steps sustainability is included "8. Cultivate sustainable relationships with interested parties" (IPMA 2006, page 94).

In IBC4 we have a strong new focus on sustainability in project management. After the reorganization of the competences and competence clusters – compared to ICB3 – we have "sustainability thinking" even in the first competence 4.3.1 on strategy – and the strategy is just the right place to start with sustainability. There are many more contributions on sustainability in project management as well as in program and portfolio management in ICB4.

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Sustainability issues in ICB4

In ICB 4 we have 29 competences in 3 competence clusters (strategy, people, and practice). In almost 10 of the new 29 competences in ICB4 we have significant contributions on sustainability – hints on sustainability are even in more competences. The following review on significant contributions is based on the part of ICB4 dealing with projects – the additional parts on programs and portfolios cannot be discussed here.

ICB4 competence **4.3.1** on **strategy** describes how to develop and implement strategies in projects aligned with the mission and strategy of the involved organizations – esp. aligned with the sustainability strategies of the organizations. Special tools and techniques are recommended for the development, communication and control of strategies like environmental analysis, balanced scorecards, critical success factors, and key performance indicators, to "assure the sustainability of an organization".

In ICB3 strategies were underdeveloped. In ICB4 we have a cluster of competences dealing with strategies – competences 4.3.1 up to 4.3.5 with a focus on strategy, governance, compliance, power, culture and values. And ICB4 also deals with the problem that we often have a strategy when we start a project but forget many aspects of our strategy when the project runs. Ongoing reviews of strategies and ongoing reflections of organizational goals are recommended in ICB4 – a strong contribution on sustainability project management.

In ICB4 competence **4.3.3** on **compliance, standards and regulations** knowledge on sustainability principles is highly recommended – including all relevant standards and regulations on health, safety, security and environment.

Individuals in projects should be able to balance economic, social and environmental aspects of the project – clear perspectives are given:

"The individual is able to assess the impact of the project on the environment and society. Realising his or her responsibility, the individual researches, recommends and applies measures to limit or compensate negative consequences. The individual follows (or even exceeds) guidelines and rules on sustainable development coming from within the organisation and from the wider society, and is able to realize a workable balance between the demands of society, impacts to the eco-environment and the economy. The individual understands that sustainability aspects, measures and attitudes often vary in different countries and cultures." (IPMA 2015, page 52).

In ICB4 competence **4.3.5** on **cultures and values** the perspectives of sustainability project management are extended for international projects. A core concept introduced here is corporate social responsibility:

"The individual needs to be sure that the project supports the sustainable development of the organization, which includes corporate social responsibility (CSR). CSR is a lever of control in complying with legal and non-governmental regulations, professional standards and other ethical and international norms. By CSR, if practised in the right way, an organization encourages a positive impact through its activities on the environment, consumers, employees, communities, stakeholders and all other members of the society." (IPMA 2015, page 60).

In the list of knowledge aspects in this ICB4 competence we also find "green project management". That´s a nice recommendation – and there are important contributions available

since several years like (*online resource: http://greenprojectmanagement.org/*)– but the job to implement green project management into ICB4 and all training and certification units is open.

In ICB4 competence **4.4.2** on **personal integrity and reliability** individuals in projects are requested to promote the sustainability of project outcomes:

"Promoting sustainability means focusing on the endurance of solutions even when engaged in time-limited tasks. Sustainability is not only about social equity, environment protection or economic results. It is the consideration of the long-term outcomes and effects of behavior. The individual has the ability to keep the bigger picture in mind and act accordingly." (IPMA 2015, page 67). In ICB4 competence **4.4.9** on **negotiation** individuals in projects are requested to negotiate to achieve a sustainable agreement.

ICB4 competence **4.5.3** deals with the **scope -** with the boundaries of a project and structural issues (work breakdown structure,…). Sustainability issues here are a bit fuzzy – the project and its outcomes are important but also an appropriate scope management avoiding scope creeps. ICB4 competence **4.5.9** deals with **procurement.** Sustainability has to be taken into account in procurement, for example when selecting commodities or suppliers – as discussed in (Reusch, Peter J. A.; Ojeda, Omarly 2013). ICB4 competence **4.5.13** deals with **change and transformation.** Change management should be developed in such a way that change and transformation sustain – and ´falling back´ can be avoided.

Sustainability issues in PMBOK®

In the fifth edition of PMBOK® (PMI 2013) sustainability is as poor as in ICB3. On page 7 of PMBOK® there a remark that organizational project management can deliver a sustainable competitive advantage. In parentheses on page 15 sustainability is mentioned. In the chapter on project integration in the section on enterprise environmental factors sustainability is just an item in a list (PMI 2013: A Guide to the Project Management Body of Knowledge (PMBOK Guide), page 75). Finally there is no real sentence on sustainability in project management.

PMBOK® is very weak regarding sustainability in project management. Therefore other initiatives started to develop a "green project management" (online resource: http://greenprojectmanagement.org/). But the problem is that these initiatives remain isolated and cannot replace the old standards.

There are several proposals to extend knowledge areas in PMBOK® to include sustainability – Reusch, e.a. (Reusch, Peter J. A. 2015 and Reusch, S. Pascal 2014). There is one option to subdivide the knowledge area on project quality management and to collect processes on project sustainability management in the new subpart. There is another option to upgrade the PMBOK® approach in general (Reusch, Peter J. A. 2015).

Conclusions and perspectives

With ICB4 we have a significant improvement in sustainability project management. ICB4 is available since September 2015 – so far only in English. In several countries translators are active to prepare other language versions. The full implementation of ICB4 will take years. The main guidelines for implementing ICB are all based on ICB3 today (Hermarij, John 2013 and Gessler, Michael 2012). The handbook (Gessler, Michael 2012) consists of 4 volumes and more than 2500 pages – the upgrade with totally new competences will not be easy.

The implementation of ICB4 gives the opportunity to strengthen many aspects of this new standard. The development of training units for the implementation of ICB4 can be used to shape the sustainability focus of ICB4.

The authors work in this direction – dealing for example with several methods and tools like balanced scorecards, critical success factors (CSFs) and key performance indicators (KPIs) combining perspectives of sustainability and project management. There are good sources available like Jessica Keyes (Keyes, Jessica 2011) or Harold Kerzner (Harold Kerzner 2013) but the right combination of sustainability perspectives and project management perspectives in CSFs and KPIs is still a challenge. With the project balanced scorecard we can improve sustainability from the beginning of projects when we develop strategies to later steps – not to forget our strategies while we run our projects.

While these approaches have a focus on strategies there are additional methods and tools supporting sustainability aspects of operations like dependency analysis, and the development of roles and responsibilities – Reusch (Reusch, Peter J. A. 2014 and Reusch, Peter J. A.; Löhr, Katrin, Khushnood, Muhammad 2012).

The new ICB4 also has an impact on other standards – even IPMA standards. There is for example an IPMA standard for the development of project management consultancy competences (IPMA 2016) – based on ICB3. Such standards must also be updated also.

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ADOPTION AND EVOLUTION OF AGILE PRACTICES

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Abstract

The traditional software product development models are characterised by a predictive approach derived from physical engineering processes. The recent developments of the software-related scenario have proved these plan-driven models to be inadequate, especially in high risk and rapidly changing environments. Agile methodologies were therefore developed as an answer to these issues. Due to their intrinsic agility, they confirmed to be capable to adapt to further changes occurred since their first introduction: methodologies were modified and tailored according to every different shortcoming found during their introduction. This research is aimed at detecting the dominant agile practices and adoption strategies, which transcends the original belonging to a certain model and may be affected by internal and external characteristics. A survey-based analysis was conducted in order to find out what are the most used practices. 194 valid questionnaires were returned. Factor analysis and cluster analysis allowed to relate practices to several environmental characteristics, with the purpose of seeking a significant relation between them. Results of the study showed that most of the companies prefer to adopt practices related to the general management of the development process, to the detriment of practices associated with coding and testing techniques. The opinions of the team members turned out to be the only inner factor responsible for the introduction or the abandonment of the practices. About the outer variables, the size of the team and the proximity of the team members have proven to significantly affect the adoption strategy.

Key words: *agile project management, agile methods, agile practices, SCRUM, Kanban, XP, Lean development*
JEL code: ***M54***

Introduction

It all started n Febraury 2001 with four values written on a website. The cornerstones of the "Manifesto for Agile Software Development" (AgileAlliance, 2001) were nothing more than four sentences, which however represented an authentic breakthrough for Project Management. Actually, the authors of the Manifesto aimed to gather a group of characteristics whose underlying values could be traced back to a unique, revolutionary way of defining a system development model. They had already created several software development methodologies (SDMs) and, after having identified the core values, decided to write a short but nevertheless inspiring list of guidelines, which should be followed by any Agile practitioner. Indeed, "rather than focusing on their differences and the competitive advantage of their own methodologies, 17 creators and supporters of the lightweight methodologies gathered (…) to discuss their common interests and philosophies, coining the term *Agile software development*" (Williams, 2012, p. 71-72). That is to say, the authors created a mind-set, a framework with general advice, which could be freely interpreted and applied in heterogeneous environments. Furthermore, the Manifesto was completed by twelve principles, which, again, could be employed regardless the particular SDM chosen for the project.

Agile is based on Values, Principles and Practices. "Agile values are the philosophy behind Agile methods, which are further defined and supported by the Agile principles and Agile practices" (Kong, Kendall, & Kendall, 2012).

Each specific project undertaken by a particular team of a certain company might be characterised by the usage of a certain set of practices, i.e. "concrete activities and practical techniques that are used to develop and manage software projects in a manner consistent with the Agile principles" (Sidky, Arthur, & Bohner, 2007).

Research questions and methodology

The importance of Agile Software Development Models (SDM) is proven to be decreasing over the recent years since agile practitioners noted that applying SDMs as is, did not generate the expected outcomes. Over the years Agile SDMs have been customised by many companies in order to find the best fit with their organisational characteristics. Therefore it is necessary to focus on the practices more than on SDMs. In addition, it would be interesting to identify the drivers that determine the adoption of certain practices. To date, however, there are no studies that address these topics.

For this reason a research study has been done in order to answer to these research questions:

1. What are the dominant Agile business practices?
2. What are the key variables that lead to a certain adoption strategy?
3. Why do the practices change within the PM groups?

In order to answer those research questions, a questionnaire-based survey has been developed and administered.

The questionnaire consisted of multiple sections, each of them containing a specific category of questions:

- General information, such as geographical location, job position, Agile role of the respondent.
- Practices, whose usage was measured through a Likert scale going from 1, "Used for every project", to 5, "Not used". Moreover, the respondents could also opt for 6, "Abandoned" or 7, "No experience, but I'd like to introduce it". These last two values were used in order to conduct a further analysis, but they still represent a subset of option 5.
- Variables, whose scale varied according to the specific item.
- Practices application, which allows identifying the determinants of practice changes over the respondents' experience.

Given that, in order to get an acceptable response rate (the time a respondent has to dedicate to the survey cannot generally be more than 8-10 minutes), it was necessary to make a selection of the practices with the purpose of reducing the answering time. A study made by Williams (2012) had already classified some practices according to their importance, given by the respondents of a survey. In this research, the 35 most important practices were selected and put in the questionnaire. This choice also gives room for further analysis: it would be possible to compare and analyse the differences between the importance given to a practice and its on-field utilisation.

The selection of Variables was based on previous literature, which tried to identify those conditions that might be responsible for the adoption and evolution over time of the practices. The Variables are: Team size, Team location and outsourcing, Organization size, Experience, Adoption rate, Decision making process, Industry.

The survey has been delivered by means of an online survey tool. Overall, 194 responses were collected and analysed.

A first, qualitative, statistical analysis allowed depicting the current state of Agile development, practices utilisation and inclination towards using Agile Methods. Then, a quantitative analysis took into consideration the correlation between the adoption of the practices and the success indicators. Both a factor analysis and a cluster analysis were performed with the software SPSS in order to: first, detect a common behaviour of the practices and reduce the analysis into a set of factors, which were associated to four explanatory concepts; secondly, divide the sample in clusters and perform a statistical analysis seeking for significant differences among the groups. Cluster analysis was based on the factor scores and allowed to compare the characteristic of the groups: statistically significant differences found in the variables would lead to identify a certain set of variables as determinants of a certain adoption strategy.

Results

Respondents were given the chance to pick multiple Agile methodologies, because the survey structure was based on the analysis of their overall experience with agility, and did not focus on the latest project they were involved in. Figure 1 shows the methodology prevalently used by the respondents. By far, Scrum is the most followed: considering the total answers, even three quarters of the sample indicated Scrum, which represents 32% of the total when the analysis is normalised to a basis of 100%. As can been seen in Figure 1, the Hybrid Scrum/XP is also largely applied, with a percentage equal to 31.8%.

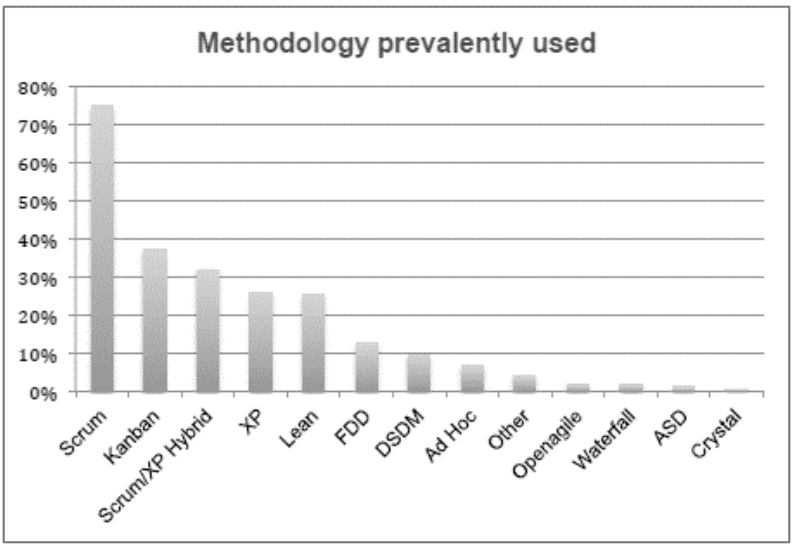

Fig. 1. **Usage of Agile Methodologies**
Source: Author construction based on survey

It is relevant to notice that the original Agile SDMs are not widely used anymore: methods such as, FDD, DSDM and ASD do not account for more than 7% overall. On the other hand, the application of new methodologies such as Lean and Kanban has increased its diffusion over the recent years; it is extremely remarkable that Kanban is the second most used

methodology after Scrum. Even if Kanban and Lean do not offer a complete guide to software development, the results are consistent with the question: as multiple answers were allowed, it is likely that many respondents combine the utilisation of these SDMs along with other, more structured and complete methods. For instance, a team could be XP-based and, at the same time, take inspiration from the Lean principles during some phases of the development.

A first conclusion can be drawn from the analysis of this question: most of the teams rely on methods that do not lead to relevant technical breakthroughs. The predominance of Scrum might imply that Agile adoption as affected mostly the managerial side of the process, whilst strictly coding related practices are still not so widespread (XP is only fourth). It seems that teams have largely embraced the agility principles without deeply transforming the practical activity of coding.

More than 65% of the sample is member of teams whose size is no bigger than 10 members. Indeed, one of the pillars of agility is communication among the team members, along with daily meetings and customer interaction. In order to effectively enhance communication, foster shared decision-making and shorten the length of the iteration, teams' members have to work close to each other.

Within the sample, about 65% is either co-located or works within the same building; this allows people to meet regularly and avoid any communication issue.

The core questions of the survey and of the analysis concerns the practices application. First of all, the application of the practices is extremely variable: not all the practices are used at the same time and most of the respondents seem to agree that only some of them deserve an intense application. Some practices are doubtless dominating.

Table 1

Usage of Agile Practices

	Used for every project	Used for more than 50% of projects	Used for about 50% of the projects	Used for less than 50% of projects	Not used	Abando-ned	I'd like to introduce it
Short iterations (30 days or	51,2	38,0	10,1	0,8	0	0,0	0,0
Prioritized product backlog	48,1	38,0	10,1	3,9	0	0,0	0,0
Stand up/Scrum meeting	46,5	43,4	6,2	3,1	0	0,0	0,0
Informal design; no big	39,5	35,7	17,8	6,2	0	0,0	0,0
Done criteria	34,1	19,4	31,0	9,3	2	1,6	2,3
Task Board	32,6	41,1	16,3	7,8	0	0,8	0,8
Iteration reviews/demos	31,0	26,4	20,9	16,3	3	2,3	0,0
Embracing changing	29,5	15,5	27,9	14,7	9	0,0	3,1
Complete features testing done during iteration	26,4	27,9	20,2	14,7	6,2	2,3	2,3
Requirements written as	24,8	42,6	29,5	3,1	0	0,0	0,0
Release planning	24,0	33,3	23,3	13,2	4	0,0	1,6
Burndown charts	21,7	26,4	26,4	21,7	0	0,8	2,3
Collective ownership of code	19,4	39,5	16,3	14,0	6	1,6	3,1

Features in iteration are customer visible/customer valued	14,0	28,7	26,4	17,1	12	0,8	0,8
Team velocity	14,0	25,6	28,7	21,7	6	0,8	3,1
Stabilization iterations	13,2	23,3	38,8	13,2	9	0,0	2,3
Design inspections	10,9	23,3	37,2	19,4	7	0,0	2,3
Emergent design	8,5	8,5	24,0	34,9	21	0,0	2,3
Frequent release of working software	7,0	11,6	24,0	31,0	21	2,3	2,3
Negotiated scope	7,0	7,0	17,8	34,9	31	0,8	0,8
Team documentation focuses on decisions rather than planning	7,0	16,3	31,0	24,0	14	0,8	7,0
Configuration management	6,2	20,2	35,7	24,0	11	0,0	2,3
Pair programming	3,9	3,9	20,2	37,2	20	0,8	5,4
Retrospectives	3,9	9,3	21,7	33,3	24	4,7	2,3
Automated unit testing	3,1	6,2	31,0	36,4	11	1,6	10,1
Sustainable pace	3,1	5,4	28,7	37,2	10	3,1	3,1
Whole multidisciplinary team with one goal	3,1	9,3	36,4	34,1	10	2,3	3,9
Planning poker	2,3	10,9	14,7	38,8	10	8,5	5,4
Test-driven development acceptance testing	2,3	3,9	11,6	29,5	28	3,1	20,9
Timeboxing	2,3	3,1	14,0	35,7	36	6,2	2,3
Synchronous communication	1,6	1,6	25,6	46,5	21	0,8	2,3
Test-driven development unit testing	1,6	4,7	12,4	37,2	24	3,1	17,1
Automated tests run with each build	0,8	7,0	30,2	33,3	14	0,8	13,2
Coding standard	0,8	0,8	13,2	32,6	51	1,6	0,0
Refactoring	0,8	0,0	7,8	37,2	42	2,3	9,3

Source: Author construction based on survey

By considering the standard deviation, high values are founded in Test-driven development, Embracing changing requirements, complete feature testing and Collective ownership of code. This gives evidence that their application is the most variable within the teams: some teams frequently use them, whilst others do not consider them worth the application.

Generally speaking, it is a bit surprising that Frequent release of working software, is not among the most used practices since it is even included in the list of the 12 principles of the Agile Manifesto.

The conclusion that can be drawn from this list is that the most used practices are generally related to soft development procedures. Instead of deeply modifying the way of working of each team member, they are mainly focused on improving the internal communication among the group members, planning and prioritising the development and,

overall, leaning towards informal design and simplification of the project management. On the other hand, taking into consideration the least used practices, it is quite surprising to notice that practices such as *Refactoring*, *Test-driven development unit testing* and *automated test run with each build* are located at the bottom of the list. They represent, indeed, some of the core practices of Agile coding processes and should –at least theoretically– be applied extensively.

In order to reduce data to a more manageable size while, at same time, retaining as much information as possible, factor analysis was applied to the 35 items that represent the various practices. In particular, the extraction methodology used was Principal Component Analysis (PCA). Prior to running the analysis, the suitability of data for this kind of analysis was assessed. As expected, the correlation matrix shown the presence of many items with a correlation higher than 0.3. Moreover, the Kaiser-Meyer-Olkin value of sampling adequacy was equal to 0.852. Also, Bartlett's test of sphericity reached statistical significance, supporting the factorability of the correlation matrix. The sample size and the absence of variables highly correlated to others (i.e. with correlation values above 0.9) allowed to keep all the 35 items in the analysis. PCA revealed the presence of eight components with eigenvalues exceeding 1, explaining cumulatively the 69.1% of the variance. A preliminary analysis of the component matrix, lead to think that an extraction with 8 components was not the most suitable solution for this case. Indeed, items loading strongly (more than 0.4) were detected within all the components, but their number was quite low for components 5, 6, 7 and 8.

An inspection of the scree plot revealed two possible breaks, respectively after the second and the fourth component. Therefore, it was decided to run a Parallel Analysis, which showed only four components with eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix of the same size. Once made the decision to retain 4 factors only, factors were rotated with the Varimax method in order to improve their interpretability. Four common themes were identified.

Component 1. Process practices. Looking at the 11 practices that load strongly on component 1, almost all of them are related to the way of managing the development process. The main themes are the way people communicate, the length of the deadlines, the way of interacting with the customer and to prioritise the requirements. There are no practices that concern a more technical side of the development.

Component 2. Testing and coding practices. In this case, all the 8 practices are easily linkable to coding and testing techniques. These practices all attain to give practical instructions for writing the code and testing it with iterative methods.

Component 3. Principles practices. The theme of component 3 is quite subtle; even if some practices could initially be associated to component 1 as well, a further analysis allowed relating them to a broader and less practical theme. These 10 practices are, indeed, strongly connected to the 12 principles of the Agile Manifesto (AgileAlliance, 2001). They do not focus either on the process or on the coding techniques; they concern instead the general mind-set that should permeate the Agile users. For instance, Sustainable pace, Retrospective, Negotiated scope and frequent releases of working software are exactly included within the 12 principles. At the same time, they are practices as they imply certain behaviours of the practitioners.

Component 4. Team practices. Component 4 includes, for sure, 6 practices that are related to the team dynamics within the development. Actually, they have some shared points with the first three components, but the difference is that they are all related to teams, not individuals. This is proven by the presence of practices such as Team documentation focuses on decisions

rather than planning, Team velocity and Whole multidisciplinary team with goal. Even though these practices include process and coding characteristics, they all concern activities that can only be done by a team or that measure the overall outcome of the team. In the end, a punctual analysis of the loadings of each item led to some further modifications.

First of all, the minimum loading threshold was set to 0.4, meaning that items that loaded no more than 0.4 in every component were deleted and not considered in the analysis. Two practices, therefore, were erased: Planning poker and Team velocity. Secondly, two items had strong loadings on multiple components. It was the case of Synchronous communication, with a loading of 0.757 on Component 2 and of 0.421 on component 3. Having considered the managerial side of this practice, it was indeed quite ambiguous: this practice concerns both a technical point of view (as it implies the synchronicity of communicating the coding modifications and the possibility to see "live" what the other members are doing) and a principles point of view (as, also, implies that all the members meet in the same place to share the progress done). A similar evaluation was made also for Pair programming: this practice showed a loading equal to 0.538.

On Component 2 and equal to 0.546 on Component 3. In this case, there was a lack of consistency between the values and the actual meaning of the practice, since Pair programming is doubtless related to coding, but PCA included it within the principles, as the loading was slightly bigger. For these reasons, it was decided not to consider these two practices either.

In order to answer the second research question, it was decided to go further with the analysis and try to carry out a cluster analysis based on the final factor scores generated by PCA with 4 components.

In order to understand to what extent the selected variables could actually affect the practices adoption, cluster analysis was the best way to relate the factor scores extracted from PCA to the characteristics of the given sample. The procedure consisted of different steps: first of all, an ideal number of clusters was detected; then, clusters was measured and evaluated according to their practices utilisation; in the end, each variable was split and analysed cluster by cluster for the purpose of detecting statistically significant variables values. The suggested number of cluster obtained was 4. K-means was selected as the best method as it allows allocating each variable to a cluster of which the distance to the mean is the smallest. So, the analysis was carried out with K-means clustering method and manually setting the number of clusters to 4. All the factor scores had significance equal to 0, which implies that the model was valuable; considering the F values, factor score 1 is the one that contributed the most to the identification of the clusters. The number of cases per cluster ranged from 19% to 30%, thus indicating a good homogeneity. Anyway, in order not to be superficial, k-means cluster analysis was run also with other numbers of clusters. Considering that significance of the other cases was lower and, furthermore, no different conclusions could be drawn from those analyses, the decision was to keep 4 as the most suitable number of clusters.

Before going further with the analysis, each observation was linked to four different scores, each of them being the mean of the practices application of the practices included in one of the four different components individuated with PCA. This way, it was possible to get an overall assessment of the behaviour of the respondents for each component.

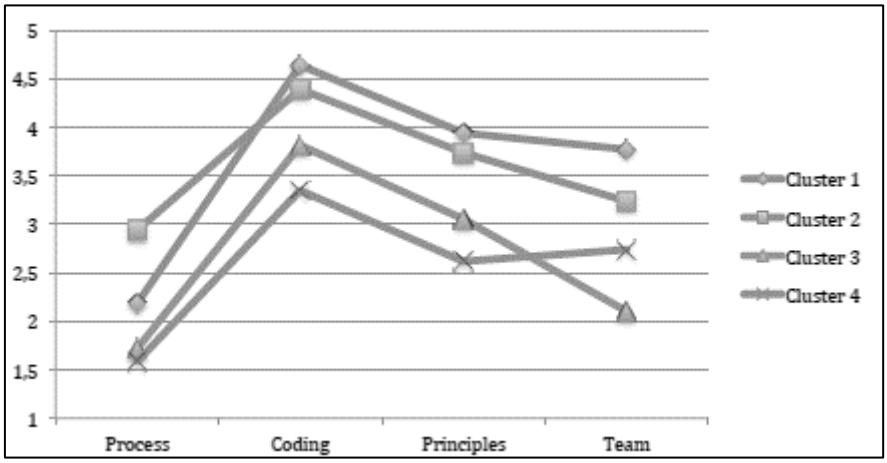

Fig. 2. **Application of practices by cluster.**
Source: Author construction based on survey

Apart for the scores of clusters 3 and 4 in the Team practices application and cluster 1 and 2 in Process, there is no significant overlapping; this means that even though practice application of the components is higher or lower among the groups, the application strategy is quite similar though. Moreover, it is extremely clear that practices related to the whole development process are by far the most used within all the respondents, while coding and testing practices are on average the least used. Anyway, there are some noteworthy differences. Group 4, for instance, seems to be made of respondents, which use the practices more intensively: it is always the one with lower scores, except for the team practices application, wherein cluster 3 is the leader. On the other hand, cluster 1 and cluster 2 are characterised by respondents who have a lower degree of practices application.

