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THE IMPACT OF INFORMATION-RISK-MANAGEMENT ON STRATEGIC DECISION-MAKING IMPROVEMENTS

DOCTORAL THESIS

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ANNOTATION

Numerous research and practical publications in business administration, economics, sociology, psychology, information sciences, etc. have been dealing with the topic of decision making, decision making behavior, decision making outcomes, or emphasizing various aspects of this research area, i.e. efficiency criteria, individual and collective decision making approaches, human characteristics, degrees of decision making rationality and measuring decision making success. All previous scholars agree on the fact that the center of all decision making is the 'information available' as a theoretical foundation to predict the future at best level, consider interfering aspects and forecast opportunities. Also, in 21st century the number information, information sources, channels massively increased as well as interpersonal communication changes significantly by Computer Mediated Communication – opening the question on how to gather, select, store, aggregate, weight, and ultimately draw meaningful conclusions and decisions for the real world. Information-Risk-Management was introduced recently in science to quantify and qualify the affiliated value/risks/opportunities resulting in each information asset.

This study puts the massive increase of information, the current mechanisms of Information Risk Management into the general context of decision making where dealing with 'as much Information as available' to increase decision results. Particular risks are examined and gaps in current business organizations are identified as well as corrective and preventive actions are proposed and organizational change needs are derived.

The present study shows that there are significant conforming but also significant different results between IRM-Experts / IRM Theory and the current Mid-Level Managers views on the need and value of 'Information-Risk-Management'. However, there are no overall significant indications that overall the hypotheses cannot be substantiated.

Finally, more research needs to be conducted in the interdependencies of structural elements in decision making processes (opportunities, risk, procedures, etc.) and in the influence of constantly changing 'Information-Situation' for decision makers (availability, correctness, relevance, weight, confidentiality, aggregation methods, life-cycle, storage, intelligence etc.).

Keywords: decision making, information risk management, management theory, enterprise risk management

JEL code: C01, D81, O33

CONTENT

LIST OF ABBREVIATIONS

CAPA	Corrective Action / Preventive Action
CDI	Customer Data Intermediary
CMC	Computer Mediated Communication
DM	Decision Making
ERM	Enterprise Risk Management
E-I	Extraversion-Introversion
F2F	Face to Face Communication
GDT	General Deterrence Theory
MRT	Media Richness Theory
MSP	Mid-structured problem
OSN	Online Social Media
IRM	Information Risk Management
ISEC or IS	Information Security
ISP	Ill-structured problem
IT	Information Technology
RM	Risk Management
RPD	Recognition primed decision model
R&D	Research & Development
SCI	Scientific Citation Index
SCR	Skin conductance responses
SDM	Strategic Decision Making
SPSS	Statistical Package for the Social Sciences
SPT	Social Presence Theory
URC	Uncertainty Reduction Theory
WSP	Well-structured problem

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INTRODUCTION

Actuality and novelty of the topic

Nowadays computer mediated communication (CMC) and the high volume of transmitted, computed, and stored information is getting a business on its own with fast-paced change and rising uncertainty, organizations are searching for application oriented approaches in management decision making which will perform satisfactorily under such ambiguous conditions. Managerial decision making behavior has been in focus both from a scientific and a professional position whether decision making leads to better outcomes. Both way the central and essential base for decision making is high quality, complete, timely, and aggregated Information. By now, scholars have agreed that new IT-Technologies drive a massive increase of 'Information Available' – needed or not – and also enables and triggers a massive variety of new communication channels but also determine the impact and change on the 'human behavior change in communication style'. On the one hand, scholars agree, that especially for the discipline of 'Risk Management' all this changes bring a lot of opportunities and risks, on the other hand it also seems quite intuitively, that this changes also impact on the base of decisions and on how decisions are made. Further, the review also shows that there is a lack of a specialization in Risk Management pointing esp. to the increasingly important item 'information'- the 'Information Risk Management' is a comparably young discipline itself. The correlation and impact of Information Risk Management on strategic decision making is not researched at all. Therefore, the aim of this research is to propose an 'empiric-norm' and measurement-model for Information Risk Management first, and propose corrective and preventive actions out of testing results with Mid-Level-Managers. First, hypotheses are derived from the literature on how Information Risk Management could be pre-determined and also, how strategic decision making could be operationalized. Second, a series of IRM-Expert-Interviews are conducted to confirm literature review results and also generating an empiric norm for the further testing. Third, a causal model and a setup for a laboratory experiment are proposed to allow testing the hypotheses. Finally, the conclusion provides an outlook on how this research could support organizations in their decision-making processes.

Purpose

Empirical findings allow out of the needs for corrective and preventive actions to propose a set of general organizational change – (1) introducing IRM as formal discipline (2) under 'Enterprise-Risk-Management' or as own organization (3) with direct reporting-line to CEO to (4) ensure independency and conflict of interests.

Aim and tasks of the promotional work

The author needs to introduce a new method for this research to empirically examine the need and the impact of Information Risk Management on the improvement of decision making based on a massively changed Information environment. Therefore the following tasks need to be conducted:

- Based on an intensive literature review and on extended theoretical analysis as well as on preliminary empirical evidence, the author is going to develop a theoretical framework propose specific cause and effect relations Information Risk Management as the independent variable and improvement of decision making as the dependent variable, intervened by differently structured decision making problems and tasks.
- The findings from the literature review might be used to formulate the hypotheses about the impact of Information Risk Management in the improvement of decision making process on the outcomes of the socioeconomic efficiency within certain problem categories
- The outcome of the IRM-Expert Interviews will be used to prove or refuse the hypothesis on a theoretically level – and also to set an *empiric-norm* for further empiric testing with Mid-Level-Managers
- The hypotheses will be the basic foundation for building the causal analytical model showing the cause-effect relationship between the independent variable with the Information Risk Management and the dependent variable with the improvement of decision making process.
- Experimental Field Study with Mid-Level Managers based on structured interviews will be conducted based on the '*empiric-norm*' formed out of the IRM-Expert-Interviews to collect empirical data for difference-analyses (parametric and non-parametric) between IRM-Experts and Mid-Level-Managers. Furthermore computation of means and standard deviations of the overall IRM-measures and decision making measures will be conducted to examine quality of results.
- Findings from the analyses will be used to falsify or tentatively substantiate the hypotheses and draw conclusions on the results.

Research object

Decision Making in Business Organizations

Research subject

Information Risk Management in Decision Making

Novelty

The following scientific and practical novelties are:

- A new model is developed to address and operationalize "Information Risk Management" discipline for improving strategic decision making in organizations along a mix of five scientific methods.
- Based on the proposed model and operationally following the five-method-mix, the author analyzes the correlations and proves a significant difference in the perception between IRM-Experts and Mid-Level Managers of the impact of IRM on improving strategic decision making the first time in Management Science / Organization Management.
- Corrective and preventive actions are derived and proposed – to reduce information risks and also enable business opportunities to ensure stability, homogeneity, effectiveness in Information Risk Management.

The overarching **research question** of this promotional work was formulated as follows: "How does Information Risk Management significantly influence strategic decision making processes" and "is there a different perception of decision makers on it compared to IRM-Professionals"

Hypotheses

The main hypothesis is formulated as:

H_0: There is no difference in perception of Information Risk Management between IRM Professionals and Midlevel-Managers / business-professionals of the correlation between *IRM* and *Improvement of Strategic Decision Making*

To proof the basic relations in theory first the subsequent-hypotheses is formulated:

H_{01}: Improving Information-Risk-Management at all in Business Organizations will significantly improve their Strategic Decision Making results

The following Sub-Hypothesis H_{02} .. H_{05} are constructed to in-detail specify H_{01}

H_{02}: The higher the *IRM-Awareness* in companies, the higher the level of decision making improvements with respect to the information used for strategic decision makings

H_{03}: The higher the *IRM-Information-Classification-Level* in companies is developed, the higher the level of decision making improvements with respect to the information used for strategic decision makings

H_{04}: The higher the *IRM-Information-Classification-Level* in companies is developed, the higher the level of decision making improvements with respect to the information used for strategic decision makings

H_{05}: The higher the *IRM-Information-Controls-Level* in companies is developed, the higher the level of decision making improvements with respect to the information used for strategic decision makings

Statements for defense as results of the research outcomes

1. Information Risk Management as sub-discipline of enterprise-risk-management contributes significantly to the improvement of decision-making topics in an environment of massively increasing information available – based on risk of mass-friction of single information-assets exponentiations.
2. Current Mid-Level-Managers do conform to the IRM-requirements set by theory and IRM-Experts only in specific areas, but not holistically
3. The highest degrees of conformity of Mid-Level-Managers to IRM-Experts could be examined on the impact of IRM in Decision-Making-Damage-Prevention and Control which could also be shown as area of over-sensitivity
4. The highest degrees of non-conformity of Mid-Level-Managers to IRM-Experts could be examined on the impact of IRM Information-Risk-Management in Decision Making-Efficiency and Effectiveness – Mid-Level-Managers would see the contribution on a significantly lower level than IRM-Experts

5 There is a strong need to correct the current practical resulting deviations closer to the theoretical need. Long-term organizationally changes required to drive preventive actions to ensure sustainable balanced IRM in enterprises.

Methodologies

A Five-Method-Mix of sequential scientific methods was necessary to ensure valid, reproducible, intersubjective, reliable, and precise results. Starting with informal observation method but extending to a broad qualitative and quantitative literature research on the five scientific fields having correlation to the main topics of ‘risk management’ and ‘decision

making', proceeding with qualitative expert-Interviews to set an '*empiric-norm*' for the measure of Information Risk Management, which does currently not exist in literature yet, and also proving the theoretical examined results out of literature-research. Based on this facts generated until that step, an experimental field study based structured interviews was initiated to check the results with real Mid-Level Managers. Especially for this, the experimental field study based on structured interviews / questionnaires is used to test the hypotheses, as no other method is more appropriate for producing data/answers in such a controlled manner. The experimental field study, as already explained, seems to provide, in the author's case, a good possibility for the observer to gain insight into the arrangement and the execution of the experiment. The intersubjective checkability and traceability of the structured interviews in the field experiment can be rated higher than that of an open field experiment which may include all kinds of disturbing side effects. A further methodical basic requirement for empirical testing, which allows repeating the experiment again under reproducible circumstances, is also fulfilled to a greater degree with structured interviews than with any other purpose like method because of the controlled environment in which the experiment takes place. The experimental field study based on structured interviews is therefore characterized by a high degree of reliability. This way it can be determined if the decision making improvements examined by IRM Experts are confirmed by Mid-Level-Managers for the specific measures of Information Risk Management on the same or different level.

Approbation of results of research

Several steps during the development of the dissertation were presented and discussed within the following international publications:

a) Publications

1. Schwerd Stefan (2012). The Impact of Electronic Communication within Organizations' Media on Managerial Leadership Behavior. In: *New Challenges of Economic and Business Development Conference Proceedings - 2012*, Riga, Latvia, pp. 603-613. http://www.evf.lu.lv/fileadmin/user_upload/lu_portal/projekti/evf/konferences/maijs_2012/session9/Schwerd.pdf (Web of Science)
2. Schwerd Stefan (2016). Blind Spot 'Information Risk Management' – The Different Perception of Experienced Managers and IRM-Professionals. In: *New Challenges of Economic and Business Development Conference Proceedings - 2016*, Riga, Latvia, pp. 645-652. http://www.evf.lu.lv/fileadmin/user_upload/lu_portal/projekti/evf/konferences/maijs_2016/session9/Schwerd.pdf, (pp 645-652) (Web of Science)

3. Schwerd Stefan (2017), “Wahr oder Falsch - Bewusster Desinformation vorbeugen”, *Wissensmanagement – Magazin für Führungskräfte*, Neusäß, Germany, Vol02/17, (pp 42-44) http://www.wissensmanagement.net/zeitschrift/aktuelle_ausgabe.html, ISSN1438-4426
4. Schwerd Stefan (2017), “Information Risk Management – Too Much Focus on Damage Prevention and Control”, *gfwm Gesellschaft für Wissensmanagement – Themen Spezial*, Frankfurt am Main, Germany, Vol03/2017, (pp 32-41) http://www.gfwm.de/fachlich/fachgruppen/kompetenzmanagement/die-zukunft-des-kompetenzmanagements/, ISSN 2511-4883
5. Schwerd Stefan (2017), “Managers view on Information Risk Managements’ Damage Prevention and Control Factors - Mid-Level-Managers Tendency to Overcompensations in Decision-Making-Situations”, in: *New Challenges of Economic and Business Development Conference Proceedings - 2017*, Riga, Latvia, (pp 564-575), ISBN 978-9934-18-242-6
6. Schwerd Stefan and Mayr Richard (2017), “Introducing a Theoretical Modell and an Empiric Norm for Information Risk Management in Decision Making”, in *Problems of Management in 21st Century*, Vol.12(1), pp39-53, Scientia Socialis, Ltd. & SMC „Scientia Educologica“, Siauliai, Lithuania, ISSN2029-6932, http://www.jbse.webinfo.lt/centras.htm

Submitted and Confirmed for Publication

7. Mayr Richard and Schwerd Stefan (2017), “Introducing a Five-Method-Mix – To Measure the Different Perception of Experienced Managers and Information Risk Management Professionals” in *Conference Proceedings: ERP-Future Research* University of Innsbruck, Springer Lecture Notes, Austria, to come in December 2017

Several steps during the development of the dissertation were presented and discussed within the following international conferences:

b) Conferences

1. Schwerd Stefan, THE IMPACT OF ELECTRONIC COMMUNICATION WITHIN ORGANIZATIONS’ MEDIA ON MANAGERIAL LEADERSHIP BEHAVIOR – Theoretical Analysis and Empirical Evidence, Global Business Management Research Conference, University of Applied Science Fulda, Dec. 02-04, 2011, Fulda, Germany.

2. Schwerd Stefan, Operationalization and Indixalisation of Measurement Variables to measure electronic communication's impact on management behavior, Current Issues in Economic and Management Science, University of Latvia, November 10-12, 2011, Riga, Latvia
3. Schwerd Stefan, THE IMPACT OF ELECTRONIC COMMUNICATION WITHIN ORGANIZATIONS' MEDIA ON MANAGERIAL LEADER-SHIP BEHAVIOUR, Beyond Current Organizational Models, International Business and Economics Conference, University of Applied Science Kufstein, August 03-05, 2012, Kufstein, Austria.
4. Richard Mayr & Schwerd Stefan, THE ROLE OF INFORMATION RISK MANAGEMENT - EVALUATION OF DECISION MAKERS; RiskNET Summit, 05.-06. Nov. 2014, Ismaning, Germany
5. Schwerd Stefan, INCREASED RELEVANCE OF APPROPRIATE MANAGEMENT OF CRITICAL INFROMATION IN GLOBAL ENTERPRISES - INFORMATION SECURITY MATTERS – THEORETICAL ANALYSIS AND STATE OF RESEARCH, International Business and Economics Conference, University of Applied Science Kufstein, Nov. 29-30, 2013, Kufstein, Austria.
6. Schwerd Stefan, BLIND SPOT 'INFORMATION RISK MANAGEMENT'– THE DIFFERENT PERCEPTION OF EXPERIENCED MANAGERS AND IRM-PROFESSIONALS REQUIRE CHANGES IN MANAGEMENT THEORY, New Challenges of Economic and Business Development Conference, University of Latvia, May 12-14, 2016, Riga, Latvia
7. Stefan Schwerd, 'MANAGERS VEIW ON INFORMATION RISK MANAGEMENTS' DAMAGE PREVENTION AND CONTROL FACTORS – Mid-Level-Managers Tendency to Overcompensations in Decision-Making-Situations'; New Challenges of Economic and Business Development Conference, University of Latvia, May 19-20, 2017, Riga, Latvia

Content of dissertation

In the first chapter, the literature review on interdisciplinary fields of 'new IT-Technology Evolution', Computer mediated Communication, Human Behavioral Change based on CMC developments, a strong dependency on the field of Risk Management and Decision Making theories could be examined – in the center of all theories and articles 'Information' is mentioned as predominant factor. It could be examined that there are no publications and research works done showing the dependencies of the various fields of science and spanning a logical bridge

between. In the second chapter the causal analytical model shows the cause-effect relationship between the dependent variable with 'increase of decision making' and the independent variable with 'Information Risk Management'. The methodical validity and setup consisting out of five scientific basic methods of (1) Observation, (2) qualitative and quantitative Literature research, (3) IRM-Expert Interviews, (4) Experimental Field Study based on structured interviews, and (5) reflecting Literature on results explains how the data during the five steps are collected in Chapter 3 to conduct statistical analyses and to measure (1) the impact of Information Risk Management on Decision Making Improvement, and (2) the conformity or difference in the IRM-Experts view compared with Mid-Level-Managers view on this correlation. In the fourth chapter statistical analyses of the Information Risk Management and the measures in the various decision making dimensions are conducted to tentatively support or refuse the hypotheses. Finally the conclusions and suggestions wrap up the dissertation.

Discussion of research results

According to the literature review, the need for considering a number of different scientific fields to approach and shape the main hypothesis as a result of interrelating facts from developments in IT-Technology, massive increase of information available, significant change in human communication behavior opening the question on the one hand to look into the impact and developments in the area of Enterprise Risk management, but also into the well-researched field of decision making theories. In both areas 'Information' is the essential core element. Which indicates from an observational point of view the need to study the relation between those two scientific areas under the newly change of the main influencing variable of 'information-quality'.

Therefore this empirical study focused firstly on setting an '*empiric-norm*' and proving the theoretical results derived from Literature review, but also checking the current real world situation in comparison to the newly generated '*empiric norm*' to identify gaps, provide direct advise for corrective and preventive actions, and finally propose structural and organizational changes to sustain the results at the '*empiric-norm*' level.

The operationalization of decision making is based on common and scientifically accepted factorizations, whereas in the area of Information-Risk-Management there are no common proven scientific models or factorizations until now, which could be built on. This was the reason to firstly generate the '*empiric-norm*' for IRM through the IRM-Experts-Interviews in this context of Strategic Decision Making improvements.

Main results of the research

The outcome of the research can be resumed by the following general experimental findings:

Literature review results on the novelties, the variables, and the operationalization of the variables of Information Risk Management impact on Strategic Decision Making will be confirmed qualitatively and quantitatively by the IRM-Experts' interviews, the hypothesis H_{01} could be substantiated.

In particular by the empiric results it could be shown, that IRM-Awareness, the IRM-Information Classification, the IRM Information Protection, and the IRM-Information Control variables do have significant impact on the Improvement of Strategic Decision Making by the Literature and the IRM-Experts' interviews and conforming H_{02} H_{03} H_{04} and H_{05}.

The empirical data provide significant differences in perception between IRM-Experts and Mid-Level Managers. As the hypothesis states that "Conformity" in the perception and view on the relation between IRM and Improvement of Strategic Decision Making, the data do not provide enough substantive results to support the main hypothesis H_0.

According to the literature and IRM-Experts '*empiric-norm*', the empirical data fully support the significance of the relation between IRM and 'Decision Making Damage Prevention and Control' factors already in current business organization – proven through the operationalization of the Mid-Level-Managers Experimental field study based on structured interviews' results.

The main conclusions and suggestions are in particular, this dissertation proves the need for solid Information Risk Management in current Enterprises, it proves deviations in perception of Mid-Level-Managers and proposes corrective and preventive actions as well as underlying organizational change needs.

Limitations

No differentiation on "highly regulated" vs. "low regulated" work background was researched. There might be also a different perception of people working in a highly regulated (legally, legislative) environment e.g. pharmaceutical industry, finance etc. compared to other fields like e.g. marketing, artwork, design. Personal-Types (in accordance to e.g. MBTI) was not distinguished – e.g. there might be personal types being per-se more risk-affine as others, and therefore having different perception on the Information Risk Management measures.

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At this stage, first and foremost I would like to thank my supervisor, Professor Dr. Maris Purgailis, for giving me enormous support and inspiration during this research project and when writing my doctoral thesis. Besides the academic support he was also able to introduce me to the “true passion” of academic work. Also special thanks to Professor Dr. Josef Neuert, for the all-time helpful advice during various sessions which helped me to make this work a success. I also would like to thank everyone for contributing to the development and the improvement of this doctoral thesis and especially to all of the participants of the empirical experiments.

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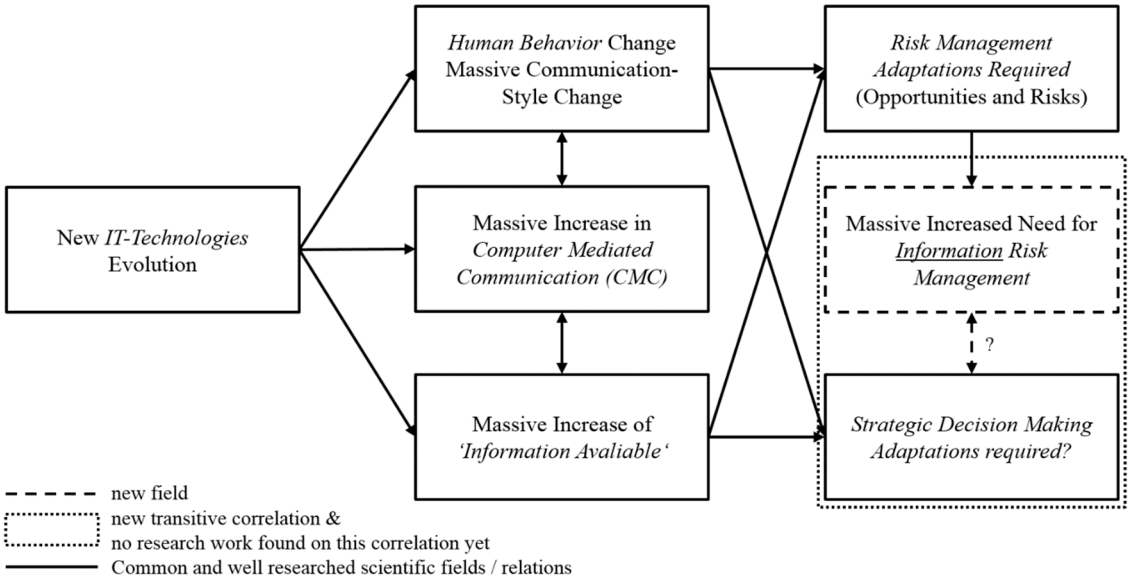
1 THEORETICAL FOUNDATION OF INFORMATION RISK MANAGEMENT AND STRATEGIC DECISION MAKING IMPROVEMENT FACTORS

Computer Mediated Communication (CMC) replaces common traditional ways of communication. Already at the end of the last century serious scientific foundational work was performed in the area of CMC. Without having to bother with stamps, envelopes, and the delay in postal mail, millions of people have interacted via email (Haines, R. et al. 2014). All it takes is a PC, Network, and some Software (Eisberg, A. 1994) and one can span not just city or national, but international boundaries. CMC has also drastically changed organizational communication, leading to the emergence of what Sproull and Kiesler (Sproull, L. & Kiesler, S. 1991) call the "Networked Organization".

1.1 Information Technology Impact on Information Risk Management

The first chapter of this scientific work examines the currency and status of science in the applicable fields where correlations and relations interacting and influencing each other. The triggering event is the massive change in the ability of IT-Technology to transmit, store, aggregate, and make information available. Figure 1-1 illustrates the different areas and correlations well known, and also the aim of this dissertation, the relation between Information-Risk-Management (IRM) and the impact on improving Strategic Decision Making (SDM)

Figure 1-1.Overview of Considered Scientific fields of Relevance and their Relations



Source: Author's Compilation

Small and large organizations use CMC for any activities as "group problem solving and forecasting, consensus development, coordination and operation of group projects sharing ideas and gossip, and mobilizing organizational action within special forums or interest groups (Siegel, J. et al. 1986). As with any technological innovation there have been costs, not purely monetary, associated with the acceptance and use of CMC. Issues of privacy, trust, security, and social control have been raised as computers have become more pervasive (Dunlop, C. & Kling, R. 1991) in the 1990s. Computer-mediated communication offers special opportunities for (…) also examining language and communication theory, in that online discourse is immune to many nonverbal communication elements that may confound language effects in speech. The role of language in communication technology research has been cyclical, with recent research refocusing on language data as evidence of humane computer interaction effects (Walther, J.B. 2004). This, looping back to early researchers in the 1979 Daniel Bell, summing (…) from all this arises a moral different from what we might expect. While technology *is* instrumental, the free and competitive use of various technologies is on of the best means of breaking up monopolies, public and private (Bell, D. 1979).