So, the last step of this analysis focused again on the elected variables. This time, though, each variable was split and separately analysed cluster by cluster. Before doing so, however, it was necessary to carry out a statistical analysis aimed to assess the significance of the differences of the means found for every cluster. Indeed, in case the Chi-Square tests or ANOVA analyses did not show significant results, the means would have to be considered homogenous for the sample analysed. Out of the 8 variables identified, only 2 of them turned out to have significant differences of the means among the clusters: Team size and Team location.

The first conclusion is that these two factors are the only ones that can actually influence the adoption of Agile practices. It is worthy, also, to consider the means differences shown in each cluster, and try to relate them to the scores of the practices adoption resulted from PCA. Clusters 1 and 2 are more likely to work in bigger teams, made of more than 10 members, whilst clusters 3 in and 4 report an average smaller size of the team. Moreover, means variation give a good explanation to the fact that, although cluster 4 was on average the best performer, cluster 3 had a higher degree of utilisation for the Team practices. It is no coincidence, indeed, that cluster 3 has the lowest mean: the lower the team members, the more team practices can be applied. Means for cluster 1 and 2 are quite similar, so was their practices application score. Results are consistent for these cases also: a big team size can tangle the extensive application

of practices. Speaking about team location, Cluster 4 is by far the ones characterised by a lower degree of de-location, while cluster 2 is the one that, averagely, has teams made of developers who work in different places. Also in this case, results are quite consistent with the initial assessments: agility requires frequent communication and interaction and it is facilitated by the proximity of the team members. Cluster 4, indeed, has a mean of 1.90 and its members are using practices more frequently than the others. The mean of cluster 3 is the second lowest and it is the cluster with the second best scores of Figure 2.

In the end, this study allows to answers to the second research question (What are the key variables that lead to a certain adoption strategy?): there are two key variables, team size and team location.

Finally, and consistently with the theoretical foundations of Agile, project members turned out to be the main subjects involved in the decision-making process. Precisely, three fourth of the survey base picked the project members in the multiple-answer question, proving that team, as a whole, is really the most important actor involved in the decisions about Agile development. However, the PM (or the analogue role for other methods) is said to be the decision-maker by 46.10% of the sample analysed.

Table 2

Decision making in Agile development

	Responses (N)	Percent	Percent of Cases
The project members	96	39,30 %	75,00 %
The coach/mentor/PM	59	24,20 %	46,10 %
Consultant	9	3,70 %	7,00 %
Company management	50	20,50 %	39,10 %
The responsible of the IT	26	10,70 %	20,30 %
Customer	4	1,60 %	3,10 %
Total	244	100,00 %	190,60 %

Source: Author construction based on survey

According to Agile suggestions, it means that not every team is applying correctly the Agile methods, either because they are still going through a transition phase or because they still believe that a unique decision-maker could be a better solution. Interesting and quite negative is also the high frequency of cases when the management of the company decides to adopt agile methods given that very often these decisions are based on word of mouth or just following the "new project management approach", than really understanding the implications.

Summary and conclusion

The Agile Manifesto formalised a series of values and principles, whose initial practical application could be found in methods such as Scrum, XP, FDD, ASD and DSDM. Empirical evidence has proven that, apart for Scrum, which turned out to be the dominant methodology, most of the initial models are not so widespread. The evolution of Agile is leading towards an intense adoption of practices related to the managerial side of the development, whilst more technical practices seem to be meant to a lower adoption.

The first research question was determined as follows: *What are the dominant Agile business practices?* First of all, there is set of 11 practices whose application is particularly frequently made by the respondents:

1. Stand up/Scrum meetings
2. Short iterations (30 days or less)
3. Prioritised product backlog
4. Informal design; no big design upfront
5. Task board
6. Requirements written as informal stories
7. Collective ownership of code
8. Iteration reviews/demos
9. Release planning
10. Complete feature testing done during iteration
11. Done criteria

More than half of the respondents declared to use these practices for more than 50% of the projects they are involved in. Moreover, some common characteristics were found: the majority of them come from the Scrum SDM, which indeed turned out to be the most used one; most of them, also, concern the managerial side of software development and do not give strict guidelines about the way of coding and testing the output.

Factor and cluster analysis allowed clarifying the second research question: What are the key variables that lead to a certain adoption strategy?

There are 4 different components to which practices can be associated:

1. Process related practices
2. Coding and testing related practices
3. Practices related directly to the principles
4. Team practices

The utilisation is quite different for the 4 groups: process related practices, once again, proved to be the most intensively applied. About the key variables, the only two that resulted to be statistically significant were Team size and the Degree of delocation: differences through these conditions influence the adoption strategy of the practices.

The third research question was: Why do the practices change within the PM groups?

Likely, the decision to deploy, modify or abandon practices is normally traced back to team members, and this is fully aligned with Agile principles. However, there is still a quite frequent influence of managers that define which practices should be used or dismissed.

Limitations and future research

This study is scoped only into respondents' opinions and their Agile experience. Limitations come from the nature itself of the research: a survey-based analysis was doubtless the best way to reach the goal of the study, nevertheless, the quality of the analysis could be affected by the sample size and the reliability of the answers. Collected data are, by definition, self-reported; hence poor memory or misunderstandings could contribute to inaccuracies. Also, even though sample size allowed a good quality factor and cluster analysis, a larger sample might have led to detect more significant key variables. Indeed, the biggest issue identified during the analysis was the lack of statistical significance means score differences of the variables among clusters.

Further research could take advantage of the analysis of the practices in order to relate their utilisation both with their theoretical importance and with their relation with the success of the development. Williams (2012) had already detected and classified these practices in terms of perceived importance; further research could look for a statistical correlation between theoretical importance and actual field usage of the practices. Moreover, this study did not focus on the possible correlation between a certain degree of practices utilisation and final success of the project. Finally, different key variables could be taken into consideration and analysed with the same procedure. Agile methods are still evolving and spreading over several different industries and countries: new potential variables might emerge in the future.

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GENDER DIFFERENCE IN THE USE OF SOCIAL NETWORK SITES PROFILES TO BE ATTRACTIVE FOR PROJECT MANAGER

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Abstract

The paper investigate the use of Social network sites (SNSs) for the employment and project seeking process under consideration of the gender of the user and different kind of SNS. SNSs user creates a profile to present their skills and knowledge to a large audience. SNS profiles can be used by individuals to present themselves to potential employer to identify employment opportunities. This paper identified differences between female and male user of SNSs. The gender influences the use of SNSs for the employment or project seeking process. The kind of SNS provides another variable which influence the use and behaviour of individuals. The research has been done with a questionnaire with 210 participants. The data has been analysed with descriptive statistical methods e.g. median, mean, cross tables and correlation. The employment seeking process is an important part for companies to be competitive and project manager needs superior members to be successful. SNSs are a new channel and substitute historical channels for the employment and project seeking process. Human Resources Management (HRM) need explanations how to use SNSs for the employment seeking process to provide a value to organizations. SNSs are a new tool to identify potential candidates. This tool needs further investigation that HRM can use SNSs for the employment seeking process effective and efficient. The theoretical background for this paper is social capital to explain the use of social networks and advantage of SNSs profiles for individuals as an opportunity to transfer information about individuals to other people.

Key words: *Social network sites profile, human resources management, project management.*
JEL Code: M1, M5, J6, D85

Introduction

SNSs are an important tool to identify project member and that individuals can present their skills to a large international audience e.g. project manager or companies. The profile is anytime for all other SNS members and authorized individual's access able. Especially SNS profiles provide opportunities for organisations to staff projects and to identify employees (Sander, Teh, & Sloka, 2015) (Pfeil, Arjan, & Zaphiris, 2009). The research question is about the thoughts of individuals to use SNSs profiles to find projects or employment. SNSs provide an advantage to their members and one advantage is the use of profiles for their interests. SNS profiles can be used by individuals to present themselves e.g. to potential employer or project manager to identify employment opportunities or that contractors can forward information about them to attract other SNS member to get in touch with them to offer project opportunities. That is one beneficial reason to be member of SNSs.

The labour market is changing and the demographic changes are a large issue for HRM. The difficulties to identify suitable candidates need new tools for example SNSs. The channel to get in touch with candidates changes permanently e.g. new technologies provides new channels. The historical channels are substituted by new channels, the society is changing their behaviour

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e.g. influenced by new social media tools and technological changes provide new opportunities. HRM has to take these changes under consideration to identify potential candidates and candidates use new tools to be more attractive for employer. Individuals who search for projects or project manager who search for suitable project members have similar opportunities as HRM has with SNSs. The potential candidates can collect information about employer or employment opportunities via SNSs. The numbers of channels are increasing and HRM has to know which channel is the best solution to identify the best candidate. The SNSs provide the opportunity to send signals to a specific group (Sander, Teh, Majlath, & Sloka, 2015). The number of suitable candidates is decreasing; well skilled members for projects are rare. The employment seeking process is an important part for companies to be competitive. SNSs are a new channel and substitute historical channels for the employment and project seeking process. HRM need explanations how to use SNSs for the employment seeking process to provide a value to organizations and individuals (Feuls, Fieseler, & Suphan, 2014) (Erickson, 2001). The decreasing number of potential candidates needs an increase of diversity to identify enough qualified candidates. The gender difference in the use of SNSs has to be investigated to design the recruiting process more effective and efficient for employees and project member.

People are aware that their profiles on SNSs are recognised by a large audience. They know that their SNS profile can be used by potential employer, project manager or head-hunter to evaluate skills and knowledge of candidates, to use SNSs profiles for the selection process. The SNSs profile can influence the selection process positive or negative. The social capital research identified advantages and disadvantages to be part of a social network. The discrimination of social network members is explained by the scientific literature with age, race or gender for example (Portes, 2000). That means the membership of a social network could have a negative impact on the member or result of a decision for an individual for example. The SNSs profiles can have a negative effect for the SNSs member and provide undesired information. Discrimination is a typical negative outcome of social network membership (Smith, 2005). HRM and project manager has to be aware about this issue to use SNSs for the recruiting process proper and careful.

Theoretical Background

SNSs are platforms to exchange information and to share knowledge. This platforms are social networks which are virtual and can be used to maintain friendship or relationships to other individuals. SNSs are internet based platforms to connect individuals and organize social relationships. The SNS support to organize social networks or relationships of individuals e.g. to transfer information to other member of the SNS fast and easily (Wasko, 2005) (Teh, Huah, & Si, 2014). The difference between real social networks and SNS is that time and distance between the members is not anymore a barrier to exchange information and resources. It exists different SNSs with different aims and purposes depending on the member of the SNSs. SNSs member has to have an advantage with their membership of SNSs that they stay with the network and use the network. Organizations use SNSs for their advantage and they need knowledge to use SNSs successfully that the organization will use the SNSs (Nahapiet & Ghoshal, 1998). One advantage is the improvement of the employment seeking process and that HRM can use SNSs profiles to identify potential candidates or project manager can use the social networks to find project team members with special skills. The search function is fast and easily at SNSs with the technical opportunities to use search engine to scan the SNS member.

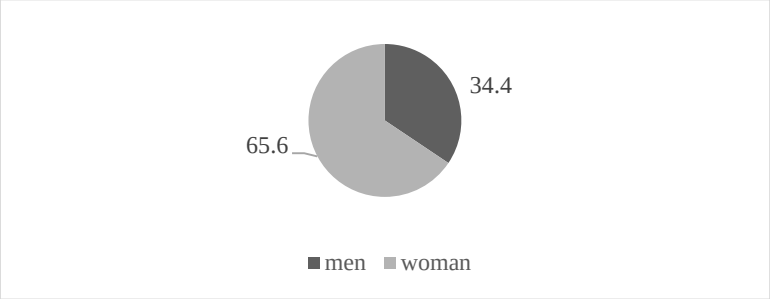
The difference between real and virtual networks is that the SNSs provide the opportunity to identify members of the network without a direct tie (Sander, 2012). That means it is possible to identify all member of the SNSs without a direct relationship compared with real social networks is the fast and easy identification only possible if a direct relationship exist. That is a difference of real and virtual networks.

The uses of SNSs supports individuals to identify employment or projects opportunities and support the employment or project seeking process. The profile is an important part of the SNSs and enables individuals to share information about skills, knowledge and personality with other SNSs members (Ellison, Steinfield, & Lampe, 2007). Headhunter and recruiter use SNSs profiles to identify potential candidates. They use the SNS to evaluate candidates to collect further information. The use of SNS reduce the time and cost to identify potential candidates. The transaction cost to transfer resources or information is reduced by the use of SNSs. Time and costs are important factors for a successful recruiting process. SNSs can support to make the recruiting process more effective and efficient (Weiss & Klein, 2011). That provides a competitive advantage to organizations. SNSs member use their profile to offer their knowledge and skills to potential employer or project manager, to make their personality and interest visible. The profiles are an important part for SNSs and an advantage for SNSs user to identify specialists or to inform other members about actual news e.g. new degrees or certificates which are important for the professional future. Business and private SNSs are different. That means the content of profiles depends on the kind of SNSs. The business SNS profiles have more professional relevant information e.g. education or degrees. Private SNS profiles have more personal relevant information for example hobbies or family related information. Both kinds of profiles have the task to present the SNS member and to share information which is relevant for other SNSs member. The use of SNSs profiles by companies to evaluate individuals can have a negative impact for the companies because individuals avoid their application. They are not interested that other individuals can misuse the information on their SNS profile, that it is possible to use their SNSs profiles to collect information about them (Moore, Daniel, Gauvin, & Dubé, 2009) (Sander, Teh, & Sloka, 2015). This knowledge influences the behaviour of individuals and their use of SNSs profiles.

The behaviour of SNSs members can be explained with social capital theory. Social capital theory is an exchange theory and explains the exchange of information and resources between social network members. That the individuals exchange their resources and information depends on trust and opportunity to penalize social network members for their behaviour (N. Lin, 2001). Further expect the social network member reciprocity and the creation of obligations. These obligations can be used to have an advantage in the future. The assumption is that the mechanism of social networks can be transferred to SNSs (Valenzuela, Park, & Kee, 2009). The investment of SNSs members can be described with the duration of the membership and use of time per day. The SNS importance for the individual can be explained with the number of contacts, the size of their social network. The size of the social network is increased because SNSs provide the opportunity with their technical opportunities to maintain relationships more easily and to exchange information fast and easily without any barrier.

Method to investigate the use of social network sites profiles

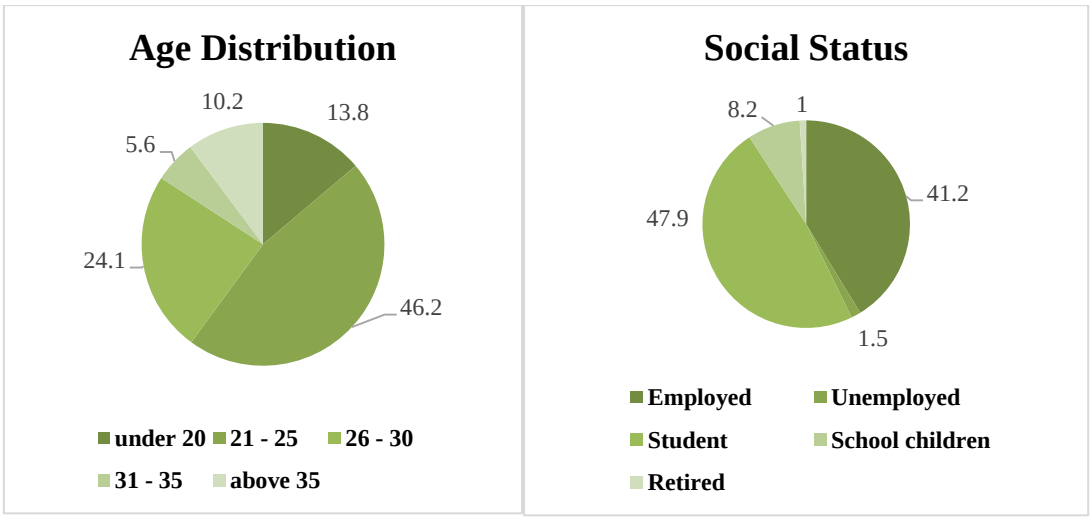
The questionnaire has been done in October 2015 at University of Ludwigshafen. The questionnaire has been part of a project about behaviour of employment seeking individuals. The questionnaire has 210 participants and all participants are speaking German. The gender distribution is described in the diagram below.



Source conducted by Tom Sander

Fig. 1. **Gender distribution of participants at University of Ludwigshafen in 2015, n = 210, results in %**

The age distribution and social status is described in the diagram below. The participants are mainly young individuals who are searching employment, will search employment in the near future or have had searched employment in the last years. That means the experience and knowledge about employment seeking opportunities is actual. That means the individuals report is with only few biases because the individuals can remember very well their employment seeking process or they are involved in the employment seeking process at the moment. That has a positive impact on the collected data. The paper is about employment and project seeking process and is investigating the behaviour of employment or project seeking individuals.



Source conducted by Tom Sander

Fig. 2. **Age distribution and social status distribution of participants at University of Ludwigshafen in 2015, n = 210, results in %**

The largest group of participants is individuals in education programs. Students and school children are 46.1% of the participants. This group will search for employment opportunities in the near future and currently evaluating different recruiting channels for their employment seeking process. Private SNSs are used by 163 participants and business SNSs are

used by 84 participants. The distribution of private SNSs and business SNSs are common. The federal statistical office of Germany and data from other research confirms that kind of distribution (Statistisches Bundesamt, 2014). The importance to differentiate between private and business SNSs is explained in the following sections.

Use of social network sites profiles to identify suitable individuals

Member can use their SNSs profiles to present their skills and knowledge. The SNSs member is aware that their profiles are important for the employment seeking process but there are differences between private and business SNSs (Krug & Rebien, 2012). The tendency for private SNSs is to "I agree completely" and the tendency of business SNSs is to "I do not agree". Mean, mode and median is different and the direction of the answer is contraire between business and private SNSs. The results in detail are presented in the table below. That means there is a difference between this two kinds of networks and is an indication for the different use of SNSs. That can be explained with the different purpose of the SNSs and that employment seeking process is different under consideration of the kind of SNSs. That means individuals use SNS profiles from business and private SNSs differently (Sander, Sloka, & Pauzuoliene, 2015). The member are differentiate their profile presentation between the kind of SNSs and the expectation about accepted content of SNSs profiles depend on the kind of SNS. That means the SNSs profiles are different.

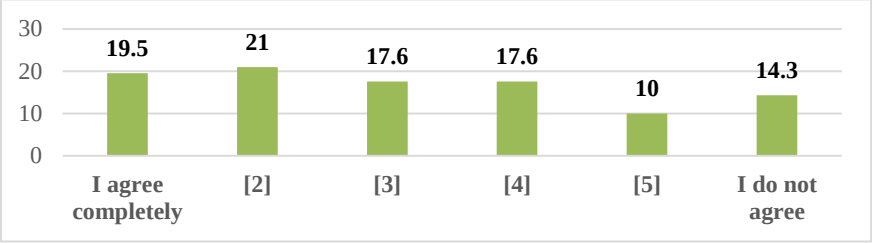
Table 1

Main statistical indicators of evaluations on questions "I try to avoid negative information for employers and to present my profile positive at private SNS e.g. *Facebook*" and "It is important for me to actualize my profile regularly and to improve the profile at Business SNSs e.g. *LinkedIn*", n=210, evaluation scale 1-6, where 1-fully agree, 6-fully disagree

Statistical indicators	I try to avoid negative information for employers and to present my profile positive at private SNSs e.g. *Facebook*	It is important for me to actualize my profile regularly and to improve the profile at Business SNSs e.g. *LinkedIn*
N	210	210
Mean	3.2	3.81
Median	3	4
Mode	2	6
Standard Deviation	1.68	1.683

Source: Survey conducted by Tom Sander at University of Ludwigshafen, 2015

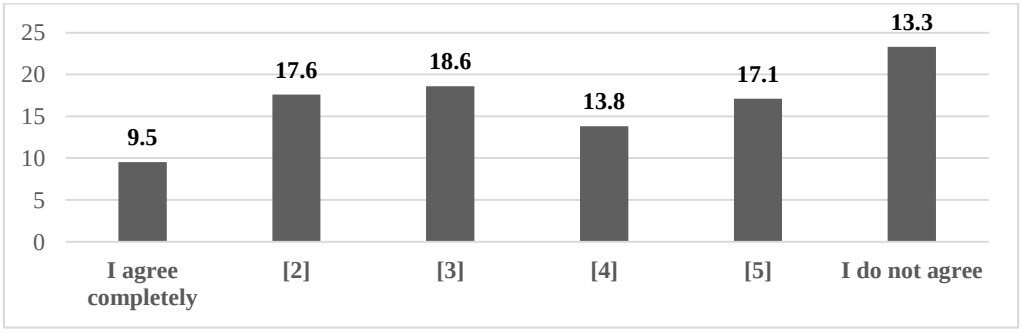
The frequency of the responses for the question "I tried to avoid negative information for employers and to present my profile positive at private SNSs e.g. *Facebook* is described in the diagram below. The diagram confirms the statistical results and there is a clear tendency to "I agree completely". On the scale one, two and three is the summarized result 58.1% which is a clear result that the private SNSs are an important part of the social live and that individuals do not provide all information about individuals (Hampton & Wellman, 2003). The user is hiding information because they know that other individuals can use the profile to evaluate each other. The evaluation leads to a decision and the decision can be positive and negative for the SNSs member. The influence of the decision can be controlled by the presentation of the SNS profile and can lead to pretended profiles or more negative to faked profiles.



Source: Survey conducted by Tom Sander at University of Ludwigshafen, 2015

Fig. 3. **Distribution of evaluations "I try to avoid negative information for employers and to present my profile positive at private SNSs e.g. *Facebook*", n=210, results in %, evaluation scale 1-6, where 1-fully agree, 6-fully disagree**

The business SNSs are contraire to private SNS. The summarized result of the scale four, five and six is 55.2%. The tendency for business SNSs is more to "I do not agree" than for private SNSs. That means the business SNSs is less important for the participants to present their skills to other SNSs member under consideration of the employment seeking process. The actualization of business SNS profiles is not so important for individuals to share their skills. That is surprising because business SNSs are mainly used for business reasons or it could be an explanation that individuals have more fears that their private SNSs profile can be misused by companies to reject potential candidates for example. The results in detail are presented in the diagram below.



Source: Survey conducted by Tom Sander at University of Ludwigshafen, 2015

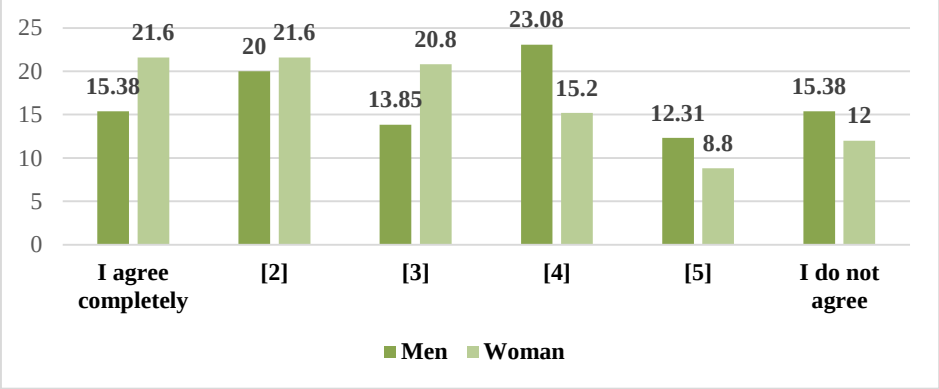
Fig. 4. **Distribution of evaluations "It is important for me to actualize my profile regularly and to improve the profile at Business SNSs e.g. *LinkedIn*", n=210, evaluation scale 1-6, where 1-fully agree, 6-fully disagree**

The use of SNSs profiles at private or business SNSs cannot be explained with the duration of membership in years, number of contacts or daily use of SNS in minutes. Only the use of SNS in minutes per day is on a significant relevant level correlated with two questions. All correlations are negative but the correlation coefficient is between -0.96 and -0.381 which is statistical not on a relevant level and cannot be used to explain the behaviour. That result is similar to other research projects and needs further explanation (Tartakovskaia, 2006). The use of SNS is mainly independent from the behaviour of SNSs member under consideration of the

employment seeking process as there does not exist any correlation between the use and behaviour indicators.

Gender differences of the use of profiles for the employment seeking process

This paper investigates the differences between the gender and how different SNSs are influenced by the gender regarding the use of SNSs profiles. The following section present the results and compares the answer of men and woman to explain the different use of SNS profiles.

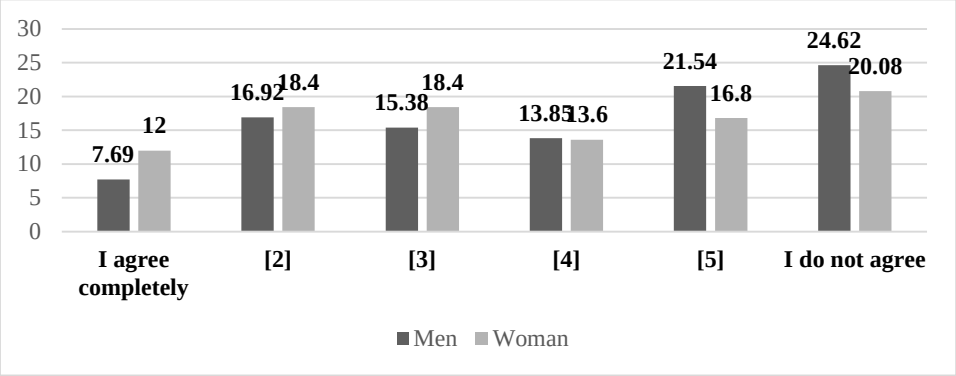


Source: Survey conducted by Tom Sander at University of Ludwigshafen, 2015

Fig. 5. **Distribution of evaluations by gender "I try to avoid negative information for employers and to present my profile positive at private SNSs e.g. *Facebook*", evaluation scale 1-6, where 1-fully agree, 6-fully disagree n (male) = 65, n (female) = 125, results in %**

The results for private SNSs are very interesting and describe the gender differences very clearly. The woman participant's main answer with 21.6% is on scale one and two. The tendency is for woman to "I agree completely" with 64% for the first three scales. The number of respondents of women participants is on the first three scales above the men. Male participants most choice is stage four with 23.08%. The answers from the male participants are cumulated 50.77% at the last three stages. That is a tendency that male participants do not agree with the statement about negative information at private SNSs. The number of respondents of men participants on the last three stages is above the woman (McDonald, Lin, & Ao, 2009). That means men and women compared for this question are different and they present a different behaviour. That explains the importance of SNSs profiles. Women attach more importance to private SNSs than male user of private SNSs under consideration of the employment seeking process. That means the chance to find unfiltered information on private SNSs could be higher than on woman private SNSs profile. Men are not prepared that employer can use their private SNS to evaluate them or they do not take care about their private profile at SNSs compared with women.

The next diagram is about business SNSs. Research evaluated that differences between SNS exist and member of different SNSs use their SNS for their advantage. SNSs have a purpose and identity, the kind of network explains the behaviour of members and provides explanation about the use of the SNSs. That is the reason to investigate business and private SNSs.



Source: Survey conducted by Tom Sander at University of Ludwigshafen, 2015

Fig. 6. **Distribution of evaluations by gender "It is important for me to actualize my profile regularly and to improve the profile at Business SNSs e.g. *LinkedIn*", n (male) = 65, n (female) = 125, results in %, evaluation scale 1-6, where 1-fully agree, 6-fully disagree**

The highest frequency is on scale six for woman with 20.08% and men 24.62%. That means there are differences between men and woman in the use of profiles of business SNSs. The tendency is clear to "I do not agree for men" with 60.01% for the scale four to six. Compared to women with 51.2% cumulated scale four to six is a clear difference visible. In addition is the frequency of answers on scale one to three women more than men and on the scale four to six is the frequency of men more than woman. That means men are less critical with their profile on business SNSs than woman. Woman takes more care for their business SNSs than men. Woman does more often agree that they actualize and improve their profile than men participants under consideration of the employment seeking process.

Conclusions

This paper explains the differences between private and business SNSs under consideration of the employment seeking process. The paper concentrates the use of SNSs profiles to present the profile owner to other individuals e.g. to potential employer or project manager. The member of private SNSs hide part of their profiles or do not mention information about them at SNS profiles to avoid negative outcomes for them. They are aware that their SNS can be used to evaluate them and they do not provide all information at their private SNSs profiles. That means companies and other member have to be aware that they cannot use private SNSs to evaluate individuals deeply.

A contraire situation has been with business SNSs profiles. Members do not actualize their profiles regularly and they do not agree that business SNSs profiles have to be improved. That means business SNSs profiles are not as important as private SNSs profiles for the individuals.

The difference between the genders is clearly described in the diagrams with the contraire trend of the answers. The women do more agree and the men do more disagree with their answers regarding the business and private SNSs profiles. The woman is on the scale from one to three above the men and the men are above the woman on the scale from four to six. That means woman take more care about their profiles than men. That is a difference between the gender which should be investigated deeper in future research.

Organizations and other individuals has to be aware that men and women behave different on SNS under consideration of the use of SNSs profiles. Further has to be under consideration that the behaviour and use of SNSs profiles depend on the purpose and kind of the SNSs. That has to be under consideration if the SNSs profiles are used to evaluate individuals and to make a decision about the skills and ability of SNS member evaluated with their profiles.

Especially HRM and project manager has to be aware that the evaluation of SNS profiles has to be carefully used to evaluate candidates and to collect information about potential candidates as the results of research explain that individuals use their profile differently and the information of SNS profiles is not complete or actualize (Pfeil et al., 2009). More worse can be that the profile is faked to appear more attractive for the recipient. The member of SNSs is aware that their profile can be used to evaluate them. The member of SNSs knows that they can use their profile to influence their reputation and to spread positive information about them to a large audience. They know that they can use their profile to influence other people to make a decision about them. That means the privacy and data protection is an anticipated issue of SNSs and people react with their behaviour on this issue e.g. hide or omit information. The member doing that to avoid disadvantages and present themselves positive to the SNSs audience.

That means they use their profile to increase their advantage with their network. That is a reason to be a member of the network and explain the use of SNSs. The disadvantage of SNSs profiles is given with the explanation that people are actualize and improve their profiles that other SNSs member cannot use the SNSs profiles of other member to evaluate them. This has to be under consideration if SNSs profiles are used to find a decision e.g. to employ somebody or to take somebody in the project team.

The use of SNSs, duration of membership, number of contacts and use of minutes per day do not have any relevant correlation regarding the use of SNS profiles. That means there does not exist any significant correlation between the creation, actualization and improvement of SNS profiles and the use of SNS profiles is on a weak level and statistically not relevant. That means the behaviour do not explain the use of SNSs.

The research needs further investigations with more participants and qualitative research is useful to get a deeper insight in the topic to identify further reasons.

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PROJECT MANAGEMENT TOOLS AND TECHNIQUES IN PRIVATE CONSTRUCTION COMPANIES IN NIGERIA: A CASE STUDY APPROACH

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Abstract

The application of project management tools and techniques (PMTT) in private sector is increasingly becoming a vital issue in developing countries, particularly in a nation such as Nigeria where project of various magnitude and structures are embarked on. This application is largely applied in organisation in developed nations as a key management strategy in realising projects outcome and organisational objectives within precise time limit as well as budget limits via optimum usage of resources.

In Nigeria, the application of modern PMTT is still not well recognized in private sector, for instance the construction industry. Hence, these results in project failure, budget overrun, low quality of project outcome and delay in project delivery. Therefore the purpose of this research is to identify the reasons why PMTT used in the construction industry in developed economies are not heavily used by Nigerian construction companies and to identify the factors influencing PMTT adoption. To realize this, an initial framework has been developed using resource based view theory (RBV) model as theoretical underpinning for empirical studies and will be further improved in the final phase of this study.

A qualitative research method has been used by adopting semi-structured interviews with major project managers in Nigerian construction companies. Qualitative research gives room for the generation of rich data, providing an insight into the nature of phenomena. In-depth study has been carried out to gain useful preliminary insights into the current practice and the adoption process of PMTT in Nigerian construction companies.18 project managers had been interviewed in different construction organisations in Nigeria, to investigate factors that influence PMTT adoption process. Results so far have revealed the main challenges project managers face in adopting PMTT especially when it is so sophisticated.

Key words: *Project management, PMTT, Construction Company, Diffusion of Innovation theory, Nigeria*
JEL code: *Y4*

Introduction

Project management tools and techniques (PMTT) are inevitable on construction projects, mainly because of the uniqueness of each project and the roles its plays in the execution process of any project irrespective of size and location (Ihesiene, 2014). Deep concern has been expressed about projects in private and public sectors that have been abandoned and delayed in several states in Nigeria, (Teslim, 2014), after making huge investment Olateju et al, (2011). Larger numbers of these projects are in the construction industry and in most cases are sponsored by external organisation such as World Bank.

Several reasons have been pointed out for this unhealthy scenario in the construction industry, the most prominent being inadequate knowledge of PMTT, poor project analysis and management. (Okoye, et al 2015; Teslim, 2014). Secondly, high cost of input caused by lack of material use in construction work. (Okoye, et al 2015). The construction community also have very low adaptation capacity of new innovation added to lack of well-trained human resource required to plan, control, manage, and to implement projects. As the organisations resort to improvise, they encounter regular occurrences of material wastage and project failure (Braimah, 2013). According to the literature review, the average wastefulness and failure in construction

project and other factors accounted for about 2.5% of 15% in Nigeria (Okoye, *et al* 2015). In addition, the industry has not been given meaningful research attention, in spite of the vital place it occupies in the nation economy. Based on this light this current study was considered convenient and suitable. The research also highlights diffusion of innovative theory as the underpinning philosophy of this study.

Theoretical Foundation

All sectors whether production, manufacturing or construction have a duty of instilling change in their organisation, in order to enhance effectiveness and remain relevant in their chosen market. However, there are barriers to effective implementation of change and these are insufficient resources, lack of organisational support and resistance to change.

Therefore, this study employed a leading business change theory known as Diffusion of Innovation theory (DOIT) as a theoretical lens to underpin this research.

According to Rogers (2003, p.5), diffusion is defined as a "process in which an innovation is communicated through certain channels over time among the members of the system". The concept of diffusion is a type of social change that is associated with new ideas, identified as the process whereby alteration happens in the structure and function of the social system. Social alteration occurs when new ideas are conceived, diffused, and adopted or rejected, that leads to a certain consequence (Bollig, 2006).

The process of innovation commence with the appreciation of inadequacy or request for effective service that are not currently provided in an organisation. Hence, innovation development is initiated when a problem or a need is recognised in an organisation (Rogers, 2003).

Though there is a robust knowledge on innovation diffusion, research on DOI in construction industries is rare. Five stages are involved in conceptualising the adoption process (Gao, 2013).

Knowledge stage: The early adopter learns about the new idea and seeks information about the innovation (Ismail, 2006).

Communication process: occurs when participants create and share knowledge with each other in order to reach a mutual understanding, it occurs through channels between sources.

Persuasion stage: acquiring knowledge does not imply the adoption or rejection of innovation. Persuasion suggests that individual attitude toward innovation either favourable or unfavourable (Rogers, 2003).

Decision Stage: at this stage of innovation process, the individual chooses to accept or reject the innovation.

Implementation: an innovation is put into practice at this phase. Innovation communicates newness; however, some degree of indecision is involved in this process.

Overview of project management

Numerous definitions had been given to project by various researchers, because project is considered as a multidisciplinary word with diverse significance from different viewpoint and orientation. For instance, Engineers, Event manager, project manager, Architects, scientist, have their own definition framed out from their experience bases on their profession (Olateju *et al*, 2011). Project is defined "is a temporary activity or endeavour undertaken purposely to create a unique output (product or service) within budget, time and standards" (PMI, 2000; Pinto, 2007)

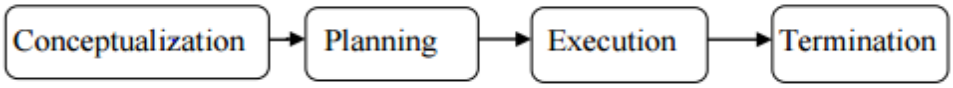
According to the definition, project has certain features that distinguish it from general management. It is design to produce a unique project which has not been undertaken before and is to accomplish a specific objective of an organization. The uniqueness of the project shows that the exact project has not been done before and it has a degree of originality (Tetteh, 2014). The temporary nature of the project indicates that the projects do have a start time and an end time, and requires a project team to carry out the activity. (Olateju *et al*, 2011). Project management on the other hand, according to Kerzner (2009) cited by Newton, (2015) "is the art and science of planning, designing and managing work throughout all the phases of the project life cycle". It is also observed as a process of planning, designing, scheduling, managing and controlling interrelated project activities in order to realise a precise objectives or goal within a given time, budget and quality (Lewis, 2007).

Project Management (PM) is a ground-breaking management practice that assists managers to accomplish specified objectives within definite time and budget limits through optimum use of resources. (Olateju et al, 2011). To achieve this objective, project life cycle is divided into sub- manageable phases. This enhances visibility of the processes and allow for easily monitoring. Each project phase required project management tools and techniques to aid carry out the activities.

Project Life Cycle and PMTT

The four different developmental phases of a project according to Pinto (2007) includes: Conception, Planning, Execution and Termination. A project life cycle presents logical relationships governing a project and form basis for project planning.

Fig. 1. Four-Step Model of Project Life Cycle



Source: Pinto (2007)

Various PMTT are used in managing projects for a required outcome. Some of these PMTT are listed in table1, which includes; Work Breakdown Structure, Gantt Charts, Project Networks (CPM and PERT), Project Sensitivity Analysis, Cost Benefit Analysis, Graphical Evaluation and Review Technique (GERT), Business Case, Benefit Realisation, Stakeholder matrix and Project Software (Hazır, 2015; Krechmer et al, 2015; Maloney, 2012; Olateju et al, 2011). These tools are commonly used in today business such as manufacturing, information system, and production and construction industry to provide effective and efficient performance (Olateju et al, 2011). Drawing from Newton (2015) the existence of PMTT is very vital in today's business, planning, controlling, resource allocation and staffing are virtually done by these tools. Organisations in the developed countries take advantage of these concepts to increase their resource base and improve their project delivery quality. For Instance Multiplex Construction Company employed these tools during the construction Wembley stadium in 2003 and Utzon, 1964 adopt this tools for Sydney Opera house (Smith, 2015; Porter, 2013). In contract these tool for example WBS, become out-dated quickly on time because project schedule change frequently during the project implementation. Hence, updating the work break structure is overhead that perhaps no project manager does (Elnaz, 2015).

Table 1

Project life cycle and 'selected' PMTT

Project phases	Tools and Techniques	Definition	Author
Conceptualization	Business case	Tools used by the management in guiding the creation of business value and decision making.	Mentor, (2013)
	Benefit realisation	The Benefits Review Plan is a base lined product and it is created in IP defines how and when measurement of achievement of the project's Benefits are expected by the Senior User.	Serra, & Kunc, (2015)
Planning	Microsoft project	A PM tool developed to assist managers in planning, assigning resources to tasks, tracking progress and managing the budget.	Wale *et al*, (2015)
	Gantt chart	Gantt charts are PM tools used during the entire design process. They are used to plan, monitor, and execute project. They are used to present tasks, deliverables, personnel, and other resources in graphically.	Wren, (2015)
	Programme Evaluation and Review Technique (PERT)	A PERT chart is a PM tool used for scheduling, organizing, and coordinating tasks within a project.	Hazır, (2015)
Execution	Work breakdown structure, (WBS)	WBS deals with breaking down of the projects into manageable components in a hierarchical structure.	Maloney, (2012)
	Critical path method (CPM)	CPM is a project network analysis method used to determine the sequence of different activities in the project.	Santiago, & Magallon, (2009).
	Graphical Evaluation and Review Technique (GERT)	GERT is a network analysis technique used in project management that allows probabilistic treatment of both network logic and activity duration estimates	Nelson *et al*, (2016)
Termination	Cost Benefit Analysis (CBA)	CBA is one of the most widely accepted and applied model for project appraisal for large scale infrastructure.	Olateju et al, (2011)

Source: Adapted by author from (Olateju et al, 2011; Nelson et al, 2016; Serra, & Kunc, 2015; Wale et al, 2015)

Practically there are several PMTT available to project practitioners. A study by Olateju et al, (2011) highlighted a list of PMTT from 236 project managers in some public institutions that leads to project success in their organisation. These are summarised in Table 2

Table 2

Most frequent use PMTT in PSO

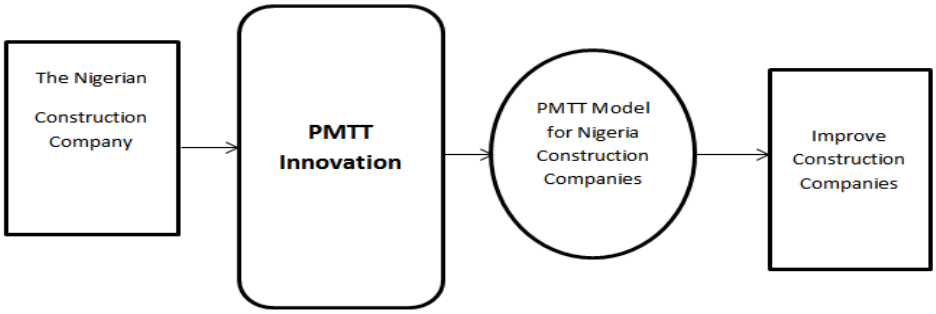
Technique/tools	Percentage (%)	95% Confidence interval
Work Breakdown Structure	26	7.6 – 36.4
Statement of Work	30	15.1 – 46.3
Critical Path Method	3	0.0 – 9.4
Project Sensitivity Analysis	6	0.0 – 12.1
Earned value management,	-	
Cost Benefit Analysis	64	36.6 – 71.5
Gantt Chart	58	52.4 - 83.6
Programme Evaluation and Review Technique (PERT)	-	-
Graphical Evaluation and Review Technique	-	-

Source: Olateju et al, 2011

Table 2 indicates that Gantt chart and Cost Benefit Analysis are the most frequent use tools in an organisation. Research has established that application of current project management approaches and methods has a great influence on private institutions (Olateju et al, 2011). Arnaboldi et al (2004) observed that adoption of PMTT in private sector was due to the pressing need on governments to shift from the bureaucratic system in favour of leaner organisation. The authors considered the projects undertaken at Italian Treasury Ministry using PMTT and find out that proper implementation of PMTT will help in evading project failure, reduction material wastage, budget overrun and project delay (Arnaboldi et al, 2004)

Similarly, Olateju et al, (2011) explored the PMTT employed by construction firm in Jordan by surveying 50 construction firms. The study shows that the use of PMTT among firms is low, but when use efficiently would bring about concrete benefit in all facets of planning, scheduling and monitoring the time, cost and specifications of projects. In Nigeria, the implementation of modern PMTT is still a challenge in private construction firms; these results into project failure and abandonment of project and budget overrun (Teslim, 2014). Studies have recognized social and political systems, cultural blocks and lack of financial support as barriers to successful project planning and execution in Nigerian public sector (Idoro & Patunola-Ajayi, 2009).

Therefore, the conceptual framework guiding this study examines the PMTT being used in Nigerian construction firms, their benefits, obstacles and problems with a view of recommending appropriate framework for the industry. These are illustrated in Figure 2.



Fig, 2. **The initial conceptual framework**.

Methodology

This research follows a qualitative approach as this allows for better understanding of social or human problems in terms of building a complex, holistic picture with words to report the several views of informants in their natural setting (Creswell, 2012). The unit of analysis form the basis of this sample is the construction company in Nigeria. The research uses a theoretical sampling approach as data is simultaneously collected, coded and analysed in order to develop theory as it emerges (Glaser and Strauss, 2001).

This initial exploratory study consisted of semi-structured interviews with project managers of ten Nigerian construction companies. Eighteen project managers were interviewed two of them were female while the rest were men, using semi-structured interviews to obtained qualitative descriptions of the life world of respondents with respect to interpretation of their meaning. The interviews lasted between 45 minutes to an hour and were for the most part conducted face to face. Initial data is being analysed using the Computer Aided Qualitative Data Analysis Software (CAQDAS) NVIVO 10. CAQDAS packages help the researcher get "closer" to the data, increase accuracy, transparency and overall rigour of the data analysis process and outcomes.

Conclusions

Applying PMTT in private construction firm has become an important issue in many developing countries, due to its successful application in developed countries and its proven efficiency as well as flexibility in achieving project goals and objectives. Nigeria occupies a major set in Common Wealth as a result; the nation is witnessing unprecedented capital projects in all the aspect of developments, which require better application and utilization of efficient, and effective management tools and techniques. Studying the application of PMTT in construction firm in Nigeria would serve as eye openers to the government and other decision maker to better plan their effort toward efficient application of PM tools and techniques. If properly applied, PM tools and techniques would result in concrete benefits in all aspects of project planning, scheduling and controlling the cost, time and quality.

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SOCIAL PROJECT MANAGEMENT?

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Abstract

The last 10 to 12 years has seen the spectacular rise of social media and online social networks, such as Twitter, Facebook, YouTube, Yammer, Google+ and LinkedIn. The use of these media is not only growing in terms of active users, but also in intensity of use. Given the importance of communication and collaboration in projects, it can be expected that social media also provide good opportunities for application in project teams and project management. However, the availability of documented experiences, research and 'best practices' of the use of social media in projects, is still quite limited. This paper reflects on the content and contributions of the book "Strategic Integration of Social Media into Project Management Practice". This book provides an overview of opportunities, barriers, technologies, limitations and experiences of social media in projects, by a diverse coverage of studies and applications from Europe, North America, South America, Africa and Asia.

The different contributions and cases show that Social media and Web 2.0 technologies provide great opportunities to enable teams, especially virtual teams, to collaborate and share information, thereby enhancing project collaboration and coordination. However, social media also allows project managers to take this development even further and to make project management truly social. 'Social Project Management', recognizing that project teams are part of a broader project community, which is both formal and informal, and that engaging with that community is the key to getting things done.

Keywords: *Project management, Social media.*
JEL code: *M1: Business Administration*

Introduction

The last 10 to 12 years has seen the spectacular rise of social media and online social networks, such as Twitter, facebook, YouTube, Yammer, Google+ and LinkedIn. The use of these media is not only growing in terms of active users, but also in intensity of use. Especially since the introduction of smartphones and other mobile internet devices, using the social media is literally a 'finger tap' away. And although concerns about privacy and misuse of personal data may discourage certain users to engage in these media, the largest social media (facebook, QQ and WhatsApp) are reporting active users numbers of between 700 and 1.400 million people. That is almost 1/5th of world population and roughly half of all people with an internet connection.

The role social media play in the social life of their users can hardly be overestimated. The way people express and present themselves on social media may be considered an inseparable part of their lifestyle and existence (Silvius and Kavaliauskaite, 2014). Also in the professional context, the use of social media is developing. The ease of use of social media, their rapidly developing functionality and their mobile accessibility, make them an efficient tool for team communication and collaboration. Some organizations even redesigned their corporate intranets and knowledge sharing systems as social media. In part replacing top-down structuring of information by bottom up inputs, discussion, personal profiling and ad-hoc collaboration.

Given the importance of (team) collaboration and (stakeholder) communication in projects, it can be expected that social media also provide good opportunities for application in project teams and project management (Harrin, 2010). However, the availability of documented

experiences, research and 'best practices' of the use of social media in projects, is still quite limited.

This paper reflects on the content and contributions of the book "Strategic Integration of Social Media into Project Management Practice" (Silvius, 2016). This book, provides an overview of opportunities, barriers, technologies, limitations and experiences of social media in projects in 18 chapters, that provide a diverse coverage of studies and applications from Europe, North America, South America, Africa and Asia.

Following this introduction, the paper is structured in three paragraphs. The next paragraph will provide an overview of the content of the book. The third paragraph, Discussion and reflection, will reflect upon this content and discuss the lessons that may be learned from the book. The final paragraph of this paper will provide some conclusions and will discuss the concept of 'social project management'.

Description of content

This book Strategic Integration of Social Media into Project Management Practice (Silvius, 2016) is structured in five sections, with the following themes:

1. The Opportunity of Social Media

In this section, four research based chapters will explore how the functionality offered by social media can be applied in project management processes and practices.

2. The Human Factor and Social Media

In this section, three chapters present the effect of social media on (virtual) teams and teamwork.

3. Tools and Technologies of Social Media

This section presents, in four chapters, an overview of technologies that can be applied to facilitate stakeholder communication and team collaboration in projects.

4. Cases and Applications

This section presents, in five chapters, a range of empirical studies of projects that applied social media in their communication strategy and discusses the experiences in these cases.

5. Conclusion

In this section, a first chapter presents an overall reflection on the content of the book by the editor. A second chapter is provided by authors of the Project Management Institute and describes the social media infrastructure that project management professionals can utilize to stay in touch with their peers and with the profession.

As the book presents a diverse set of contributions, developed by almost 30 project management professionals and academics, the next section provides a short description of each chapter.

Section 1: The Opportunity of Social Media

Chapter 1 is titled "Project Management 2.0: Towards the renewal of the discipline" (Nach, 2016). In this chapter, the author addresses the question why project managers would integrate social media in the communication in and around their projects. One the 'why' is clear, he describes a number of social media types that can be applied in projects and provides a roadmap for the integration of social media in project management.

Chapter 2, "Effects of Social Media on Project Management" (Sponselee, 2016), reports an explorative study into the potential application areas of social media within the project management subject groups of the ISO 21500 guideline. Next to the potential application areas, the author also explored the perceived barriers to social media use.

In chapter 3, "Social Media Use in Managing Project Communication" (Dokkum and Ravesteijn, 2016), the authors develop a framework that project managers can use in order to apply in social media to projects. The chapter concludes that social media can improve organizational communications, especially so in the context of project management, and has an impact on the costs of a project. Important success factors in the use of social media are: affordability, trust and ease-of-use. If these factors have been met than social media technologies can provide a self-organization information network were workers can have: peer-to-peer sharing, content evaluation and push nature.

Chapter 4 is titled "Social Media for Project Management" (Manzoor, 2016). In this chapter, the author explores how project managers can use social media tools. He describes a range of social media tools that can provide value in projects and provides practical implications and recommendations. The author concludes that "social media is here to stay" and that project managers should carefully research social media tools to determine their fit into the project and the organization itself.

Section 2: The Human Factor and Social Media

Chapter 5, "The influence of social media on teamwork aspects" (Molendijk, 2016), reports a study into the perceived effect of the functionalities of social media on quality of teamwork. The author concludes that the use of social media has the potential to have a positive influence on the quality of teamwork in projects.

In chapter 6, "Investigating the Intention To Use Social Media Tools Within Virtual Project Teams" (Giltenane, 2016), the author reports a study into the intention to use social media within virtual project teams, using the Unified Theory of Acceptance and Use of Technology (UTAUT) model. The findings validate the findings of previous studies using the model and indicate the models suitability for further refinement in the virtual project team area and in virtual teams in general.

Chapter 7, "Barriers to Social Media Adoption on Projects" (Harrin, 2016), explores the reasons behind the lack of adoption of social media tools in a project environment. In this chapter, the author, having authored a frequently cited book on social media in project management before (Harrin, 2010), discusses how project practitioners can overcome concerns about the lack of overall strategy, lack of senior management sponsorship, lack of a proven business case, security issues, information overload and the blurring of lines between professional and personal data online in order to realize the benefits of social and collaboration tools. The chapter concludes that social tools are a fundamental part of the current and future project management landscape and that 'social' should be intelligently incorporated into working practices in order to meet a need instead of being a response to outside trends.

Section 3: Tools and Technologies of Social Media

Chapter 8, "Analyzing the landscape of Social Media" (Silvius, 2016b), describes the 'landscape' of social media and discusses the landscape from the perspectives of functionality, social media size and growth, geographical market position, generational differences and gender differences.