On the other hand most decision makers are in a situation of incomplete and non-robust information. Behavioral economics provides unusually robust data that show that people have hard-wired, systematic cognitive biases that greatly limit their intellectual capabilities (Etzioni, A. 2014) – All decisions are experimental. People tend to invest themselves in their choices, to bet their pride and money on having made the correct decision. When things go awry as they - very often do -they tend to act as if afflicted with what Daniel Kahneman calls theory induced blindness (Kahneman, D. 2011). Forrester (2007) states that people cannot intuitively analyze and make policy recommendations in complex environments, but also that introductory system dynamics courses have a limited value in terms of helping people to grapple with dynamic complexity. Bakken (1993) provides an early overview of educational and training efforts to solve poor decision-making outlined by Sterman (1989a,b). The question posed in the present paper is this: in the absence of Dane and Pratt (Dane, E. 2007) or Forrester's (Forrester, JW. 2007) suggested more than 10 years of full time study and coached practice, how should shorter educational efforts be organized so as to significantly improve upon decision performance when people face dynamic complexity. In essence the study work of Bakken explains the poor improvement record in dynamic decision-making (Bakken, B.E. 1993). Hogarth (Hogarth, RM. 2005) indicates that decision-making follows heuristic rules. Intuitive decision-making is the norm. However, they also indicate that systematic decision errors can be mitigated through a mixture of approaches. Consistent with Schön (Schön, D. 1983) and Forrester (Forrester, JW. 2007), typical coursework in modelling will only modify processing into a less superficial and

context robust mode if it is intense over many years and under the supervision of a senior colleague.

1.2 New Information Technology Evolution, Massive Increase of Computer Mediated Communication Channels and Massive Human Communication Behavior Change

The change in CMC technology, conceptually and feature-wise, from previous technologies and more importantly, is new CMC technology giving rise to new social practices and if it is so, then in which direction? These questions, which regularly frame inquiry into the design and use of CMC systems, reflect two underlying assumptions: first, that "new" CMC technologies really are new; and second, that CMC technologies shape communication, and through it, social behavior. The first of these assumptions is rarely challenged, other than by historians who note parallels between the Internet and previous tele technologies such as the telegraph and telephone. The second assumption, technological determinism, was vigorously critiqued in the early to mid-1990s, but has been making a quiet comeback as a result of a growing body of empirical evidence that the medium can shape the message, or at least, how the message is packaged and processed (Herring, S. C. 2004).

Table 1-1 The New World of Work in Globalization 3.0

Organizational Changes	Changes in the Work Itself	Communication Related Changes
Manufacturing to Service	Fewer Hierarchies and rules	Virtual Relationships
Globalization	Reduced supervision	Electronic mail
Focus on human capital (talent management)	Increased use of information technology	Intercultural communication
Complex organizational structures	Transnational work	Horizontal communication
Corporate ownership and organizational performance	Integration of work across stovepipes	Strategic communication
	Constant changes	Change communication

Source: Thomas, Gail F. 2007. P287

E-mail is rapidly emerging as the key platform for knowledge creation and knowledge dissemination (Sussman, Siegal and Schneider, 2003). In fact, it is considered as the foundational communication component of networked organizations, virtual teams, and electronic communities. (Brown, Fuller and Vician, 2004). Sarbaugh-Thompson and Feldman (1998) suggest that increased use of CMC might subsequently result in the decline in other forms of communication such as face-to-face (FtF) meetings and one-to-one conversations. The

differences and advantages of CMC and FtF may become increasingly crucial as timely communication and decision-making continue to be concerns for organizations. Berry (Berry, Gregory R 2006) lists several advantages of CMC over face-to-face or synchronous communication — more active and equal team member participation, flexibility over time and distance, low cost of changing teams quickly, time available for team members to reflect on views shared, information shared with other members in the group, and instant record of the exchange that can be revisited and reexamined.

Thomas (Thomas, G. 2007) describes this new media revolution as the "Globalization 3.0" based on Friedman (Friedman,T. 2005) who defined, what is different about the three eras is that 1.0 is about countries globalization, 2.0 is about companies globalization, and 3.0 is about individuals worldwide globalizing, see Table 1-1.

1.2.1 Social Media / Networks /Platforms – Literature Review and Characteristics

The basic idea of social media networks (online media networks ONS) is to assist users with creating and maintaining their relationships (Matook, S. et al. 2015). Individuals have become increasingly mobile, and in doing so travel significant distances from their homes to reside at the target destination for an extended period of time (de Silva, H. et al. 2011). Consequently, individuals are separated from the social environments that are both familiar and comforting to them (Marshall, G.W. et al. 2007). Prior research in sociology has suggested that this separation leads to negative social outcomes, including feelings of loneliness (Peplau, L.A. & Perlman, D. 1982). It is assumed that lonely people desire human attachment that can be achieved through creating new or nurturing existing relationships.

Other Authors e.g. Ollier-Malaterre et al (Ollier-Malaterre et al, A. 2013) researched the identity and role behavior of people in social media. A key reason why employees navigate their multiple identities in this way is to maintain or enhance their professional relationships (Dumas, G. et al. 2009). On the one hand, the professional domain often includes strong and clear norms and expectations of what constitutes appropriate professional behavior (Bloor, G. & Dawson, P. 1994). Thus, employees who enact their personal identities in ways that are seen as inappropriate in the professional domain lose respect in the eyes of their professional contacts. On the other hand, employees' professional contacts may appreciate seeing aspects of their personal identities, since personal self-disclosure and frequent interactions tend to increase liking (Collins, N.L. & Miller, L. C 1994). Therefore, if employees can effectively manage the boundaries between their professional and personal identities such that they engage in some personal disclosure in their interactions, but without violating professional norms, they will be

more respected and liked by professional contacts. Consequently employees' online boundary management capabilities moderate the consequences of content and hybrid behaviors such that content and hybrid behaviors will increase average respect and liking if employees are high in these capabilities but decrease average respect and liking if they are low in this capabilities (Lewicki, R.J. et al. 1998). Another implication is that employees' own choices are shared by others (Ross, L. et al. 1977), employees and employers should be aware that others' online behaviors might be driven by motives and circumstances different from their own. To help employees with online boundary management, organizations may consider implementing policies regarding online connections and interactions with professional contacts, as well as provide training to support employees as they develop online boundary management capabilities.

1.2.2 Email Communication Channel – Literature Review and Characteristics

The email-Channel is the oldest of the new CMC-Channels. First email was sent in the year 1962 in the Arpanet, the predecessor of the todays Internet. In newer days approximately 300 Billion emails are sent per day, most of them with advertisement content. E-mail became over the time the preferred medium of personal to organizational communication, evidenced by the steep rise in personal computers and home-based Internet communication (Levitt, M. & Mahowald, R.P 2003).The move to this new era of communication is driven more by the immediate, practical advantages, and the availability of the technology, rather than a rational assessment of its advantages and disadvantages. The use of e-mail and electronic messaging is the biggest change in the medium of communication since the introduction of the telephone, which became an integral part of the development of the modern business era of the last century (Taylor, H. et al. 2013). It is likely that communication in the new millennium will present new concerns and challenges. The apparent advantages in using e-mail as the preferred medium of communicating, as well as other forms of electronic messaging (mobile phone texts, Internet chat rooms), have opened up immense opportunities for work-related communication and derived efficiencies. The technology is easy to use and cost-effective, facilitating networking and access (Garton, L. & Wellman, B 1995), as is indeed manifested in it being so readily, rapidly and universally embraced in a wide range of occupations and services. Cooper and Clarke (Cooper, C.L. & Clarke, S. 2003) already researched in 2003 on the epidemic proportions caused by increased stress levels of employees, they found various reasons also based on the earlier work from Romm and Pliskin in 1999 (Romm, C. & Pliskin, N. 1999) listed in Table 1-2

Table 1-2 Email as an inbuilt work stressor

Criteria	Description
Speed	Messages transmitted by e-mail can reach their destination in a very short time, regardless of whether the message is being sent to the office next door or to someone on the other side of the globe
Multiple Addressability	The capacity to send an e-mail message simultaneously to a large group of people
Recordability	The capacity to store e-mail messages indefinitely, automatically. This feature allows a database of messages to develop. Some of the messages may have no significance at the time but may later be used as evidence, in a dispute for example
Processing	This allows a message to be altered by a recipient before forwarding it on to other recipients. Information can be added, removed or emphasized
Routing	Defined as the capacity of senders to transmit messages to groups of addressees whose names may or may not appear as recipients. This function allows the sender to alter the names of the recipients in a group, resulting in individuals who think they are being sent the same message as others, actually receiving slightly (but significantly) different messages. This feature also allows messages to be passed on to individuals who the original sender had not intended the message to get to

Source: Authors Compilation based on Romm, C.T. and Pliskin, N. (1999)

Taylor (Taylor, H. et al. 2013) derived from the special characteristics of emails the anticipated impact and consequently the personal and organizational consequences shown in Table 1-3. Taylor et al. examined the various characteristics Emails are used to substitute other communications, derived in each case the anticipated impact on the one hand, but also focused on the negative personal and organizational consequences.

Table 1-3. Email-Characteristics and the Anticipated Impact

Email Characteristics ➔	Anticipated Impact ➔	Negative Personal and Organizational consequences
Speed and convenience	Increased number of messages and increased expectation of response speed	Work overload and errors
Recordability	Increased control potential	Resentment, reduced autonomy
Multiple addressability, processing and routing	Communication manipulation	Potential harassment, possible litigation
Lack of social cues (facial, expression, feedback)	Weakened interpersonal, bonds: lowered commitment	More misunderstandings, lower decision quality, context: escalation of disputes
Lack of conversational cues (turn-taking, colour, clarification, tone)	Focus of attention on internal (negative) states	Greater susceptibility to negative affect (mood) and negative evaluations

Source: Taylor, Howard, Fieldman, George & Altman, Yochanan 2013 p167

As email is an indirect communication media, not seeing the recipients and also not being able to immediately react on unpredicted emotions the criteria of the appropriate deference in

professional but also private email communication has to be considered. Fragale et al (Fragale, A.R. et al. 2012) discussed 3 different situations, the hierarchical upwards deference, the deference amongst equals, and the deference to subordinates. People express deference, behaviors that convey a willingness to yield to another's preferences or opinions as a sign of respect or reverence (Henrich, J. & Gil-White, F. 2001). It is agreed that deference likely a functional behavior. For a hierarchy to facilitate the coordination of effective organizational performance, people must defer at times, and they need to know to whom they should defer (de Kwaadsteniet, 2010). When members of a hierarchy continually challenge the existing rank structure and compete with others for placement, organizational performance suffers, as the group's energy is spent jockeying for status positions, rather than accomplishing its collective goal (Groysberg, B. et al. 2011). Thus an organization will perform best when at least some members of the hierarchy express deference, indicating that they accept their place and do not intend to challenge the rank ordering. Another professional performance driver for using email is the size and style of emails and email newsletters. Big data insights have uncovered that the top-perform in emails include approx. 40 characters in the subject line and 20 lines of text in the body and maximum 3 or less images (Tornoe, R. 2015). Never the less email is seen as overload and it is one of the difficult challenge which many organizations are facing today. On one hand, technology gives machines the capacity to generate and transmit information to a wide range of recipients regardless of their need. The web, e-mails, faxes and other communication technologies have facilitated, even accelerated, information generation and duplication, leading to the expansion of networks both within and outside organizations. On the other hand, in order to combat information overload, organizations acquire, design, and implement search engines, information agents, and information-customization software. Unclear is whether it actually helps ameliorate or indeed compounds it (Farhoomand, A. et al. 2002).

1.2.3 Chat Software and Virtual Chat Room– Literature Review and Characteristics

When People have more social contact, they are happier and healthier both physically and mentally (Cohen, S. & Wills, T.A. 1985). Individuals seek to begin and maintain interpersonal relationships usually face to face. Cyberspace and its relational possibilities are changing the way satisfactory relation-ships are conceived even among people who have never met physically (Peris, R. et al. 2002). An element to be taken into account to maintain interpersonal relationships, whet her face-to-face or online, is the perceived quality of the satisfaction in the relationship with an-other person. The internet facilitates the development of relationships,

(Katz, J. & Aspden, P. 1997) but this does not necessarily imply satisfaction. There is a wide range of possibilities as far as internet relation-ships are concerned such as short online chats, long-lasting friendships, or love affaires that can remain in the virtual world or can be transferred to the real world (Lea, M. & Spears, R. 1995). Studies show that most relationships developed online are weak. (Kraut, R. et al. 1998) This conclusion implicitly compares online and face-to-face relationships, but it does not take into account that people begin and maintain social contacts both in the physical and the virtual realm alike. Suler (Suler, J. 1999) presents an analysis of computer-mediated relations according to which cyber relations fulfil the self-actualization needs and favor the self-knowledge and personal growth of the Internet users. They point to the fact that chat users seem to find, in online chats, a media for rich, intense, and interesting experiences. These relationships are not only rich per se but chat users report an intrinsic quality of online chats; the fact that social interaction is set up more quickly and straight forwardly than in face-to-face encounters, conferring chat relationships a genuine character with its own identifying attributes. Despite interpersonal relationships, other researchers stressed the field of professional use e.g. online counseling (Young, K.S. 2005). In this study e-clients in psychotherapy expressed a potential lack of privacy, session transcripts might be stored, and information might be caught by unauthorized people as well as the risk of being caught by someone else while conducting online sessions. Online-Chat-Rooms are seen as the most cost effective tool for short consultations, e.g. quick alignments, questions on content (Mubarak, A.R. et al. 2009) it saves money for traveling and also time but could only be seen as complementary communication channel as there is no guarantee that in an emergency situation, other people / addressees are online and available to help.

1.2.4 Telephone Channel – Literature Review and Characteristics

Invented by Philipp Reis in the year 1861 the telephone seems to be the oldest of the electronic communication media. The initial idea of direct audio transmission to a recipient is still valid in 21st century by establishing a direct line. Even in newer days the telephone is seen as the media with the fewest distortion in communication factors compared to other CMC channels (Sussman, S.W. & 1999). Sussman figured out while measuring Distortion, Satisfaction, Comfort, and Likability in all cases the results for telephone use are the closest to F2F talks. None of the other CMC channels was significantly seen as equal. Newer days the telephone device becomes a multimedia device, giving the possibility to use almost any other channel discussed in this section. The security of the devices is in average technically very high. Users themselves – intentionally or unintentionally – allow apps to send information out

(Crider, D.M. 2009). With the invention of cell phones the 1992 by IBM, a first step in the direction of CMC was done. In the old days the establishing of a call depended on the availability of the call recipient at a certain time at a certain place – next to the stationary telephone. With the upcoming cellphones the geographic reach was not limited at the point of the stationary phone anymore and the recipient could be reached almost everywhere at any time. Madell et al (Madell, D.E. et al. 2007) figured out that the main category that emerged from analysis of the focus group data was "Control over Social Interactions." That is, participants indicated that different communication media afforded them differing levels of control over their social interactions. The types of communication media that were discussed included: instant messenger, mobile phone text messaging, email, voice calls, and letter writing.

1.2.5 Video Conferencing – Literature Review and Characteristics

The history of Video Conferencing goes back to the days of the invention of TV in the early 20th Century. The quality of audio and video picture was comparably bad and not accepted by the broad mass of people in professional live. Starting in the 90s of last century, where VC was based on common digital protocols via internet or still point to point connection the acceptance increased a little bit. Latest with upcoming mobile devices with integrated cameras the break-through of Video Conferencing was accomplished (Scott, J. 2012). Cameron Craig et al (Craig, C. et al. 2013) researched on the needs and developments of Video-Conferencing systems in 2013. It could be shown, that senior manager and executives use VC at least once a week, saving time and avoiding cost, by almost having F2F meetings. Also VC-Systems are seen as too complex for the daily use (Panteli, N. & Dawson, P. 2001), a study was conducted by Panteli & Dawson to find out how the real confidence level for VC-Systems is seen after a half-hour training. Surprisingly over on third of people perceived it as "confident", over 70 per cent perceived it "Comfortable" and only approx. 25 per cent claimed to the need of more practice or gave other results. While having the ability to not only hear all participants but also to see behavior, movements, and also dressing, video conferencing adds one more dimension to distance communication ontop of common tele- and -audio-conferences. It could be seen as the richest CMC channel (Zhou, L. 2006) in the area of synchronous communication

1.2.6 Summarizing and comparison of Significant Changes in Communication Behavior and Massively Increased Information Exchange over all

Madell et al. (Madell, D.E. et al. 2007) investigated already in 2007 that instant messaging tended to be viewed positively in regard to control, for various reasons such as the ability to see

if specific individuals were available to communicate, the ability to talk to many individuals at once, immediate clarification of ambiguous statements, the ability to leave gaps in conversations, the ability to conceal the truth, the management of emotional interactions and the use of emoticons to elaborate the meanings of statements. However, there were one or two negative aspects associated with the control of interactions using instant messaging; including the fact that people could interrupt in an argument, that message intent could be misunderstood, and that emoticons were only useful when joking. As well as instant messaging, mobile phone text messaging tended to be viewed positively in terms of the level of control it afforded interactions. For example, participants indicated that the use of text messages allowed them to control interactions in terms of their financial cost, which supports findings reported by (Grinter R.E. & Eldridge, M.A 2001). In addition, text messages permitted reduced interactions with those whom participants did not know very well or had little to say. This also supports findings reported by (Grinter R.E. & Eldridge, M.A 2001). In addition, text message communication allowed participants time to think about their responses to messages and also encouraged others to deliver prompt replies to messages. However, a negative issue in regard to control with text messaging was that comments could be misunderstood; especially those of a sarcastic nature, and that messages could also be sent to the wrong person. Whereas email was also generally regarded positively in terms of control as participants felt that it was useful to control heated dialogues. However, a negative issue in regard to control with this medium was that misunderstandings could occur and could not necessarily be quickly rectified. Letters were also viewed positively in terms of control as they allowed participants to communicate with other people without disturbing them. Voice calls were not viewed positively, because it was felt that, with these, breaks in conversation were not possible.

Concluding the literature investigation in the area of new media type usage and summarizing – see details in Table 1-4 – some patterns and new challenges to people can be formed as (1) Need to avoid unnecessary communication, (2) Need to prevent unconcise and poorly edited communications, and (3) Appropriate use of the electronic communication channel to replace the more traditional channels of communication

Table 1-4. Overview of related research on increased CMC usage and implications

CMC-Channel	Main Sources	Relevance / Characteristics	Criticism	Implication on IRM
Social Networks/Platform (e.g. Facebook, Flickr, etc)	Matook, S. 2015. The Impact of Relationship Characteristics and Online Social Network Features on Loneliness Marshall, G.W.; Michaels, C.E.; and Mulki, J.P. 2007. Workplace Isolation: Exploring the Construct and Its Measurements.	High coverage swarm theory own dynamics, broad reach anonymous information unreliable real-time relationship-less synchronic and asynchronic written – evident mostly informal vs. formal	Networking ability of actors Active and passive Self-disclosure Demographics Computer self-efficacy Communal orientation Exchange orientation Broadcasting	Media listening Programs No avoidance Proactive profiling of company / individuals No records retention
Email	Taylor, Howard, Fieldman, George & Altman, Yochanan 2013. E-mail at work: A cause for concern? The implications of the new communication technologies for health, wellbeing and productivity at work. *Journal of Organisational Transformation & Social Change* 5(2), p159–173 Cooper, C.L. and Clarke, S. 2003. Managing the Risk of Workplace Stress, *London: Routledge* Henrich, J., and F. Gil-White, 2001. The evolution of prestige, *Evolution and Human Behavior*, 22, p165–196	Very High Dedicated 1:1,1:m possible user authentication written evidence asynchronous low level of relationship	Abuse as chat Broadcasting / cascading Terminology change informal to formal ambivalence deference human stress factor	mix of formal information with informal spam Threats: Trojans / viruses etc. careless use retention period undefined / uncontrolled
Chat (e.g. WhatsApp)	Peris, R., u.a. 2002. Online Chat Rooms: Virtual Spaces of Interaction for Socially Oriented People. *CyberPsychology & Behavior* 5(1), 43–51 Suler, J. 1999. The psychology of Cyberspace [online] www.rider.edu/users/suler/psycyber/psycyber.html Mubarak, A. R., Rohde, A. & Pakulski, P. 2009. The social benefits of online chat rooms for university students: An explorative study. *Journal of Higher Education Policy and Management* 31(2), 161–174	Medium Dedicated 1:1,1:m possible user authentication written evidence debatable Synchronous Medium, level of relationship Straight forward	Identity fraud Broadcasting Real-time Low quality relationship ambivalence deference non-bindingly no guarantee for response	Non evident Context-less No central control on content Potential privacy issues

Audio Call	Sussman, Stephanie W. 1999. Straight Talk: Delivering Bad News through Electronic Communication. *Information Systems Research* 10(2), p150-166 Madell, Dominic E. & Muncer, Steven J. 2007. Control over Social Interactions: An Important Reason for Young People's Use of the Internet and Mobile Phones for Communication? *CyberPsychology & Behavior* 10(1), 137–140.	High Dedicated 1:1,1:m possible user authentication informal, no written evidence synchronous, high level of relationship highly dynamic	non evident real time High immediate relationship impact recipient's availability	User authentication in professional area Call hacking Decentral, no control over callers Average low encryption standards
Video Conferencing	Scott, Jennifer 2012. WILL VIDEO CONFERENCING FIND ITS BUSINESS MARKET IN 2012? *Computer Weekly*, p22-25 Panteli, Niki & Dawson, Patrick 2001. Video conferencing meetings: Changing patterns of business communication. *New Technology, Work & Employment.* Vol 16, p88-100	High Dedicated 1:1,1:m possible user authentication Formal and informal, no written evidence Synchronous, relationship	non evident real time High immediate relationship impact recipient's availability	technical security

Source: Author's compilation based on literature review

In the previous chapter the fundamental fields of current science and their current individual developments are reviewed. Changes over time are elaborated also as forecasts for the near future. In the coming subchapter the link between those fields are examined in particular focusing on the correlation to the role of "information".

1.3 Massive Increase of 'Information Available' and Information Risk Management as Part of Enterprise Risk Management in business

This discussion of the characteristics of technology and the possibilities of virtual teams in constructing team identity through CMC leaves open an important issue, namely the role of team leaders in fostering their members' identification with a virtual team. Overall, the team leaders are eventually responsible for the effective performance of their teams. Whether or not the technology itself can help the team member. The other way around, most global enterprises established solid Enterprise Risk Management Systems – prominent example are insurance companies, where the risks of clients are economically transferred to. The basic methods are well researched and with the upcoming era of high performing computers the mathematical

models became very detailed including thousands of variables. But also, with this ability to process in real-time billions of data, a new risk became more prominent – the risk of having correct information at the time needed in a secure way available. In newer days systems take economic decisions in milliseconds, esp. in the banking and brokerage area. No human is re-calculating the equations. Including also the legislative circumstances like data privacy or SOx. Authors in ERM agree that a focal point for the future is also the human being, being still an essential part of the whole ERM/IRM discussion in a fully automated and computerized world. Other than IT Systems human capabilities are not scalable ad infinitum. Changes in organizational structures and interpersonal relationships are the consequence and are projecting into the quality of information. The systems-specifications, the data-models already are reflecting this human limitations as they are created by humans. A whole business was created about information as a good sold to ensure competitive advantage to clients using this aggregated or even detailed profiling for their primary business.