Chapter 9, "Social Media Use Within Project Teams" (Merwe, 2016) gives practical recommendations about the social media tools and applications for use on projects. It introduces the reader to the most popular and widely used social media tools and provides considerations for the selection of the best tools to integrate in projects.

In chapter 10, "An Integrated Approach to Collaborative Learning in Projects" (Veronese and Chaves, 2016), the authors develop a social media and web 2.0 based architecture for

knowledge management in order to analyze how the web 2.0 technologies can support capturing, sharing and disseminating lessons learned in project management.

Chapter 11, "'Smart' Project Management: Smartphone Apps for Project Management" (Silvius and Silvius, 2016), reports an explorative study into the functionality of project management apps in the Google Play and Apple App stores. The authors analyze the apps according to type of functionality, project management processes supported, methodology/standard supported, topics covered, website support, languages supported, project roles supported, number of team members supported and number of projects supported.

Section 4: Cases and Applications

Based upon the theories of communication, chapter 12, "Developing a social media communication plan: a case study of the Quicker Steps project" (Nazari, 2016), describes the development of a social media communications plan for a the Quicker Steps project in Finland. The Quicker Steps project aimed to disseminate knowledge and best practices of the diverse cooperation and partnership solutions between higher education institutions and working life in Finland, Luxemburg, Austria and the United Kingdom. Next to describing the plan, this chapter also presents the result of a study into the effectiveness of the different communication channels.

Chapter 13, "Projects without email, is that possible?" (Wijngaard et al., 2016), describes the case of how the IT and consulting firm ATOS designed and implemented a landscape of project communication that eliminated email and replaced it with unified communications and social media. The authors share their view on the implementation steps, experiences, change aspects and lessons learned.

Chapter 14, "From reactive to proactive use of social media in emergency response: A critical discussion of the Twitcident project" (Boersma et al., 2016), reports a pilot project on the use of social media in the public safety sector. The authors discuss how social media, and in particular Twitter, could be used in the response room setting. The study concludes that the centralists had a hard time interpreting and validating social media data and linking them to other sources of information. This finding, however, does not mean that the use of social media data has to be abandoned. The authors conclude that the effective use of social media data requires a learning process.

In chapter 15, "Using Twitter for Collaborative Student and Project Manager Learning" (Barnett-Richards and Sams, 2016), the authors discuss the evolving nature of project management education and in particular the development towards collaborative learning in order to enhance both the employability of students, and enabling managers to reflect on their own practice and understanding. They report their experiences in using Twitter in order to support for collaborative learning. The authors discuss their reflections and perspectives of the value and challenges in using Twitter for this type of endeavor, and present their view on the future implications for adopting the use of Twitter, and social media more broadly, for project teams.

Chapter 16, "Social Media Applications Promote Constituent Involvement in Government Management" (Merwin et al., 2016), explores the use by local governments of social media applications to communicate with constituents and promote involvement in policy and project management activities. The authors provide a variety of examples from the local government context and discuss suggestions for the use of social media in government.

Section 5: Conclusion

In Chapter 17, "Social Project Management?" (Silvius, 2016c), the editor of the book reflects upon the lessons that may be learned from this book. In three concise paragraphs, it discusses the common ground amongst the different contributions, the 'takeaways' from the book and the concept of 'social project management' as the future outlook on social media in project management.

The final chapter, chapter 18 "Inside the Project Management Institute: Setting up Change Makers for Success Based on Social Connection" (Walker and Garrett, 2016), presents how the Project Management Institute (PMI) utilizes popular social media platforms in order to better support project management practitioners, as well as create a robust virtual community. Through social media, PMI aims to create an environment in which project practitioners create, curate, and share strong value-added content, take part in well-informed discussions, and collaborate to seek effective solutions.

Discussion and reflection

This section aims to reflect upon and summarize the lessons that may be learned from the book. In order to do so, we will discuss the common ground amongst the authors. What statements may summarize the different experiences and contributions? Elaborating on this, we will summarize what the reader may or should 'take away' from the book. What can be learned from social media and applied to project communication? In the final paragraph of this epilogue, we will take these lessons further and ask ourselves what 'social project management' could look like.

Common ground

When reflecting upon the contributions in the book, some common ground can be discovered amongst the different contributions.

Efficient and effective team communication

First of all, social media provides an opportunity for supporting efficient and effective team communication in project teams. Many contributions in this book, most notably Nach (2016), Sponselee (2016), Dokkum and Ravesteijn (2016), Manzoor (2016), Molendijk (2016), Giltenane (2016), Merwe (2016), Veronese and Chaves (2016) and Wijngaard er al. (2016), highlight the opportunities that social media offer for supporting efficient and effective communication within project teams.

Understand differences

While recognizing the opportunities of social media, Silvius (2016b) highlights the fact that the social media landscape is not unified. By discussing differences between regions, countries and generations, this contribution makes us aware that a social media communication strategy needs to be carefully planned, especially in the case of international projects with geographically dispersed teams.

Develop a plan

Plan the project's social media communication strategy is also the conclusion that comes from Silvius and Silvius (2016) based upon their analysis of project management apps. An example of the development of such a social media communication strategy is contributed by Nazari (2016). The step-for-step approach described here may provide project managers with a practical process description for the development of their communication strategy.

There is a learning curve

The cases reported by Boersma et al. (2016) and Barnett-Richards (2016) show us that there will be a learning curve in the effective use of social media. Just as any new technology requires some 'getting used to', this may also be the case in the application of social media in the professional setting of projects.

And there may be barriers

The chapters by Harrin (2016) and Sponselee (2016) help us understand that the adoption of social media in projects may also experience barriers. Some of these barriers may have to do with individual concerns of team members, for example loss of privacy and blurring of lines between professional and personal online presence, whereas other barriers may be caused by the organization's engaged in the project. For example concerns about data security or compliancy with the organization's policies.

Social media in stakeholder engagement is lagging behind

A final reflection should be that the 'external' use of social media, the use of social media in stakeholder engagement, is lagging behind the 'internal' use, the use of social media within the project team. In the 'opportunity' section of the book, Manzoor (2016), Nach (2016), Sponselee (2016) and Dokkum and Ravesteijn (2016) do identify stakeholder management as an application area of social media in projects, however, the use of social media with the project team is more prominent in these contributions. This bias towards the internal use of social media is even stronger within the sections 'human factor' and 'tools and technologies', where only Silvius and Silvius (2016) explicitly discusses the use of social media for stakeholder engagement. In the 'cases and applications' section, Nazari (2016) and Merwin et al. (2016) report cases in which the use of social media was specifically aimed at engaging with external stakeholders.

Should it be concluded that in the external use of social media in projects the actual use of social media is ahead of our conceptual understanding of this use?

Take aways

What should the reader 'take away' from the book? Well, first of all some questions. Questions on how social media are used in his or her project and on how they may be used in a project. The following paragraph discusses these questions.

Is your project social?

For many professionals working in projects, social media is part of their everyday life. Some may use it mainly in their personal life, whereas others also engage professionally on social media. How is this in your project? How do you use social media to support team communication? Can team members ask questions and seek information within the team? Are social media used to share updates and inform each other? Can team members 'show' themselves in profiles? Is the way social media are used deliberate or accidental? Is it clear for everyone in the team what the boundaries of social media use are? Is there a 'code of social media conduct' with regards to the project?

And also in the communication with stakeholders outside the management team, social media provide a powerful tool. Is social media part of the project marketing mix? Are social media used to create stakeholder engagement? Is the project sponsor involved in the communication on social media?

In today's world, it is not a question whether social media are used in projects, but how they are used. Communication is a key aspect of project management and social media are part

of this. The project manager should therefore deliberately integrate social media in the communication strategy of the project.

What can you learn from social media?

Social media differ from traditional communication in many ways. This section addresses some of these differences and discusses what we can learn from social media.

- Fast and unforgiving

Social media are fast and unforgiving. Fast in the sense that social media are perfectly fit for spreading information quickly to a large group of direct and indirect stakeholders. This quality offers tremendous opportunities. However, social media are also unforgiving. Messages that are inaccurate, inadequate or sent by mistake are 'out there' forever. Corrections are hard to make and carefully developed reputations can be destroyed in seconds. Be careful! is a meager, but oh so true advice.

- Top-down and bottom-up

By nature, social media allow for both top-down and bottom-up communication. This is a great quality if we want to support team collaboration or engage with stakeholders. However, this openness also has a flipside. The traditional control that the project manager had over the communication with the project sponsor and (external) stakeholders decreases. Team members may post updates on their work in the project on twitter, facebook or LinkedIn, as part of their personal profiling or online socializing. Project managers should be aware of this and set guidelines and boundaries for how team members can express themselves with regards to the project. A general ban on social media is probably not the best solution. Paying attention in the team on what is sensible on social media and what is not, may make more sense.

- Create a community

Social media provide the opportunity to build a community within or around your project. And as humans are social beings, communities are a great good. Communities create involvement, engagement and, sometimes, loyalty. Use the opportunities that social media offer to find interested individuals, understand interests, keep stakeholders informed and create a fan-base. Do not neglect the 'social' in social media.

- Entertaining

Effective communication through social media requires more than a text based newsletter or press release. Make content rich, attractive and entertaining. 'A picture is worth a thousand words' and social media are very well suited for sharing photos and videos. Include this visual aspect in your project communication.

- Engage

Social media provide unprecedented opportunities for two-way communication with stakeholders. The traditional approach to stakeholder management, 'sending' information to stakeholders in order to hope to win their support, can therefore evolve to stakeholder engagement. An approach to stakeholder relations that builds upon a two-way communication with stakeholders in order to create a 'better' project for all stakeholders involved.

Encouragement

The book should also be seen as an encouragement. An encouragement to apply social media in projects, both within project teams and in stakeholder engagement. Engaging on social media is fun! And it makes us more aware of news, fun facts and interesting events that may be worth sharing. Social media increase the intensity of communication and thereby the engagement of the ones communicating. All of which are desirable effects in projects.

The editor therefore concludes: "*Social media are here to stay, so go out there and 'play'. Make a plan, but do it. Try and learn.*" (Silvius, 2016c).

Conclusions: Towards social project management

Projects have never been easy, but project managers today face high pressure to perform. Rapidly developing technologies and changing markets force organizations to anticipate, respond and change constantly. Projects are more than ever at the heart of every organizations survival and success.

In this highly volatile environment, the execution of projects also is dynamic. Project teams are international, intercultural, geographically dispersed and increasingly self-organizing. Project managers are faced the question how to increase collaborative capabilities and maximize performance of the team, while maintaining control and oversight? Social media and Web 2.0 technologies provide great opportunities to enable teams, especially virtual teams, to collaborate and share information, thereby enhancing project collaboration and coordination.

However, social media also allows project managers to take this development even further and to make project management truly social. 'Social Project Management', recognizing that project teams are part of a broader project community, which is both formal and informal, and that engaging with that community is the key to getting things done (Triolog, 2012). In social project management, the core business processes of the project and project's management are brought online. Social project management makes the project process visible to everyone, both inside and outside the team. Thereby creating transparency and giving the internal and external project community visibility into the events of the project, in order to enable smarter, quicker and more efficient collaboration. Social project management allows for anyone who is interested, to engage socially with the team to assist in accomplishing the project and organization's goals (Triolog, 2012).

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ICELAND – UK INTERCONNECTOR: IS PROPER POLITICAL RISK MITIGATION POSSIBLE?

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Abstract

The proposed interconnector between Iceland and the United Kingdom carries numerous different types of risk for Iceland. Ownership of the interconnector and the infrastructure related to it needs to be settled in a way that minimizes political risk for the Icelandic nation without sacrificing national sovereignty over its renewable energy sources. A public-private partnership project could use various methods to mitigate risk, many of which are related to ownership and financing. Guarantees and loans provided by IFIs, such as the European Investment Bank and the Nordic Investment Bank, might play a key role in the mobilisation of capital. Export credit agencies might also support trade finance. Other solutions, such as a bilateral legal agreement and contracts for difference, will also be assessed with regard to the interconnector. In the event of disputes occurring, the Energy Charter Organization and ICSID, of the World Bank, might be key players among other institutions. This would require serious arbitration provisions in those agreements and awards would be subject to the New York Convention.

Keywords: *Political risk, risk mitigation, cross-border investments, international business, dispute settlement.*
JEL Code: *P48, F50, G28, G32, F23.*

Introduction

The proposed interconnector is by no means a new idea (Thoroddsen, 1954; Gíslason, 1955). It has been contemplated for decades but due to various issues, including technical and financial concerns, it has not been seriously considered until in recent years. Landsvirkjun, Iceland's National Power Company, has compiled a list of reports, news and other literature related to the proposed interconnector on their website (Landsvirkjun, n.d.a; Landsvirkjun, n.d.b). A literature review, carried out by the authors, included this list among other relevant literature. According to this review, the vast majority of articles on the subject cover the economic and financial aspects of the interconnector as well as environmental and technical factors. Current research on the subject therefore apparently fails to address political risks properly, even though serious incidents have occurred in the history of the two nations. Political and commercial relations between Iceland and the UK are normally good, as is usually the case between two western nations, but there have certainly been some major exceptions. Serious disputes have erupted in the past, for instance the Cod Wars, when Iceland expanded its fishery territory, (Hellmann & Herborth, 2008) and more recently, the Icesave dispute when the UK activated the Anti-terrorism, Crime and Security Act of 2001 against Iceland (Méndez-Pinedo, 2011). During the Icesave dispute, Iceland was largely isolated and without friends. Major central banks such as the European Central Bank, the Bank of England and the Federal Reserve refused to assist. The limited support provided by Nordic Central Banks proved inadequate. This shows that Iceland cannot rely on allies during times of crisis and political disputes with a

larger nation such as the UK (Hilmarsson, 2015; Goncharuk, 2016). Both disputes had serious economic and political consequences for Iceland.

Furthermore, numerous disputes have arisen due to shifts in government policies within the energy sector in Europe in recent years, some of which had serious consequences for the parties involved. It is therefore clearly important to assess the political risks involved and contemplate possible solutions. Because of the large scale and long operating lifetime of the interconnector, incidents such as those mentioned above cannot be overlooked, and studies that do not take political risk properly into account are insufficient to make a final decision about the feasibility of Iceland's participation in this project.

An electricity interconnector, such as the one in question here can be defined as "*... a cable* […] *connecting two separate market or pricing areas*" (Turvey, 2006, p. 1457). This kind of energy projects tend to be very large and with long repayment periods. As a result, they face political risks that may adversely affect their viability (Bankes, 2012). The investment needed for this particular project can be roughly divided into three different phases. Those phases differ considerably in terms of required funding and scale but all must be taken care of to get the 1000km long 800-1200MWh DC interconnector operational (Landsvirkjun, n.d.a). The phases are as follows:

- Investment needed to upgrade and increase the supply of electricity in Iceland, including the construction of geothermal and hydro-electric plants.
- Investment related to the strengthening of the national grid and the construction of launching and landing stations.
- Investment to construct the interconnector.

The total amount of investment needed for the interconnector is not certain but for the last few years, numerous different parties have come up with estimates. For instance, The Institute of Economic Studies at the University of Iceland stated that the total investment needed ranged from 288 to 553 billion ISK (Hagfræðistofnun Háskóla Íslands, 2013). Bloomberg New Energy Finance suggested a considerably higher estimate of up to 813 billion ISK or 4.327 bnGBP (as cited in Gíslason, 2014 [using current exchange rates]). It seems likely that the total investment will be in excess of 4 bnGBP, of which a significant portion will be allocated to grid connections and upgrades, power plants and related infrastructure. Björgvin Skúli Sigurðsson (2014, p. 26), executive vice president for the Marketing and Business Development division at Landsvirkjun, notes that although the investment is huge compared to the Icelandic economy (the average estimate of 553 bnISK is roughly 30% of gross domestic product) this certainly is not the case for the UK, a much larger player in the global economy.

The main subject of this article is to analyse the important role of political risks in this particular energy project and consequently look at available risk mitigation instruments and venues for dispute settlement. Moreover, the article will seek ways to answer the following research questions: Is proper risk mitigation possible for the Iceland – UK electricity interconnector? What would be possible venues for dispute settlement? While this article focuses on political risks, numerous other types of risks are apparent, such as technical, financial, economic and environmental, which is not the subject of this article.

In an attempt to answer these research questions, information was collected from many different sources including – but not limited to – international financial institutions (IFIs), government institutions and state-owned-enterprises (SOEs). In addition, leading experts within the field at Harvard Business School, John F. Kennedy School of Government, Fletcher School of Law and Diplomacy, Landsvirkjun and University of Iceland were consulted.

Numerous relevant cases for clean energy investments were studied to provide some insight into the problem at hand. The methodology used is the case study method. Compared to other research methods, a case study enables the researcher to examine the issues involved in greater depth. According to Yin (2014), six sources of evidence are most commonly used in case studies. These are documentation, archival records, interviews, direct observations, participant-observation and physical artefacts. Each of these sources has advantages and disadvantages and according to Yin (2014, p. 105), one should *"…note that no single source has a complete advantage over all the others. In fact, the various sources are highly complementary, and a good case study will therefore want to rely on as many sources as possible*".

Possible solutions

A wide variety of factors affect the risk profile of this project. Ownership and financing of the interconnector and related infrastructure play a key role in that regard. This needs to be settled in such a way as to minimize political risks without compromising an acceptable return for the investment. Besides solutions related to ownership and financing, preliminary results suggest a few possible options available for the Iceland – UK interconnector which also include ways to settle disputes, should they occur:

- A well-established power purchase agreement and/or Contracts for Difference, possibly offered by the UK government, could mitigate some risks.
- Other risk mitigation solutions could include serious arbitration provisions in the agreement that both parties find appropriate. This could be included in a bilateral investment treaty between Iceland and the United Kingdom. Currently, there is no bilateral investment treaty between the countries (Kluwer Law International, 2016)
- Dispute settlement under the Energy Charter Treaty, which Iceland and the United Kingdom have both ratified (Energy Charter, n.d.a). Dispute settlement via the International Centre for Settlements of Investment Disputes (ICSID) of the World Bank, of which Iceland and the United Kingdom are both members (International Centre for Settlement of Investment Disputes, n.d.a). Other forums of international arbitration might also be beneficial. Awards would be subject to the New York Convention.
- Other options that deal with financing, as well as risk mitigation, might include export credit agencies and investment banks, such as the European Investment Bank and the Nordic Investment Bank. By providing loans and guarantees, they might assist in the financing of the project and lower risk premiums.

Ownership and financing of the proposed interconnector, as well as related infrastructure, has yet to be determined. After these factors are settled and the terms of the project are agreed, it is crucial that all commitments and agreements will be honoured by both parties throughout the contract period. Any large and unexpected changes in the policy, including laws or regulations of the participating countries, might be detrimental. Such changes are a principle form of political risk according to Salacuse (2010) and may even be the essence of it. In more general terms, political risk can be defined as *"…the probability of disruptions in company operations by political forces and events*" (The World Bank Group [International Finance Corporation & Multilateral Investment Guarantee Agency], 2012).

Ownership & Financing

As stated before, ownership can have a significant impact on the project's political risk profile. Due to the enormous scale of the project, it seems clear that the Icelandic government and its institutions or SOEs have neither the capabilities nor the will to invest in the project directly and consequently take on the risks that follow. In light of these circumstances the authors believe that a likely outcome is that the project will be a public-private partnership of some kind. A public-private partnership can be defined as an "*…arrangement between public and private entities for the delivery of infrastructure services and are seen as a way of raising additional funds for infrastructure investments but more importantly as a means to extend or leverage better budget funding through efficiency gains* (Delmon, 2009, p. 7)**.** In fact, numerous private investors – mainly, Atlantic Superconnection Corporation, Powerbridge LLC and Starwood Energy Group – have been named as companies showing interest in taking some part in the project (Eysteinsson, 2015). A possible ownership scenario, incorporating the private sector, can be seen in figure 1, below.

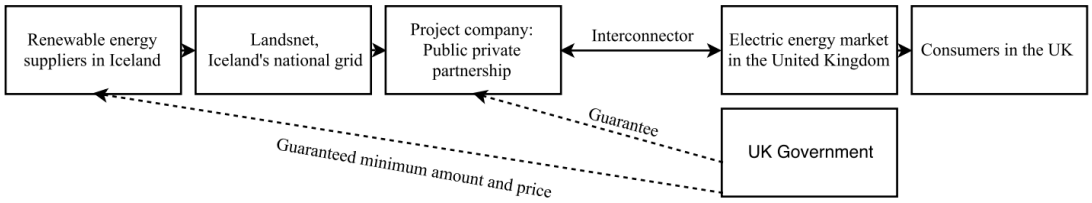

Figure 1. **A possible ownership scenario, incorporating the private sector**

Source: Authors' construction

According to this scenario (figure 1), the interconnector would be operated, owned and financed by a project company which would be some sort of a public-private partnership without the direct involvement of the Icelandic government or its SOEs. The PPP would serve as a project company for the interconnector and have a state-guarantee from the UK government that could be critical for its capital mobilization efforts. Investment-guarantees for necessary infrastructure in Iceland might also be provided by the UK government, as was done in a recent project in the UK[45]. These infrastructure investments could include the construction of new hydro and geothermal power stations in Iceland in addition to the upgrade of current utilities. In order to enable private investors to take part in these investments, a Build-Operate-Transfer (BOT)[46] arrangement might be feasible. To be able to secure a steady supply of electricity to the UK, the project company would arrange take-or-pay[47] contracts with renewable energy

[45] The UK government recently provided a 2 billion GBP guarantee for a large nuclear energy project (EDF Energy, 2015).
[46] A BOT is a form of investment where "*…the project is transferred back to the party granting the concession* [in this case the Icelandic government or its SOEs]" (Delmon, 2009, p. 552).
[47] According to Holland and Ashley "*…take-or-pay clauses require a purchaser to pay for a minimum quantity of goods or services* [i.e. electricity], *whether or not those goods or services are taken.*" (2013, p. 205).

suppliers in Iceland and therefore assume the demand risk. These take-or-pay arrangements would have a UK government guarantee.

A guaranteed minimum amount of electricity would, in turn, be transferred via the interconnector to consumers in the UK at an agreed minimum price. This revenue guarantee could be provided with a power purchase agreement, Contracts for Difference or perhaps some other means. In addition, the project company would pay a fee to Landsnet, Iceland's national grid. These fees need to cover the cost of investment with acceptable returns and be guaranteed by the UK government. Under the current law, it seems unlikely that the necessary upgrade of Iceland's national grid could be financed with foreign investment (Raforkulög nr. 65 , 27. mars 2003). The scenario in figure 1 could enable the private sector to take part in the project and thus shift risks from the Icelandic government, its SOEs and the Icelandic nation to the UK government and the consumers in the UK. Efficient allocation of risks is key to the success of the project and the UK government is in the best position to prevent such political risk events from occurring. Those events could include energy policy changes in the UK that might negatively affect the feasibility of the interconnector. Therefore, it should be willing to assume most of the political risks involved.

Power purchase agreements (PPAs) are frequently used when participating parties face considerable uncertainty. In some cases, it is unclear whether supply will meet demand or if the spot prices are high enough to secure the necessary minimum revenue. These are some of the main reasons for the use of PPAs in energy projects according to the Public Private Partnership in Infrastructure Resource Center (n.d.). One might assume this to be the case with regard to the proposed interconnector. As a very large and expensive long term project, it might be very sensitive to price changes whether they stem from increased competition or other risk factors.

In addition to PPAs, it is worth mentioning that the United Kingdom's Department of Energy and Climate Change offers Contracts for Difference (CfDs) as part of the Electricity Market Reform programme which is meant to make investments in renewable energy more attractive. The CfDs are at the core of the programme and ensure that the generation of energy from renewable resources is economically feasible by paying the variable difference between the market price and a fixed price, i.e. the strike price. Consequently, investor uncertainty is lowered and financing 'green' projects becomes cheaper (Department of Energy and Climate Change, 2013).These contracts were introduced as part of the Energy Act in 2013 which is "*An Act to make provision for the setting of a decarbonisation target range and duties in relation to it*"(*Energy Act 2013*, p. 1).

The importance of CfDs for the project seems to be considerable. Landsvirkjun has shown interest in studying these contracts further (Landsvirkjun, 2013). Although it is not the only supplier of electricity in Iceland, Landsvirkjun – an SOE – is by far the largest (Orkustofnun, n.d.). Consequently, any decisions on this project in Iceland are likely to be influenced by Landsvirkjun in some way, not only because of its importance as an electricity supplier, but also due to its expertise and research within the renewable energy sector. Furthermore, other potential investors, such as the Atlantic Superconnection Corporation, have stated that CfDs play a key role in the project's revenue stream (Atlantic Superconnection Corporation, 2014).

One might argue that it is essential for the feasibility of the interconnector to secure such a contract and the revenue guarantees that follow. While that may be true, they might also increase the effect of political risks on the project. The consequences of government action, such as policy changes, could seriously undermine the feasibility of the interconnector. The

likelihood of these events occurring might be high. In fact, the UK government recently made changes to its renewables subsidies in order to cut costs (Department of Energy & Climate Change and The Rt Hon Amer Rudd MP, 2015). It is essential that any contracts about the project include provisions that cover this possibility. Despite this, CfDs remain a possibility and might play an integral role in the first stages of negotiation about the project.

Securing a revenue stream is not the only aspect of getting the project operational. It must be financed as well. How this will be done is unclear but preliminary results suggest a few possible options in addition to equity funding and loans from private investment banks. Some IFIs, such as the European Investment Bank (EIB) and the Nordic Investment Bank (NIB) provide financing as well as risk mitigation instruments, i.e. guarantees. The EIB, which is entirely owned by member states of the European Union, mainly provides loans but may also provide guarantees. According to Matsukawa & Habeck (2007, p. 45), the EIB provides the following instruments: "*Inside EU: EIF loan guarantees, microcredit guarantees, equity guarantees, and loan guarantee. Outside EU: political risk carve-out on guarantees to EIB* […]*; credit enhancement guarantees by EIB to assist local borrowers to raise funds; portfolio credit risk sharing with local banks*". These instruments are available to large as well as small projects for private and public beneficiaries. Guarantees such as those mentioned can be beneficial for projects in addition to possible loans from the EIB. The benefits mainly stem from lower capital charges and greater value added (European Investment Bank, n.d.a.). Whether or not these solutions from the EIB would be available for the interconnector remains to be seen. Furthermore, it is unclear if the parties involved would choose to approach the EIB at all. However, it is clear that the EIB has already financed numerous projects in Iceland for around EUR 780 million, most of which (EUR 650 million) were associated with renewable energy production (European Investment Bank, n.d.). The EIB has attached high priority to clean energy projects in recent years.

Another IFI worth noting is the Nordic Investment Bank. Just as the EIB, it offers long-term loans and guarantees that can support capital mobilization. Its main area of operation is the Nordic and Baltic region. The NIB attaches special emphasis on the development of clean energy projects and environmentally friendly solutions in general (Nordic Investment Bank, 2015). One might assume that the export of energy from renewable resources fits the emphasis well.

In addition to this, national export credit agencies could also take part in the project and provide guarantees for related trade finance (Dinh & Hilmarsson, 2014). A recent example of this occurred when Japan Bank for International Cooperation took part in the financing of a renewable energy project in Iceland in cooperation with other financial institutions (Landsvirkjun, 2015).

Dispute Settlement

Where and how disputes can be settled is likely to be included in the agreements related to the project. This might be a bilateral investment treaty between Iceland and the UK, which – as noted before – is non-existent at the moment, or a contract made on an ad hoc basis for the interconnector project. Numerous forums of international arbitration are available but preliminary results suggest a few in particular. The Energy Charter Treaty is important in that regard because the dispute settlement venue depends, to a degree, on provisions in the treaty. Iceland and the UK have both ratified the treaty so it will likely affect the project in some ways.

The roots of the Energy Charter Treaty lie in the problem that many countries faced at

the turn of the last century when they themselves lacked energy resources but other, more politically unstable, countries had an abundance of resources but needed foreign investment. Consequently, steps were taken to amend this problem and in 1998, the ECT came into power. The treaty mainly aims to minimize non-commercial risks and promote investment within the energy sector (Hobér, 2010; Energy Charter , n.d.b). According to Hobér (2010, p. 155), the ECT is *"...the only binding multilateral instrument dealing with inter-governmental cooperation in the energy sector, and contains far-reaching undertakings for the contracting parties. The ECT includes provisions regarding investment protection, provisions on trade, transit of energy, energy efficiency and environmental protection and dispute resolution*". It seems clear that these provisions could be very beneficial in reducing political risk for the interconnector project.

Dispute settlement under the ECT has taken place numerous times and the frequency is rising along with increased renown of the treaty and, in turn, more awareness by investors. The Energy Charter Website mentions three ways for investors to bring a dispute to arbitration under the treaty.

> "*the International Centre for the Settlement of Investment Disputes (ICSID - an autonomous international institution with close links to the World Bank); a sole arbitrator or an ad hoc arbitration tribunal established under the rules of the United Nations Commission on International Trade Law (UNCITRAL); or an application to the Arbitration Institute of the Stockholm Chamber of Commerce.*" (Energy Charter, n.d.c).

According to these options, dispute settlement under the treaty can work in close relation with ICSID, among other institutions. Hobér (2010) names numerous cases which have been settled by ICSID under the Energy Charter Treaty. Arbitral awards set under the treaty are binding and final so each contracting party has to act accordingly (Energy Charter, n.d.c).

As noted above, both Iceland and the United Kingdom are members of ICSID and as such have access to arbitration and conciliation services. It uses a number of instruments for arbitration in disputes between member states and nationals of other member states, i.e. investors. The ICSID Convention is one of those instruments and has very wide state support with 159 signatory states and 151 contracting states (International Centre for Settlement of Investment Disputes, 2015). The Convention works as a neutral and independent system that allows ICSID member states and their nationals to settle investment disputes in a fair manner using a basic arbitration and conciliation framework provided by the Convention. The ICSID website states that "*Independent conciliation commissions and arbitral tribunals constituted in each case are vested with the power to rule on procedural issues and resolve the parties' dispute"* (International Centre for Settlement of Investment Disputes, n.d.e). If the parties involved agree to the ICSID proceedings under the Convention they accept the arbitration as an exclusive, final and binding solution (International Centre for Settlement of Investment Disputes, n.d.b.).

The other arbitration venues mentioned – the Arbitration Institute of the Stockholm Chamber of Commerce and a tribunal set under the United Nations Commission on International Trade Law (UNCITRAL) – are also valid options, although they are not used as commonly as ICSID in ECT cases (Energy Charter, n.d.). UNCITRAL is the "…*core legal body of the United Nations system in the field of international trade law*" (UNCITRAL, n.d.a). It

provides arbitration rules which cover state-state as well as investor-state disputes (UNCITRAL, n.d.b)**.** The Arbitration Institute of the Stockholm Chamber of Commerce also offers international arbitration services which the contracting parties of the project might agree to (Arbitration Institute of the Stockholm Chamber of Commerce, n.d.a; n.d.b). In addition, The Convention on the Recognition and Enforcement of Foreign Arbitral Awards, somewhat better known as The New York Convention could be useful by enforcing arbitral awards after disputes are settled, as both Iceland and the UK have ratified the Convention (New York Arbitration Convention, n.d.a; United Nations, 1958). Examples of how some of these arbitration options can be used can be seen in recent cases.

Recent experiences

Most cases related to political risk mitigation and dispute settlement are between developing and developed countries. Because of that, cases between two developed, high-income countries, are not abundant. However, the number of disputes within the energy sector in Europe, Spain in particular, has increased significantly in recent years. Many of these disputes occurred due to changes in subsidies that were meant to promote investment in renewable energy. Nathanson (2012) notes that such policy changes are one of the primary barriers of renewable energy investment.

Spain used a system of subsidies, mainly feed-in tariffs, to promote the solidification of renewable energy within the country. By implementing a series of subsidies, Spain continuously strengthened this system. For instance, renewable energy suppliers were offered a choice of either a fixed total price (fixed feed-in) or a fixed premium in addition to the market price, much like the CfDs mentioned before (Gonzáles, 2008). The system was meant to limit investor risk as well as financing costs by providing security and revenue guarantees (Río & Gual, 2007). This resulted in a significant increase in renewable energy generation. Most importantly, solar photovoltaic generation expanded from 18GWh in 2000 to c.a. 6.4 TWh in 2010 (Bridle & Beaton, 2012). Consequently, the feed-in tariffs became a huge burden on the Spanish state and the situation was made even worse by unfavourable market conditions (White, 2013). The policy changes that followed were intended to close this deficit by reducing subsidies and introducing additional limitations on renewable energy generators, therewith compromising the rationale that had attracted investors to the sector. A large number of claims followed, many of which were filed with ICSID under the ECT (Baltag, 2015; Rucinski & Rodríguez, 2013). The Energy Charter Secretariat maintains a regularly updated list of cases where the ECT is an invoked instrument and there are currently 27 listed in Spain (Energy Charter, n.d.). Many of these cases have yet to be settled and will have to be analysed further at a later point in time.

Similar situations have occurred in other European countries. One recent case, in particular, received substantial attention. It occurred in Germany following the 2011 Fukushima nuclear disaster. A shift in policy by the German government resulted in the phase-out of nuclear energy, earlier than had been announced before, and included the immediate shut-down of some old reactors. Vattenfall, owned by the Swedish government, partly owned two of these reactors and filed for arbitration before ICSID because of the losses associated. The arbitration is listed under the Energy Charter Treaty but further details are mostly confidential (*Vattenfall AB and others v. Federal Republic of Germany (ICSID Case No. ARB/12/12)*) (Bernasconi-Osterwalder & Brauch, 2014; International Centre for Settlement of Investment Disputes, n.d.a; Vattenfall AB, 2014; World Nuclear Association, 2015).

These cases from Spain and Germany are only examples of some of the recent disputes

that have occurred within the energy sector in Europe. Of course, other cases may be relevant, some of which may have occurred outside of Europe, but they will not be analysed in this article. As the proposed interconnector is rather unique, with regards to size and other factors, cases directly related to it are hard to come by. There are, however, other interconnectors which may provide some comparison for the project.

One energy project that is often mentioned in the discussion about the Iceland – UK interconnector, is the NorNed interconnector between Norway and the Netherlands. Commissioned in 2008, the 580km long 700 MW merchant interconnector depends on price variations between markets to secure a profit (Nooij, 2011; Parail, 2009). As such, its revenue model is likely to differ from the Iceland-UK interconnector, which is – as stated before – likely to rely on revenue guarantees. The NorNed project was a joint venture between the national electricity grids in Norway and the Netherlands, Statnett and Tennet respectively. The project was partly financed by the Nordic Investment Bank. It is therefore clear that although NIB primarily engages in the Nordic and Baltic region it also participates in projects that have connections outside this specific area of operations (Nordic Investment Bank, 2007). EIB also took part in the financing of the NorNed project and financed 50%, even more than NIB. The project matched the EUs emphasis on sustainable energy as well as the integration of energy markets throughout Europe (European Commission, 2007). NorNed is likely to be financed and operated differently from the proposed interconnector between Iceland and the UK. However, it highlights some of the financing options available for the project at hand.

Conclusion and further research

It seems clear that the proposed interconnector between Iceland and the UK could have access to a variety of risk mitigation instruments, financing options as well as forums for international arbitration. However, it is rather unclear which of them are most feasible. This is, to a large extent, due to the fact that many important decisions regarding the interconnector have yet to be made. Regardless of these decisions, it certainly seems important to study political risks and the effects they may have on the feasibility of the proposed interconnector. The state of the energy sector in Europe, in addition to historical relations between Iceland and the United Kingdom, shows that it would be ill-advised not to analyse the effect of political risk factors on this project in detail.

Ownership and the financing of necessary infrastructure, as well as the interconnector itself, may be one of the most important risk factors. There are many possible solutions that may be suitable for the project. The article showcased one ownership scenario where risk is shifted to the UK away from the Icelandic public and its government. A public-private partnership played a key role in that scenario and it is likely that it would be the case in many scenarios that allow the private sector to take part in the project, including financing. Regardless of ownership, the project – including infrastructure upgrades – must be financed. The participation of the European Investment Bank and the Nordic Investment Bank may be beneficial in that regard. Both of them offer loans and guarantees that might be available and feasible if the project company and other parties involved choose to approach them for participation.

A comprehensive power purchase agreement or Contracts for Difference, possibly offered by the UK government, might partly guarantee revenue and mitigate certain risks. These contracts might also increase the project's vulnerability to regulatory changes in the UK. Recent cases in Europe have shown that energy reforms and policy changes in general can have a

significant impact on investment feasibility within the sector.

Due to the risk of policy changes occurring, it is imperative that any agreements about the project address dispute settlement and where it may take place. If disputes occur, a few well-recognised organisations offer international arbitration which might be available. Where disputes are settled is, however, dependant on the parties involved. If the opinions put forth in the article materialise, the dispute would likely be between a PPP company and a state. The Energy Charter and ICSID are likely to play a key role in these cases. This is supported by recent cases from Europe where the ECT was used in ICSID arbitration of investor-state disputes. However, there are numerous other institutions that also offer arbitration, though they have not been as prominent in recent cases. The subjects of this article are only a few of the many factors that need to be analysed further. The article is largely based on preliminary results as the project is still in the feasibility stage and many factors remain unclear.

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CRITICAL SUCCESS FACTORS FOR THE CONSTRUCTION INDUSTRY

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Abstract

This study aims to identify the critical success factors for projects in the construction industry. A list of factors were identified from the existing literature and grouped into categories. The authors added project risk management and requirements management to the list of categories to test the hypothesis that these should also be considered as critical success factors in the construction industry. The study identified 58 success factors classified into 11 groups, which were tested using an elicitation technique. Forty-nine responses were collected from project managers, who had an average or 15 years of project management experience and had participated in more than 15 projects. Once the data was collected, the authors adopted the use of the relative importance index to rank the categories. From the results, the top five most important are (1) Project Organization, (2) Project Manager Competence, (3) Project Risk Management, (4) Project Team Competence and (5) Requirements Management. This lead to the conclusion that both project risk management and requirements management should be considered as critical success factors. Further analysis of the data highlights the importance of scope management and soft skills in Requirements Management and Project Risk Management respectively.

Keywords: Construction Projects; Critical Success Factors; Project Risk Management; Project Success; Requirements Management.
JEL codes: *D20, L10, M19*

Introduction

The Construction industry is one of the main sectors of the economy; it consists of the entire process from project visualization to demolition of buildings and infrastructure. As a service industry it is interlinked with various industries. The importance of the construction industry can be seen throughout history and in the development of economies. According to the World Market Intelligence (2010) the construction industry employs more people than any other single industry in the world. The report by Global Construction Perspectives and Oxford Economics (2013) suggest that the sector is globally expected to rise by $6.3 trillion or over 70 % to $15 trillion by 2025 compared to $8.7 trillion in 2012. The construction industry incorporates all civil engineering projects such as building projects as well as the maintenance and repair of existing constructed projects.

As the industry is constantly growing, newer and bigger projects are always undertaken (Chan & Chan, 2004). These new undertakings generally come with more complexities as boundaries are being pushed. An example of such large project currently being undertaking is the Saadiyat Island project in Abu Dhabi, UAE with an estimated budget cost of $26 billion (Ponzini, 2011).

Project success is the end deliverable of every undertaken project. Project success has been a subject of debate (Alexandrova & Ivanova, 2012). In the construction sector various efforts have been taken in other to determine these project success criteria because different

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stakeholders have different views and perception of a project this in itself can lead to various views on project success.

Background

Project Success

In the past, research on project success focused on the achievement of the iron triangle objectives (time, cost and quality) until recently researchers have identified the need to widen the criteria for measuring project success (Atkinson, 1999; Wateridge, 1998). Researchers such as de Wit (1988) emphasize that a project is considered successful if its stakeholders are generally successful and the projects technical performance specification has been achieved. Muller (2007) states that projects differ in a variety of ways such as size, uniqueness and complexity this has lead researchers such as Westerveld (2003) to state that the criteria for measuring project success should vary from project to project and hence it would be difficult to have a unique set of criteria for all projects in all industries.

Critical Success Factors

The identification and careful consideration of critical success factors can have a positive outcome on a project. New participants in the construction industry and also established companies can use these factors to easily help themselves in better project delivery for future projects (Bullen & Rockart, 1981).

Rockart (1982) define critical success factors as "those key areas of activity in which favorable results are absolutely necessary for a manager to reach his/her goals". Researcher such as Futrell et al (2001) agree with the above stated definition as they believe critical success factors are those factors in a project that can lead to a positive achievement of stakeholder expectations and requirements. Boynton & Zmud (1984) goes to the extent of stating that the achievement of CSFs in projects ensures positive outcome.

Critical success factors have been used in a wide variety of projects in different sectors such as information technology (Almajed & Mayhew, 2014), Petroleum (Tsiga et al., 2016), Space (Tsiga et al., 2016) as well as for generic projects (Muller & Jugdev, 2012; Pinto & Prescott, 1988). A review of the literature by Tsiga et al. (2016) identified the critical success factors and their corresponding categories as shown in **Table 1**.

Table 1

Critical success factors and categories

Category	Critical Success Factors	Sources
External Challenge	Economic environment, social environment, political environment, physical environment and regulatory/legal environment.	(Gudiene et al., 2014); (Omran et al., 2012); (Tan & Ghazali, 2011)
Client knowledge and experience	Nature of finance, experience, organization size, emphasis on cots quality and time, ability to brief, decision making, roles and contribution, expectations and commitment, involvement and influence.	(Gudiene et al., 2014); (The Standish Group, 2013); (Omran et al., 2012)
Top management support	Support given to project head, support to critical activities, understanding of project difficulty and stakeholder influence.	(Ram & Corkindale, 2014); (Varajao et al., 2014); (Almajed & Mayhew, 2014).
Institutional	Standards and permits.	(Gudiene et al., 2014);

factors		
Project characteristics	Project type, size, nature, complexity, design, resources allocation time and level of technology.	(Yong & Mustaffa, 2013); (Omran et al., 2012).
Project manager competence	Experience, coordinating and motivating skills, leading skills, communication and feedback, management skills, conflict resolution skills and organizing skills.	(Toor & Ogunlana, 2009); (Malach-Pines et al., 2009); (Barclay & Osei-Bryson, 2009).
Project organization	Planning and control effort, team structure and integration, safety and quality program, schedule and work definition, budgeting and control of subcontractors.	(Gudiene et al., 2014); (Varajao et al., 2014); (Berssaneti & Carvalho, 2015).
Contractual aspects	Contract type, tendering (procedures or steps for the selection of that service) and procurement (company selection to provide services) process.	(Yong & Mustaffa, 2013); (Omran et al., 2012); (Tan & Ghazali, 2011); (Chan et al., 2004).
Project team competence	Team experience, technical skills, planning and organizing skills, commitment and involvement, teams adaptability to changing requirements, working relationships, educational level, training availability and decision making effectiveness.	(Gudiene et al., 2014); (Varajao et al., 2014); (Almajed & Mayhew, 2014); (Ram & Corkindale, 2014).
Project Risk Management	The factors under project risk management are sub divided into two which are firstly hard aspects with initiation, identification, assessment, response planning, response implementation and secondly, soft aspects of risk, which are risk communication and attitude, monitoring and review	(Almajed & Mayhew, 2014), (Rabechini Junior & Monteiro de Carvalho, 2013), (Didraga, 2013),
Requirements Management	Elicitation technique, identification, analysis and negotiation, modelling, validation and scope management	(Mirza et al., 2013) (Didraga, 2013)

Source: (Tsiga et al., 2016)

Methods

There has already been some research performed on projects in the construction industry. The first step taken in this research was to examine the already established CSFs from literature and previous work. Projects such as the London Olympic Park (Davies & Mackenzie, 2013) and the Sydney Opera House (Colbert, 2003) were carefully analysed before a standard set of factors was obtained. The factors gotten where then categorised into 11.

Another strategy implemented in this research was to develop the questionnaire using the key categories and factors identified and test them by asking professionals working in the industry to provide us with their views. The implementation of the technique allowed the authors to be able to analyse and quantify the data gotten from the respondents.

The data was analysed using the Statistical Package for Social Science (SPSS) software to perform test such as the hypothesis test would be discussed in section 4.

Questionnaire Design

The survey consisted of 37 questions, which were then grouped into 5 different sections. The first section contained background information of the respondents such as experience and qualification. The next section had 11 questions that the respondents ranked based on a 10-point scale. The third and fourth sections asked respondents to rank factors of project risk management and requirements management also using the 10 point scale and the final section consisted of only two questions aimed at asking respondent's details of they wanted to be contacted for further research and discussions.

After the questionnaire was designed before being distributed, a small pilot test was conducted with potential participants to get feedback on possible improvements. The recommendations gotten from the test was implemented to the design before final distribution.

Study Sample

The study was distributed online via email and business oriented social networking sites LinkedIn, as such the participants are geographically located in different parts of the world with diverse project experience in the construction industry. The total number of completed and valid responses are obtained from the survey was 49.

Most respondents are currently project managers with master's degrees, have an average of more than 15 years' project experience and also more than 15 years' project management experience.

They have participated in more than 15 projects with an average value of order of magnitude 100 million $/€/£, delivering service projects and other categories of projects; they are mostly geographically located in the United Kingdom, United States of America, Nigeria, Australia and Canada.

Data Analysis and Findings

Relative Importance index

Relative importance index has been implemented in this study with the aim of it providing a better understanding of individual predictors and their individual role amongst a given set (Tonidandel & LeBreton, 2011). This method has been implemented in various project management literature such as (Gudiene et al., 2013; Iyer & Jha, 2006). The formula for the calculation is shown below:

(1)

M is the weight given to a factor by a respondent, in the range of 1 to 10. N is the highest score available (10 in this case) and P is the total number of respondents that have answered the question. The results of the relative importance index for the CSFs are shown in **Table 2**.

Table 2

Results of Relative Importance Index Calculation

Category	RII	Rank
Project Organization	0.892	1
Project Manager Competence	0.890	2
Project Risk Management	0.850	3
Project Team Competence	0.843	4
Requirements Management	0.827	5
Top Management Support	0.824	6

Contractual Aspects	0.806	7
Institutional factors	0.790	8
External Challenge	0.749	9
Client Knowledge and Experience	0.730	10
Project Characteristics	0.716	11

Source: Authors' construction

Table 3

Results of Relative Importance Index Calculation on aspects of Project Risk Management

Project Risk Management	RII	Rank
Communication and culture	0.864	1
Initiation	0.853	2
Planning of Responses	0.834	3
Identification	0.823	4
Monitoring and Review	0.823	4
Implementation of responses	0.809	6
Assessment	0.760	7

Source: Authors' construction

Table 4

Results of Relative Importance Index Calculation on aspects of Requirements Management

Requirements Management	RII	Rank
Scope Management	0.883	1
Identification	0.867	2
Analysis and Negotiation	0.826	3
Validation	0.817	4
Modelling	0.770	5

Source: Authors' construction

Reliability of Scale

Reliability of scale is used to "calculate the stability of a scale from the internal consistency of an item by measuring the construct" (Santos, 1999). Nunnally & Bernstein (1994) suggest that in order to ensure high reliability and internal consistency the value of the Cronbach's alpha for the construct should be grater that 0.7. Table 5 depicts the results of the test on our study 47.

Table 5

Reliability of Scale Test Results

Constructs	No of Items	Cronbach's Alpha
Critical Success Factors	11	0.864
Project Risk Management	7	0.812
Requirements Management	5	0.745

Source: Authors' construction

Factor Analysis

Bartletts Sphericity is one of the methods used for factor analysis, here the constructs in the study are considered viable and acceptable only if their individual factor loading is above 0.5

(Tabachnick & Fidell, 2007). In the case of this study all the questions had a factor loading of above 0.5. This is considered to be good.

Hypothesis Test

In order to accept a hypothesis and reject the null hypothesis, certain conditions have to be considered. The t-value should be > 2.0 and the p-value should be <0.05. **Table 6** depicts the results of the test, which means both hypotheses have been accepted as they meet the both criteria's.

Table 6

Hypothesis Test Result

Hypotheses	t-value	p-value (Sig)	Outcome
H1: Project Risk Management	4.569	0.002	**Accepted**
H2: Requirements Management	2.051	0.008	**Accepted**

Source: Authors' construction

Discussion

The first aim of this research is to determine if project risk management and requirements management have an influence on project success in the construction industry. Once the data was collected, a hypothesis test was carried out on the data, the results of the test as depicted in **Table 6** supports the relationship of project risk management to project success and requirements management to project success which has led to the rejection of the null hypothesis.

As both hypotheses have been accepted, it is important to also rank the factors against the already established categories. To achieve this, the use of the relative importance index was implemented for the ranking. From the results in **Table 2,** one can denote that the most important factor is Project Organization. As Project Risk management and Requirement management have not been previously included in the past literature it is a bit surprising to see that Project Risk Management is regarded as the 3rd most important factor and Requirements Management came in as 5th in the ranking. More research should be carried out as to ascertain why so? Are they important for all projects in all sectors or only for the construction sector? And why they haven't been included as CSFs in previous research?

In the category of Project risk management, from the results shown in **Table 3,** communication and culture is deemed to be the most important aspect of the category, which showcases the importance of the soft side of risk management. Scope management is also deemed to be the most important factor in requirements management as show cased in the results in **Table 4**, this is known to have a cob web effect on the other factors in requirements management.

The result of this study highlights areas to utilize scarce resources with the aim of improving the chances of delivering better projects in the construction industry.

Conclusion

CSFs that can influence the outcome of projects have been an area of great discussion and debate in project management; some studies have determined that CSFs are sector specific and some factors play greater roles in some sectors. This study has identified 11 categories that have been with 58 factors that have an impact on projects in the construction industry.

The 11 categories have been ranked based on their relative importance index calculated from the data gotten. This research highlights the importance of requirements management and project risk management in construction projects as both had a positive relationship with project success and ranked higher than some already established categories.

The results of this research highlights the importance of more research should be carried out in this area for better delivery of projects.

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THE IMPACT OF CORRELATIONS IN THE CRITICAL FIELD

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Abstract

In almost every project there will be uncertainties in the duration of the individual tasks. Therefore an elaborated risk management is needed and the best known tool to handle this in practice is the PERT approach. It has been shown in former publications (Tysiak (2015a), (2015b)) that the PERT approach comprises a lot of inaccuracies, contortions, and systematic miscalculations. Some of these disadvantages can be avoided or reduced by substituting PERT with Monte Carlo simulation. Unfortunately one unrealistic assumption still remains even in the Monte Carlo approach: The supposition that the durations of the individual tasks are independent from each other. In the present contribution it will be shown how to introduce correlations into the Monte Carlo approach and which impact they might have.

Key words: *project management, risk management, PERT, critical field, Iman-Conover approach, correlated distributions*
JEL code: G32

Introduction

Since a project is said to be "a temporary endeavor undertaken to create a unique product, service, or result" (PMI (2010)), there will always be the need of implementing some kind of risk management in project management (c.f. PMI (2010), Schelle/Ottmann/Pfeiffer (2006)). Risks in projects can occur in different dimensions, such as time, cost, quality etc. In this contribution we will only consider uncertainties related to time, but as everybody knows, who has experience in project management, a prolongation of a project normally will also affect its costs. A commonly used approach to deal with this situation is PERT (project evaluation and review technique, c.f. Kerzner (2009), Taylor (2010)), which has been developed by the United States Navy together with the OR department of Booz, Allen and Hamilton in the 1950s. Purpose of this development was to support the deployment of the Polaris-Submarine weapon system (c.f. Fazar (1959)). Unfortunately there are still some weaknesses, disadvantages, errors, and inaccuracies in using this method and therefore there still is the strong need for further improvement.

The PERT approach

PERT is based on the Critical Path Method (CPM) that was invented by DuPont in the late 50s of the last century (c.f. Kelley/Walker (1959)). CPM assumes deterministic durations of the different activities of a project and by calculating the earliest starting and finishing dates of the individual activities, it achieves the earliest finishing date of the whole project. Calculating the whole project backwards, one also gets the latest finishing and latest starting dates of the

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activities. Those activities that have no buffers (the difference between the earliest starting and latest starting date) then constitute the critical path.