In the following the essentials according risk management are elaborated from a modelling perspective but also from a human interrelation and implication perspective concluding with the implications of information business itself.

1.3.1 Enterprise Risk Management – Literature Review

The aim of Enterprise Risk Management is to detect, eliminate, avoid or transfer (Auer, M. 2008) risk and their economic impact for the company (Cruz, M.G. 2002). With increasing media-presence and new media it becomes more and more important to open a coherent and effective framework that includes necessary steps and processes for integrating Reputation Risk management into an organization's overall ERM approach which is intended to support corporate strategic success (Gazert, N. & Schmit, J. 2016). In particular, reputation creation, enhancement, and protection are critical to an organization's success, yet highly challenging given the wide ranging and somewhat opaque nature of the concept. These qualities call for a strong ERM approach to reputation that is holistic and integrative, yet existing knowledge of how to do so is limited. Gazert, N. & Schmit, J. address risk strategy, risk assessment, risk governance, and risk culture as key elements of ERM – adding to common strategies the integrated Reputation Risk Management that applies across industries. In contrast to previous work, Gazert, N. et al (Gazert, N. & Schmit, J. 2016) offer a broader perspective on the underlying causes and consequences of reputation damage based on empirical evidence and insight from the academic literature and provide additional detail in identification of reputation determinants, antecedents, and drivers. Results in a study by Fiordelisi et al. (Fiordelisi, F. et

al. 2011), for example, indicate that substantial reputational loses follow after operational loss events and that the highest reputational damage is caused by the operational risk type “fraud”. Methods of preventing operational losses mainly comprise the monitoring and optimization of processes as well as the initialization of training for the employees and business continuity management. These methods only influence the probability of operational losses, but not the magnitude of single operational loss events (Auer, M. 2008). Ontop, internal operational loss (…) is often limited as operational risk includes human errors and, thus, the willingness of employees to inform about operational loss events will be one crucial success factor (Kalhoff, A. & Maas, H. 2004). Bowling D. (Bowling, D. 2005) describes a meta-strategy to approach to be considered when implementing an ERM-Strategy:

- Focus on strategy and business objectives
- Think broadly about the expansive range of risks facing your organization
- Recognizing that ERM is not a quick process but a multi-year journey

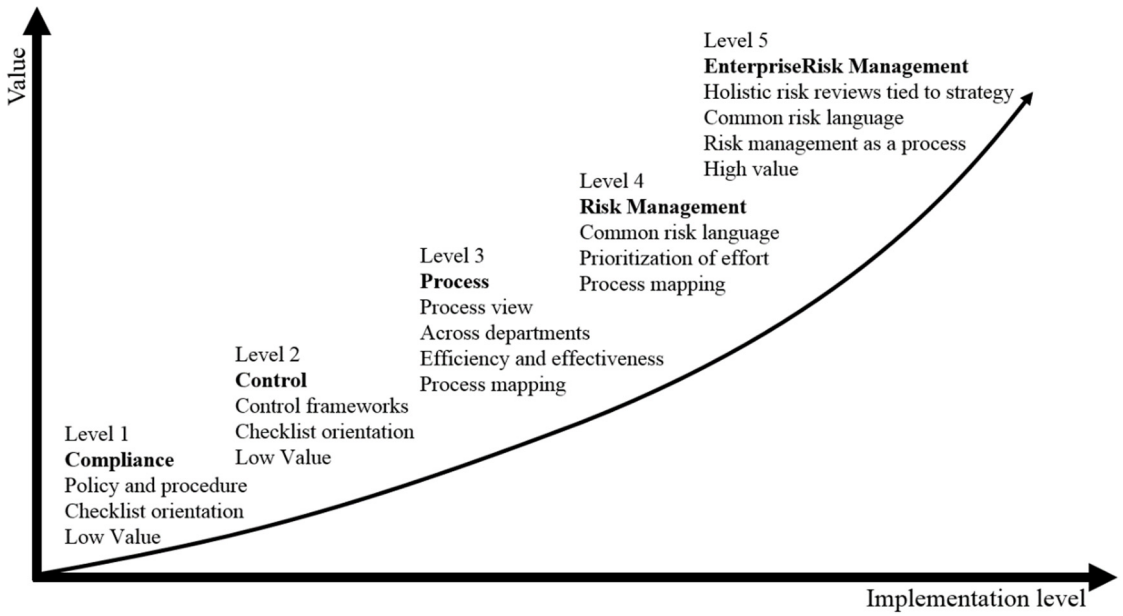
Figure 1-2 Enterprise Risk Management Model

Source: Bowling, David M. 2005. Success Factors for Implementing Enterprise Risk Management (pp26)

In Figure 1-2 Bowling describes the fundamental and anytime ongoing four steps of Enterprise Risk Management. Starting with an overall analyses, building a strategy based on the analyse results, implementing this strategy while continuously monitoring and analyzing the efforts done but also the changes outside in the market but also internal changes iteratively.

David Bowling (Bowling D.2005) proposed a model for the implementation in hierarchy of steps to be followed which became in the meantime an accepted business organizations’ standard – see Figure 1-3.

Figure 1-3. The Journey to ERM



Source: Bowling, David M. 2005. Success Factors for Implementing Enterprise Risk Management (p54)

This is also confirmed by Kaplan R. & Mikes A. (Kaplan, R. & Mikes, A. 2012) who showed the four most important dimensions: Enterprise risk management consists of active and intrusive processes that (1) are capable of challenging existing assumptions about the world within and outside the organization; (2) communicate risk information with the use of distinct tools (such as risk maps, stress tests, and scenarios); (3) collectively address gaps in the control of risks that other control functions (such as internal audits and other boundary controls) leave unaddressed; and, in doing so, (4) complement – but do not displace – existing management control practices. Each of the taxonomy's (Kaplan, R. & Mikes, A. 2012) three risk categories—"preventable," "strategic," and "external"— has a different source, a different degree of controllability, and a different approach for identification, mitigation, and management

1.3.2 Common Models for Information Risk Management

Not surprisingly all principals shown according Enterprise-Risk-Management apply the same way for the specific sub-discipline of Information Risk management. But the advancement of technology plays an effective role in enterprises to maintain profitable, as information security has become more of a business enabler than ever thought possible. The main goal of information security (IS) is to secure the business against

threats and aid the businesses in reaching the desired level of reliability and productivity through ensuring integrity, availability and confidentiality (Bt Fakhiri, N. 2015. The business needs approaches have been identified as a holistic approach which examines the system as a complete functioning unit and the other approaches are to examine the whole organization. The specification of security requirement is to recognize organizations' requirement with respect to security. The effectiveness of business information security should be aligned with business strategy through a well-defined element process. The strategy requires the process element to identify, measure, manage and handle risk, avail - ability, integrity and privacy as well as to ensure accountability. Janine Spears et al. (Spears, J. 2010) showed, that there are at least two reasons why user participation in IS security risk management can be valuable. First, user awareness of the risks to IS security is widely believed to be fundamental to effective IS security (Furnell, S. 2008). That is, organizational security controls (i.e., policies, procedures, safeguards, and countermeasures that prevent, detect, or minimize an IS security breach) can only be effective to the extent that people handling the information in their day-to-day jobs (e.g., functional business users) are aware of those measures and adhere to them. SRM includes the strategies, policies, activities, roles, procedures, and people used to manage security risk, while the resulting controls are intended to reduce the likelihood or impact of a breach. In other words, effective SRM is expected to result in a system of controls that collectively protect IS security, defined as the preservation of an information system's confidentiality, integrity, and availability (ISO/IEC 2000)

1.3.3 Rich-Media-Theories, Socio-Psychological-Aspects – Limitations of Human Capability in Information Management

Both social presence theory (SPT) (Short, J. et al. 1976) and media richness theory (MRT) (Draft, RL. & Lengel RH. 1984) argue that the lack of nonverbal cues inherent in CMC inhibits communication. More specifically, SPT suggests that communication channels that carry more social- context cues, such as F2F, are perceived as warmer, more personal, more sensitive, and more sociable because a communicator can perceive a higher degree of presence of the other person. Likewise, MRT lists F2F as the richest in their media hierarchy, and argues any media placed lower than F2F are less able to manage equivocal or ambiguous messages than F2F (Draft, RL. & Lengel RH. 1986). In short, the lack of social-context cues inherent in CMC was traditionally considered to make communication more impersonal and task-oriented, which can

hinder the development of personal relationships online (Ishii, K.2010). Close relationships are characterized by high levels of psychological intimacy, attachment, self-disclosure, perceived similarity, and mutual support (Maxwell, G.M. 1985). For example, individuals tend to use the integrating and com- promising styles for securely attached individuals' compared to fearful, dismissive, and preoccupied (Bippus, A.M. & Rollin, E. 2003). Similar to F2F contexts, personal relationships in online contexts differ in terms of the degree of closeness. Indeed, closeness plays an important role. Further, those who feel psychological closeness with their partner reported that they are less likely to experience an aggressive conflict management style between them (Mackey, R.A. & Diemer, M.A 2000). This means, individuals try to solve conflict constructively in close relationships. But CMC is also seen as catalyst for reducing uncertainty, inspired by Berger and Calabrese's uncertainty reduction theory (URT), which assumes that when strangers meet, their primary concern is to reduce uncertainty and increase the predictability of the behavior of the interaction partner (Berger, C.R. 1979). Berger identified three types of uncertainty reduction strategies: passive (e.g., reactivity search, social comparison), active (e.g., asking others about the target individual), and interactive (e.g., direct questioning, self-disclosure). On the other hand, Walther's hyperpersonal communication theory. (Walther, J.B. 1996) assumes that the reduced nonverbal cues of CMC encourage people to feel less inhibited and to disclose their inner feelings at an earlier stage. Although it is still unknown which of the aforementioned theories more validly explains positive CMC effects on self- disclosure, empirical research has consistently demonstrated that CMC stimulates intimate self-disclosure (Joinson, A.N. 2001). A look at the prevailing theories in the field of CMC is necessary to shed some light onto the competence issue. Still, the claim to address competence issues remained mostly unheard (Boos, M. et al. 2000). At the same time empirical evidence for the influence of competence in CMC was produced in the field of evaluating virtual teaching projects. Utz and Sassenberg (Utz, S. & Sassenberg, K. 2001) showed that dropout rates and motivation to participate in a virtual seminar are related to the identification of the participants with the seminar itself (Jonas, K.J. 1999) could show that an appropriate match of media competence and structural demands in the seminar increase the identification with the seminar. In case of a mismatch, the identification drops and the stated patterns of increase d dropout and loss of motivation occur. In virtual seminars, interpersonal impression formation and relationship patterns are related to competence evaluation, too. This first conclusion can be embedded into general theories of communication as skilled behavior. (Hargie, O. et al. 1986)(Wiemann, J.M. 1989) This integration adds an interactive and process-oriented perspective to the emergence of communicative competence that the aforementioned approaches lack. Communication as skilled behavior can be defined generally as "a set of goal-

directed, interrelated situationally appropriate social behavior s which can be learned and which are under the control of the individual" (Hargie, O. et al. 1981). Following Hargie , (Hargie, O. at al. 1986) this definition emphasizes six main features of social skills: goal-directedness, interrelatedness, appropriateness to the situation, identifiability , learnability , and controllability. Concluding, there is a media competence gap in the group, as more competent participants interact with each other and are only a little interested in cooperation with and granting or giving further support to less experienced partners (Jonas, K.J. et al. 2002) .The ability to substitute the richness of f2f interaction in a socially sparse environment and the ability for a proper interpretation of the message sent and received.

Further on, it is important to also look in this circumstances in neuro- and socio-psychological research of human capability. In particular, considering two aspects: (1) "*Selective Attention*" Capability of Humans, and (2) "*Motivated Reasoning*" - Reality vs. Fantasy. The Selective Attention phenomena in essence shows, that if a person is focusing on one special thing in the near surrounding, all other even abstruse things are not recognized. An extensive body of empirical research (Karlsson, N. et al. 2009) in psychology supports the idea that people have some capacity to attend to or not to attend to - i.e., ignore - information. This is sometimes called the selective exposure hypothesis. Selective exposure has made its way into economics. (Caplin, A. 2003), building on earlier ideas in (Witte, K. 1992), develops a model in which people respond to health warnings either by adopting behaviors consistent with those beliefs, or, if the warnings are too threatening, by willfully ignoring them. There is also huge evidence from psychology research that desires exert a powerful influence on beliefs, a phenomenon that psychologists call "motivated reasoning" (Kruglanski, A. 1996). Economists, too, have been interested in motivated formation of beliefs, but have focused more on modeling the phenomenon than on studying it empirically

Concluding this section to also stress simple mechanical factors about the abilities of individuals to handle Information. First the professional education is important, ensuring the ability to logically and technically synthesize data and reports. Second, the role and technical permissions-need to be set appropriately to grant access to the data/information required – including the underlying sophisticated role Modell and maintenance. This includes formal channels (Loomis, Ch. 1960) of communication, formal policies, procedures and rules, formal authority and duties assigned to each office and employee, and norms that the officeholder is expected to observe

1.3.4 Information as "Good-Sold", new Markets and Actors Behavior Change

Information vendors, such as market research firms are specialized in the production and sales of market information. These firms often engage in the activities of data collection (panel data or primary surveys), information processing (85 % of market research involves certain quantitative methods, packaging of reports and the interpretation of the research. In these information markets, competition could be observed on both sides, on the supply side and on the demand side (ESOMAR 2005). Firms purchase information to make better decisions (Jensen, F.O. 1991). As such, information products are typically associated with some level of uncertainty). Furthermore, information is typically used in a decision context where the goal is to outperform a competitor. When there are multiple information products offered on the marketplace, buyers can combine these to arrive at a more accurate view of the world, which is what ultimately counts for better subsequent decisions (Admati, A.R. & Pfleiderer, P. 1987). Of course, the benefit of combining multiple pieces of information depends on their statistical properties: reliability and correlatedness (Winkler R.L. 1981). Clearly, the more correlated information products are, the less beneficial it is to combine them. Similarly, for a given level of correlation, the more reliable individual information sources are, the less beneficial it is to combine them because the marginal impact of an additional piece of information in revealing the truth is smaller (Xiang, Yi. et al.2013). When buyers are also strategic players in their own businesses, the value of information also depends on the asymmetry of information between competitors. Information acquisition strategy under competition has received much attention in academia. General wisdom suggests that firms prefer more information to 'gain an edge' in a competitive environment (Vives, X. 1999). Iyer and Soberman (Iyer, G. & Soberman, D. 2000) found that competing buyers may buy extra information without using it because simply holding the information can soften competition. Christen (Christen, M. 2005) found that firms may prefer less cost information to decrease chances of direct confrontation. Chen (Chen, Y. et al. 2001) claim that firms may adopt qualitatively different strategies to improve their market knowledge, depending on the degree of asymmetry and the cost of information. Villas-Boas (Villas Boas, M.J. 1994) proposes that three kinds of effect jointly influence the overall impact of information: a 'decision framework effect', a 'strategic effect', and an 'uncertainty effect'. In this context, Kahle (Kahle, D. 2009) proposes a five step strategy to gather information effectively, (1) Creating a list of the categories of information – containing information about customers, competitors, and products/programs, (2) developing deeper inside in specifics needed per category, (3) defining tools and systems that help to gather this information assets timely – introducing profile form, (4) efficient storage of this information – right-size systems

and processes, (5) regular update and usage. One general discussion point in the question, how much is the value of an information, many researchers tested the price-finding strategy with games. Hörner (Hörner, J. 2009) describes it as the potential buyer is reluctant to pay for information whose value to him is uncertain, but the seller cannot credibly convey this value to the buyer without disclosing the information itself. Information comes as divisible hard evidence. In particular it is important to find ways for self-enforcing contracts based on gradual persuasion/communication and possibly mixed strategies and side bets to help resolve the moral hazard/holdup problem (Hörner, J. 2009). Also in a similar way the termination of information value occurs amongst competitors, and how to find ways of cooperation while giving the right level of information needed to execute the day to day business (Ha, A.Y. & Tong, S.2008). As a result, the classical model (Barnes, D. 2006) of firm versus firm competition is giving way to a new model: supply chain versus supply chain competition.

Table 1-5. Summary on Literature Research Results in ERM, IRM Rich Media Psychology, and Information Selling Market Research Works

Main Authors	Enterprise Risk Management - Literature Review Findings
Cruz, M.G. 2002	- strong media impact on decision making
Gazert, N. 2016	- reputation management is part of ERM
Fiordelisi, F. 2011	- identification methods
Auer, M. 2008	- antecedents
Kalhoff, A. 2004	- drivers
Bowling, D. 2005	- essential ERM processes:
Kaplan, A. 2015	- risk-strategy
Kaplan, A 2012	- risk assessment
	- risk governance,
	- risk culture
	- human factor in ERM – information level of employees as major contribution factor
	- awareness on risks
	- operational loss events
	- crucial success factors
	- most prominent meta-strategy in ERM
	- success factors by Bowling, D. 2005
	- 4 key drivers for ERM concepts by Kaplan, A. 2012

Main Authors	Information Risk Management Models - - Literature Review Findings
Bt. Fakhiri, N. 2015 Spears, J. 2010 Furnell, S. 2008 ISO/IEC 2000	- success factors for solid IRM – Information quality needs to reach a high level of: - reliability - integrity - availability - confidentiality - accountability - key success factor – awareness of each person - improvement through strong governance - policies - procedures - safeguards - countermeasures - damage prevention - early detection of threats

Main Authors	Rich Media Theories – Socio-Psychological Aspects – Human Factors - - Literature Review Findings
Short, J. 1976 Draft, RL.1984 Ishii, K. 2010 Maxwell, G.M. 1985 Bippus, A.M. 2003 Mackey, R.A. 2000 Bergerr, C.R. 1979 Walther, J.B. 1996 Joinson, A.N. 2001 Boos, M. 2000 Utz, S. 2001 Jonas, K.J.1999 Hargie, O. 1986 Wiemann, J.M. 1989 Loomis, Ch. 1969 Karlsson, N. 2009 Caplin, A. 2003 Witte, K. 1992 Kruglanski, A.1996	- F2F most rich communication (warmer, more personal, more sensitive, more scaleable) - CMC lacks on nonverbal cues - hierarchy/degree of human/personal presence - CMC more task orientated, thus risk of miss interpretation - CMC avoids self-disclosure => not all aspects might be discussed - CMC driven missing closeness provokes more aggressive conflict management – looping back to non-self-disclosure - less uncertainty in “bad news” communication due to un-personal relationship - human ability to only have Selective Attention - human “motivation” to auto-complete information by “sensemaking” - CMC leads to less team-identification – leads to less support to pears (less personal - CMC Communication requires dramatic higher communication skills in sharp selecting the cannel, phrases, point in time etc. -individuals requirements are: - Directedness; interrelatedness - appropriateness to the situation; identifiability; learnability; controllability - currently there is a GAP between needed ability and as is ability of average business people as this needs to substitute the richness of F2F - this GAP could not be solved with technical tools – new channels might just transfer needed ability to new ones

Main Authors	Information Business – Information as Good-Sold, Information Markets - Literature Review Findings
ESOMAR, 2005 Jensen, F.O. 1991 Admati, A.R. 1987 Winkler, R.L. 1981 Xiang, Yi, 2013 Vives, X. 1999 Iyer, G. 2000 Christen, M. 2005 Chen, Y. 2001 Villas Boas, M.J. 1994 Kahle, D. 2009 Hörner, J. 2009 Ha, A.Y. 2008 Barnes, D. 2006	- data/information is a good of economic value – an Information Market already exists – with strong competition on both sides - information market based on the NEED of Information to compensate uncertainty – mainly in the decision making context - goal – with more, better, accurate Information to outperform competition – maximize asymmetry - correlatedness and reliability of information is key success factor - value of information is individual / negotiable/ intangible – resulting in various proposals for pricing models - "less cost" information is preferred – without correlating to the impact - need-identification-model proposed by Kahle 2009: - categorize need areas; sub-categorize - tools for gathering, storing, aggregating (flexible) - effective flexible storage strategy update and usage strategy - dilemma of level of information disclosure to competition – cooperation (e.g. supply chain) with competition requires information exchange – as less as possible

Source: Author's compilation based on literature review of applicable fields

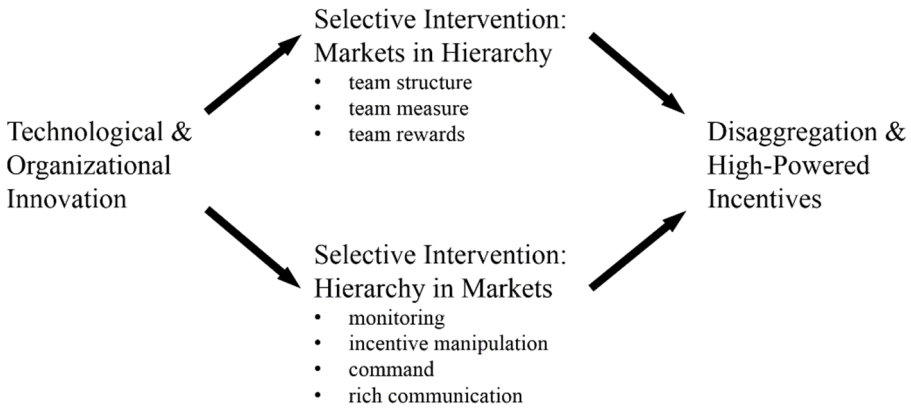
In the previous Chapter and summarized in Table 1-5 the scientific fields of Enterprise Risk Management, Information Risk Management, Rich Media Theories, Socio-Psychology, human factors, and the new upcoming Information Business as such were investigated. A comprehensive investigation in this fields sets the foundation for further effects resulting out of this fields. In the next subchapter a review on current Organizational Models is performed already reflecting those scientific fields in a combined way.

1.4 Information (Risk-) Management in Common Organizational Models

There is a long-standing concern that the strategy literature needs a better understanding of the relationship between organizational structure and performance. This concern goes back at least to Cyert and March (Cyert, RM. & March JG. 1963), who posed the following questions when motivating their theoretical enterprise: what happens to information as it is processed through the organization? What predictable screening biases are there in an organization? Yet with few exceptions, questions of this sort remain largely unexplored in the strategy literature (Rumelt, R.P. et al. 1994). The lack of knowledge about how decision-making structure affects organizational performance surfaces repeatedly in different areas of management. For example, in the context of ambidextrous organizations, Raisch and Birkinshaw (Raisch, S. & Birkinshaw J. 2008) note that far less research has traditionally been devoted to how organizations achieve organizational ambidexterity, and in the context of R&D organization, Argyres and Silverman (Argyres, N.S. & Silverman, B.S. 2004) show surprise that so little research has addressed the

issue of how internal R&D organization affects the directions and impact of technological innovation by multidivisional firms. These observations are congruent with the view that organization design – the field specifically devoted to studying the links between environments, organizational structure, and organizational outcomes – is, in many respects, an emerging field despite its long history (Daft, R.L. & Lewin, A.Y.1993). Zenger et al. (Zenger, T.R. et al. 1997) researched the relationship and correlation of Technological change and the impact in Organizational change and proposed the Model of Organizational Disaggregation see Figure 1-4 on the following page.

Figure 1-4 Organizational Disaggregation Model



Source: Author's compilation based on Zenger, T.R. et al. 1997 p214

Considering even the newest innovations – big data – it enables companies to even deal with more accurate, timely, analytical information at the same time, being seen as a driver for competitive advantage. Pennington (Pennington, R. & Tuttle, B. 2007) stated early that this way of bringing the Information as asset and the way of analyzing into the center of the value-chain, it has dramatic impact on the organizational structure of the companies itself – it leads to improvement in an organization's overall decision-making capacity, which enhances its ability to conduct its business intelligently. So, the desire (and accelerating need) to achieve a higher level of organizational intelligence is a prime driver for implementing business analytics. Pennigton (Pennigton, R. & Tuttle, B. 2007) differentiates this clearly from known data-analytical approaches seen in last century.

In this particular area of how CMC driven, big-data-orientated developments in technology influence the formal and informal organizational setup and structure models of companies is not researched well yet, only a few authors published their conclusions out of the social media theories mostly focusing on communication topics on the human side. Thus, this

discussions are more about applicable workplace environments, social needs and future collaboration (Durcikova, A. & Gray, P 2009) (Huang, Y. et al. 2015). Whereas self-determining systems, supporting actively decision making, even self-learning systems which developing automatically decision models and execute (faster ever) decisions is not broadly researched yet.

1.5 Summary and Conclusion of First Chapter

In summary, Chapter1 has contributed to an understanding that the upcoming changes caused by newer computer mediated communication (CMC) causing a new category of new risk/opportunities – these Information Risk/opportunities (IRM) ultimately impact decision making processes essentially, which is not considered yet in current literature:

1) The field of Strategic Decision Making the is comparably well researched based on the circumstances of the 20th century

2) Newer researchers showed that Information (availability/ quality) is a key success factor for solid decision making processes and models – the continuously increasing amount of information available, the way of gathering the right information under this circumstances are not well reflected

3) The basic human needs and behavior-changes in CMC driven society and working environment are well researched since the 1990's. The influence on the effectiveness and efficiency in decision-making is rarely/not reflected – only in the light of personal decision, but not on changes in professional decision making – most probably only as interfering factor/variable.

4) The human limitation to be able to focus on all information available at the same time leads inevitably to not being able to consider all information for decision making processes also known as "blind spots problem"

5) The human limitation to autocomplete (interpret and add missing) information unintentionally leads to a potentially wrong impression on which information is really available and which is correct or simply added – consequently this is in contradiction to strong statistical and analytical models in decision making.

6) The human characteristics and importance of "trust (in other people or information) vs. pure rationality is reflected in a number of qualitative and quantitative studies. The better the relationship to humans, the higher the level of trust. Also for information it could be proven in current science, that the more obvious reliable information sources are, the more often they are used and trusted without questioning individual correctness. The residual risk of wrong

understanding or misleading interpretation of information in the light of strongly increasing data is not reflected at all.

7) The factor of Trust (in information) can therefore be operationalized in level of ”competence (of the organization), expertness, and dynamism”, the level of “responsiveness, goodwill, and benevolence”, the level of being “integer, reliable, credible, and moral (both, humans and people)”, and finally into the level of “attractiveness, open to use, predictable, and careful”

8) Many researchers in Decision-Making field focused on various qualitative and mathematical models to improve the economic outcome. It is also well accepted, that the risk averse behavior (quantification of potential negative impact) and therefore damage prevention is one of the goals of solid decision making theories. In contrary there is a gap in current literature of linking this to the risk awareness of the increasing information markets and organizational theories, having potential impact (or not) yet.

9) Models for quantitative measuring the level of Information-Risk-Management in current companies seem not to be researched yet – indeed meta-models and approaches from general enterprise risk management are transferred to IRM but not giving quantitative measures.

10) Derived from decision-making models, esp. the factor of anticipated damage prevention and control could be seen as key indicator for successful improvement of decision making. In literature it is operationalized in general (Kirby, S. & Nailer, L. 2013) but not for the special case of information management in the light of decision making improvements

2 MODELLING THE RELATION OF INFORMATION RISK MANAGEMENT AND STRATEGIC DECISSION MAKING IMPROVEMENT

The chapter analyses how the current situation of IRM in business organizations impacts and the current view of different professional groups on IRM. Out of this results from Chapter 1, the relation between Information Risk Management and Strategic Decision Making will be modeled resulting in a Causal Model while determining the variables and the according operationalized measurement factors. Finally closing this chapter with the construction of the main research hypothesis based on the theoretical foundations discussed in Chapter 1.

The in average limited human capabilities (according graduation/university degree/professional experience), to process and analyze a continuously increasing data in a continuously developing information environment seem too obvious and are already covered by socio-psychological studies (seen from the impact-side to the human) – Correlations to the area of risk-management and decision-making could be derived but are not explicated yet.

2.1 Delimitation of Decision Making and Strategic Decision Making

In this subchapter the delimitation of the general *decision making* terminology and the special case of *strategic decision making* is examined, but also the linkage in the light of Information Management. Strategic decision-making is the process of developing and putting into action choices that will influence the long-term welfare of the organization. These choices often involve major organizational change and large resource commitments that are difficult to reverse once they are implemented. Strategic decision-making reflects decision makers' experience, the positions they occupy and their organizational environment. Work on improving strategic decision-making has focused on the content of decision outcomes and the process that produces these outcomes. Strategic decision-making takes place within a context defined by the organization's strategy and varies according to the extent to which this strategy is a deliberate, as opposed to an emergent, process (Lampel, J. 2014

Table 2-1 Strategic Decision Making - Delimitation

Strategic Decisions	Administrative Decisions	Operational Decisions
Strategic decisions are long-term decisions.	Administrative decisions are taken daily.	Operational decisions are not frequently taken.
These are considered where The future planning is concerned.	These are short-term based Decisions.	These are medium-period based decisions.

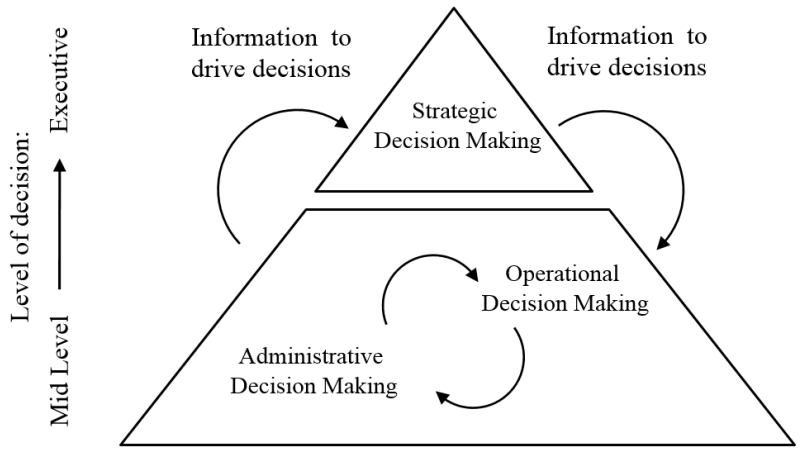
Strategic decisions are taken in Accordance with organizational mission and vision.	These are taken according to strategic and operational Decisions.	These are taken in accordance with strategic and administrative decision.
These are related to overall Counter planning of all Organization.	These are related to working of employees in an Organization.	These are related to production.
These deal with organizational Growth.	These are in welfare of employees working in an organization.	

Source: Author's compilation based on Forbes, D. 2007. Vol32, p361-376

In general Strategic Decision Making could be delimitated from (1) Administrative Decision Making, and from (2) Operational Decision Making. Operative decisions are taken daily, are short term based, are related to working of employees. But also Operational Decisions have to follow the strategic goals / decisions made, and also the overall welfare of employees. Operational decisions instead are not taken frequently, have a medium period which they base on, are in accordance with strategic and administrative decisions and have a direct input to the performance / production, see Table 2-1.

Vice versa, in business organizations the quality of the information on which administrative and operational decisions are based on are influencing the decision makers on the Mid-Level Management. Further on, those information used in Mid-Level-Management and the decisions taken on that administrative end operational level exponentiate up to the executive level into the strategic decision making. Consequently, it could be stated, that the individual available information quality on the mid-level-management is drilling up indirectly into the strategic decision making.

Figure 2-1 Information – Dependencies in Decision Making Hierarchy inside Business Organizations



Source: Author's compilation based Literature Research

In Figure 2-1 the hierarchy and dependencies in the areas of decision making are visualized. Any information used in the operational or administrative area is implicitly an input to the strategic decision making. Given, there are individual small deviations or compromises in the atomic administrative and operational decisions in business organizations – which is most likely – this would exponentiate up into even more significant deviations and errors in the strategic decisions details, which are taken on the information base from the mid-management-level. Consequently also the other way around, the taken strategic decision – with all supportive information around about the aim, goal, targets, background might be not transported as information to all required recipients down into the business organization. Mid-Level-Managers might take administrative and operational decisions in a slightly deviating way based on a partly compromised or not understood information base – which ends up in corrective strategic decisions on the executive level and so on and so on.

This logical correlation between the impact of the strategic decision making field and the general decision making shows the economic importance of this discussion about the value of *Information* itself.

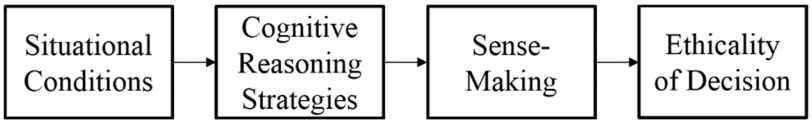
2.2 Decision Making Improvement Factors

Making decisions is the nature of any business, everybody, every day. In the climate of rapid change (Agor, C.F.), this aspect becomes even more important. From Descartes to Hume and beyond, “emotions” were long regarded as synonymous with irrationality. Passion and reason were antithetical (Li, Y. et al. 2014). Emotions were thought to be chaotic, haphazard, and immature (Ashforth, B.E. & Humphrey, R. H. 1995). It was common to try exclude emotions from reasoning and thinking on the basis that emotions were likely to interfere with the rational process (Barsade, S.G. et al. 2003). Revisiting the potential rationality of emotions, however, has become a timely issue in recent years partly in response to the improved understanding of emotion in human intelligence, social discourse, employee attitudes, and decision-making (Ashkanasy, M.M. & Humphrey, R. H. 2011). Emotions and rational decision-making have not traditionally been associated (Ashkanasy N.M. & Humphrey, R. H. 2011). Furthermore, prior to pioneering work by Kahneman (Kahneman, D. et al.1974) and others, it was commonly believed that decision-makers strove for rationality and the best decisions were rational and should exclude emotion. Research by Simon (Simon, H.A. 1957) concurred, indicating that while rationality was bounded, most decision-makers still at least sought to be rational. As a consequence, and as Ashforth and Humphrey (Ashforth, B.E. & Humphrey, R. H. 1995) noted, decision-making research has long been dominated by cognition, emotions

were by and large excluded from accounts of rational thought and behavior. Globalization further demands a new understanding of the effects of emotion in decision-making, particularly when regional differences result in variations of culture and social norms (Gong, Y. et al. 2011). March (March, G.J. 2006) phrased it, "choice should be derived from carefully considered expectations of future consequences, not from the dictates of habit, custom, identity, intuition, or emotion." All of these findings give rise to the central query about emotion's role in organizational decision-making, a corollary of which is what criteria could be applied to assess rationality (Howard, R. 2008). Although the paradigm shift away from the use of point estimates to the use of distributions has been dramatic, the role of dependence in making decisions about risk has received relatively little attention to date, and is not always adequately understood, either by decision-makers or even sometimes by risk analysts (Thompson K.M.2003). Little research has been done on effective methods of communicating risk analysis results to decision-makers (Bier, V.M. et al. 2013), even though the advent of risk-informed decision making means that decision- makers are increasingly being asked to take highly technical risk analysis results into account in their decisions (INSAG, 2011). Within the epistemic uncertainty, researchers and practitioner often differentiate structural from data-driven uncertainty (Walker, W.E. et al. 2003). The first refers to our lack of knowledge of the processes and casual links at play while the second refers to lack of data which prevents us from fitting a structural model to a specific problem (Boschetti, F. 2011). The first essential dimensions to be discussed in this context is are the level of (1) *Certainty/Uncertainty* and the level of (2) *Awareness/Un-Awareness.* It spans of 4 principal areas (1) *Known Known*, (2) *Unknown Known*, (3) *Unknown Unknown* and (4) *Known Unknown* as described by Cross et al. (Cross, R. et al. 2001). For this four cases (Boschetti, F. 2011) proposed the following approaches for decision making: (1) *Known Known* formulate a clear strategy, for (2) *Unknown Known*, improve Engagement to lift to known known, (3)*Unknown Unknown*, adapt yourself on the blind spot and for the last section (4) *known unknown*, a precautionary approach including strong monitoring is proposed. Most decision making models and theories are primarily focusing only on the primary economical outcome optimization. Mumford and colleagues (Mumford, M.2008) consolidated the list of reasoning strategies to a set of seven distinct cognitive reasoning strategies and established that these strategies can promote ethicality. The strategies are (a) recognizing personal circumstances, (b) anticipating consequences, (c) considering others' perspectives, (d) seeking help, I questioning your own judgment, (f) dealing with emotions, and (g) examining personal values. Sense-making is a complex cognitive process by which an individual develops an understanding of a vexing set of circumstances. The process of making sense of an emergent situation helps people figure out

what caused the situation, what the likely outcome of the situation is, and how they can influence the developing situation (Weick, K. et al. 2005). More simply, sense-making begins when an individual realizes something abnormal is happening and ends when that individual understands the situation well enough to make a decision to act, monitor, or ignore the situation. This involves looking for information that can help the individual understand how this situation differs from expectations. Once this information has been gathered, the individual can assign meaning to the information and decide how important each piece of information is (Caughron, J.J. et al. 2011) see Figure 2-2.

Figure 2-2 The role of environmental factors, ethical reasoning strategies, and sense-making in ethical decision making

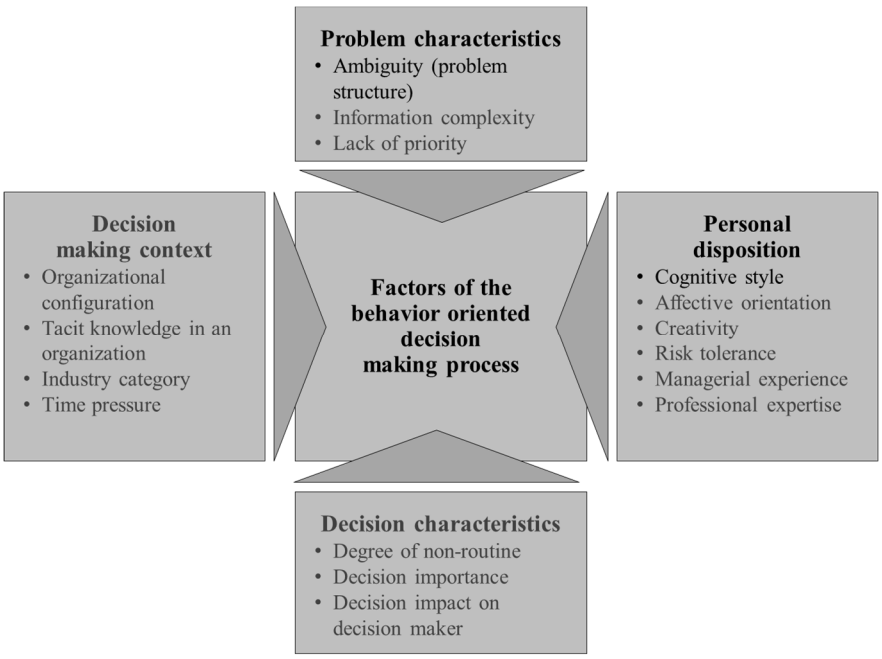


Source: Caughron, J.J. 2011., p355

Caughron (Caughron, J.J. et al. 2011) elaborated four key-dimension which have to be considered by decision makers, (1) Sitaional Condition, (2) Cognitive Reasoning Strategies, (3) Sense-Making, and (4) Ethicality of Decision. All four factors are strongly depending and therefore significantly influencing the result of a decision made.

Summing up various authors mentioned, Sinclair and Ashkanasy (Sinclair, M. 2002) proposed a model of four main factors of the behavior orientated decision making process – see Figure 2-3 on the next page. He describes *Problem Characteristics*, as a first influencing factor for the behavior orientated decision making process, consisting out of (1) Ambiguity – the problem structure, (2) Information Complexity, and (3) Lack of priority. Also he considers *personal disposition* as key influencing. Here esp. the cognitive style, Affective orientation, creativity, risk tolerance, managerial experience and professional expertise are to be mentioned. Further the *Decision Characteristics* has to be considered as being the degree of non-routine, decision importance and the decision impact on decision makers. Finally, the *Decision Context* as being the organizational confirmation, the tactical knowledge in the organization, the Industry category, and the time pressure are mentioned. Over all, Sinclair summarized the various well researched areas of decision drivers in an accepted holistic way.

Figure 2-3. Factors of the behavior orientated decision making process



Source: Sinclair, M. 2002, p9

It could be seen as the foundation for research in the behavior oriented decision making processes as the model contains more than one influencing factor unlike other theories and models (Sinclair, M. 2002)

2.2.1 General Improvement Factors in Decision Making Theory and the Influence of Risk Management

In well-structured problem environments one of the common models for improving the decision making is the *Weight Assessment Model* (Heerkens, H. 2006) – structuring the approach in seven phases, and giving a devotion factor to each phase – see Table 2-2. Weight Assessment Model.

The goal of Heerkens (Heerkens, H. 2006) is to compile the pieces of delivered from former researchers together in one basic methodical model, covering the attributes of *concept of importance*, the *relationship between attribute score*, and the *weight and attractiveness of alternatives*

Table 2-2. Weight Assessment Model Categories and Phase Names

Phase Category	Phase Name
Structuring cluster	- Problem Identification
	- (Sub-) Attribute processing
Weighting cluster	- Absolute sub-attribute weighting
	- Homogenous sub-attribute weighting
	- Heterogeneous sub-attribute weighting
	- Attribute weighting
Evaluation cluster	- Evaluation

Source: Author's compilation from Heerkens, H. 2006, p388

Jonassen (Jonassen, D.H. 1997) also proposed a structural model for well-structured problems in decision making, starting with a solid problem representation, searching for solutions (iteratively) once solution is defined, execution follows, in case of failure (in parts) go back to problem presentation and follow same algorithm until no more failures at the end. In the light of full information knowledge, the proposed highly structured models are deterministic with low potential risks other than iterative loop-backs. Voss (Voss, J.F. 2005) defines four main characteristics for well-structured problems: "(1) The goal is well-defined, and generally the solution is agreed upon by the members of the respective community. (2) Constraints are usually stated in the problem statement or are readily apparent. (3) Operators are frequently mathematical, logic- based, or in the case of some games, object moves. (4) The problem lends itself to computer simulation, because the number of states, the constraints and the operators are readily within computer simulation capabilities".

In contrary to this, in literature also "ill-structured" problems in decision-making are found and characterized by Voss (Voss, J.F.) with the following 6 features: "(1) The goal is vaguely stated, and requires analysis and refinement in order to make the particular issue tractable. (2) The constraints of the problem typically are not in the problem statement; instead, the solver needs to retrieve and examine the constraints when appropriate during the solving process. (3) In most cases, the solver's solution is divided into a representation and a solution phase, as previously discussed. However, in contrast to well-structured problems, different solvers may vary considerably in the nature and contents of each of the phases. This is because ill-structured problems may be approached in different ways, according to the solver's knowledge, beliefs, and attitudes. (4) Solutions to ill-structured problems typically are not right

or wrong, and not valid or invalid; instead, solutions usually are regarded in terms of some level of plausibility or acceptability. Furthermore, solution evaluation may be a function of the evaluator's knowledge and beliefs regarding the issue at hand. (5) When a solution is stated, it usually is justified by verbal argument that indicates why the solution will work as well as providing a rebuttal by attacking a particular constraint or barrier to the solution or by attempting to refute an anticipated opposing position. The solver's definition of the problem in the representation phase and presentation and justification of its solution demonstrate that this solution process is rhetorical in nature. (6) The solutions of ill-structured problems often are not final, in the sense that a solver may generate an exit plan for Iraq, and the problem asked for is ''solved,'' but to know if it would ''really work'' would require implementation and subsequent evaluation". Also Simon (Simon, A.H. 1973) gave the definition of ill-structured as being any other problem than a well-structured problem by exclusion logics. This definition might seem plausible but is discussed esp. under the implications of the incompleteness theorem by Kurt Goedel 1931. Considering this, Simon (Simon, A.H. 1973) later, that definiteness of problem structure is largely an illusion that arises when we systematically confound the idealized problem that is presented to an idealized (and unlimitedly powerful) problem solver with the actual problem that is to be attacked by a problem solver with limited (even if large) computational capacities.

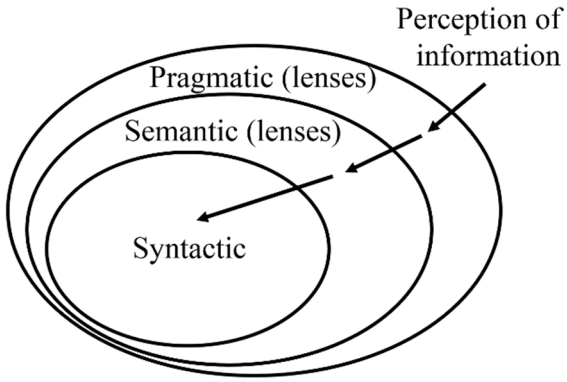
If formal completeness and decidability are rare properties in the world of complex formal systems, effective definability is equally rare in the real world of large problems. With this Simon is giving and indication on the fatal assumption, that real-world-decision-making-problems could be described deterministically/holistically. On the other hand it shows the need for strong pursuit to get as close as possible to the theoretical "*known known*" status. Here the question of *Information-Completeness and Quality* comes in and will be discussed in next subchapter.

2.2.2 The role of Information in Decision Making Models

There is increasing recognition of the importance of information quality to organizations and the need for active management of information quality. As a starting point, organizations must be able to monitor the quality of the information they produce or use, including both stored data sets and the information retrieved from those data sets (Price, R & Sharks, G.. 2008). This requires both a clear understanding of the information quality criteria that must be considered and a means of measuring quality based on these criteria. Essentially, the necessary foundation for information quality management is an effective means of defining and evaluating

information quality. Price and Shanks (Price, R. & Sharks, G..2005) discuss the consequent possibility that objective measurements of syntactic and semantic quality may not match information consumer perceptions (i.e. subjective measures of the same criteria) and the potential value of being able to measure such discrepancies for identifying and solving information quality problems – resulting in the proposed *Onion-Model* – see Figure 2-4.