In PERT we do not assume deterministic durations. The durations are usually estimated by so-called three-point-estimates (optimistic, most probable, and pessimistic durations). PERT then assumes beta distributions for the given three-point-estimates, calculates the expected durations and the variances for each activity, then performs a CPM approach with the expected durations, and by this identifies a critical path. Afterwards the non-deterministic approach is introduced by calculating the convolution of the distributions along the critical path. This convolution implies that the distributions of the durations of the activities are assumed to be independent. Furthermore the resulting distribution for the duration of the whole project is assumed to be normal, which is quite reasonable due to the Central Limit Theorem.

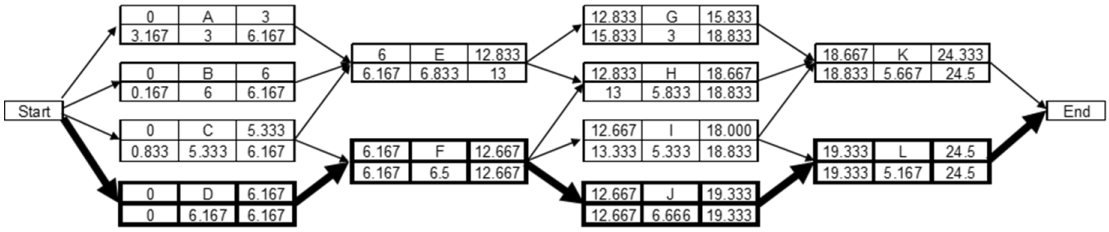
Fig. 1 shows a fictitious project plan with predecessors, optimistic durations, most probable durations, pessimistic durations, expected durations, and their variances (with assumed beta distributions), whereas fig. 2 gives us the resulting critical path. The bold line in fig. 3 shows the estimated distribution of the duration of the whole project as the independent convolution along the critical path.

Activity	Predecessors	OD	MD	PD	ED	VAR
A	-	2	3	4	3.000	0.111
B	-	3	6	9	6.000	1.000
C	-	2	5	10	5.333	1.778
D	-	4	6	9	6.167	0.694
E	A, B, C	3	7	10	6.833	1.361
F	C, D	2	7	9	6.500	1.361
G	E	2	3	4	3.000	0.111
H	E, F	3	6	8	5.833	0.694
I	F	3	5	9	5.333	1.000
J	F	2	7	10	6.667	1.778
K	G, H, I	2	6	8	5.667	1.000
L	I, J	3	5	8	5.167	0.694

source: Tysiak (2015a)

Fig. 1. **A fictitious project plan**

One of the main problems of PERT is the fact, that unfortunately the assumption of a unique critical path is not realistic. Due to the varying durations of the individual activities, it is not the case that the activities can be divided into critical and non-critical: Each activity possesses a probability between 0 and 1 to become critical. This was already mentioned by Van Slyke (1963), who called this property “criticality”. Van Slyke performed a lot of Monte Carlo simulations, which at his time of course were only possible with the deployment of large mainframes. In the end we have to admit that in the case of uncertainties, there is no unique critical path, but only a “critical field”.



source: Tysiak (2015a)

Fig. 2. **The critical path due to PERT**

To illustrate this critical field idea, we perform Monte Carlo simulations with the given example. To make the results comparable to the PERT approach, we use exactly the same beta distributions for the durations of the individual activities (see Tysiak (2015b) for computational background). Fig. 4 shows the "critical field" as a result of 10,000 simulations, whereas the dotted line in fig. 3 compares the distribution of the total duration of the project with the PERT result. It is obvious in fig. 3 that the mean increased from 24.5 in the PERT approach to 26.2 in the Monte Carlo simulation, whereas the standard deviation decreased from 2.128 to 1.636. More meaningful in the context of risk management is to observe quantiles. If we look at the maximum duration that will be achieved with a probability of 95% (here denoted as VaR95 (value-at-risk)), we find that the VaR95 increased from 28.0 in the PERT approach to 28.8 in the Monte Carlo simulation. By this, it becomes obvious, that PERT underestimates the real risk. A more detailed explanation of this fact can be found in Tysiak (2015b). It can also be shown that this underestimation is systematical and perceivable in quite almost every project plan.

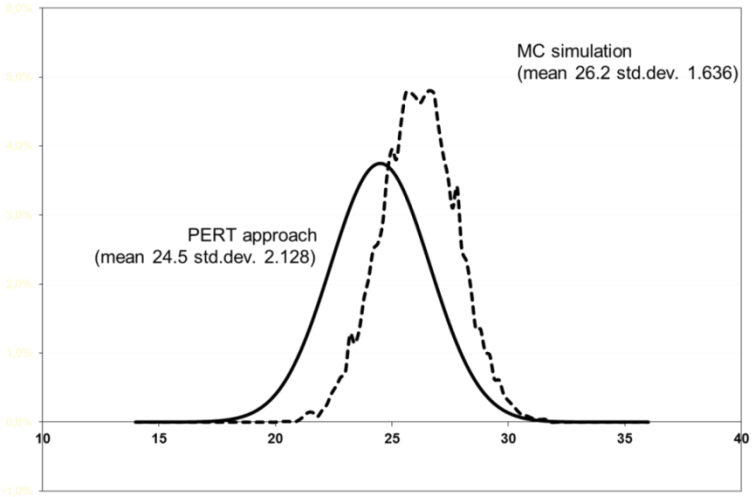


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Fig. 3. **Results of PERT and Monte Carlo simulation with assumed independence**

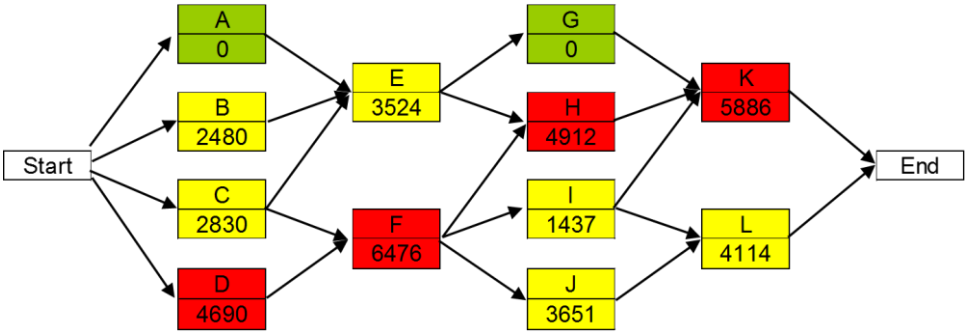

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Fig. 4. **The critical field (number of times that a node is critical)**

Correlations of the durations

By using Monte Carlo simulation instead of PERT we might get a more realistic model of the real distribution of the duration of a project. But there is still one rather unrealistic assumption: The independence of the distributions of the durations of the individual activities. If we look for example at a construction project. Then one severe risk that may occur and affect the duration of tasks might be the weather. But if we have really bad weather, this will usually affect several tasks. Or if we fear in some other project that some tasks may last a little longer because of the qualifications and talents of the staff, then this will be the case for all the activities where this staff is involved. If you think of projects, you will easily identify reasons for dependencies/correlations between the durations of individual activities and quite seldom you can really believe that all the activities are totally independent from each other. Therefore in this contribution we will introduce correlations into the Monte Carlo simulation approach and additionally we will show their impact to the resulting duration of the whole project.

In recent years, the interest in the generation of correlated random numbers (so-called "copulas"), that follow given distributions, rapidly increased. One main driver in this progress was certainly the need of such numbers in the vast field of simulation in finance (c.f. Mai/Scherer (2014), Huynh/Lai/Soumare (2008), Brandimarte (2014)).

In the current publication we follow the technique that was proposed by Iman/Conover (1982). This approach is based on the well-known method to generate multivariate normal distributed random numbers that follow a given correlation matrix C. This can easily be achieved by calculating the Cholesky decomposition $C = L \times L^t$ of the given correlation matrix into a lower triangular matrix L and its transpose L^t. By multiplying the matrix of the independently generated normal distributed random numbers with the matrix L, we get the correlated normal distributed random numbers. Iman/Conover realized that correlations can easily be achieved just by reordering the existing data. Therefore they proposed for arbitrary distributions to create independent random numbers and afterwards reorder them by using the ranks according to a multivariate normal distribution with the desired correlation matrix. Especially in the case that these arbitrary distributions are quite "good-natured" and not "too different" from the normal distribution these approach works very well.

Since beta distributions fulfil these conditions quite well, these results could be verified in our analysis. To show this, we present the following example: If we take the 12 beta

distributions defined for the tasks A to L with the given correlation matrix C_1 (fig. 5) and we perform the whole process of creating the independent beta distributed random numbers, generate the Cholesky decomposition of the given correlation matrix, create the normal distributed random numbers, and then reorder the beta distributed random numbers due to the ranks given by the normal distributed random numbers, we will get the empirical correlation matrix $\hat{C}_1$ (fig. 5). The congruence between C_1 and $\hat{C}_1$ is quite obvious.

The matrix C_1 has been chosen with a lot of zero entries. The main reason for this is the fact that it is quite difficult to create correlation matrices with several negative values. It is well known, that apart from the symmetry, a correlation matrix has to be positive definite. This is equivalent to the property to possess only positive eigenvalues. In practice this complicates the construction of a valid correlation matrix very much. It is much easier to create correlation matrices with positive values than with negative values. In some sense this might be seen as a validation of "Murphy's law", because in risk management, positive correlations lead to an increase of risk, whereas negative correlations reduce risk.

This is also the reason why in the following examples the matrix C_α is chosen with a lot of positive entries, whereas the matrix C_β, which additionally contains negative values, is very sparse and only contains a few non-zero entries.

$$C_1 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0.8 & 0 & 0 & 0 & -0.2 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & -0.8 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0.6 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0.4 & 0 & 0 & 0 & 0.2 \\ 0 & 0 & 0.6 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & -0.6 & 0 \\ 0.8 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0.4 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & -0.8 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & -0.4 \\ -0.2 & 0 & 0 & 0 & 0 & -0.6 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0.2 & 0 & 0 & 0 & 0 & 0 & -0.4 & 0 & 1 \end{pmatrix}$$

$$\hat{C}_1 = \begin{pmatrix} 1 & 0.012 & -0.007 & 0.010 & -0.003 & -0.004 & 0.797 & 0.016 & 0.003 & 0.003 & -0.195 & 0.014 \\ 0.012 & 1 & 0.140 & -0.011 & 0.001 & 0.000 & 0.008 & -0.003 & -0.8 & 0.013 & -0.008 & 0.005 \\ -0.007 & 0.140 & 1 & 0.005 & 0.601 & 0.018 & -0.006 & 0.002 & -0.015 & -0.002 & -0.011 & 0.002 \\ 0.010 & -0.011 & 0.005 & 1 & -0.006 & -0.007 & -0.004 & 0.409 & 0.013 & -0.006 & 0.014 & 0.212 \\ -0.003 & 0.001 & 0.601 & -0.006 & 1 & 0.015 & 0.000 & 0.006 & -0.006 & -0.003 & -0.011 & -0.002 \\ -0.004 & 0.000 & 0.018 & -0.007 & 0.015 & 1 & 0.002 & 0.008 & -0.002 & 0.007 & -0.596 & -0.001 \\ 0.797 & 0.008 & -0.006 & -0.004 & 0.000 & 0.002 & 1 & 0.015 & 0.007 & 0.000 & 0.001 & -0.006 \\ 0.016 & -0.003 & 0.002 & 0.409 & 0.006 & 0.008 & 0.015 & 1 & 0.006 & 0.003 & -0.002 & 0.009 \\ 0.003 & -0.800 & -0.015 & 0.013 & -0.006 & -0.002 & 0.007 & 0.006 & 1 & -0.013 & 0.008 & -0.003 \\ 0.003 & 0.013 & -0.002 & -0.006 & -0.003 & 0.007 & 0.000 & 0.003 & -0.013 & 1 & -0.003 & -0.406 \\ -0.195 & -0.008 & -0.011 & 0.014 & -0.011 & -0.596 & 0.001 & -0.002 & 0.008 & -0.003 & 1 & -0.008 \\ 0.014 & 0.005 & 0.002 & 0.212 & -0.002 & -0.001 & -0.006 & 0.009 & -0.003 & -0.406 & -0.008 & 1 \end{pmatrix}$$

Fig. 5: **Requested (C_1) and achieved ($\hat{C}_1$) correlation matrix**

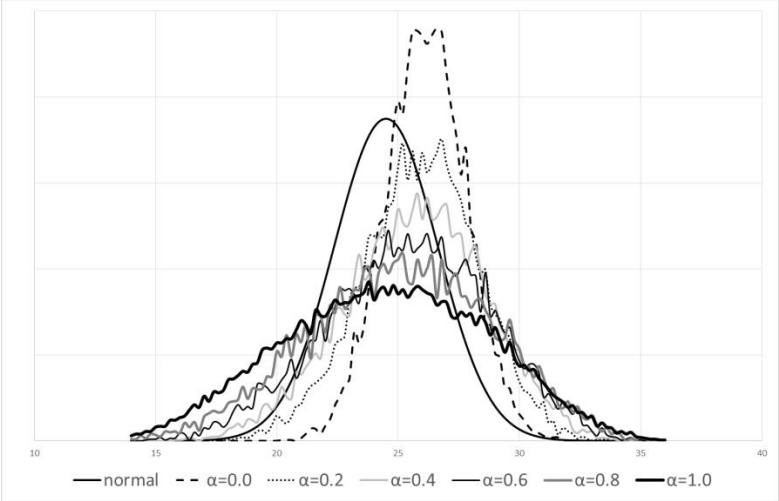
Monte Carlo simulation with correlations

To illustrate the influence of positive correlations first, we want to take a correlation matrix C_α (fig. 6) with values of α between 0 and 1, where - of course – the case α = 0 constitutes the already shown case of independency. This is an extreme example just to show the maximum impact.

$$C_\alpha = \begin{pmatrix} 1 & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha \\ \alpha & 1 & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha \\ \alpha & \alpha & 1 & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha \\ \alpha & \alpha & \alpha & 1 & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha \\ \alpha & \alpha & \alpha & \alpha & 1 & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha \\ \alpha & \alpha & \alpha & \alpha & \alpha & 1 & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha \\ \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & 1 & \alpha & \alpha & \alpha & \alpha & \alpha \\ \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & 1 & \alpha & \alpha & \alpha & \alpha \\ \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & 1 & \alpha & \alpha & \alpha \\ \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & 1 & \alpha & \alpha \\ \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & 1 & \alpha \\ \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & \alpha & 1 \end{pmatrix}$$

Fig. 6: **The matrix C_α**

The resulting densities of our example can be found in fig. 7. For the sake of comparison, the already known densities of fig. 3 are again included. It is obvious that with increasing values of α, the density becomes flatter, the tails get heavier, and the mode moves slightly a little to the left. This can also be seen if we compare the values of the mean, the standard deviation, and the VaR95 (fig. 8). We have to keep in mind that the calculation of the duration depends mostly on two operations: To build sums and maximums. If we look at two random variables and increase their correlation, this will not affect the mean of the sum, but the standard deviation will significantly increase, because there will be less compensations. If we look at the maximum of two variables, the increase of correlations will lead to a decrease of the mean of the maximum, because of less independency. The standard deviation of the maximum also depends on the relation of the means of the two random variables, but usually will not change that dramatically. Referring back to the results in fig. 8, we can postulate that the slight decrease in the mean is a consequence of the maximum operations, whereas the large increase of the standard deviation can be deduced from the summations. The resulting increase of the VaR95 is due to the fact that the decrease of the mean does not compensate the increase of the standard deviation.



source: authors' construction

Fig. 7: **The impact of positive correlations – case α**

	Mean	Std.Dev.	VaR95
PERT	***24.50***	***2.128***	***28.00***
α = 0.0	26.15	1.636	28.84
α = 0.1	26.04	2.039	29.34
α = 0.2	25.92	2.365	29.68
α = 0.3	25.80	2.651	30.05
α = 0.4	25.68	2.906	30.34
α = 0.5	25.55	3.138	30.55
α = 0.6	25.40	3.353	30.74
α = 0.7	25.25	3.553	30.90
α = 0.8	25.07	3.742	31.05
α = 0.9	24.86	3.924	31.18
α = 1.0	24.51	4.161	31.21

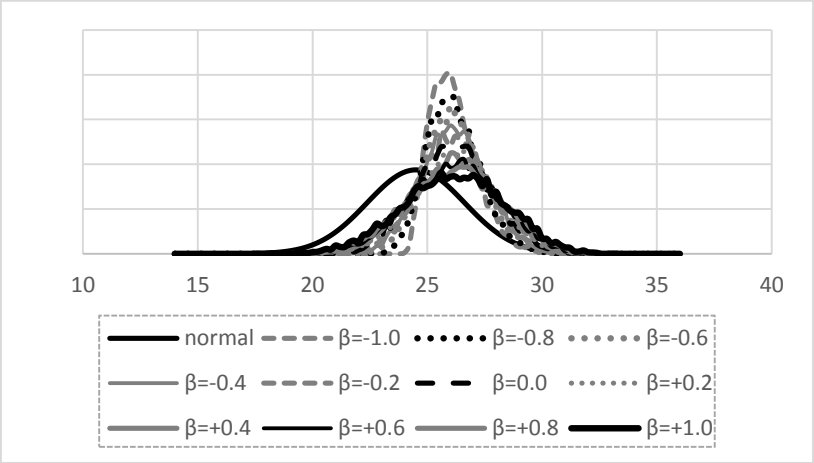
source: authors' construction

Fig. 8: **The means, standard deviations, and VaR95 depending on α**

In the second example we use the correlation matrix C_β (fig. 9) with values of β between -1 and +1. Looking at the results in fig. 10 and 11, we can detect almost the same behaviour of the mean, the standard deviation and the VaR95 as in the first example. The only obvious difference is the fact that the mean remains constant. This seems to be a result of the sparsity of the matrix C_β. The main statement that follows from both examples is: The increasing correlations lead to an increase of risk!

$$C_{\beta} = \begin{array}{c} \begin{matrix} A & B & C & D & E & F & G & H & I & J & K & L \end{matrix} \\ \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & \beta & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \beta & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & \beta & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & \beta & 0 & 0 & 0 & 0 \\ 0 & 0 & \beta & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & \beta & 0 \\ \beta & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \beta & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & \beta & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & \beta \\ 0 & 0 & 0 & 0 & 0 & \beta & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \beta & 0 & 1 \end{pmatrix} \begin{matrix} A \\ B \\ C \\ D \\ E \\ F \\ G \\ H \\ I \\ J \\ K \\ L \end{matrix} \end{array}$$

Fig. 9: **The matric C_{β}**



source: authors' construction

Fig. 10: **The impact of positive and negative correlations – case β**

β	Mean	Std.Dev.	VaR95	β	Mean	Std.Dev.	VaR95
- 1.0	26.15	1.026	28.02	0.0	26.15	1.636	28.84
- 0.9	26.14	1.095	28.11	0.1	26.14	1.703	28.93
- 0.8	26.15	1.160	28.20	0.2	26.14	1.761	29.02
- 0.7	26.15	1.225	28.25	0.3	26.14	1.817	29.10
- 0.6	26.15	1.288	28.34	0.4	26.15	1.874	29.20
- 0.5	26.15	1.349	28.42	0.5	26.15	1.931	29.31
- 0.4	26.15	1.409	28.48	0.6	26.15	1.986	29.38
- 0.3	26.15	1.469	28.57	0.7	26.15	2.041	29.47
- 0.2	26.15	1.528	28.67	0.8	26.15	2.098	29.55
- 0.1	26.15	1.586	28.75	0.9	26.15	2.152	29.62
0.0	26.15	1.636	28.84	1.0	26.15	2.201	29.69

source: authors' construction

Fig. 11: **The means, standard deviations, and VaR95 depending on β**

Conclusions and Remarks

It could be shown, that it is possible to introduce correlations in Monte Carlo simulation. This offers the possibility to make a model more realistic. And, although it is quite difficult to estimate complex correlation structures in practice, this offers a way to get an impression of the possible impacts of these correlations (sensitivity of the model). In our case we had in the first example amplitude in risk (measured in VaR95) from 28.84 to 31.21. In the second example we found 28.02 and 29.69. Therefore this influence cannot be neglected.

It should also be mentioned here that this way of implementing correlations in the Monte Carlo approach can not only be used for durations, but also for other parameters like costs.

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THREE SOURCES FOR THE PROJECT RISK REGISTER ANALYSIS

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Abstract

The aim of the current research is to examine risk registers of real projects to find correlations between the risk management theory and practical results of risk management in real projects – the risk registers publicly available in the Internet.

In the research the author has analysed the compliance of the risk management theory which is described in *AS/NZS ISO 31000:2009* with projects risk registers. The previous two studies dealt with the Project Management Institute "*A Guide to the Project Management Body of Knowledge*", European Commission Aid Delivery Methods Volume 1 *Project Cycle Management Guidelines*, Tasmanian Government *Project Management Guidelines*, and *A Guidebook of Project & Program Management for Enterprise Innovation*, Volume II and risk registers.

In the previous two studies the author concluded that just in 30 risk registers significant differences can be found between the risk register described in theory and risk registers of projects. As a result of the research it cannot be concluded what the minimum amount of information in the risk register is to make it comply with the risk register described in theory.

Key words: *Risk, Project, Project Risk Management, Risk Register.*
JEL code: *M00*

Introduction

Project management is a relatively new science characterized by dynamic development in the second half of 20th century. The first editions of the one of the most popular project management guidelines, A Guide to the Project Body of Knowledge, were launched in 1996. The latest version of A Guide to the Project Body of Knowledge, the fifth one, was issued in 2013. Other project management manuals have seen similar updates, for example, the first edition of the Tasmanian Government Project Management Guidelines was published in 1996, however the latest, 7th version, came out in 2011 (Uzulans, 2015).

Although a new edition is issued in average every three years, the author considers that none of them contains references to research results; it can therefore be assumed that the manuals represent theoretical reflection on the authors' experience. However, the development of a science is impossible without research and research-based conclusions and recommendations (Uzulans, 2015).

Project risk registers have been analysed in research and development project (Luppino, Hosseini, Rameezdeen, 2014), construction projects (Dunović, Radujković, Vukomanović, 2013), and research project (Bodea, Dascalu, 2009). A project risk register is a result of the risk management process (Larson, Gray, 2011; Chapman 2006), the structure of the risk register can be simple or complex (Hillson, 2009), and the structure of the risk register is determined by many factors (Chapman 2006).

Methodology of Research

The article describes the research on risk registers. The aim of the study is to assess the compliance of the publicly (in the Internet) available project risk registers and theoretical risk registers created based on the AS/NZS ISO 31000:2009 Australian/New Zealand Standard Risk

management – Principles and guidelines and ISO Guide 73 standards. For the purposes of the research the author has used both quantitative and qualitative research methods.

The research comprised analysis of 30 publicly available project risk registers. The selection of the registers was made in November, 2013 with the Google search engine by requesting "project risk register" and the first 10 web pages with the search results were examined.

In the research the author restricted the search term "*risk register*", as widely distributed by the term of the document which is defined as "record of information about identified risks" (ISO Guide 73, 2009, p.12).

In the previous two researches the risk registers were described and it was concluded that by analysing just 30 risk registers significant differences can be found between the risk register described in A Guide to the Project Management Body of Knowledge by Project Management Institute, Tasmanian Government Project Management Guidelines and Risk Management Guide for DoD Acquisition and project risk registers and between term "*risk*" in the European Commission Aid Delivery Methods Volume 1 "Project Cycle Management Guidelines" and "Caltrans Project Risk Management Handbook, Threats and Opportunities, Second Edition, Revision 0" and the risk registers publicly available in the Internet. Taking into account that the aim of the research was not to find regularities in the risk registers, no assessment was made concerning the general set of risk registers and the kind of the selection. The author assumes that 30 risk registers constitute a sufficient number for comparing the selected registers.

Among the selected risk registers there were 29 pdf (Portable Document Format) and one xls (Excel Binary File Format) documents. All registers are designed as a table with columns about project risks. The minimum number of columns is three, maximum is 25, and the most common number of columns is 14 in eight registers. There was no risk register which would completely coincide with another register. In one register there were two different tables with a different number of columns – the table with the biggest number of columns was chosen because the column titles coincided and in the biggest table there were columns, which could not be found in the smallest table. In the xls format table 12 columns are hidden. In the hidden columns there is information about the influence by the kind of it. For the research purposes the author used the table without the hidden columns. In one register there are two tables, the title of one of which contains the term "draft", in the research the other table was used where a part of the title is "risk register".

AS/NZS ISO 31000:2009 Australian/New Zealand Standard Risk management – Principles and guidelines was prepared by Joint Standards Australia/Standards New Zealand Committee OB-007, Risk Management to supersede AS/NZS 4360:2004, Risk management. In 2005 the International Organization for Standardization (ISO) established a working group to develop the first international risk management standard using AS/NZS 4360:2004 as the first draft. The standard development process included extensive public consultation in Australia and New Zealand and resulted in the publication of ISO 31000:2009 (AS/NZS ISO 31000:2009). This Standard recommends that organizations should have a framework that integrates the process for managing risk into the organization's overall governance, strategy and planning, management, reporting processes, policies, values and culture. Risk management can be applied across an entire organization, to its many areas and levels, as well as to specific functions, projects and activities (AS/NZS ISO 31000:2009, p.IV).

The study is structured in three steps. First, analysis of the term "*Risk*" and risk register definitions, risk management process and project documentation. Second, theoretical risk

register column identification, and third, comparison between theoretical risk registers and project risk registers.

AS/NZS ISO 31000:2009 defines the risk term and describes each subprocess of risk management process. The risk is defined as "effect of uncertainty on objectives" (AS/NZS ISO 31000:2009, p.1). There are three terms in the definition – "*Effect*", "*Uncertainties*" and "*Objectives*". Possible theoretical risk register columns are 3: objective, uncertainty and effect. AS/NZS ISO 31000:2009 risk definition has been enhanced with five notes, which explain risk definition terms and expand risk definition.

The first note explains the meaning of the term "*Effect*" – "An effect is a deviation from the expected — positive and/or negative" (AS/NZS ISO 31000:2009, p.1). It can be concluded that, firstly, effect is measured and the measurement scales range from multiple values to only two values – positive and negative. The first note adds two new terms "*Deviation*" and "*Expected*".

The second note "Objectives" can have different aspects (such as financial, health and safety, and environmental goals) and can be applied at different levels (such as strategic, organization-wide, project, product and process)" to classify objectives. The second note did not add new terms to clarify the contents of columns.

The third note "Risk is often characterized by reference to potential events (2.17) and consequences (2.18), or a combination of these" (AS/NZS ISO 31000:2009, p.1) expands risk definition and adds two new terms "*Potential events*", "*Consequences*" and combination of both.

The fourth note "Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood (2.19) of occurrence" expands risk definition and adds three new terms "*Combination of the consequences of an event*", "*Likelihood*" and "*Circumstances*".

The fifth note "Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of an event, its consequence, or likelihood" (AS/NZS ISO 31000:2009, p.1) explains term "*Uncertainty*" (AS/NZS ISO 31000:2009, p.1-2)

The total number of the theoretical risk register columns will be 9: effect, uncertainties, objectives, expected, deviation, potential events, consequences, likelihood and circumstances.

Table 1 lists the comparison of theoretical and project risk registers. All together in the risk registers there are 374 columns and 279 original column titles. The first column contains theoretical risk register columns in accordance with the AS/NZS ISO 31000:2009 risk definition and notes. The second column contains of project risk register columns where the number is equal to the theoretical risk register column names and content. The third column contains similar column names, but the content of project risk register columns is not equal to AS/NZS ISO 31000:2009 risk definition and notes. The fourth column contains different names, but equal content.

Table 1

Real project risk register columns according to the AS/NZS ISO 31000:2009 risk definition

Theoretical risk register columns in accordance with the AS/NZS ISO 31000:2009	Project risk registers* columns with equal names and content	Project risk registers columns with equal names, but different content	Project risk registers columns with different names, but equal content
effect	1 (0.27% from all columns and 0.36% from columns names)	0	1 (0.27% from all columns)
uncertainty	0	0	0
objectives	1 (0.27% and 0.36%)	0	2 (0.54%)
expected	0	0	0
deviation (deviation from expected)	0	0	0
potential events	1 (0.27% and 0.36%)	4 (1.1% from all columns and 1.4% from columns names)	0
consequences	10 (2.7% and 3.6%)	0	3 (0.71%)
likelihood	7 (1.89% and 2,52%) or 9** (2.43% and 3.24%)	0	4*** (1.08%)
circumstances	0	0	0

* – in the tables "Project risk registers" is equal to "The 30 risk registers of real projects publicly available in the Internet".
** – two register with two Likelihood columns.
*** – one register with one column with three sub-columns, one is Likelihood.
Source: Author construction

Risk management process in AS/NZS ISO 31000:2009 includes 3 sub-processes – establishing the context, risk assessment, and risk treatment, and 2 supporting sub-processes – communication and consulting, and monitoring and review. Risk assessment sub-process is divided into 3 parts – risk identification, risk analysis, and risk evaluation (AS/NZS ISO 31000:2009, p.IV). Table 2 lists information about risk management process.

Table 2

Information for risk register columns according to the AS/NZS ISO 31000:2009 risk management process

Subprocess and parts of subprocess	**Information from subprocess and parts of subprocess**	**Information for theoretical risk register**
Establishing the context	defining responsibilities for and within the risk management process	responsibilities
	the nature and types of causes and consequences that can occur and how they will be measured	causes, consequences
	the timeframe(s) of the likelihood and/or consequence(s)	likelihood timeframe, consequences timeframe
Risk identification	identify sources of risk, areas of impacts, events (including changes in circumstances) and their	sources of risk, impacts areas, events, events causes, events

	causes and their potential consequences	consequences
Risk analysis	Risk analysis involves consideration of the causes and sources of risk, their positive and negative consequences, and the likelihood that those consequences can occur. Factors that affect consequences and likelihood should be identified. Risk is analysed by determining consequences and their likelihood, and other attributes of the risk. An event can have multiple consequences and can affect multiple objectives. Existing controls and their effectiveness and efficiency should also be taken into account	causes, source, consequences, consequence likelihood, factors controls, controls effectiveness, controls efficiency
Risk evaluation	The purpose of risk evaluation is to assist in making decisions, based on the outcomes of risk analysis, about which risks need treatment and the priority for treatment implementation	decisions, treatments
Risk treatment	Treatment plans should include: – the reasons for selection of treatment options, including expected benefits to be gained; – those who are accountable for approving the plan and those responsible for implementing the plan; – proposed actions; – resource requirements including contingencies; – performance measures and constraints; – reporting and monitoring requirements; and – timing and schedule.	treatments selection responsibilities actions resources performance measures, constraints date
Communication and consultation	No information that can be used in for risk register	
Monitoring and review	– ensuring that controls are effective and efficient both in design and operation; – obtaining further information to improve risk assessment; – analysing and learning lessons from events (including near-misses), changes, trends, successes and failures; – detecting changes in the external and internal context, including changes to risk criteria and the risk itself which can require revision of risk treatments and priorities; and – identifying emerging risks.	controls evaluation (effectiveness), controls evaluation (efficient) lessons learned historical records historical records comparison emerging risks

Source: Author construction

Table 3 provides information about the comparison of the risk management process in theoretical and project risk registers.

Table 3

Project risk registers columns according to the AS/NZS ISO 31000:2009 risk management process

Theoretical risk register columns in accordance with the AS/NZS ISO 31000:2009	Projects risk registers columns with equal names and content	Projects risk registers columns with equal names, but different content	Projects risk registers columns with different names, but equal content
responsibilities	2 (0.54% from all columns and 0,72% from columns names)	0	risk owner* 12 (3.24% from all columns), others 9 (2.43%) or 11** (2.97%)
causes	6 (1.62% and 2.16%)	0	2 (0.54%)
consequences	13 (3.51% and 4.68%)	0	1 (0.27%)
likelihood timeframe	0	0	0
consequences timeframe	0	0	0
sources of risk	2 (0.54% and 0.72%)	0	0
impacts areas	0	0	1 (0.27%)
events	1 (0.27% and 0.36%)	5 (1.35% and 1.8%)	0
events causes	0	0	0
events consequences	0	0	0
source	0	0	0
consequence likelihood	0	0	0
factors controls	0	0	0
controls effectiveness	0	0	0
controls efficiency	0	0	0
decisions	0	0	0
treatments	0	0	0
actions	0	0	14 (3.78%)
resources	0	0	0
measures	0	0	5 (1.35%)
performance constraints	0	0	0
date	0	0	14 (3.78% and 5.04%)
controls evaluation (effectiveness)	0	0	0
controls evaluation (efficient)	0	0	0
lessons learned	0	0	0
historical records	0	0	0
historical records comparison	0	0	0
emerging risks	0	0	0

* – column with information about responsibilities in the project risk register can have different names, for example, Risk Owner, Action Owner, Owner, Responsible.
** – one risk register contains two columns with responsibilities.
Source: Author construction

In the AS/NZS ISO 31000:2009 risk register is not defined, risk profile definition is "description of any set of risks" (AS/NZS ISO 31000:2009, p.5). Risk register is defined in ISO Guide 73, as a "record of information about identified risks" (ISO Guide 73, 2009, p.12). ISO Guide 73 also contains risk profile definition with note "The term "risk log" is sometimes used instead of "risk register"" (ISO Guide 73, 2009, p.12). Both definitions have very comprehensive content and may be open to different interpretations.

First, according to the risk register definition in ISO Guide 73 the theoretical risk register contains all columns from Table 1. Terms "*Identified risks*" and "*Information*" are not defined and "*identified risks*" can be attributed to all risk management processes. Second, we can use information from "Risk treatment" sub-process or part of information, assuming that there is a separate document "Treatment plan", because term "*risk register*" in ISO Guide 73 is defined in part 3.8 "Terms relating to risk treatment". However "Treatment plan" also can be interpreted as a set of activities. Thirdly, it can also be interpreted that risk register contains information only from two sub-processes – "Establishing the context" and "Risk identification" because the risk definition contains "*identified risks*" and does not contain "*analysed risks*" or "*risk treatment*".

The Inter Agency Policy and Projects Unit, Department of Premier and Cabinet, Tasmania "Project Management Fact Sheet: Project Documentation" was used to identify risk register requirements. "Project Management Fact Sheet: Project Documentation" defines requirements for a risk register – details of how risks are managed, risk register is prepared at the start of the project, updated regularly and approved by the steering committee, senior management or line manager (Tasmania, 2008, p.18). Table 4 provides comparison between "Project Management Fact Sheet: Project Documentation" and AS/NZS ISO 31000:2009.

Table 4

Project risks registers columns according between the Project Management Fact Sheet: Project Documentation, AS/NZS ISO 31000:2009 risk management process and project risks register

"Project Management Fact Sheet: Project Documentation"	AS/NZS ISO 31000:2009 risk definition	AS/NZS ISO 31000:2009 risk management process
details of how those risks are being managed		responsibilities, factors controls, controls effectiveness, controls efficiency, decisions, treatments, actions, resources, measures, performance constraints, controls evaluation (effectiveness), controls evaluation (efficient)
risk register is prepared at the start of the project		
updates regularly		date
approved by the steering committee, senior management or line manager		

Source: Author construction

Risk management process (details of how those risks are being managed), when adding up column "Project risk register columns with equal name and content" and "Project risk register columns with a different name, but similar content" from table 3 the values of all columns account for 11.34%. Together with "updates regularly" it accounts for 15.12%.

Conclusions

It is difficult to create the theoretical risk register, because definitions of many terms used in the definitions are missing. "Defining responsibilities for and within the risk management process" cannot be concluded about term "*Responsibility*" volume, may be limited to all risk management process or some of the sub-processes or sub-process results, or final results of the risk management process. In the AS/NZS ISO 31000:2009 term "*Responsibility*" is used five times and defined. Terms "*Responsibility*" and "*Responsible*" are not defined in ISO Guide 73. The author has taken that "defining responsibilities for and within the risk management process" can be applied to sub-processes or parts of sub-processes, results of sub-processes or the final result of a process. However, this assumption does not guarantee the repeatability of results. Another researcher may get different results in an analogous situation. It is not possible to answer the question which of the results would be more reliable.

The research can only be described as partially successful. To be considered as an achievement is the provision for the comparison of the project risk registers with the theoretical risk register that is created in accordance with the theory from AS/NZS ISO 31000:2009, ISO Guide 73 and "Project Management Fact Sheet: Project Documentation".

The analysis of the project risk registers should be continued, complementing the research methods with new methods, including deeper analysis of the risk definitions and terms and notions that are used in the definitions.

The effectiveness of project risk management and the risk register as one of the components of effective risk management could be one of the criteria of the risk register accuracy. However, the theory of project management effectiveness has not been fully designed either. The research on risk registers could promote and facilitate the research on the effectiveness of project management. (Uzulans, 2015).

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3. http://www.north-herts.gov.uk/churchgate_project_risk_register_v9__updated__13_12_2012__web.pdf
4. http://www3.hants.gov.uk/appendix_9_risk_assessments_2.pdf
5. http://www.norwich.gov.uk/TransportAndStreets/Transport/Cycling/Documents/Annex 18QRA.pdf
6. http://www.nerc.ac.uk/research/programmes/appraise/documents/risk-register.pdf
7. http://www.drdni.gov.uk/a2_project_risk_register_-stage_2_issue_6__25-09-09_.pdf
8. http://files.whatdotheyknow.com/request/edge_lane_contract_and_dft_money/Volume%20 2/ Project%20Risk%20Register/Project%20Risk%20Register.pdf
9. http://www.epsom-sthelier.nhs.uk/EasysiteWeb/ getresource.axd?AssetID=17404&type=full&servicetype=Attachment
10. http://www.southhams.gov.uk/administration/committee_agendas/executive/26jan12/item1 3_appA.pdf
11. http://www.scottish.parliament.uk/OMG/OMG_Paper_004_-_I_- _Records_Management_project_Risk_Register.pdf
12. http://www.plymouth.gov.uk/appendix_5a_- _swdwp_risk_register_v4_update_24_apr_08.pdf
13. http://www.derrycity.gov.uk/DerryCitySite/files/4d/4de2ecb9-6a4a-4a5b-8d8b-9c73462c58fb.pdf
14. http://www.brighton.ac.uk/aquamanche/images/aquamanche_risk_rRegister.pdf
15. http://www.carbontrust.com/media/82096/low_carbon_buildings_risk_register.xls
16. http://www.honolulutraffic.com/PMOC_Risk_Register.pdf
17. http://jurassiccoast.org/pathfinder-project/public-documents/category/1-final-report/download?=3:final-report-to-defra-appendices
18. http://www.gloucestershire.gov.uk/CHttpHandler.ashx?id=53319&p=0
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www.nelincs.gov.uk/GetAsset.aspx?id=fAAyADAAMAB8AHwAVAByAHUAZQB8AHwAMAB8AA2
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PROJECT MANAGEMENT FOR SMALL- AND MIDSIZE-ENTERPRISES IN THE EMBEDDED SYSTEM INDUSTRY

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Abstract

Embedded systems development and production is an important domain for small- and mid-size enterprises (SME). The main reason is the adaptation of these systems to the specific use case – the product customization. Embedded systems are very often application specific standard products (ASSPs). They are based on a common (micro-controller) platform, which is tailored to the specific application. Such systems are produced in small or medium quantities and require close interaction with the development of the technical systems into which the embedded system will be integrated. They are customer specific and many customers are SMEs, too. Therefore, the lean development and production processes of an SME are better suited for this kind of business than the more complex and expensive processes of large enterprises. Nevertheless, the complexity of the embedded systems, of the respective applications and especially of the embedded software is rising fast. This is partly driven by the Internet-of-Things (IoT) trend. To stay competitive in term of technology, speed and quality, the SMEs in embedded systems have to move towards more sophisticated project management processes for their development and production projects. While doing this, they have to take process complexity into account to avoid overloading their projects with bureaucracy and losing the advantage of lean and fast processes. The solution we propose is a process framework derived from the standardized industrial processes of large technology enterprises. This process framework can be tailored to the specific needs of certain project types in SMEs. This takes a lot of complexity away while still guaranteeing state-of-the-art execution quality of projects. The concepts presented in this paper are derived from an industrial use case in an electronics manufacturing services (EMS) SME.

Keywords: *R&D processes, milestones, embedded systems development*
JEL code: *O33*

Introduction

Embedded systems are an important component for the emerging era of Cyber-Physical Systems and the Internet-of-Things (IoT) (CERP-IoT: Vision and Challenges for realizing the Internet of Things, European Union, 2010). They are the interface between the cyberspace and the physical world. The demand for such embedded systems is changing the industry of electronic manufacturing service (EMS) providers which consists of large players (e.g. Foxconn) but also of a huge number of small and midsize enterprises (SMEs). The customization of embedded systems to the ever changing applications and the development of more complex embedded systems with a higher amount of software (software intensive systems) leads to more research and development (R&D) effort and a higher complexity in R&D. Furthermore, EMS providers are facing more complex quality and process requirements (e.g. in automotive industry (Maurer, M.; Winner, H. Eds., 2013 and Hoermann, K.; Mueller, M.; Dittmann, L.; Zimmer, J. 2008) since their products become a more relevant part of new products (so called software defined products). Therefore, SMEs in the embedded systems industry have to convert from production-oriented EMS providers into R&D oriented electronics and software companies. This leads to a demand for well-defined processes,

standards and quality guidelines that achieve the quality level of large technology enterprises while keeping the bureaucratic overhead at a manageable level. This challenge can only be met by an intelligent design of the respective project management framework.

Development of Embedded Systems

The following contribution is mainly based on the experience with the case study of converting a former EMS provider into a R&D oriented electronics and software company. The change process was mainly conducted from 2011 to 2015. The company (CP contech electronic GmbH, Germany) was hit hard by the financial crisis and the subsequent economic crisis in Europe in 2009 to 2010. By that time, 50 employees were working mainly in production and production related service functions. The company was certified according to ISO9001, but had only a very limited development process. By 2015, the company still had 50 employees but with a most people in R&D and supply chain management while productivity in manufacturing increased by 2-3 times. Software-intensive products with IoT functionality are a major share of the overall products. To comply with the product complexity and the rising customer requirements, R&D processes are defined and rolled-out in both production and development.

For embedded systems development it is important to do a concurrent engineering of the product itself, the production process for this specific product and for the test and qualification process. Otherwise, the interdependencies between the three areas cannot be addressed sufficiently (Gausemeier, J.; Kahl, S., 2010). From a generic point of view, the process starts with a customer order. R&D develops prototypes (engineering samples) to support the in-house validation and verification of the product. Such samples focus on the functionality of the product and don't require the final production or testing process. While finalizing the product design, the customer is becoming involved. Based on prototypes which are much closer to the final product (customer samples) the customer does a validation and finally releases the product for production. This is a first acceptance test and therefore an important milestone of the R&D project. In this phase the production and testing process needs to be considered since product features are finalized which determine the production (Design-for-Manufacturability, DfM) and testing (Design-for-Test, DfT). While developing the production and test processes, the supply chain is set up and the purchasing and qualification of material and parts required for the product are done.

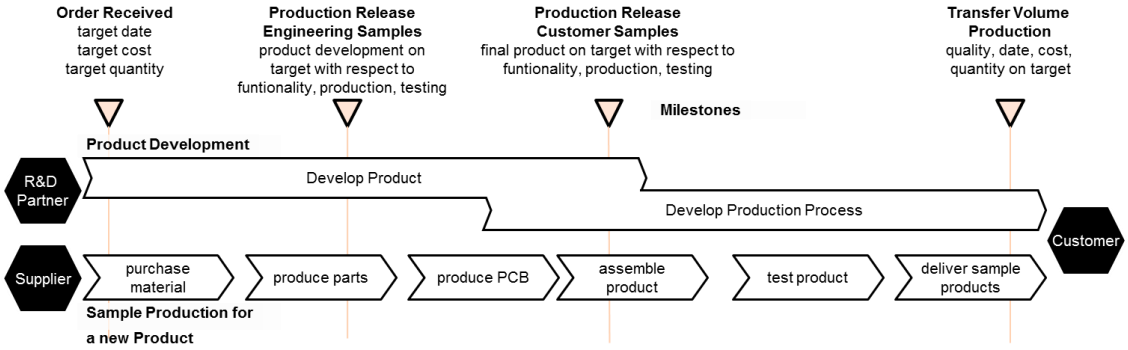

Fig. 1: **Stage-gated product development process with the concurrent production process development**
Source: *contech: www.contech.de, last accessed Feb 26, 2016*

During the final stages of the product development process, the ramp up of the production is done and the incoming supply chain is set up. Developing, adapting and tuning the product and the production process for mass production is called the industrialization process.

Milestone Process

Milestones are an important tool within a project management process (Kerzner, H, 2013). They are used for quality assurance (QA), for project controlling, for performance measurement (key performance indicators, KPI, e.g. cycle times) (Ha, W.; Sun, H.; Xie, M., 2012), for reporting, and for project communication in general (Kerzner, H, 2013). Milestones help to define a stage-gated project management process where certain tasks and deliverables need to be accomplished before moving on to the next phase. A milestone is accomplished after successfully conducting a milestone review. Such reviews are used to have a four eyes principle with at least another person (e.g. engineer from another project) together with a project team member (or the project manager) checking the results achieved by the project. Some milestones involve customers and lead to an acceptance of the accomplished results by the customer. At contech, reviews are used for both internal and external (customer) purposes. For an SME, it is important to have a simple but standardized milestone process (Kerzner, H, 2004). Standardization of milestones leads to better communication within the company and to a better understanding of the project status within the team and the whole organization (Guilin G., Chen Y., Sun Y., Zhou, X, 2007). Therefore, contech defines a set of 6 standard milestones and some optional intermediary milestones.

Table 1

Set of standard milestones for an embedded systems company

Phase	***Milestone***	***Name***
Initial Offer/Basic Concept	*M0.1*	Customer Request/Product Idea
	M0.2	Feasibility
System Concept	**M1**	**Project Release/Customer Order**
	M2	**Product Specification**
Develop Internal Prototypes (Engineering Samples)	**M3**	Prototype Phase Completed/ **Release for Pre-Series-Production**
Develop Final Prototypes (Customer Samples)	*M3.1*	Handover to Production for Pre-Series-Production
	M4	Pre-Series-Phase Completed (Customer Feedback)/**Design Freeze**
Pilot Phase	*M4.1*	Handover to Production for Pilot Production/Zero Production
	M5	**Volume Production Release**
Volume Production	*M5.1*	Ramp Up Completed
Ramp Down	**M6**	**Production Ramp Down**
	M6.1	Product Cancellation

Source: *contech: www.contech.de, last accessed Feb 26, 2016*

To ensure a proper definition of the required results to accomplish a milestone and to document the required checks during the milestone review, for each milestone a specific milestone checklist is provided.

Table 2

Example entries of the milestone checklist for the milestone M1 "Project Release"

Milestone M1 Project Release								
ID	**Mile-stone**	**Check**	**Document**	**Version**	**Result**	**Resp.**	**Review**	**Tailoring**
1	M1	Project Manager (PJM) appointed			done	PGM		Required
2	M1	Project plan available (MS-Project)	Project Plan	V1.0	Open	PJM	PGM	Required
4	M1	Project Manual available (with team liet)	Project Manual	V1.0	done	PJM		Optional
5	M1	Risk assessment (FMEA) done and risk management initiated	FMEA	V1.0	done	PJM	PGM	Required

Source: *contech: www.contech.de, last accessed Feb 26, 2016*

The milestone checklist contains references to relevant standard documents. Since these documents are "living documents" which grow and change through the project cycle, a

standardized numbering and versioning scheme is used. The "FMEA V1.0" for example contains always the initial risk assessment at project start and can later be used as a reference about the risks communicated with the customer at the joint project release milestone. Furthermore, the checklist contains who is responsible for the check and who is doing the review (four eyes principle). The last column allows a tailoring of the checklist to the needs of the project. With this feature, optional checkpoints can be skipped if not needed. This offers the possibility to make the process "lighter" e.g. for smaller or less complex projects.

To make such a milestone process useful for technology driven SMEs, it is necessary to design it in a way that is:

- Expandable for new business models: since customer requirements change fast, the process must be customizable e.g. if a customer requires in addition to the embedded system the development of mechanical parts, if for example only software is needed without producing hardware or if a new technology (e.g. cloud based services) is introduced. SMEs need pragmatic means to adapt to such a situation.
- Using roles instead of resources: roles in SMEs are not defined by assigning specialists to each role but they are defined by giving a person (maybe the same for several roles) the responsibility for a certain topic. Since people can be required to cover several roles, it is specifically important to define the roles and responsibilities clearly and attach them to the product development process. IPMA ICB is an important basis for this (ICB – Individual Competence Baseline for Project, Programme and Portfolio Management, Version 4.0 (2015).
- Based on standard documents, forms and checklists: Standardization is important to simplify communication (everybody knows what is meant if the project is at M3) but also for maturity development of the company and quality assurance. This follows the trend for project management standardization (PMS) (Guilin G., Chen Y., Sun Y., Zhou, X , 2007) (Oktaba, H.; Piattini, M., 2008) which makes it much easier for new employees to familiarize with and integrate into the ongoing projects.
- Allowing the tailoring of the process to the needs of the respective projects both in methods and tools (Silva, M.; Jeronimo, C., 2013) and in development software (Wolff, C.; Krawczyk, L.; Hoettger, R.; Brink, C.; Lauschner, U.; Fruhner, D.; Kamsties, E.; Igel, B, 2015): This is required to reduce the bureaucratic burden for projects while ensuring the development quality of a "heavy-weight" process.

Tailoring towards different project types

The tailoring of the process is specifically important for the SME contech from our case study. This is due to the fact that contech offers a full scale development and production service to the customer but also offers subsets and parts of the full scale solution as independent services. This means that contech (contech: www.contech.de, last accessed Feb 26, 2016) offers:

- The development of new embedded systems with electronic hardware, software, mechanical assembly, inhouse production or production by manufacturing partners, testing etc. based on a customer specification
- The modification/iteration/customization of an existing product e.g. by adding a different electronic component or a new software feature (also re-engineering e.g. for cost saving or because an electronic component is no longer available)

- The development of test systems for an existing product (no matter if the product itself was developed by contech)
- The "industrialization" of new or existing products both with an inhouse production process or a production process at a manufacturing partner, production process improvements (e.g. to safe cost or time)
- Software development
- Prototype development as means for new product validation by customers or as marketing samples.

Due to the iterative and more agile development process for software-intensive systems (Liggesmeyer, P.; Trapp, M., 2009 and Oktaba, H.; Piattini, M, 2008) these offers need to be iterated and combined according the requirements of the customer. E.g. a customer could request to get 2 versions of customer samples (B-samples) because he wants to introduce changes after validating the first samples (B0) and still validate the resulting second samples (B1). Fig. 2 shows how the product development processes for a "Redesign or Standard Product" and for "Concepts/Prototypes" can be derived from the full scale R&D process for "New Products" by skipping process phases and milestones (M1-M6). E.g. a redesign of an existing product usually does not require a basic concept before doing a system concept and it does not require the production of engineering samples. On the other hand, the development of a concept or a prototype without the intention to bring it into mass production (e.g. because it is just needed as a technology demonstrator) does not require the later phases of the process.