Figure 2-4. The Onion Model – Users View of Pragmatic Criteria



Source: Price, R & Sharks, G. 2008,.p55

On top Price and Shanks (Price, R. 2005) gave various criteria to the proposed *Onion-Mode*l further elaborating clear measurements on – see Table 2-3

Table 2-3 Quality Criteria by Category according the Onion Model

Category	Quality Criteria
Syntactic Criteria	conforming data integrity rules
Sematic Criteria	complete, consistent, unambiguous, meaningful mapping phenomena and properties mapped correctly
Pragmatic Criteria	data accessible, and suitably, flexibly, understandably, timely, secure presented; relevant metadata accessible; perceived to be complete, reliable, integer

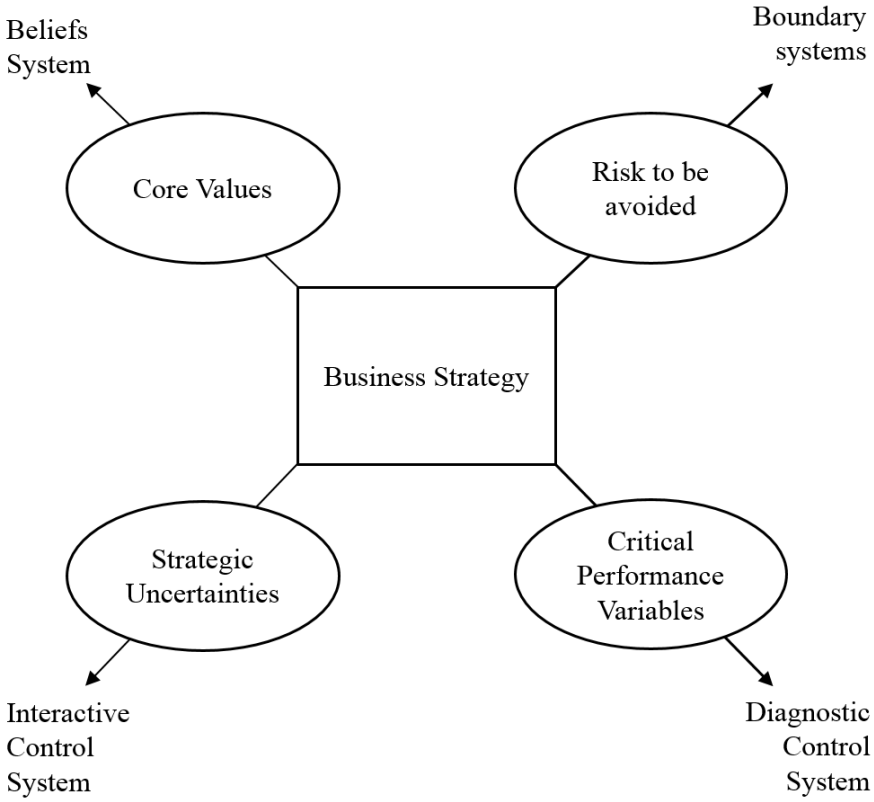
Source: Authors compilation based on Price, R & Sharks, G. 2005, p52

A very important meta model for decision making is Simons' control model (Simons, R 1990) Simons' three levers of control model (1) the *Intelligence Phase*, (2) the *Design Phase*, and (3) the *Choice Phase*. This basic model was later extended to extended a (4) *Implementation Phase*, and (5) the *Review Phase*.

It is used as a basis to balance control mechanisms in an organization in order to realize the business strategy. The model distinguishes four different types of control mechanisms: (1)

beliefs systems, (2) boundary systems, (3) diagnostic control systems and (4) interactive controls systems. Two of these four levers increase individual freedom (i.e. beliefs systems and interactive control systems), and two restrict individual freedom (i.e. boundary systems and diagnostic control systems). The four levers are explained below in figure Figure 2-5:

Figure 2-5 Simons' four level of control model



Source: Simons 1990, van der Wiele et al. 2011 p591

Further developments in Information Management and Decision Making science postulate the necessity of dynamic models, which are able to include systematically additional information over time. This is not in contradiction to the vast amount of common models basted on the attribute-weights in multi-criteria multi-dimensional incomplete decision problems strategies – it even more builds on those. Graf and Six(Graf, Ch. & Six, M. 2014) recently proved that in average, the quality of decision increased if the information becomes more precise. Niederhuber et al. (Niederhuber, J. et al.2014) research results could confirm this and showed on top, that in particular, a messy and untidy environment (i.e., contextual disorder) can lower levels of biased information evaluation and search. In a disorderly environment, people take standpoint-inconsistent information into greater account than when making a decision in an orderly context. Also Price (Price R. 2011) confirmed in quantitative experiments

that the quality of information (Data Quality Tags) significantly increases decision time, even when decision choice is not affected – leading to higher efficiency and effectiveness in decision making processes.

Critically in this circumstances is the result from O'Reilly (O'Reilly, C.A. 1980) showing already, that the perceived quality of an information source will be used more frequently than those perceived as lower quality – which sounds not very surprising, as it is about perception. The question opens in the context of decision-making how could the quality of information be attributed that it is perceived as high quality. Second O'Reilly found out that individuals use more often information sources that are more accessible will be used more frequently than those which are less accessible (O'Reilly, C.A. 1980) – also not surprisingly as the consequence for decision making problems seems logically. Either limiting the number of sources for decision makers down to a trustful minimum or reduce (aggregate) information down to a still meaningful minimum, anything else will impact negatively the decision making process. In other words: Keeping sources and information on a still meaningful minimum – by taking the right choices.

Concluding this section with reviewing correlations between different role-holders and perceived data-quality (information-quality) by examining studies from Tee, S.W. et al. (Tee, S.W. 2007) who proved in quantitative research, that (1) Management Commitment to data-quality is positively associated with the level of data quality achieved, (2) the presence of champions is positively associated with management's commitment to data quality, (3) The perceived need for data quality to support operations and client services is positively associated with management's commitment to data quality, (4) Meeting government priorities is positively associated with the perceived need for data quality to support operations and client services. Tee, S.W. (Tee, S.W. 2007) validated the assertions that management responsibilities, including commitment to continuously improving data quality, effective communication among stakeholders, and data quality awareness are important organizational elements that influence data quality.

Table 2-4. Summary on Literature Research Results in Strategic Decision Making, Models of Improvement in Decision Making and the Role of Information in

Main Authors	Strategic Decision Making overview – Literature Review Findings
Agor, C.F. 1986 Li, Y. 2014 Ashforth, B.E. 1995 Barsade, S.G. 2003 Ashkanasy, M.M. 2011 Kahnemann, D. 1974 Simon, H.A.1957 Gong, Y. 2011 March, G.J. 2006 Howard,R. 2008 Thompson, K.M.2003 Bier, V.M. 2013 INSAG, 2011 Walker, W.E.2003 Boschetti, F. 2011 Weick, K. 2005 Mumford, M.2008 Caughron, J.J. 2011 Sinclair, M. 2002	rapid change in DM by new media impact (not necessarily in theory, but in volume and speed) aspect of human emotions and feelings (attitude) is considered in newer models as significantly needed impacting factor development from single point statistics to distribution orientated calculation models – simple structured models are not possible any more – increasingly complex modelling required with CMC – more / better analytics of information possible – broader base for mathematical models – more complex modelling required uncertainty moves from situational uncertainty to data uncertainty/model uncertainty models for approaching known and unknown problems by Boschetti sanity check of models and outcome by "Sense-making" models by Weick – proposing: back to understanding the situation as good as possible by humans/decision makers newer times strong involvement of ethic factors in decision making (welfare as secondary goal) models for behavioral orientated decision making factors problem characteristics personal disposition decision context decision characteristics

Main Authors	Models for Improvement of Decision Making in the light of (I)RM – Literature Review Findings
Simons,R. 1995	well-structured problems in decision making:
Heerkens, H. 2006	highly structural and well defined models of clustering and proceeding
Jonassen, D.H. 1997	mathematical models possible
Voss, J.f. 2005	limitations only in scalability and computing power
Simaon, A.H. 1973	ill-structured problems
Goedel, K. 1931	self-non determining problem
	only meta models possibly by problem design (unknown unknown)
	formal issue of completeness vs incompleteness in any mathematical approaches
	depending on Basic information quality/completeness/reliability

Main Authors	Role of Information in Decision Making Models – Literature Review Findings
Price, R. 2008 Graf, Ch. 2014 Niederhuber, J. 2014 Price, R. 2011 O'Reilly, C.A. 1980 Tee, S.W. 2007	key success factor is the ability of organizations to monitor ad determine the quality of data gathered/stored/used => formal Information Quality Management is proposed
	information quality is proven success factor in Decision making models
	syntactic and semantic quality measurement methods of information including and educated estimate on the value
	model(s) for quality analyses
	environmental aspects are considered as key for the result quality of information quality – messy, untidy environment leads statistically to less data quality
	high quality of information decreases decision time (not necessarily) decision itself) ⇒ competitive advantage
	quality information sources are more used
	better accessible information is used more
	management commitment to high quality data is associated with the level of data quality achieved
	presence of data-champions is positively associated with positive management commitment to high quality data
	meeting governmental priorities is positively associated with the need for data quality to support operation and clients

Source: Author's compilation based on literature review of applicable fields

In this first section of the second chapter a dedicated literature review on the topic of Decision Making could be shown. Starting with the general overview on Strategic Decision Making literature, further elaborating on dedicated triggers for decision making improvements and finally closing with the evaluation of current and historic decision-making-models. This evaluation is the base for further model-development, but also for the question of the level of importance of this topic in the light of the Information economy – elaborated in the next subchapter.

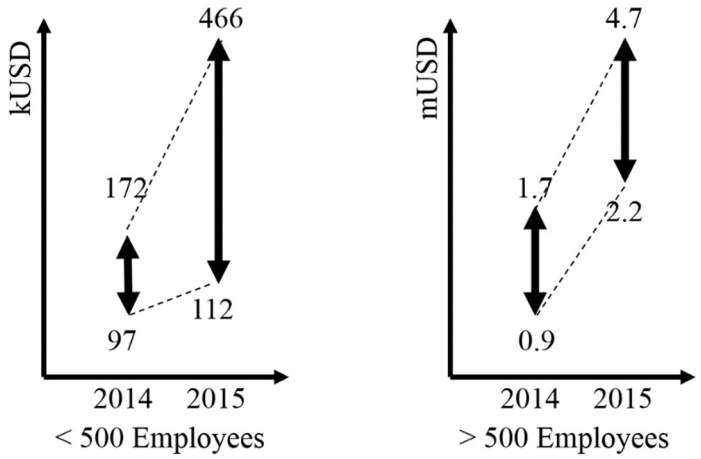
2.3 Importance of Information Risk Management for Improvement of Strategic Decision Making Processes

There are various dimensions showing the currency and importance of IRM in the light of decision making processes. Looking in particular in technical developments such as intended or unintended data breaches, security leaks, automated decision making systems in brokerage but also into human motivated factors such as whistle-blowers, awareness, ignorance, or personal monetary advantages. Finally reflecting the results and status back to the current view and impact of IRM in today's companies and business.

2.3.1 Technical Drivers in Cyber Security

The average cost of the worst single security breach experienced by UK businesses of all sizes has risen sharply over the last year, according to the Information Security Breaches Survey 2015 commissioned by the UK's Department for Business, Innovation and Skills (BIS). Breach costs include elements such as business disruption, lost sales, recovery of assets, and fines and compensation (PwC 2015). The average total costs consisting include elements such as business disruption, lost sales, recovery of assets, and fines and compensation almost doubled up – see Figure 2-6. In larger companies, 60% of the threats came from external, in smaller businesses only 38%. Approx. 50% of the worst breaches resulted in inadvertent human errors in 2015 compared to 31% in 2014 – considering that 72% of large businesses do security trainings for their employees (PwC 2015).

Figure 2-6. Doubling Average Costs for Security breaches in 2015 vs. 2014 in UK Companies



Source: Author's compilation from PwC 2015 p10

Besides the discussed total costs (spend) it seems also interesting to have a deeper look into the question, what is the mid- and long-term impact for shareholders. Gatzlaff and McCullough (Gatzlaff, K. & McCullough, K .2010) did a meta-research in 2010 – results see in Table 2-5. The fact that breach costs significantly increase over time, which gives a clear indication of increasing importance but also in correlation, that the overall amount of reported breaches continuously increase could be seen as a signal, that either there is not too much serious attention, because economically it is seen as "*does not matter too much*" still. This particular question of any "cost-benefit" research could not be found at all.

Table 2-5. Summary of Recent Research Findings on the Impact of Data Breaches on Shareholder Wealth

Researchers	Findings
Cavusoglu, H.. (2004)	- beaches result in overall loss of 2.1% of value over 2 days following event - breach costs are higher for Internet firms - costs not related to breach type - breach costs increase over time - negative correlation between size and stock market response
Hovav, A. (2003)	- breach costs higher for Internet firms - no overall significant market impact for denial of service attack
Garg et al. (2003)	- security attacks result in overall loss of 5.3% of value over 3-day event window - internet security vendors experience positive returns of 10.3% over the same window when security attacks are reported - property–casualty insurers experience a loss of 2.0% over the same window when security attacks are reported
Campbell, K.. (2003)	- aches result in no statistically significant loss for entire sample - breaches involving unauthorized access to customer personal data or firm proprietary data result in an average loss of firm value of 5.5%

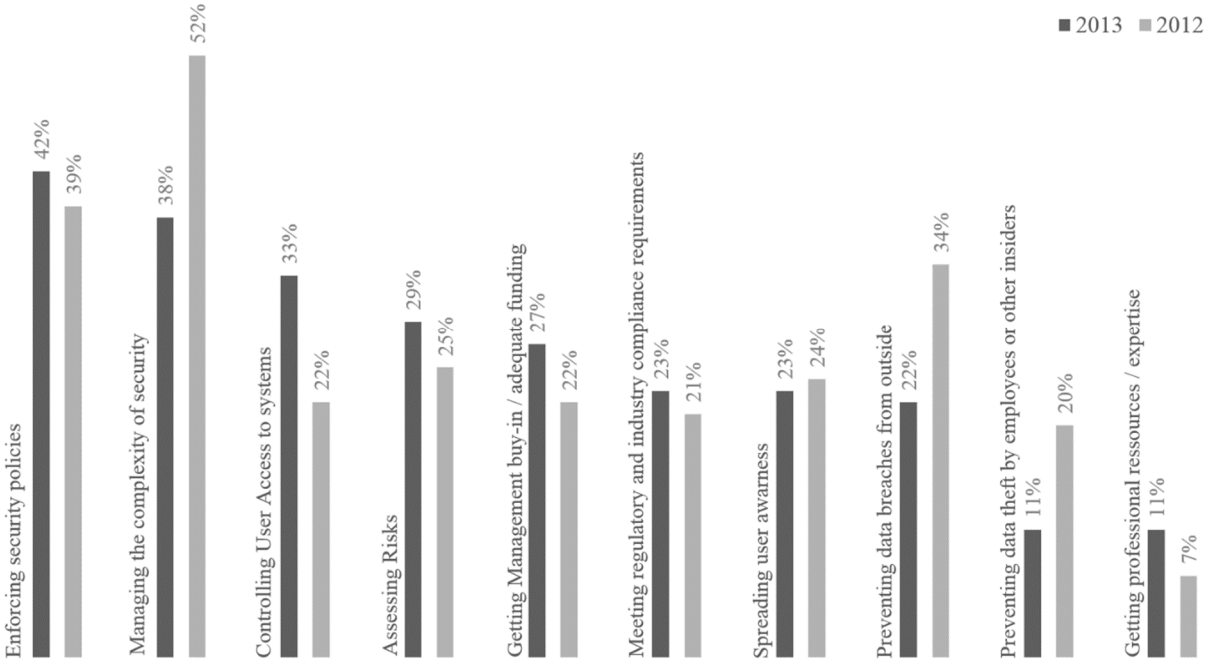
Source: Gatzlaff, K. & McCullough, K. 2010.p65

Banker (Banker, M. 2015) calculated the total costs for business resulting out of cybercrime on $2 Trillion by the year 2019. Banker concludes out of the "*Hacktivism Professionalizing*" going after bigger targets – concluding, hacks will become more successful and less prolific – in other words, less hacks but more successful. One sub-result out of Banker's study was that obviously it seems to be up to 60% of all data breaches worldwide in 2015 occurred in the US.

Ashok (Ashok, P.2015) performed a study to the top 10 information management and security challenges in companies. In 2012, 946 responses were recorded, in 2013 about 1029 responses could be compared. The result is illustrated in Figure 2-7. Looking into the results in more depth it could be seen, that about only 40% in both years seem to see *Security Policies* as an essential part, and only about 10% see the necessity to put *Extra Resources/Experts* on this topic as challenging, which is in contradiction to the seen necessity of *managing the complexity of security* at all at a level of 38%-52%. The overall result seems quite surprising, almost all other proposed activities as (1) *Controlling User Access,* (2) *Assessing Risks,* (3) *Preventing Data Breaches,* (4) *Preventing Data Theft*, are seen as challenging with only less than 30% of all asked people. Looking into the organizational aspects it could be observed that 27% see *management buy-in / adequate funding* as challenge. With some exceptions (1) *Managing*

Complexity of Security and (2) *Preventing Data Breaches* the tendency could be observed that challenges could be seen as increasing to achieve the goals – the 2013 numbers are higher as the 2012 ones.

Figure 2-7. Top 10 Information Security Challenges Facing Companies

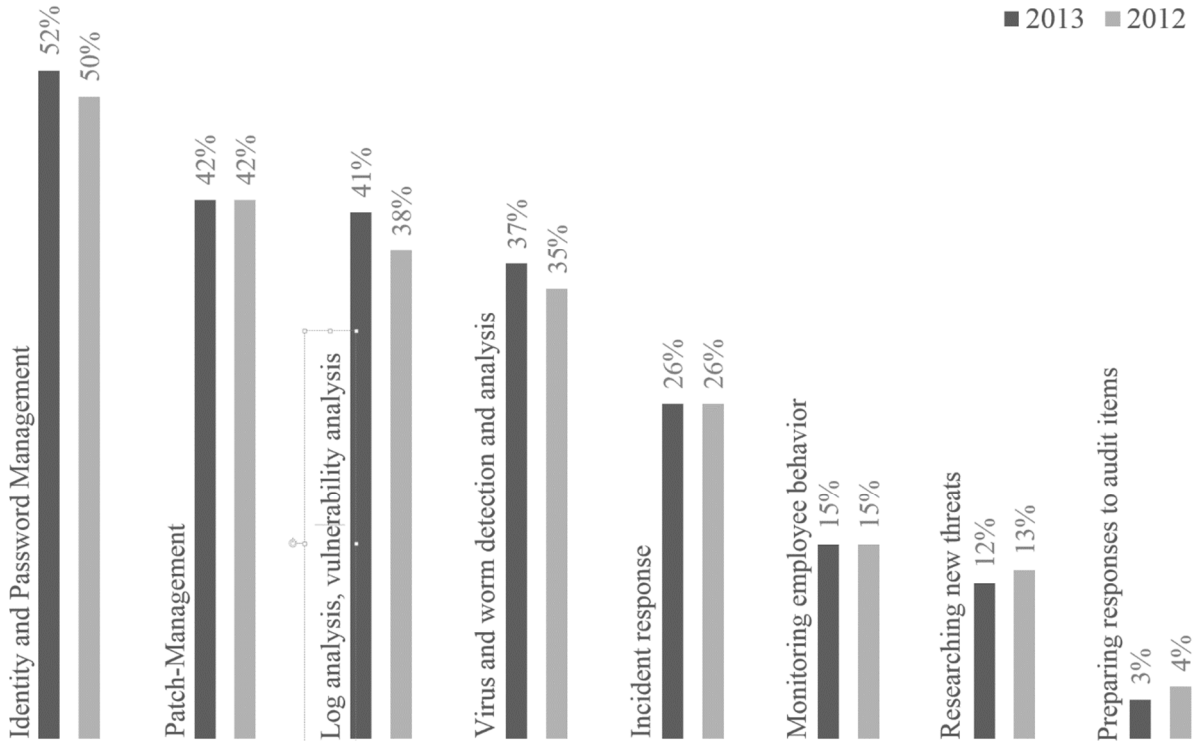


Source: Author's compilation on research results from Ashok, P. 2015 p21

In an subsequent part of this research from Ashok (Ashok, P. 2015) the question of which practices or information security are seen as the most value adding for the organization in comparison – overview see Figure 2-8

In this second part, *Identity and Password Management* was seen as the most valuable practice for improving information security in organizations followed by pure technical measures (1) *Patch Management,* (2) *Log Analysis and Vulnarability Analysis,* and (3) *Virus and Worm Detection and Analysis* all three sitting at about 40% confirmation niveau. A significant difference between the 2012 and the 2013 results could not be observed which shows a stady state in this results which might be contributed to the fact, that in 2012 neither in 2013 no very big information/data breaches were reported which could have lead to a different view.

Figure 2-8. Most Value Adding Practices in Organizations



Source: Author's compilation on research results from Ashok, P. 2015 p22

.As one of the consequences of "*Big Data*" and a high volume of information on the one hand and the need of very fast "*decision making*" requirements to ensure competative advatage on the other hand is the so called – and more and more increasing – area of "*Algorithmic / Automated Decision Making*". This area is already comparably well developed for Brokerage on the big stock exchange places around the world, less known by a majority of the public is that the Facebook newsfeed is algorithmically curated (Eslami, M. 2015). This becomes a lot more problematic when you consider Facebook can affect voter turnout in elections based merely on the amount of hard news promoted in an individual's news feed (Sifry, M. 2014). This bit of information, together with recent research showing biased search results can shift the voting preferences of undecided voters, 10 points to the need to start asking questions about the degree to which such curation and ranking systems can affect democratic processes (Diakopoulos, N. 2016). These are just a few examples of algorithms influencing our media and information exposure. But the impact of automated decision making is being felt throughout virtually all strands of industry and government, whether it be fraud-detection systems for municipalities managing limited resources, a formula that grades and ranks teacher performance, or the many ways in which dynamic product pricing is done by Amazon, Airbnb, or Uber (Diakopoulos, N. 2014). In this field, there is comparably few scientific work available yet. Neither on the question of how to keep ultimately control on the information in this

systematics nor on how to call-back calculation errors. Ideas are posted that he software engineering of algorithms also needs to consider architectures that support transparency and feedback about algorithmic state so they can be effectively steered by people (Mühlbarcher, T. 2014). Algorithm implementations should support callbacks or other logging mechanisms that can be used to report information to a client module. This is essential systems work that would form the basis for outputting audit trails. Feldman (Feldman, M. 2015) proposes that work on machine-learning and data-mining solutions need to be considered that directly take into account provisions for fairness and anti-discrimination. For example, recent research has explored algorithmic approaches that can identify and correct for disparate impact in classifiers by statistically transforming the input data set so that prediction of protected attributes is not possible. Diakopoulos (Diakopoulos, N. 2014) proposed therefore to have a closer look to 4 specific areas – see Table 2-6.

Table 2-6. Improvement Areas in Automated/Algorithmic Decision Making

Criteria	Description	Goal
Human Involvement	- explaining the goal, purpose, and intent - including editorial goals, process or social context - ownership within the company	Identify authors/designers ⇒ disclosure of specific human involvement might bring about social influences that both, reward individual's reputations and reduce the risk of free riding – involved individuals might feel a greater sense of public responsibility and pressure if their names are on the line
Data	- accuracy, completeness, and uncertainty - timeliness, representativeness, limitations	Data transparence esp. on the way of data gathering/collection: definition, transformation, vetting, editing (automated / by human)
Data Model	- input parameter of the model used - features of variables used – weights used - training-Data for Performance Testing (consistency) - test limitations of variables used	Model characteristics is correct and transparent – even with extreme values – checking statistical assumptions, and comparing models
Inference	- classification and predictions made - machine errors triggered by human errors	Improve accuracy, define error margin, eliminate human errors being considered as false positive – implement "validation layer"- implement confidence values for the quality of the result (based on meta model)
Algorithmic Presence	- disclose personalization of algorithms - disclose filtering (if so)	Avoid general usage out of individualized adaptations, show what is not seen in the results, and v.v. what is in, but others will not see if using individualization

Source: Author's compilation from Diakopoulos, N. 2015, p60

Diakopoulos' (Diakopoulos, N. 205) conclusion out of the observed lacks and need is to introduce new multidisciplinary roles for "*Algorithmic Risk Modelling*" or "*Transparency Modelling*".

2.3.2 Human Threats

Since many years technical solutions like increasing network firewalls capability or implementing better user access control system might have addressed security risks in the past, today's environment is more challenging (Ashok, P.2015).Trends like employees using social media and their own devices for business produce evolving risks, making it more and more difficult for IT to address them. Buying sophisticated new technologies is not necessarily the answer. Buying new solutions to control every new technology that enters the market or respond to information trends will break almost any IT department's budget. Increasingly the risks are inside the organization.