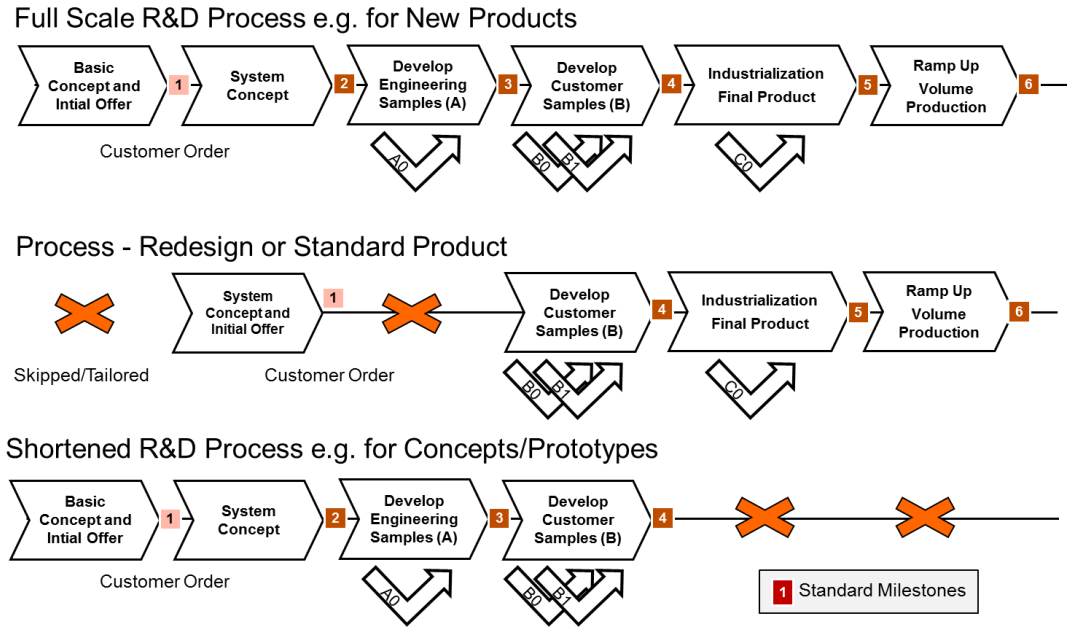

Fig. 2: **Tailoring of the full scale R&D process for embedded systems to different project types and sub processes**
Source: *contech: www.contech.de, last accessed Feb 26, 2016*

Results and Conclusion

Based on the experience with the development of a milestone and project management process for the embedded systems SME contech it can be concluded that a SME can operate R&D processes with similar quality levels as large enterprises while still managing the bureaucratic overhead. Project management standardization (PMS – based on standards like PMI or IPMA) and the development of a set of standardized milestones are powerful tools to introduce high quality processes in SMEs while still providing agility and flexibility. A defined way for tailoring leads the way to the generation of different service offers to customers out of a basic set of sub-processes while still keeping the process complexity in a manageable range. Finally, such processes give employees a framework to cooperate and communicate while allowing new colleagues an easy and fast integration into the projects.

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CRITICAL ANALYSIS OF THE POSSIBILITY OF APPLICATION OF PARTICIPATORY METHODS IN LOCAL DEVELOPMENT MANAGEMENT IN POLAND

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Abstract

The paper is devoted to the specific features of participatory management of local development in Poland, where the pursuit of empowerment of residents of local communities through the implementation of participatory initiatives is noticeable. Such actions, although they are expected to bring numerous benefits for self-governments, have certain limitations in post-communist countries. They are characterised by an additional burden of experiences and barriers that hinder the smooth implementation of participatory development. The authors of the paper, using the example of the concept of the Living Lab, present determinants of the use of participatory management methods in Poland. The experience gained through the implementation of the project "Systemic support for management processes in local government units" provides empirical background for the paper. The paper provides recommendations for local authorities of post-communist countries which should contribute to the efficient use of participatory methods for managing local development.

Key words: *participation, local development, project management, self-government, Living Lab*
JEL code: *H70, 0350, R5, H430*

Introduction

Political changes shape the relationship between the ones "responsible" and the ones "liable" for the city in a different manner. Residents, who are voters exercising their right to vote every four years to then become petitioners in four-year periods when the power is held by the elected government, take on the role of "stakeholders" of the city, its shareholders, who control the quality of management and renegotiate their ownership rights by becoming actively involved in the decision-making process of public authorities which and are treated in this regard as the management board or the supervisory board of a company (Filar P., Kubicki P., 2012 quoted after: Czepczyński M., 2014).

In order to meet the society's changing needs, representatives of authorities and local communities seek new approaches to the management of public affairs. Currently, the concept of Public Governance enjoys the greatest appreciation. It focuses on openness and transparency in the flow of information between authorities and the society. Public Governance requires connections between institutions and organisations and is based on their extensive cooperation (Noworól A., 2006). The concept of governance refers to the involvement in the decision-making process (and the decision implementation process) of the widest possible group of stakeholders interested in the development of the particular unit. The evolution of the theory and practice of management in the public sector is directed towards the development of concepts based on collaboration, partnership and cross-network connections (Noworól A., 2014). Since the 1990s, different approaches focused around concepts such as governance (co-managing, co-governing), networks, partnership, joining-up, transparency and trust have been developed

simultaneously (Pollit C., Bouchaert G., 2011). The transition from civic participation through involvement to empowerment of citizens is highlightened (King C.S., Seagers Martinelli A., 2005; Fung A., Wright E.O., Abers R., 2003); from the model focusing on the legality of actions through the model based on the consideration of economic effects and quality of action to the model that recognises the effectiveness and usefulness of the action from the perspective of citizens (Kożuch B., 2004, Rydzewska-Włodarczyk M., 2013).

In recent years, the literature on public management has also allowed a voice of criticism of the participatory approach to the management of public affairs, or has shown imperfections and potential threats related to the use of this approach in a certain manner (Cook B., Cothari U., 2001; Mohan G., Stokke K., 2000; Hickey S., Mohan G, 2004; Kesby M, 2005; Eversole R., 2010).

Apart from academic discussion, the practice of applying participatory methods of public governance in local communities also provides a valuable perspective. In 2013-2015, the researchers from the Department of City and Regional Management, Faculty of Management, University of Lodz participated in the project "Systemic support for management processes in local government units ", co-financed by the European Union from the European Social Fund. The project included the task called "The development of innovative solutions in the field of public governance", where one of the approaches was to solve local problems in accordance with the concept of the Living Lab, which was implemented in 16 local government units. The concept is discussed in the further part of the paper as an example of project implementation in accordance with the principles of public participation. Action on such a scale was a pioneering venture in Polish conditions. This allowed, on the one hand, to test the assumptions of the concept of the Living Lab, and, on the other hand, to identify determinants of smooth implementation of the participatory approach to management in self-governments.

The authors of the paper aim to provide a new perspective on the possibility of using participatory approaches in the management of public affairs by self-governments. This is possible through the confrontation of the current academic achievements in this field with practical experience. It should be also noted that the empirical foundation is formed by the territorial units of the country for which the experience of local government is relatively new. The historical background of Poland, associated with belonging to a group of post-communist countries, is another important aspect. Polish history lends a special character to processes related to cooperation, networking and the idea of civil society, which in fact is mainly due to the lack of such tradition and social trust.

The specificity of Poland in the light of the use of participatory approaches to governance at the local level

After World War II, Poland, similarly to other countries that were subject to the influence of the USSR, functioned in the new socio-economic system modelled on the Soviet system. The general principle of state operation amounted to stating that its task was the implementation of the great ideas of socialism, the development of the country in accordance with a specific model and the extension of care and protection to all its citizens. The slogan "the party rules and the government governs" accurately reflects the relations prevailing at that time. A centralised state was built, and any form of decentralisation allowing the formation of independent views, let alone their implementation, constituted a threat to the authorities. The state took on the role of the decision-maker in the economy and took control over the lives of all society members. Self-government in the conditions of that autocratic regime was completely eliminated as any form

of social self-organisation could pose a threat to the totalitarian system of government. Concerned that the public could be opposed to the imposed regime, in the post-war period the authorities organised the state in such a manner that it was able to control and subordinate its citizens to its decisions. The central authorities made decisions concerning everything and any sort of social control over their activities was reduced to pretence. The whole apparatus was set to pass instructions down and control their execution as hierarchical structures were in place. Various central management boards, i.e. the so-called unions grouping individual companies, were subordinated to the Ministry, and basic party units, crucial for the functioning of enterprises, careers as well as living conditions of people employed there, operated in each enterprise. The authorities wanted to tie people to their workplace, and not the place of residence, as it is easier to control the undesirable behaviour of different social groups this way. For this purpose, enterprises used additional perks in the form of allocation of holiday vouchers, vouchers for the purchase of cars, camps for children, or housing allocation.

In the 1950s, trade unions were centralised, censorship was introduced, the functioning of the professional self-government organisations was restricted, local government was eliminated (local authorities had no legal personality or their own property, they only managed state-owned assets), private ownership was limited (nationalisation of industry and banks, as well as collectivisation of agriculture on a smaller scale), and the elections to the parliament, as well as local and regional governments, were properly controlled. The consequence of all those actions was the incapacitation of citizens, reflected in the state – citizen relationship. In practice, common assets – (i.e. state-owned) were perceived by the public as anyone's, therefore they could be damaged or appropriated for one's own use, and they certainly did not require the attitude of care and proper use on the part of citizens (Regulski J., 2000).

In such a system, entrepreneurial and creative attitudes were not widely accepted as a rule. Willingness to take risks, so important in the processes of governance, was minimised almost to zero. Communal interests and real actions taken at the local level, in small communities, among neighbours and friends, did not in fact exist. The level of trust in the society was very low, alienation of power occurred, there was a clear division between "us" and "them" (the society and the government), and the self-organisation in the society, if ever occurred, centred around the Catholic Church. The great social movements against the government that arose in Poland, including the "Solidarity" movement, had their origin in the great social discontent, primarily resulting from living conditions and restrictions of civil liberties. Changing the society's mentality towards the recognition of values such as public good, cooperation, solidarity, involvement in public affairs, etc. after a period of real socialism is not possible in the short term, it takes time counted in decades.

Public participation in the management of local development in Poland – systemic determinants

Building the foundations of local democracy and the inclusion of various city stakeholder groups in making decisions concerning directions and ways in which the city should be developed is the basis of participatory management. The foundations of such management are constant interactions between local administration and members of society based on appropriate participatory and consultative procedures. Its special features include the involvement of all actors in work for the city, openness and transparency of decision-making, non-discrimination in access to public service, as well as responsibility and striving for the sustainable development

(Hausner J., 2008) increasing the efficiency of actions taken by authorities. Within this concept, public administration institutions are part of civil society, in which various interest groups represent different, often conflicting goals. The beginnings of public participation in Poland are connected with the establishment (or rather reactivation) of territorial government at the local (communal) level. Since 1990 the self-government in communes has been reactivated and since 1999 the county-level (poviat) and regional (voivodeship) government has been established.

By virtue of statutory provisions, there are mandatory and optional forms of public participation used in Polish local government units. Public consultations are the most common form of cooperation between residents and the commune. According to Art. 4a. 2 of the Local Government Act, consultations with residents on changes to the boundaries of communes or city limits involving the exclusion the area or part of the area of the auxiliary communal unit and its incorporation into the adjacent auxiliary unit of the commune or the neighbouring commune are obligatory. The duty to conduct consultations was also indicated by Art. 5 of the Act, referring to the situation when the commune on its own initiative or at the request of citizens seeks to create an auxiliary unit in the form of village, city district or housing estate. It is worth noting that, in accordance with Art. 5a of the Act, in the cases provided for by law and in other matters of importance for the commune, consultations with residents of the commune can be carried out in its territory, based on the rules and procedures for conducting such consultations determined by a resolution of the communal council. Another provision requiring the commune to carry out public consultation is contained in the Act of 27 March 2003 on Spatial Planning and Development. Pursuant to Art. 11 and 17 of the Act, the commune is obliged to consult with residents the study of land use conditions and directions as well as its local development plan. The Act of 3 October 2008 on the Release of Information on the Environment and its Protection, Public Participation in Environmental Protection and Environmental Impact Assessment also introduces the duty to consult with the public planning documents and decisions on environmental conditions of approval of an undertaking. Another Act that obliges the commune to carry out consultations is the Act of 6 January 2005 on National and Ethnic Minorities and the Regional Language. In accordance with Art. 13, the communal council after consultations with the residents can, through the governor (voivode), extend a request to the Minister of Religious Denominations and National and Ethnic Minorities to add a word or a physiographic object in the minority language to the name of the village. These consultations are most often open meetings organised after publicising the relevant document draft. The Act of 24 April 2003 on Public Benefit and Volunteer Work obliges communes to consult with public benefit institutions drafts of normative acts related to the statutory objectives of these organisations and normative acts regarding the implementation of public tasks (annual and multi-annual cooperation programmes). This obligation arises from Art. 5 paragraph. 2 points 3 and 4 of the Act.

Practice of local government unit management in Poland shows that public authorities also reach for methods and instruments not required by the law. One example of public participation, a comparatively new one, related to the functioning of rural communes and urban-rural communes is the village fund. This fund allows residents to choose projects to be implemented in the area of the village within the framework of available resources. Pursuant to art. 5 of the Act of 21 February 2014 on the Village Fund, the prerequisite for granting financial resources of the fund in a given financial year is the submission to the communal head/mayor/president of the city the proposal adopted by the village gathering on the initiative

of the village head, the village council or at least 15 adult residents of the village. The fund can only be used for the implementation of projects which comprise the duties of the commune, serve to improve the living conditions of residents and are consistent with the strategy of local development. The exception to the rule is the use of the fund to cover expenditure on measures to eliminate the effects of natural disasters.

In the case of cities, the civic (participatory) budget is an instrument similar in principle. In the framework of this instrument, residents of urban areas have the opportunity to participate in the decision-making process concerning investments that should be carried out. Due to the fact that there is no legislation governing the principle of the creation and operation of the civic budget, communes deciding to transfer part of the budget for the tasks indicated by the residents' base their actions on Art. 5a of the Act of 5 March 1990 on Local Government. Each commune can, therefore, have its own rules governing the method of submitting projects to the budget as well as methods of their consultation and selection.

The Polish self-government has increasingly used the instrument of public consultations, mainly in the case when the planned project may affect particular interests of certain social groups. This may refer, for example, to the implementation of revitalisation projects, road construction, the location of investments burdensome for the environment or the introduction of certain privileges, e.g.: for large families.

Polish local government units have at their disposal also other innovative approaches to the implementation of local projects involving public participation. The Living Lab, i.e. the implementation of the project in which the chief role is played by end-users who are participants of the solutions developed in the framework of the project, is an interesting, innovative concept. It is not regulated by Polish legislation and experience in its use is rather insignificant.

Living Lab

The Living Lab is a fairly new approach to creating new solutions. The Massachusetts Institute of Technology and the person of William Mitchell, an initiator of innovative urban planning approaches, are considered as the source of this idea (Stawasz D., Wiśniewska M., 2015). Currently, this concept refers to the creation of any kind of innovative solutions, assuming, however, that they are developed under the conditions of their actual application with significant involvement of their users. They are included in the process of developing the concept, its prototyping, testing and validation.

Thus, the Living Lab is the concept involving users in the development of ideas and the creation of innovations in various phases of the process, i.e. developing novelties, their prototyping, validation and improvement (Lama N., Oigin A., 2006).

It should, however, be noted that the active involvement of future users in the Living Lab concept is not sufficient. The involvement of the broadest possible group of stakeholders is also necessary. In the case of a residential area, for example a city, where local community members reside and strive to meet their own needs, stakeholders comprise its residents as well as businesses that function in this area, along with tourists, and employees of the communal office, local authorities, representatives of auxiliary communal units or managers of communal enterprises, and many others. The interests of these entities may be slightly different, and sometimes even contradictory. The postulate to reconcile the interests of all these parties is often difficult or even impossible to fulfil. Nevertheless, it can be said that fulfilling interests of one of the groups may entail directly or indirectly the fulfilment of interests of another group.

An appropriate response to the needs of various interest groups requires the support for the process of creation of novelties on the part of public authorities and potential suppliers of new solutions (business) as well as science (which provides creative human resources, laboratories, procedures, etc.). Therefore, for the effective use of the Living Lab, a partnership is created, mostly a private-public one, in which business, science, public authorities and residents work together on the development, validation and testing of new public services, business ideas, technologies, etc. (Stawasz D., Wiśniewska M., 2015).

Due to the fact that the Living Lab concept is very innovative, the development of smoothly running processes, connections and relationships is based on the experience gained through the existing initiatives. In 2006, entities using the concept of Living Lab established the European Network of Living Labs (ENoLL) aimed at sharing knowledge, experience and good practices. 5 Polish initiatives are registered in the European Network of Living Labs. It cannot be said, however, that the Living Lab concept is widely used in the development of Polish territorial units as initiatives implemented are only partially in accordance with the Living Lab methodology.

Limitations in the use of participatory governance in Poland

The experience gained from the implementation of numerous research projects on the principles of functioning of local self-government in the new reality in Poland after 1990 and the project entitled "Systemic support for management processes in local government units " implemented in the years 2013-2015 by the authors of the paper allows to identify some significant limitations in the use of participatory approaches to the management of local affairs. However, the main focus in this field centres on the conclusion that public participation in decision-making processes taking place in public organisations in post-communist countries (including Poland) needs to be learnt by authorities as well as citizens in order to contribute to improving the efficiency of activities carried out by various public administration bodies.

Active participation of the local population in the decision-making process related to the management of public affairs generates transaction costs, and the decision-making process is extended in time. Transaction costs consist of, for example, the costs of negotiating, monitoring, as well as enforcing the terms of the transaction, contracts and agreements. These costs significantly increase the total cost of the project. The decision is taken by a group of interested people, which in practice may not always mean the implementation of the project in accordance with the public interest. At the same time, responsibility becomes blurred as public authorities do not make the decision regarding the specific activity on their own, and the other participants are usually not financially liable. Therefore, it should be recognised that the understanding of the significance of transaction costs incurred should be thorough and widespread on the part of authorities and responsible social groups so that participation could be considered as a desirable method of cooperation between the government and the public. The ability to carry out the entire consultation process, from reaching the potentially concerned group and establishing contact, through negotiations, consultations, and appeals, as well as spreading the risk of failure and monitoring to the verification of feasibility, is also extremely important.

Extending the decision-making process due to the need to make joint decisions may result in its deterioration. Over time, it becomes dramatically different than it was during the introduction of the idea and its initial development. For example, the price of building materials or installation costs can increase, a potential investor can lose interest in the selected object or

area, the number of potential recipients of public services in the region or the city can increase or decrease, which may significantly affect marginal costs. The prolongation of the decision-making process stems sometimes from bureaucratic legal provisions which require a time interval between the dates of partial arrangements. However, the cause of the delay may be also related to the behaviour of co-participants of the consultation process, their absence, lack of position taking, requests for postponement of meetings, or appeals not justified by substantive considerations.

It is also worth noting that relevant authorities are always the initiator in the management of public affairs. Stakeholders participating in the decision-making process are invited, though they become engaged primarily according to their preferences, additionally, authorities have their own recognised expertise and capabilities, which is not always the case with stakeholders. They do not need to possess and usually do not have the relevant expertise concerning the costs of execution and maintenance of the particular investment aimed at satisfying public utility needs. And in the situation requiring the apportionment of liability, there will always "stiffen" their stance.

In addition to these factors, the mechanism of decision-making in public sector organisations has a specific nature. Bhatta [Bhatta 2003] indicates that in the public sector there is no tolerance for failure, which prompts representatives of the sector to play a "safe game", this is often associated with the lack of actions taken beyond the sphere hitherto accepted by the community. This observation is related to another concept present in the scientific literature and practical studies in relation to making difficult and important, i.e. simply new and innovative, decisions in the public sector, namely the "blame game". New solutions are a source of uncertainty as well as various types of risk. Risk management in such a blame game will mean avoiding blame or assigning it to others. The public sector is under constant scrutiny, and any kinds of failure are eagerly picked up by the media and the public opinion. Being in the public eye and the related high cost of being associated with failure provide an incentive to shift risk onto other stakeholders [Hood C., 2002].

It should be noted that the daily life of an average citizen and the course of a project have a different rhythm. It is not easy to implement projects with participation of a large group of stakeholders according to a pace assumed in advance. Residents, apart from their private lives, also have professional duties, and adjusting the schedule of a participatory project, especially one which requires frequent collaboration of a large group, to the needs of all its participants is difficult. Communications technologies can play a key role in this area.

It should be also admitted that participation as a new phenomenon and a challenge in the practice of Polish self- governments can be implemented in a manner inconsistent with the original assumptions. As in some other countries, sometimes actions taken are reduced to the "sham" consultations of the decision which in practice has already been made (Eversole R., 2010) The process of apparent participation is carried out only as a formality. In practice, although the community is given a voice, it has no bearing on the actual execution.

Sometimes representatives of authorities do not develop suitably the extremely important aspect of participation which is the creation of an appropriate environment (Eversole R., 2010). It can be observed also in Poland, that representatives of local governments invite residents to places distant from their homes, during the hours in which potential participants are engaged in professional work, and the manner of conducting the meeting reflects the specificity of clerk's work, but it does not take into account the purpose for which the meeting has been set.

It is also sometimes mistakenly assumed that the average citizen knows and understands his or her needs and is able to identify potential areas for improvement (Eversole R., 2010). Even assuming that this is the case, it is necessary to develop a methodology that will allow the implementation of projects which will coincide with the interests of the widest possible group of stakeholders and allow avoiding a strong lobby. Initiatives related to socially excluded groups should be treated in a different manner as it is natural that in this case the project will serve a narrow group of entities. Non-profit organisations are a source of valuable knowledge in such a situation. The activity of NGOs is a key element of civil society, stimulating the local community's activity and increasing public trust. Non-governmental organisations are knowledgeable about the local community, local issues, as well as social needs, and thus enable the efficient and effective implementation of public tasks of local government units. The activity of these organisations translates into the improvement of the quality of life of the local community.

The skilful use of knowledge of local residents as well as specialists' expertise is another aspect which should be noted (Eversole R., 2010). Residents are in possession of "tacit", local knowledge, embedded in the local context. However, their access to information and the ability to use it is limited.

The literature points to the important role of "transaction agents" (Eversole R., 2010). In practice, Polish local authorities are definitely in need of this kind of support. Revitalisation projects, which require the involvement of a broad group of heterogeneous stakeholders, can be a good example in this respect. Degraded areas, with specific social problems, are often revitalised. Reaching these people with the right message and the ability to translate their needs into the language of the revitalisation project require the involvement of well-trained mediators. Leaders of local communities may also play an important role in this regard.

Modern ventures, both economic and social, are implemented with leaders' participation. Similarly, the success of participatory projects may be subject to proper identification and involvement of local leaders. In the process of leadership, the leader has the ability to influence others in order to shape the goals of the given group or organisation. The leader accomplishes this through motivating others to adopt behaviours aimed at achieving these objectives (Griffin R. W., 1999). Actions taken by local government units must include leadership roles performed by leaders in the area of local communities. It is important to identify these people and create conditions facilitating their impact. People with an entrepreneurial spirit, focused on achieving the synergy effect within individual actions undertaken in the given area, are natural candidates to be leaders within the processes of leadership. Regardless of whether they are self-employed people or people employed in organisations of the private or public sector, their actions should provide the opportunity to implement the previously adopted strategy. Local government units are a natural place to identify people whose characteristics, behaviours and attitudes will allow the initiation and implementation of such actions. Especially in communes where changes are needed and their scope is large, the identification and support of such a leader (a group of leaders) seems to be a prerequisite for further changes.

The above-mentioned competencies are particularly important for leaders of transformation, for whom awareness of the change means the need to be a charismatic leader that will encourage other participants to work towards the change which is in line with the adopted strategy. Such a leader (a group of leaders) should be identified and supported by local government units focused on implementing significant changes that can provide a chance for

creating a well-functioning community in the particular area and the prospects for its further development.

During the implementation of participatory projects, the risk of making irrational decisions due to the dominance of a particular lobby must be taken into account. There is a possibility of the creation of industry-related or territorial monopolistic structures (strong stakeholder groups) which will subordinate the developed and implemented solutions to their interests.

The failure to adapt communication channels to the recipient may be another limitation on effective participation. There are several elements that have an impact on the effectiveness of communication process. First, the specificity of the recipient and his or her ability to read the message must be taken into account. Thus, the content of the message must be conveyed in a manner corresponding with the ability (related to their knowledge and experience or vocabulary used) of each individual that needs to be reached. Information noise is also an important element – the message will be one of many with which recipients are confronted. That is why the channel of communication, the repetition of the message and its legibility, completeness, and adequacy are crucial. Assuming that local authorities decide to implement a participatory project (e.g.: Living Lab) for the purpose of solving local problems, the content of the message and the form of communication should be adapted to the phase of the project cycle. This requires professional marketing actions.

Conclusions and recommendations

For the efficient use of participatory approaches to the management of local development in countries with relatively short experience in self-government, inter-sectoral cooperation and government-citizen partnership, the implementation of the following recommendations is advocated:

1. Educational actions aimed at building the civil society should be taken.
2. Organisational units focused on establishing cooperation with local residents should operate in local government units. Nevertheless, actions taken in the implementation of participatory processes should take into account "soft" factors related to the adaptation of the environment in which meetings are held (the physical surroundings and the appropriate atmosphere) to achieve the objective, i.e. the identification, recognition and exploration of points of view and opinions of internally diverse community.
3. An analysis of the transaction costs associated with the implemented participatory methods should be conducted. Modern ICT techniques can improve the consultation process, which translates into a reduction of these costs.
4. The use of modern communications technologies helps to reduce the gap between the rhythm of the project and the rhythm of the resident's life.
5. Local authorities need to review the matters that should not be subject to lengthy procedures of consultation with local stakeholders. The participatory approach should encompass issues important to the local community the implementation of which without its participation would be fraught with risk of a mismatch to their preferences.
6. The participatory approach should not be a choice in the case of projects characterised by a high risk of failure. Public consultations can be helpful in this case for the authorities to make an appropriate decision, but do not make the said authorities exempt from liability. Hence, there arises the requirement of transparency in decision-making, and consequently –

democratisation of these processes. The desired risk management strategy is participatory transparent risk governance [Renn O., 2008], which consists in the inclusion of all stakeholders in risk management. This process is transparent and it is recommended as the best approach to risk in public services, instead of minimising or managing it.

7. Participation should not be used only as a formality for decisions already made. Attempts to implement participation in the later period may end in failure due to the bad experience of stakeholders.
8. Expertise should not be underestimated. It ought to form the second pillar, alongside the local community's knowledge, of the implemented actions.
9. Establishing close cooperation with NGOs in order to use their knowledge and experience is recommended.
10. The use of participatory "intermediaries", who are able to translate the language of government representatives into the language of citizens, as well as translate matters articulated by citizens into the language of local authority representatives, is recommended.
11. The identification of local leaders and their involvement in participatory projects is recommended. Leaders are often, in fact, people who themselves have achieved success in the economic sphere, services sphere, social sphere, etc. They can, through their actions, be role models, based on the saying that "I've done it so can you – succeed thanks to your own actions". In the case of communes, it is important to find people having characteristics of leaders, who are successful and come from the local community. Good practices to follow always have a positive impact on the attitudes of the local population.
12. In the implementation of participatory processes, one must seek to incorporate the broadest possible group of stakeholders, thereby reducing the risk of influence exercised by strong stakeholder groups.
13. It is important to use carefully chosen methods, communication channels and message content in order to effectively reach all recipients, and any decision taken as a result of mutual consultations should be made public as soon as possible in a form affordable for every citizen.

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