A close look on the implications and consequences of *Whistle blowers* shows, that it occurs in all forms of organizations, whether for-profit, non-profit or public sector. Nonetheless, the processes may play out differently depending on the type of organization. Recent publication of several large studies, including data from employees in the public sector in Australia (Smith, R. 2010) and Norway (Bjørkelo, B. & Matthiesen S.B. 2011) allow to compare results from similar organizations in those countries with earlier findings using data collected. Researchers have studied how culture, economic systems, and legal and regulatory environments may affect observation and la- belling of wrongdoing, whistle-blowing and its consequences (Brown, A.J. et al. 2010). A meta- study on comparing studies from Australia, Norway and US on Whistle-Blowing by Miceli (Miceli, M.P. et al. 2013) shown in Table 2-7

Table 2-7. Incidence of Perceived Wrongdoing and Whistle blowing in AU, NO and US

Samples	Australia	Norway	US
Percentage of Respondents who perceived wrongdoing in the previous 12 months (24 Mths.in AUS sample)	71% (any), 36%-66% (by type of incident)	40% to 83% (by type of incident)	45% (1980) to 14% (1992)
Percentage of Observers of perceived wrongdoing who said they reported it (Whistle-Blowers)	39%	76%	26% (1980) to 48% (1992)
Percentage of Whistle-Blowers who said they perceived negative treatment or retaliation	22%	4% - 8%	17% (1980) to 38 % (1992)

Source : Miceli, M.P. 2013, p438

The meta-research work from Miceli (Miceli, M.P. et al. 2013) showed a rational of how many people perceive wrongdoing, how many of them report this, and how many perceive negative treatment or retaliation. It is important to understand the two sides of Whistle-Blowing, (1) of course none of the big enterprises wants to see any misconduct/wrongdoing published, but (2) also all companies want to eliminate any wrongdoing to avoid any further risks and threats. Whether perceived or real, managers often learn of wrongdoing in their organizations only when an employee blows the whistle about that wrongdoing. Clearly, managers would prefer that the whistleblowing be internal and limited to the confines of the organization rather than publicized through external channels such as the media or law enforcement agencies. Ironically, research shows that the actions managers may take in order to prevent whistleblowers from going external turn out to be precisely the actions that drive them to do so (Near, J.P. 2016). In her recent publication, Near et.al. (Near J.P. et al. 2016) examines four essential definitions on whistle-blowing – see Table 2-8

Table 2-8. Definitions of Different Whistle-Blowing Variations

Topic	Examination Result
Definition of Whistle Blowing	- The disclosure by organization members (former or current) of illegal, immoral, or illegitimate practices under the control of their employers, to persons or organizations that may be able to effect action (Near, J.P. 1985)
The matter of whistle-blowing for managers and organizations	- All whistleblowing cases involve multiple parties, including one or more wrongdoers, whistleblowers, and complaint recipients (e.g., internal or external auditors) who receive the whistleblower's allegation of wrongdoing - The vast majority of whistleblowers start by reporting the wrongdoing internally to the organization, often to their direct manager, and use external channels only if the internal reports prove unsatisfactory - Many whistleblowers find their experiences difficult, although not all suffer retaliation
Target organization – where does whistle blowing happen	- Everywhere – rates of wrongdoing varies over time, industry, job-type, and organization type but no significant tendency for distinction could be made - In most cases, employees first blow the whistle internally – to direct manager - External whistle blowing almost only in cases where internal whistle blowing was unsuccessful or produced reprisal
Most favorite reasons for whistle-blowing	- Stealing of federal/state funds or federal/state property; accepting bribes/kickbacks; use of position for personal benefit, unfair advantage to contractor, and employee abuse of office - Waste of organizational assets, by ineligible people receiving benefits or by a badly managed program - Mismanagement, including management's cover-up of poor performance or false projections of performance - Safety problems, including unsafe or non-compliant products or working conditions - Sexual harassment and illegal discrimination / Violation of law

Source: Author's compilation from Near, J.P. 2016 et al. p109-112

Near et al. (Near, J.P. et al. 2016) proposes therefore the following four behavioral patterns, (1) Listen to employees who allege wrongdoing and carefully investigate the allegations, (2) Make the results of the investigation known to those who were aware of the alleged wrongdoing, whether this is a small group of employees or all employees, (3) Correct the problem if one is found and do so transparently (e.g., a change in policy or firing the wrongdoer), and (4) Treat whistleblowers with respect and care, and ensure that other coworkers and managers do not punish them for their actions.

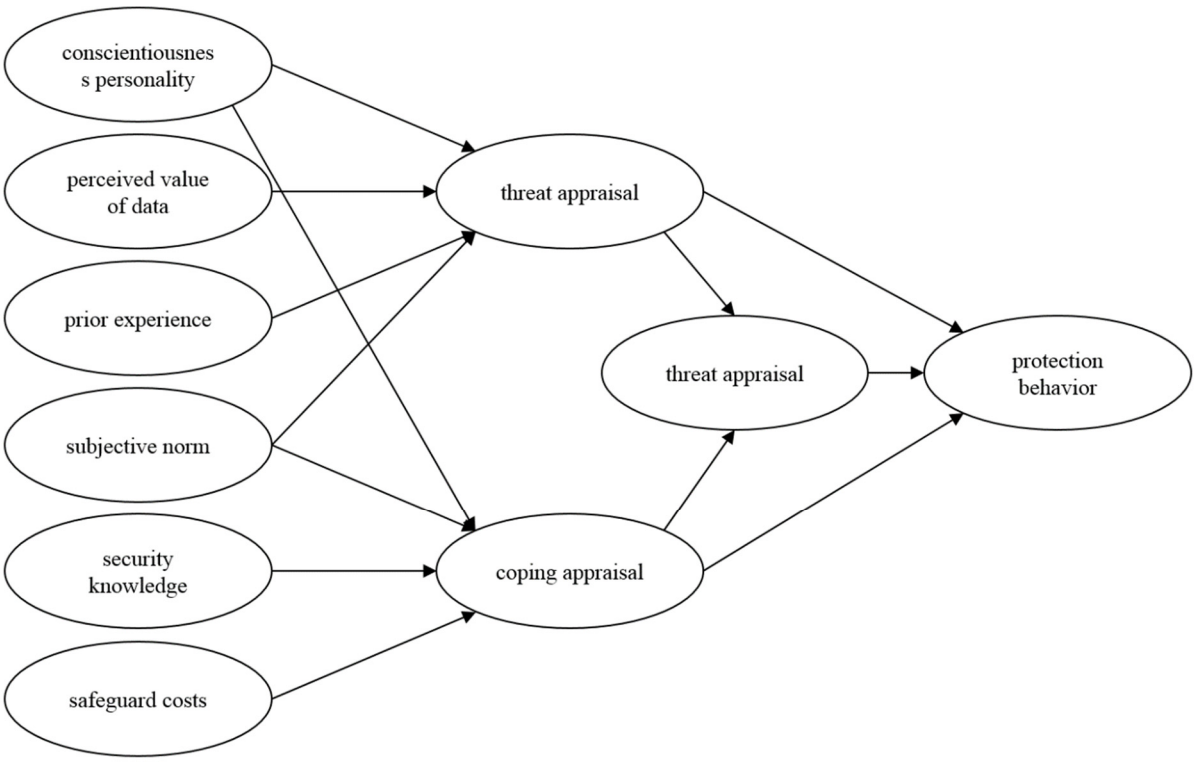
Concluding on the reviewed research of whistle-blowing, it could be summarized in the light of IRM and decision making: (1) With the increasing amount of information/data in companies accessible for employees, the risk of wrong-doing with information increases as like. In consequence this could mean, that a (not researched) threat of in total more whistleblowing cases could occur due to the increasing total number of potential wrong information processed. (2) Due to the increasing number of information and data, a holistic overview and simple correction is not easily possible, whistle-blowers might falsely interpret a longer lasting remediation as inactivity of the company and go public with the disclosure of the case without giving adequate time to resolve. (3) With increasing information there is a (not researched) risk of falsely interpreting information/data as wrongdoing and starting falsely wrong a whistle-blowing initiative – and as consequence of non-believing into potential professional statements, that it is not wrongdoing – going public and disclosing internal information, that leads to dramatic reputational loss.

2.3.3 Computer-/Information-Crime and Employees Awareness

On the other side we see also an increasing rate of computer crime. Computer crime is caused by criminal or irresponsible actions of individuals who are taking advantage of the widespread use and vulnerability of computers, the internet and other networks (Gupta, H. 2011). Another definition could be found by (Halder, D. 2011) computer crime is "*Offences that are committed against individuals or groups of individuals with a criminal motive to intentionally harm the reputation of the victim or cause physical or mental harm to the victim directly or indirectly, using modern telecommunication networks such as Internet (Chat rooms, emails, notice boards and groups) and mobile phone.*" Computer crime is defined by the Association of Information Technology Professionals (AITP) as including the following five factors: (1) the unauthorized use, access, modification, and destruction of hardware, software, and data; (2) the unauthorized release of information; (3) the unauthorized copying of software;

(4) denying an end user access to his or her own hardware, software, and data; and (5) using or conspiring to use a computer or network resource to obtain property illegally. Considering the definitions above, in essence, two categories might also be distinguished: (1) Unintended Computer-/Information-Crime – here there individual is not intentionally following the willing to harm somebody, which could be compared with speeding while driving a car and not recognizing a special speed-limit sign, and (2) the Intentional Computer-/Information-Crime – with the above stated clear intend – comparable with intended speeding on a road while knowing exactly the speed-limit. Both areas seem to become also more and more interesting in its own way in times of strongly increasing information-/data-availability. Besides socio-psychological aspects, which will be discussed later, there is a clear need to limit and control the access to information also technically to avoid both, unintentionally and intentionally data-/information-crime. Sirirat (Sirirat, S. 2015) proposed and proved a model of factoring individual's *protection behavior* as a consequence of (1) *Threat Appraisal* and (2) *Coping Appraisal* – see Figure 2-9

Figure 2-9. Operationalization of Data-*Protection-Behavior* by Sirirat, S. 2015



Source: Sirirat, S.2015, p4

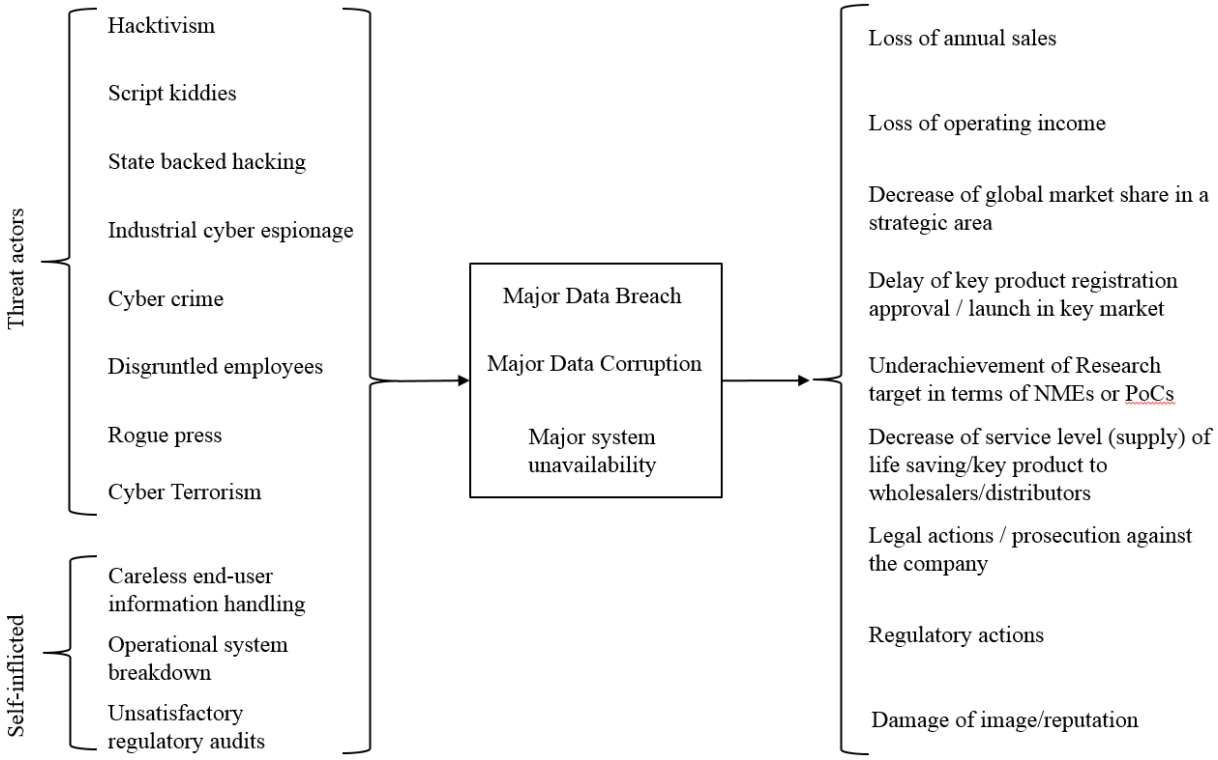
As in all other areas of day to day life, not all computer-/information-crime is inevitable, but concluding out of the proposed model there are strategies, triggers and correlations, that indicate both, technical preparedness and human- /employee-awareness.

Exactly on the area of awareness creation also various researchers recently published their results on the organizational needs and the underlying social-, psychological- and technical reasons. Posey et al (Posey, C. et al. 2016) found out, that insiders may become committed to organizations for various reasons, three major types of organizational commitment have been identified: *affective, continuance*, and *normative* (Meyer, J.P. 1997). Employees with high affective organizational commitment are those who want to continue their organizational membership because the organization's values, goals, and initiatives align with the employees' views (Meyer, J.P. 1997). Employees with high continuance organizational commitment stay with organizations simply because the costs of leaving it are too great and the alternatives provide no greater benefit. Finally, employees with high normative organizational commitment feel obliged to continue as organizational members because they are expected to or believe they have already invested too much time to leave (Meyer, J.P. 1997).

Important for the further operationalization of variables are the proposed operationalized measures introduced and compiled by Posey (Posey, C. et al. 2016. P193): (1) Intrinsic maladaptive rewards, (2) Extrinsic maladaptive rewards, (3) Threat vulnerability, (4) Threat severity, (5) Fear, (6) Response efficacy, (7) Self-efficacy, (8) Response Costs, (9) Protection motivation, (10) Past protection-motivated behaviors, (11) Affective organizational commitment, (12) Job satisfaction, (13) Financial incentives, and (14) Managerial Support to measure the *Protection Motivation* of individuals. Bulgurcu (Bulgurcu, B. 2010) also operationalized measurement items that almost overlap with those from Posey et al (Posey, C. et al. 2016) – one newly introduced is the *normative beliefs* which are seen as important. The positive motivational approach is also poven by Dinev (Dinev, T. 2007) the centrality of technology awareness in the formation of user attitudes toward and behavior surrounding usage of *protective technologies*, in this case, anti-spyware. Additionally, a strong correlation exists between awareness and all of the other *belief constructs* included in Deniv's (Deniv, T. 2007) study. Indeed, higher awareness and conscious knowledge of the need to use protective technologies affect the perception of their usefulness and are related to the perception of ease of use. On the other hand there is the concept of deterrence. D'Arcy (D'Arcy, J. 2009) examined the relationships between security countermeasures, sanction perception, and information security misuses. The results suggest that user awareness of security policies, security education/training/awareness- programs, and computer monitoring each have some deterrent

effect on IS misuse intention, and this effect is achieved indirectly through perceived certainty and/or severity of sanctions. There is also evidence that the influences of sanction perceptions vary based on one's level of morality. From a theoretical perspective, the research from D'Arcy (D'Arcy, J. 2009) introduces an extended version of General Deterrence Theory GDT and confirms its applicability to the IS security domain.

Figure 2-10 Disastrous IT-Events – What and who can cause this



Source: Wulgaert, T. 2005, p4

Wulgaert (Wulgaert, T. 2005) examined a comprehensive overview on the one hand on *threat actors* and *self-infliction*, on the other hand on potential scenarios triggered by those, see therefore Figure 2-10.

In the previous subchapter the technical field of lacks of IT-Security was examined also with examples out of UK, showing dramatic increase of economic impact over last years, and putting this into a general picture by authors (e.g. Wulgaert, T. 2005). In the following subchapter the delimitation between those IT-Security view and the underlying Information Risk Management will be examined.

2.4 Delimitation of IRM in the Context of IT Security

At this stage of the literature evaluation it is important to delimitate the huge amount of science being done in the area of IT-Security from the more generic Information Risk Management discipline. IT-Security sees the IT-Systems in the center of all evaluations, beginning at the purpose, the technical setup, the user-accounts, back-up and recovery etc. as first hand object of evaluation. Whereas *Information Risk Management* focuses on the holistic *End to End life cycle* of the Information it self, regardless in which media type the information is stored, gathered, aggregated, and transmitted at a point in time. The life-cycle view also implicates the criteria of changing classification over time, which also triggers different treatment requirements over the time – it is a highly dynamic view instead of static models/treatment which adds an extra layer of complexity to current models e.g. for employees the awareness, of the awareness of changing classifications during life-cycle, or the varying protection and access layers when Information is stored electronically down to the processes of secure printing of confidential documents and the further handling and physical storage of those printed (and confidential) documents. This dynamic view excludes "out of the box" solutions and pre-definitions as simple rules of engagement or execution. It requires the employees' knowhow of the day to day business – which nobody else outside the applicable department has – to incorporate and instance to common behavior rules. Which requires ultimately the training and awareness of this omnipresent gender of Information Risk Management as such, to encounter employees and departmental heads to define their "own" specific rules applicable for their day to day work – and also loop this information back to IT-department to adapt IT-Sytems / IT-Security standards to the applicable layer.

Concluding out of this specific dynamic gender of IRM a very basic approach of pedagogic modelling is required. As by Burack (Burack, E.H. 1966) proposed the basic model for any business organizations' supervision process are the following 3 steps to be undertaken from a pedagogical view: (1) Give clear instructions, based on the knowledge and applicability for employees, (2) Ensure, that instructions are fully understood, concepts are clear, and the purpose why it has to be done is intellectually accepted (and supervise in case of questions), and (3) Check and measure success to identify risks and gaps to adapt and to ultimately reach the business goal.

In the light of the fundamentals of Decision Making Theories, both the basics of organizational super-visioning and the decision making theories span the fundament for deriving the exogenous variables for Information Risk Management. To recap the aim of Risk Management is to detect, eliminate, avoid or transfer (Auer, M. 2008) Risk and their economic

impact for the company (Cruz, M.G. 2002). Consequently IRM could be derived transitively from both angles measured by (1) the awareness of the IRM itself in the overall enterprise, (2) by identifying those risks (information assets) which will be called further-on "Information Classification", (3) eliminate or avoid risks by setting appropriate protection mechanisms, and (4) control measures success of all three above to be able to adapt and correct where appropriate and being possible to adapt to outside changes like changes in regulations or competition.

2.5 Modelling the Relation between Information Risk Management and Strategic Decision Making Improvement – Structured Equation Model

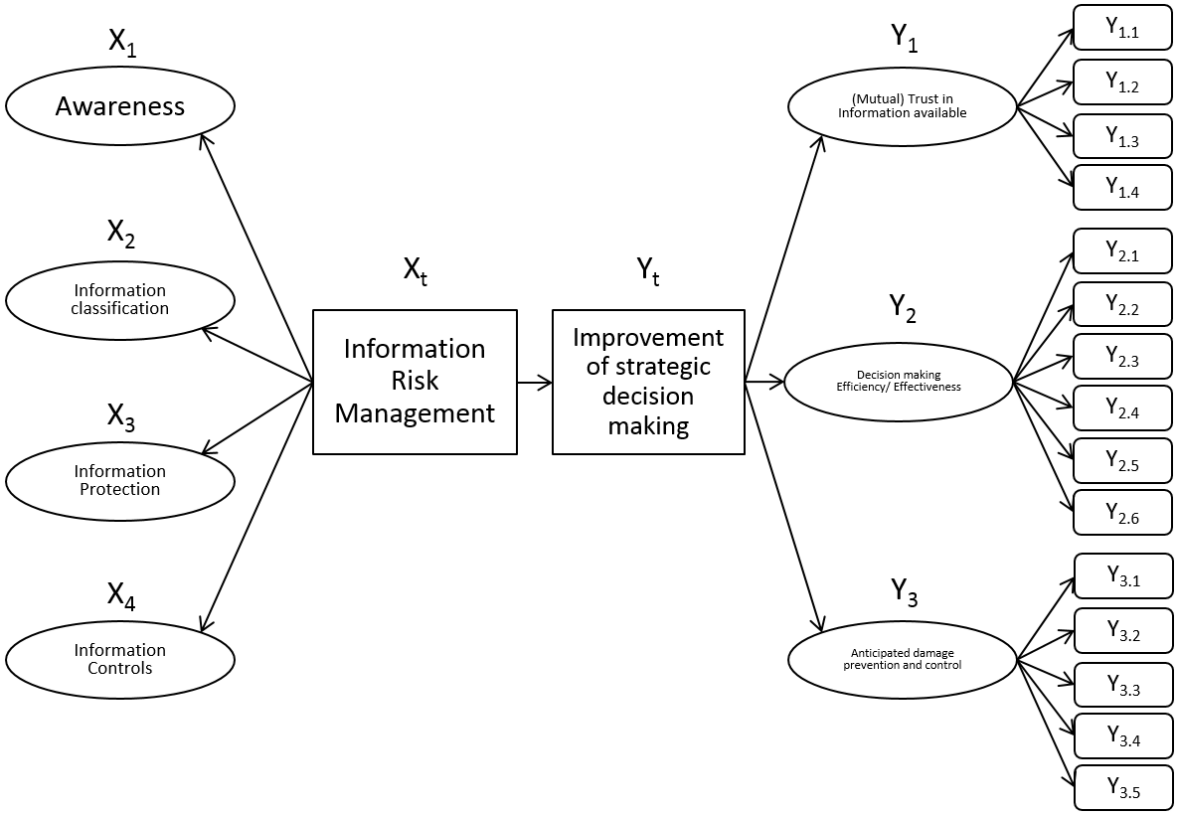
As argued in chapter 2.1 and 2.2 Information Risk Management can be considered as rational consequence on the continuously increasing information amount and availability in newer time and the in parallel upcoming new dimensions of threats caused directly or indirectly – by human factors or by systemic drivers or combination out of both. This includes the variety of individual personal behavioral changes, the communication style in the era of CMC, the triggered changes of professional communication, which swaps significantly also to CMC but also only partly substitutes the common F2F communication and increases the reach geographically and timely. It gives less chance to "call-back", and less personal exposure, as often limited to the essential information – it requires the ability and responsibility of each individual to balance the level of hard facts communicated with personal self-disclosure to keep the adequate / appropriate distance between sender and receiver. On the other hand it also includes the changes necessary in technology as both trigger and consequence. High-speed communication networks, almost infinite storage location in clouds, personal devices/smartphones being 100% online and granting access to all information 24/7 are available. Legislative compliance must be guaranteed at all time regardless. As elaborated in chapter 2.1. This changes open a variety of organizational and technical challenges/risks/threats which are already part of some scientific investigations about IT Security. In consequence for IRM there was no holistic view on variables or operationalized measures for variables found. Therefore the author of this dissertation proposes a holistic meta-view on IRM variables as discussed in 2.3.2. which have to be proven as such separately and which will later also act as statistical baseline.

As previously discussed, the core of any decision making theory in the last decades is the focus on information as base for any further decision. Graf (Graf, C. 2014) summarizes various incomplete-information-models, all conceptually different but similar in essence on how to model calculations for incompleteness probability distributions, or attribute weights in multi

criteria decision problems. Other researchers focus on best-alternative models (Fishburn, P.C. 1965) as a consequence of incompleteness of information. With the before mentioned significantly increased variety of information availability the impact on decision making could be seen as both opportunity to faster, better decision, and also as risk of dependency on the quality and availability of the right information required. As a consequence out of the literature review and the elaboration in chapter 2.1. and chapter 2.2. the author of this dissertations include all three dimensions of decision making improvements into the proposed causal model (1) human, interpersonal factor – trust, (2) hard facts on efficiency and effectiveness, and (3) damage-prevention/-control view.

The measurement items in the causal model – see Figure 2-11 – are developed and derived from other scientific proven sources for the specific proposed causal-relation – it might not necessarily be generalized for other causal relations of decision making improvements. The specific use of each measurement will be elaborated late in this chapter.

Figure 2-11. Postulated Causal Model for Information Risk Management Correlations to Strategic Decision Making



$X_{1..4}$ = Latent exogenous variables

$Y_{1..3}$ = Latent endogenous variables

$Y_{1.1..3.5}$ = Measurement indicator on Latent endogenous variables

Source: Author's own construction

The proposed causal-model does not necessarily allow to test in a common way, as both sides require deeper understanding of the meaning and correlation within the topic. In the following first the special situation, implications, and scientific instruments and methods are discussed to adequately cover this special requirements. Further on the model-testing is examined with the focus on the selection and measure of the operationalized measurement items. After proving the scientific validity of the operationalized items of the chosen variables, the main hypothesizes are generated.

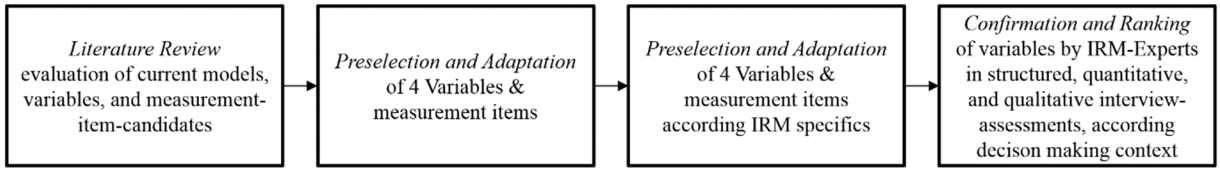
2.6 Determination of Variables

The operationalized measurement items were develop by the author of this dissertation based on the initial literature research. They consider previous scholars models in particular, but also meta-models of social-science.

Determination of Latent Exogenous Variables

Especially the development of the latent exogenous variables need deeper investigation, as there is no current measurement model for *Information Risk Management* at all / holistically developed yet. The overall approach to determine the latent exogenous variables consists out of a four-step-approach – see Figure 2-12.

Figure 2-12. Four-Step-Process: Determining Latent Exogenous Variables



Source: Author's compilation

As described in chapter 0 by Burack (Burack, E.H. 1966) the basic-/ meta- model for any organizational supervision process are the following 3 steps to be undertaken from a pedagogical view: (1) Give clear instructions, based on the knowledge and applicability for employees, (2) Ensure, that instructions are fully understood, concepts are clear, and the purpose why it has to be done is intellectually accepted (and supervise in case of questions), and (3) Check and measure success to identify risks and gaps to adapt and to ultimately reach

the organizational goal. Transferring this approach on the topic on IRM, the following 3 Variables could be examined and further on measured:

- *Information Classification*: The need for clear rules and governance on how information is classified and what his means for the company as baseline for any further decisions, it has to be clearly defined and transparent to everybody

- *Information Protection*: The need on protecting the information on an adequate level based on the Information Classification, in all instances (paper based, electronically stored, verbally communicated etc.) – clearly defined and transparent rules have to be implemented

- *Information Controls*: The need of a formalized control-framework to oversee and check the level of fulfillment and herewith the overall risk-situation, to enable corrective and preventive actions, and where needed sanctions.

As discussed in chapter 2.3.2 there is a strong need for ongoing and continuous involvement of everybody to apply to specific needs in the direct work surrounding and adapt changes accordingly based on an own broad knowledge – this represents the essential difference – *active participation role* – of everybody in contrast to a strict order taking role in the current observed models. Here the author postulates also a dynamics and bi-directional demand-management. IRM Experts my span the frame of the meta-concept, but will not be able to consider all implications in a special department, because these are based on the organizational setup, formal and informal rules, communication style internally and externally and all this in a highly volatile and dynamic ongoing change. In essence, the IRM Concept rules of a dedicated group or department are as individual, as the communication/organization-needs are. Concluding this discussion that the individuals in the groups need to have a high *IRM-Awareness* level – which is hereby the 4th identified latent exogenous variable to measure the level of IRM (-readiness) in companies.

As mentioned previously, there is no proven scientific model with operationalization / measurement items proposed yet. Consequently the measurement characterization items identified by the author of this dissertation need to be proven separately. First a transfer from common models out of the literature review was conducted. To prove, an expert interview was conducted to identify and rank the measurement items and consequently the variables themselves in the light of decision making improvement (chosen latent endogenous variables were be disclosed, measurement items not). Overall 41 measurement criteria were identified which characterize (load) the 4 chosen variables. In the following list – see Table 2-9 – the measurement area and the acceptance level. The acceptance level is calculated as the normalized mathematic mean out of 10 results from a Likert-5 scale.

Table 2-9. Summary of Measurement Items of Latent Exogenous Variables

Criteria – recursively derived from other scholars scientific investigation fields– adapted to IRM-topic by author	Awareness	Information Classification	Information Protecton	Information Controls	Mean (normalized)	Initial Literature Source, from which the IRM adapted measruement criteria is derived from (by author)
To be transparent to the executive board, a register of ALL CRITICAL information assets and all related risks should be in place and up to date at any time	X	X			0,82	Ashok, P. 2015; Gatzlaff, K. 2010; Banker, M. 2015; Garg, A. 2003
Because of the rules and guidelines are formally in place and could be read at any time, it is important to actively train employees affected by the business controls	X	X			0,96	Spears, J. 2010; I SO /IEC 2000; Furnell, S.2008
An EXTERNAL information crisis would cause a significant negative impact to the company (e.g. Information Breach, stolen intellectual property)	X	X			0,92	Chen, Y. 2001; Xiang, Y.2013
Regarding "Information Risk Management" it is important to have a "crises Team" implemented – being able to respond immediately to any threats	X		X	X	0,84	Fiordelisi, F. 2011; Kalhoff, A. 2004
It is important to distinguish between information, that could be stored on public storage locations and information that should be stored on restricted storage locations	X		X		0,92	Bowling, S. 2005
Formal "business controls" need to be agreed and sponsored by the executive board of the company to ensure that they are taken serious and are executed	X			X	0,94	Kaplan,A. 2015 Auer, M. 2008
A lack of transparency in particular on "Information Risks" on executive management level could be a reason for not fully implemented "Information Risk Management" Awareness / Preparedness	X			X	0,86	Kalan, A. 2015; Kaplan, A. 2012; Iyer, G. 2000
To ensure, that the controls are executed in an appropriate way, this should be part of the "role description" of the employees affected	X			X	0,78	Wiemann, J.M.1989; Hargie, O. 1986
To ensure better awareness /preparedness in "Information Risk Management" within companies, it is important to have a formally implemented communication and decision map (defined communication streams and mandates for decision making in crises)	X			X	0,9	Kruglanski, A. 1996; Auer, M. 2008
"Time/Costs" constraints could be a reason for not fully implemented "Information Risk Management" Awareness / Preparedness	X			X	0,88	Kaplan, A. 2012
The value of risk analysis results increases with the company affiliation of the employee	X				0,68	Short, J. 1976; Maxwell, G.M. 1985
An INTERNAL information crisis is less negative impacting the company than an EXTERNAL information crisis	X				0,74	Marshall, G.W. 2007
An INTERNAL information crisis would cause a significant negative impact to the company (e.g. loss of relevant information, non-integer information etc.)	X				0,76	Chen, Y. 2001; Xiang, Y.2013
To ensure better awareness /preparedness in "Information Risk Management" within companies, it is important to do good "Information Security and/or Management" awareness programs to all associates	X				0,9	Ashok, P. 2015; Gatzlaff, K. 2010; Banker, M. 2015; Garg, A. 2003
"New-joiners" should be trained automatically if applicable for their new role	X				0,88	Marshall, G.W. 2007
Smaller groups are more effective in risk assessment then bigger groups	X				0,8	Boos, M, 2000
To ensure better awareness /preparedness in "Information Risk Management" within companies, it is important to have a formal "Learning and Training System" in place	X				0,78	Marshall, G.W. 2007
Regarding "Information Risk Management" it is important to ensure, that the executive board is playing "a significant role" in this (general management buy in – e.g. as part of the crises etc.)	X				0,88	Chen, Y. 2001; Xiang, Y.2013
The "NSA Affair" (disclosure of many secrets by Mr. Snowden in Summer 2013) proved that "Information Risks" are not only relevant for Military and Government	X				0,98	PwC 2015; Gatzlaff, K.2010
However classified information should be only accessible by limited number of people		X	X		0,9	Campbell, K. 2003
Also for critical applications it is possible to outsource this to 3rd party vendors – unauthorized information theft is covered/avoided by contractual terms and conditions		X	X		0,64	Campbell, K. 2003; Ashok, P.2015
It is important that these professionals do have a good inside in the local organization and processes and are not only "headquarters functions"		X			0,94	Campbell, K. 2003; Ashok, P.2015
It is good to involve these professionals in the classification process with a formal approval of all classifications to also ensure the "mandatory involvement"		X			0,68	Campbell, K. 2003; Ashok, P.2015; Diakopoulos, 2015

A consistent and sustainable "information classification" scheme is KEY to identify Information related risks at all (e.g. Confidentiality/Integrity/Availability/Privacy/Legal requirements)		X			0,88	Campbell, K. 2003; Ashok, P.2015; Diakopoulos, 2015
In general, there is a strong need to have an overview on enterprise level on all classified information asset types (the types only, not the instanced assets themselves!)		X			0,8	Ashok, P.2015; Diakopoulos, 2015
There is a high need to have a number of professional people (e.g. Information Risk Managers) helping the information asset owners with the classifications to ensure an enterprise wide well balanced and calibrated classification over all asset types		X			0,86	Ashok, P.2015; Diakopoulos, 2015
It is important to distinguish in particular between this different dimensions (e.g. Confidentiality/Integrity/Availability/Privacy/Legal requirements)		X			0,8	Utz, S. 2001; Bt. Fakhiri, N. 2015; Spears, J. 2008
It is important to have exact definitions on how to classify each of this dimensions (e.g. for confidentiality: public use, internal use, confidential, strictly confidential)		X			0,86	ISO/IEC 2000; Utz, S. 2001; Bt. Fakhiri, N. 2015; Spears, J. 2008
The "information asset owner" should be the person to define the group of people which should have access to the information			X	X	0,78	Cruz, M.G. 2002; Gazert, N. 2016; Kaplan, A. 2012
Formal "business controls" (like SOX, etc.) help to manage "Information Risk Management" activities in an appropriate way in big enterprises			X	X	0,76	Kaplan, A. 2012; Fiordelisi, F. 2011
It is essential for companies, that IT department provides an up to date IT security back-bone (anti-virus, Intrusion detection, etc.)			X		0,96	Diakopoulos, N. 2015; Campbell, K. 2003
For mobile devices there is NO need to encrypt the hard drive because all employees are trained and reliable in handling critical information (to avoid unauthorised information access in case of theft)			X		0,9	Diakopoulos, N. 2015;
Employees should not have "local administrative" accounts on their PCs			X		0,88	Sirirat, S. 2015; Diakopoulos, N. 2015; Campbell, K. 2003
If office doors are not locked in big companies, it is important NOT to leave classified information on the work desks			X		0,96	Posey, C. 2016; Meyer, J.P. 1997
To avoid unauthorised access to PCs, it is important to lock the PCs logically (Screensaver with password) and physically (fix the PC to the desk with e.g. a steel cable)			X		0,88	Diakopoulos, N. 2015
IT department should implement an automated "backup" for specific local (on local PC) folders to avoid data-loss in case of hardware-crashes etc.			X		0,82	Banker, M. 2016
Formal rules and guidelines (Standard Operating Procedures and e.g. "how-to" guidelines) need to be in place to ensure that "business controls" are understood and executed in the correct way				X	0,82	Kaplan, A. 2012
A review on the fulfillment-level could also be done by the people being responsible for the execution				X	0,68	Feldman, M. 2015; Near, J.P.2016
A reason for not fully implemented "Information Risk Management" Awareness / Preparedness could be that there are no significant risks at all (as an outcome of a formal evaluation within the company)				X	0,74	Conceptually inspired by Goedel, K. 1931
A good "tracking system" on the fulfillment level of the "business controls" should be in place				X	0,86	Elbashir, M. 2011

Source: Author's compilation based on the IRM-Expert-Interviews

An individual rating / ranking per measurement criteria could be statistically done, based on the 10 answers given in the interviews, but was not proposed / considered due to the fact of the statistical meaninglessness, only a number of 10 IRM experts could be interviewed which does not provide the statistical significant base for a quantitative-only-method. This limitation was considered already in the conceptual setup-phase of the scientific modeling. Resulting, the normalized mean was calculated (standard-distribution) serving later as *EMPRIRC-NORM* – the results are reflected in Table 2-10. All scientific necessary boundary conditions on the method of *Likert-Scale-Questionnaires* are examine in Chapter 3 of this dissertation work and are followed.

Table 2-10 Latent Exogenous Variables – Median / Empiric Norm

Exogennous Variables	Mean (in Likert-5-scale)	Mean: inverted and normlized
Awareness	1,731578947	0,817105263
Information Classification	1,808333333	0,797916667
Information Protection	1,733333333	0,816666667
Controls Framework	2,030769231	0,742307692

Source: Author's calculation based on structured IRM Expert Interviews

Concluding on the examination of latent exogenous variables it is essentially to focus on the overall five-method mix (methodically examined in detail in chapter 3). Due to the limitations (knowledge of specific technical terms and implications in IRM) of most average Business-Professionals the aim is NOT to disclose the operationalized IRM measurement criteria to them directly. Even if the number of later asked Business Experts will allow theoretically a scientific valid statistical calculation, there is a high risk that the results would be incorrect qualitatively, as meaning and definitions are not clearly understood and therefore any answers could be differently understood due to individual/human/knowledge limitations. To eliminate this risk, the technical terms and meanings must be introduced separately, to have a common and balanced understanding on the four main variables and their meaning, more than on ranking each individual measurement criteria of the variables itself. In the later work, there are no measures / calculations pointing to the operationalized measurement criteria of the latent exogenous variables – it is only used for qualitative explanation to business experts – therefore the proof by the IRM experts was essentially.

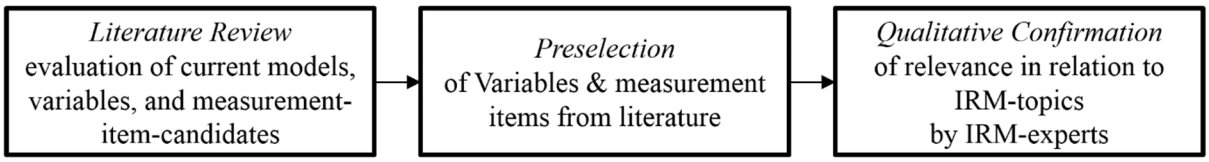
Implicitly with proving and ranking the measurement criteria of the four variables, the significance and individual characteristics are also confirmed as well as their significant relevance for characterizing Information Risk Management as such. Secondly, in a qualitative approach, the chosen endogenous variables are also confirmed to be seen as a well-fitting selection mirroring decision-making-improvements in the light of IRM-characteristics (qualitative proof of the proposed latent-endogenous-variable candidates).

It could be summarized, that all chosen variables describing Information-Risk-Management are confirmed quantitatively, the empiric-norm is calculated Also it could be summarized, that all chosen measurements / operationalization of the variables describing Information-Risk-Management transitively and are confirmed qualitatively (transitively)

Determination of Latent Endogenous Variables

In the area of decision making many models, variables, and measurement items were researched and proven by numerous scholars over the last hundred years. In this section the focus was put on the explanatory power of the chosen variables in a first step. In the second step, the measurement-items are taken from literature review one-by-one. Only the context was adapted, not the content and meaning (other than in the determination of the latent exogenous variables phase). Formally the approach for determining the latent endogenous variables consists out three steps – see Figure 2-13.

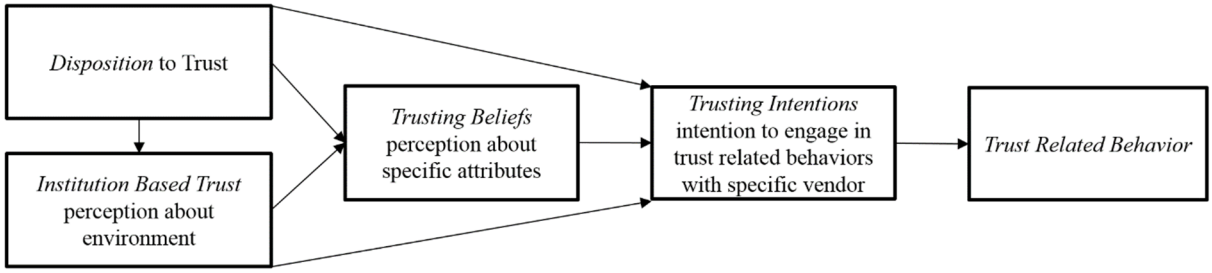
Figure 2-13. Three Step Process: Determining Latent Endogenous Variables



Source: Author's compilation

As proposed by McKnight (Mc Knight, D.H. 2002) *trust* is an integral part of any customer relation where as it has traditionally been difficult to define and measure (Rousseau, D.M. 1998). But *trust* helps to overcome perceptions of uncertainty and risk and engage in trust related behaviors. Initially *trust* (McKnight, D.H. 2002) refers to an unfamiliar trustee, a relationship, in which the actors do have not yet have credible, meaningful information about. Credible information is gleaned after partners have interacted to for some time (Bigley, G.A. 1998). In other words – *trust* even matters and could be seen as one of the improvement factors for decision making in times where the information-completeness-level is comparably low in relation to the strongly increasing mass of information available around the world. Trust acts as a predominant criteria, before rational any criteria (Rowthorn, R. 2008). Thus *trust* into the partner and implicitly into the information given is essential for improving own decision making (Mathews, M.2013). McKnight (McKnight D.H. 2002) examines a principal algorithm to improve *trust* in professional relationships – see Figure 2-14

Figure 2-14. Trust Model – Overview



Source: McKnight; D.H. 2002 p337

McKnight et al (McKnight, D.H. et al. 2002) conducted a meta-literature study to operationalize and prove the hierarchy and relevance of fifteen measurement-criteria for *trust.* The results are taken over to this dissertation work as proven. The clustering table – see Table 2-11. Clustering Types of Trust – of McKnight is the base for the operationalization of measuring items for the value *trust.* The aggregated four categories (1) *Competence*, (2) *Benevolence*, (3) *Integrity*, and (4) *Predictability* where chosen. As there exists no analysis of the qualitative relations (weight-factors / initial load factors) the four factors are ranked as equal. The pure number of citation/ scientific works written by other scholars does give a basic indicator of the predicted level of importance, on the other hand, the 32 investigated sources of McKnight (McKnight, D.H. 2002) were explicitly not intended to quantitatively represent an empiric norm in general. Especially for the use in this dissertation work, it is exactly the goal to see the different correlations as a result in the relation of IRM and Decision Making Improvement factorization.

Table 2-11. Clustering Types of Trust by Literature Research

	Competence			Benevolence			Integrity					Predictability			
Article / Book	Competence	Expertness	Dynamism	Goddwill	Benevolence	Responsiveness	Integrity	Morality	Credability	Reliability	Dependability	Predictability	Openness	Carefulness	Attracton
Anderson and Narus 1990	X											X			
Baier 1986	X			X											
Barber 1983	X							X							
Blakeney 1986		X	X	X			X						X	X	
Bonoma 1976					X				X	X	X				
Cummings and Bromiley 1996					X		X								
Dunn 1988				X											
Gabarro 1978	X			X			X					X	X	X	
Gaines 1980					X					X					
Giffin 1967		X	X	X						X	X	X			X
Heimovics 1984		X	X		X					X					
Holmes 1991					X	X									

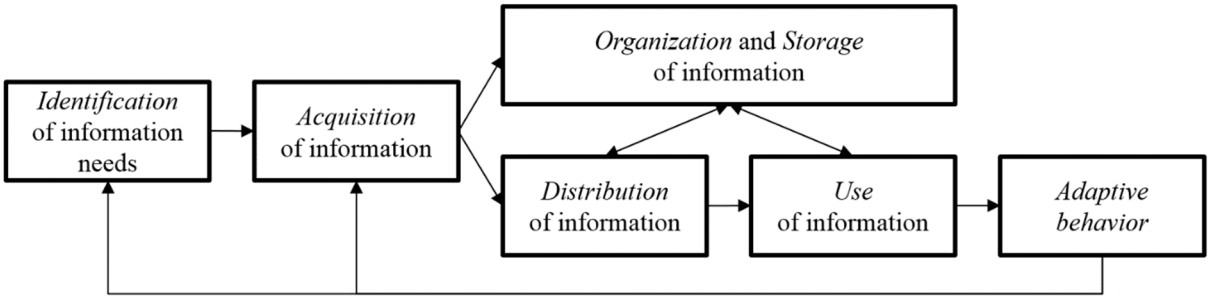
Husted 1990								x							
Johnson-George & Swap 1982					x	x	x			x	x				
Kasperson et al. 1992	x				x							x			
Kee & Knox 1970	x				x										
Koller 1988	x				x		x			x					
Krackhardt & Stern 1988				x											
Lindskold 1978					x					x					
McGregor 1967					x										
McLain & Hackmann 1995					x					x					
Mishra 1996	x				x					x			x		
Rempel et al. 1985					x	x	x				x	x			
Ring & Van de Ven 1994				x				x							
Sato 1988					x		x								
Sitkin & Roth 1993	x														
Solomon 1960					x										
Thorslund 1976	x			x				x							
Worchel 1976				x				x							
Yamagashi & Yamagashi 1994				x											
Zaheer & Venkatraman 1993							x	x							
Zaltman & Moorman 1988						x									
Totals	11	3	3	10	16	4	8	6	1	7	5	6	3	2	1
% of Total (86)	13	3	3	12	19	5	9	7	1	8	6	7	4	2	1

Source: McNight, D.H. 2002, p338

With this, the human component of decision making improvement factors is covered and a correlation to the human factors elaborated in IRM-topic could be proven or denied by the later testing of the model. Finally it is important elaborate the relation-characteristics between:

It is important to mention, that the relation between the endogenous variables and their proposed measurements the relation is a positive continuous, but not necessarily linear relation following the expression of "the more …the more…" without a maximum or a turn-point. As a second latent-endogenous-variable for characterizing decision-making-improvement, *Decision Making Effectiveness & Efficiency* was chosen candidate. In economics, improvement of efficiency and effectiveness is a reflexive synonym for economic improvement at all (Kahneman, D. 1974) based on pure rationality (Simon, A.H. 1957).

Figure 2-15. Information Management Cycle Model



Source: Laihonen, H. 2014 p115 – adapted by Choo, C.W. 2002

Various scholars provided different models for measuring decision making effectiveness / efficiency. Choo (Choo, C.W. 2002) introduced a cyclic model – see Figure 2-15 – for the information management cycle. Reflecting each step of Choo's model on the question of effectiveness/efficiency it provides the initial set of potential measurement item candidates.

Table 2-12 Clustering Types of Decision Making Effectiveness & Efficiency

Article / Book	Information as inhouse value – information as intelectual property	Temporal effeiciency accuracy & integrity of information	Readyness preparedness for growht in using multiple sources	Need to know principle – socio- economic efficiency	Information as business / good sold on Information Markets	Personal efficiency / effectiveness in information Handling
Admati, A.R. 1987	X				X	
Agor, C.F. 1986		X	X			X
Ashforth, B.E. 1995	X	X	X			
Ashkanasy, M.M. 2011	X	X				X
Barnes, D. 2006				X	X	
Barsade, S.G. 2003					X	
Bier, V.M. 2013	X		X			X
Boschetti, F. 2011	X		X			X
Caughorn, J.J. 2011			X			X
Chen. Y. 2001	X			X	X	
Christen, M. 2005	X	X			X	
Esomar, 2005						
Gong, Y. 2011	X	X	X	X		X
Graf, Ch. 2014		X	X			X
Ha, A.Y. 2008	X			X	X	
Heerkens, H.2006	X	X		X		X
Hörner, J. 2009	X			X	X	
Howard, R. 2008	X		X			X
INSAG, 2011			X			
Jensen, F.O. 1991	X				X	
Jonassen, D.H. 1997	X	X		X		X
Jyer, G. 2000	X			X	X	
Kahle, D. 2009	X			X	X	
Kahneman, D. 1974	X					X
Lee, Y. 2014		X				
March, G.J. 2006	X					
Mumford, M. 2008			X	X	X	
Niederhuber, J. 2014		X	X			
O'Reilly, C.A. 1980	X	X				X
Price, R. 2008		X		X		X
Price, R. 2011	X	X	X			X
Simon, A. H. 1973	X	X	X			
Sinclair, M .2002	X	X				X
Tee, S.W. 2007	X	X		X		X
Thompson, K.M. 2003	X		X			X
Villas Boas, M.J. 1994					X	X
Vives, X. 1999	X				X	
Voss, J.F. 2005						
Walker, W.E. 2003		X	X			
Weick, K. 2005	X	X	X			X
Winkler, R.I. 1981	X				X	
Xiang, Yi, 2013	X			X	X	
Totals	28	18	16	13	15	19
% of Total (109)	26%	17%	15%	12%	14%	17%

Source: Author's compilation of own Literature Review Results

Inline with Choo's (Choo, C.W. 2002) and Laihonen's (Laihonen, H. & Sillanpää, V. 2014) model for the generic information management cycle, following 5 principals proposed by Hazy (Hazy, J.K. 2006) with the following 5 measurement items for management effectiveness: (1) Rate of resource flow through the system, levels of resources available, (2) Rate of aggregation of slack or excess resource, (3) *capabilities to gain and use resources at appropriate rates*, (4) Self-organizing /leadership activity and its impact – resource allocation to exploit current capabilities and explore, and (5) Matching of internal capabilities to environment. The following measurement items for effectiveness and efficiency are holistically taken and proven from literature-review results, 42 Articles/Books were reviewed, the results see in Table 2-12

The following six measurement items for Efficiency & Effectiveness Improvement resulting out of the literature review: (1) Level of Willingness to see "Information" as an intellectual property, (2) Level of temporal efficiency (accuracy and integrity of information), (3) Readiness for increasing use of new and multiple communication sources / channels, (4) Level of economic efficiency ("need to know"), (5) Level of willingness to treat "Information" as valuable good sold / information market, and (6) Level of individual, personal efficiency and effectiveness. Finally it is also important to elaborate the relations-characteristics between.

It is important to mention, that the relation between the endogenous variables and their proposed measurements the relation is a positive continuous, but not necessarily linear relation following the expression of "the more …the more…" without a maximum or a turn-point.

The measurement items are not weighted (loaded) individually as there is no predicate scientific justification. Even if 109 citations and an indication of usage within the 42 reviewed articles would give statistically a base for ranking, the significance of the result might be questioned. The author of this dissertation does not claim a representative literature result which would quantitatively prove the ranking (load), the literature review has to be interpreted as qualitative review. An equal distribution is assumed indicating that each measurement has the same weight-factor (load)

As a third latent endogenous variable a typical measurement from the area of strategic decision making is chosen and characterized as "what if…" or *anticipated damage prevention and damage control*. Often also *Risk Aversion Opportunity Costs* are seen as measurement index for the cost/impact of risk materialization (Disatnik, D. et al. 2015). In the context of decision making the costs of decisions vs. the expected advantage is key element for any decision making theory. But is seems also applicable to question the potentials of improvement in this area of "avoidance of wrongdoing" reflecting back to the topic of IRM. For measuring

the *anticipated damage prevention and damage control* also a broad literature research was conducted. Cornish and Clarke (Cornish, D.B. & Clarke, R.V. 2003) proposed 5 key dimensions with each 5 measurement items see Table 2-13

Table 2-13 Damage Prevention and Control Techniques

Increase Effort	Increase Risk	Reduce Reward	Reduce Provocation	Remove Excues
target harden	extend guardship	conceal targets	reduce frustration and stress	set rules
control access	assist natural surveillance	remove targets	avoid disputes	post instructions
screen entry/exit	reduce anonymity	identify property	reduce emotional arrousal	alert conscience
deflect offenders	utilize place managers	disrupt markets	neutralize peer pressure	assist compliance
control tools	strengthen fromal survilance	deny benefits	discourage imitation	control interfering variables

Source: Cornish, D.B. & Clarke R.V. 2003 p90

Discussion of the results and transfer to decision making: For strategic-decision-making-improvement factors, one examined key element is “Information”. The better the information base, the better the decision making (Kahneman, D. 1974). To prevent any damages on the information used during decision making process, the five key elements of Cornish (Cornish, D.B. 2003) are transferred as the following:

1. *Increase Effort (for offenders)*: could be interpreted in the light of information availability and reliability, that the level of readiness of information (access) control should be increased to prohibit intentionally or unintentionally changes, while screening / super-visioning the entry points – what is the information source, is it reliable
2. *Increase Risks (for offenders)*: could be interpreted as putting the bar actively as high as possible in the protection of information and using “natural” given supportive aspects – in other words: actively decrease given weaknesses of the surrounding – the current information processes as stated in Figure 2-15 at all sub-steps. The measurement criteria therefore is “The level of actively decreasing (information) risks”
3. *Reduce Rewards (for offenders – internal as well as external)*: could be interpreted as not giving any target of value to take effort or risk of theft. For Information in the context of decision making it means to handle all information well protected with care without sharing with anybody. The measurement criteria therefore is the “Level of readiness to reduce the rewards of theft / disclosure”
4. *Reduce Provocations (for offenders)*: In the whole process of decision making, mostly human factors are also playing a big part as examined in chapter 2.1.2. Also an important

part of decision making are the potential personal drivers for individuals participating in the decision making process. Peer-Pressure, frustration and stress, unnecessary disputes, and emotional arousal are seriously intervening/interfering. It could be derived, that the better those characteristics could be avoided / controlled in any decision making process, it would positively contribute to the decision making process. Therefore the measurement item could be formed as "the level of readiness to reduce provocations (frustration, stress, etc.)" especially under the conditions of less F2F interactions (Berry, G. 2006)

5. *Remove excuses (for offenders – inside and outside)*: Also here the human factors discussed in chapter 2.1.2 kick in. If there are no alternative rationales for wrongdoing in decision making – at least those which are predictable and avoidable – a whole series of wrongdoing could be avoided based on a lack of alignment and information e.g. misconduct. Therefore, to also eliminate the interfering abilities of humans it was mentioned by Cornish (Cornish, D.B. 2003) to put effort into setting clear rules of engagement, build an alert conscience, support in achieving compliance goals, and oversee and control interfering variables to optimize decision making processes. Therefore the measurement item could be formed as "the level of readiness to remove excuses (with clear rules, alerting conscience etc.)" esp. under the limitations of globalization (Thomas, G.F. 2007)

Finally it is also important to elaborate the relation-characteristics which are adapted intentionally by the author while adapting originally reciprocal relations by rephrasing into steady relations – for the third variable of *anticipated damage prevention and control* within *decision-making-improvement is defined as a positive continuous relation,* but not necessarily linear relation following the expression of "the more …the more…" without a maximum or a turn-point

The measurement items are not weighted (loaded) individually as there is no predicate scientific justification. An equal distribution is assumed indicating that each measurement has the same weight-factor (load)

Finally it might be summarized, by design all 3 latent endogenous variables and their applicable measurement items are chosen/adapted to be in a positive steady relation having no specific weight-factors (load) as examined earlier – all are weighted with same equal factor

After the deduction and conception of the latent variables and their respective indicators based on existing theory, the underlying assumptions of the causal model are explained. The theses postulated by the author of this dissertation are decelerate statements about the relationships between the latent exogenous (independent) and latent endogenous (dependent) variables in the causal model.

The main hypothesis to defend with the norms of reciprocity that govern decision making processes in the times of fast changing communication channels, the implications for humans and organizational structures, and continuously increasing information on the markets and business organizations:

Main Hypothesis H_0: There is no difference in perception of Information Risk Management between IRM Professionals and Mid-Level-Managers/ Business Professionals of the Correlation between *IRM* and *Improvement of Strategic Decision Making*

In addition to the main hypothesis, five further theses are deduced from the discussed theoretical framework and developed causal model:

Hypothesis H_{01}: Improving Information-Risk-Management at all in Business Organizations will significantly improve their Strategic Decision Making results

Hypothesis H_{02}: The higher the *IRM-Awareness* in companies, the higher the level of decision making improvements with respect to the information used for strategic decision makings

Hypothesis H_{03}: The higher the *IRM-Information-Classification-Level* in companies is developed, the higher the level of decision making improvements with respect to the information used for strategic decision makings

Hypothesis H_{04}: he higher the *IRM-Information-Protection-Level* in companies is developed, the higher the level of decision making improvements with respect to the information used for strategic decision makings

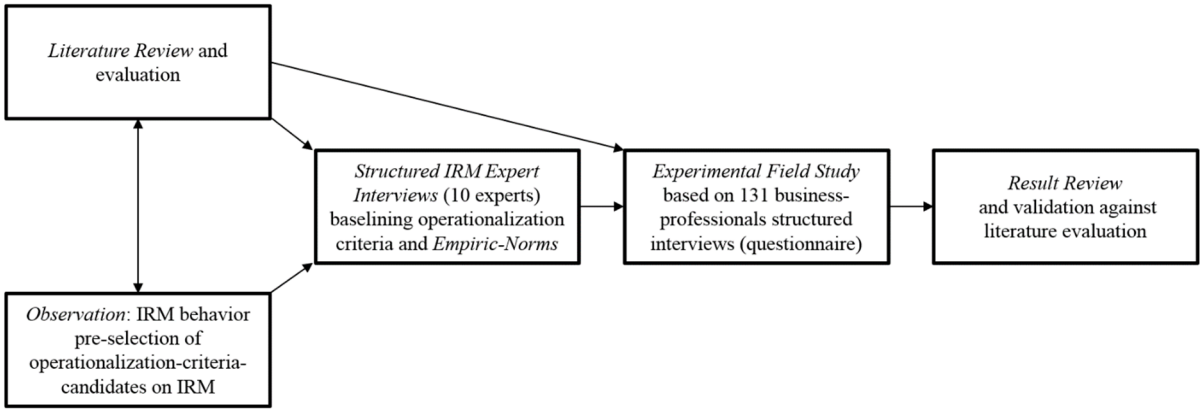
Hypothesis H_{05}: The higher the *IRM-Information-Controls-Level* in companies is developed, the higher the level of decision making improvements with respect to the information used for strategic decision makings

All variables have been operationalized by indicators, i.e. measurement variables, to allow for testing the predictions against experience. The postulated causal model and theses build the framework for the empirical study and can be considered as an organizing framework for the determination of the empirical design and data collection procedures.

3 SCIENTIFIC-FIVE-METHOD-MIX OF INQUIRY FOR TESTING THE RELATIONSHIP BETWEEN INFORMATION RISK MANAGEMENT AND DECISION MAKING IMPROVEMENT FACTORS

The overall scientific approach of testing the hypothesis consists out of a combination of a scientific-method-mix of five different basic methods – see Figure 3-1.

Figure 3-1. Five-Method-Mix – Scientific Approach



Review variety of potential impacting scientific fields, socio-, psycho-, economical-, statistical fields

Observation of current standards in business organization, common practices, threats, developments, trends.

Check obvious correlation between observations and scientific literature

Identify potential discrepancies between scientific theory and business organization practice

Identify requirements on scientific methodology and approach

Collect operationalization criteria/items for modelling exogenous- and endogenous variable-measurement items

Discuss / confirm observations and literature research findings

confirm basic need of investigation in topic

confirm chosen exogenous variables for causal model

rank exogenous variables/ operationalization items for *IRM side* of model

generate *Empiric Norm* for exogenous variables for later testing

With case-study introduce basic definitions, tools, approaches and meanings of IRM

Recap basics of decision-making theories

delimitations from IT-Security

question *all concatenations* of exogenous- and endogenous variables measurement items

reach statistical significance level of returned questionnaires

Test results against the *statistical norms* from previous expert interviews

Prove / reject main theses

Interpret results

Critical contextualize results with current state of research

Identify confirmations and potential further correlations

Identify objections / restrictions / limitations to existing models & theories

Identify practical implications and suggestions for business organization

Source: Author's compilation

In empirical research there is a variety of qualitative and quantitative investigation methods. In the following sub-chapter the used methods are described, the limitations outlined,

and the applicability for this dissertation work examined – for detailed overview of the followed methods of this dissertation see Figure 3-1.

3.1 Observation-Method (of cause-effect relations)

Feger (Feger, H.1985) and also Greve (Greve, W.1997) contributed essentially in the formal method development of scientific "Observation". In general, the observation-method is based on pre-defined Hypothesis, could be used to validate test results, needs to objective and recorded. Weaknesses are: the individual anticipation of behavior, the risk of potential misinterpretation of behavior in different milieus.

Predicate modelling rules for the Observation Method are (1) Limitation to well selected indicators, (2) Abstraction: aggregation of the observed situation and reduction to essential cause-effect relations, and (3) Integration of results into the theoretical form. The practical ways of Observations are: (1) Participating and non-participating observation, (2) Field and labor observations, (3) pen and undisclosed observations, (4) Self- and the observation of others, (5) Standardized, semi-standardized, and non-standardized observations, and (6) Direct and indirect observations.

On the other Hand, well known limitations of observation methods at all: (1) Affecting the result by presence of observer, (2) Acceptance of observer, (3) Recording of results, and (4) the limited access of observer to target groups at all. Also well-known validity issues of result recording are (1) Perception errors, (2) the "Halo-effect", (3) Chronological effects, (4) Physical fatigue of observer, and (5) the interaction with target groups

The method of *Observation* was used by the author to initially characterize and shape the scientific questions / ideas of this dissertation work. In essence two main findings could be identified – but not formally proven:

1. The practical need and execution of IRM in business organizations is not holistically seen as an essential contribution factor for improving decision making
2. A difference in the view on the need of how IRM has to be set up between IRM-Experts and Business-Professionals (in the context of decision making improvement) could be observed

Discussion the methodical limitations of the Observation Method it could be noted, that there is no scientifically accepted prove of the observations. Formal indicators were not identified. An abstraction in the observation of some few companies was done, a scientifically accepted significance could not be reached – caused also by the limitation of numbers of

companies that were observed. Formally a field-observation, involving author itself and others, non-invasive (as it is not looping back to individual's behavior immediately) was conducted. Due to the lack of formalization and limited access, standardized observation- criteria could not be implemented and not statistically analyzed. Finally perception errors or Halo-effects could not be excluded / normalized.

As an intermediate result on the method itself, it could be noted, that almost none of the formal methodological requirements of the *Observation-Method* could be followed – therefore this step only served as "idea-shaping" phase but without any scientific relevance or value. A solid literature review on the proposed question needs to be conducted to evaluate the novelty, and applicable / existing correlating scientific models.

3.2 Literature Research – Method Review

The goal of *Literature Review Method* in scientific context is to evaluate the state of science in a specific field to contribute- or directly answer further scientific-questions. Shields et al. (Shields, P. et al. 2013) and Granello (Granello, D.H.2001) link the activities of doing a literature review with Benjamin Bloom's revised taxonomy (Bloom, B.S. 1994) of the cognitive domain – the different ways of thinking: remembering, understanding, applying, analyzing, evaluating, and creating. Philipp Mayring (Mayring, P. 2005) also describes this method as *qualitative content analysis* to delimitate it from the *quantitative content analyses*. The character is to qualitatively investigate scientific sources of scholars in an inter-subjective manner. The goal is not to have a holistic population of sources that can quantitatively be analyzed. Another goal is also to evaluate the development of certain topics over time which requires literature review of comparably older publications and newer publications in the same way to understand trends limitations and impacting / intervening factors. The level of reliability of publications is key, only primary scientifically proven sources and databases can be used and cited. Sources with a high SCI (Scientific Citation Index) must be chosen preferably. The by the author of this dissertation aggregated results of the literature research are:

1. In Literature there is no holistic view on the impact of rapidly developing information management / IRM to the needs for improving decision making in business
2. A number of very specific measurement factors from the specific disciplines of social-, psychological-, economical-, and statistical field investigated in isolated approaches single factors on both sides – in decision making but also in Risk Management – but none of them in correlation of Information-Risk-Management and the upcoming special impacts to humans and business neither in a comparable study amongst

3. No holistic model/measurement for IRM exists at all

The method *Literature Research* was used by the author as *qualitative literature review* to investigate on the variety of different scientific fields. Hereby the core literature on decision making theories as well as fields of Enterprise Risk Management was intensively studied, but also intervening fields of human social- and psychological-behavior models in this context and the developments in communication theory on the newer CMC was reviewed. *Broad-search* and *deep-search* approaches were followed. Only sources with high SCI were selected and used in citations from international scientific databases (Academic Search Premier, EBSCO, PIO (Periodicals Index Online)). A listing of all authors which were reviewed, the scientific topic and area are listed. Qualitative and quantitative methods are used. For determination of exogenous variable-measurements, qualitative method was applied, and later tested, proven, and ranked in the Expert interviews. A mixed Quantitative and Qualitative approach was applied for determining the measurements of the endogenous variables, based partly on former scholars results but also on own results.

The formal requirements of the method Qualitative Literature Review were followed. An area of not yet researched scientific question(s) could be examined. Hypothetically transitive relations and correlations were identified and underline the strong need for research in the temporary context of newer business. Formally this transitively constructed relations could not be seen as scientifically proven with the qualitative literature review yet. Whereas the pure existence, relevance, and validity of the examined scientific question itself could be proven, interfering scientific fields are identified, operationalization-items for constructed variables could partly be taken over from other scholar's proven models. The results of the literature results are formally listed and categorized by issue and item and sources are completely published in the list of references/citations.

3.3 Structured-Expert-Interviews – Method Review

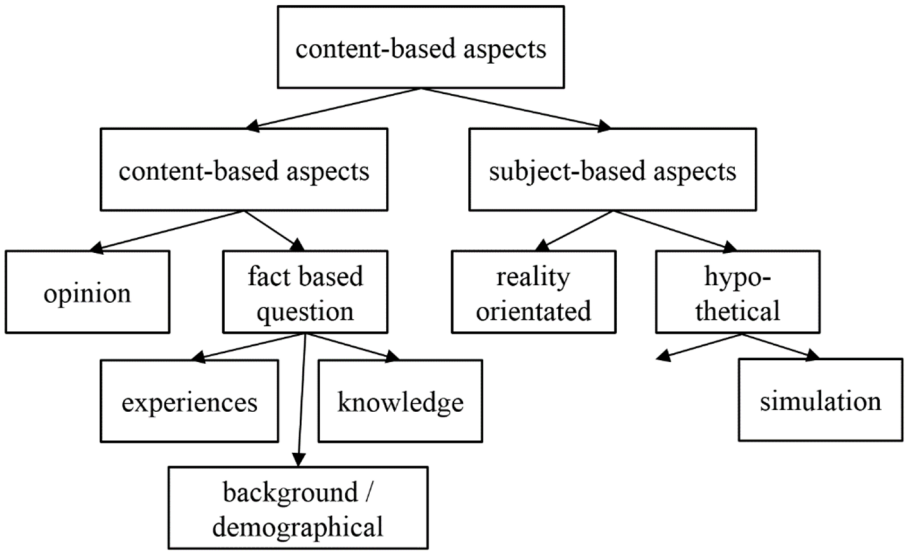
Linderman et al. (Linderman, A. et al. 2011), Mayer (Mayer, O.H.2008), and Gläser,J. (Gläser, J. & Laudel, G. 2009) performed significantly contributing meta-studies on the development of the *Expert-Interview-Method.* All three agree that the so called *Expert Interviews* could be conducted in a qualitative and quantitative way – depending on the scientific questions and the limitations in this field. It could also be segregated in structured interviews with dedicated pre-prepared questions, and a story line along the answers are constructed in a SMM (sense making methodology) way. In qualitative interviews situations

are openly discussed and recorded. Especially for structured interviews the following four entry conditions need to be considered

1. The operating range of questions needs to be well balanced – risk of too limited view or specialization where not necessary
2. Specific and well-defined contextual semantic expressions need to be used – ensuring the precision of the result
3. Balanced effectiveness – Ensuring the correct balance of detail-level amongst question areas, value-related ratings/classification needs to be transparent to the interviewee
4. Expert-Context – proving the areas of expertness to ensure applicable questioning

Gläser and Laudel (Gläser, J. & Laudel, G. 2009) distinguished between two groups of types of questions, (1) *Content based Questions*, and (2) *functions based questions*. In Figure 3-2. The basic typing for content based questioning shown.

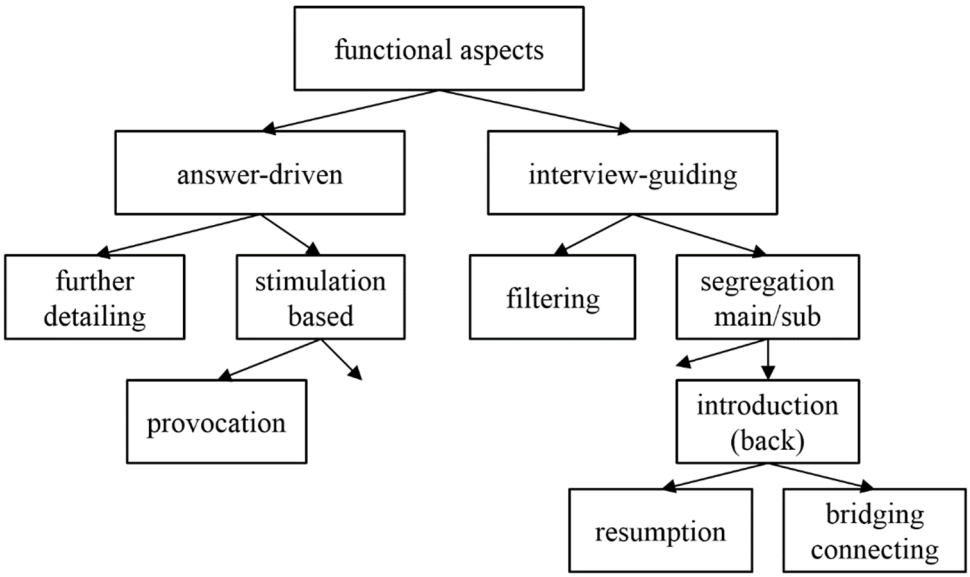
Figure 3-2. Content-Based Question Types



Source: Author's compilation from Gläser, J. 2009 p130

Most reliable and therefore prominently used technique is the category (1) *fact based questions* and (2) *reality orientated questions*. On the other hand also the typing of functional categorized questions is used to ensure a storyline (Mayer, O.H.2008) and keep the flow of the interview on a balanced level – see Figure 3-3:

Figure 3-3. Functions-Based Question Types



Source: Author's compilation from Gläser, J. 2009 p130

The focus in the area of functions-based question types is on the (1) *stimulation based*, (2) *further detailing*, (3) *filtering*, and (4) *introduction-type* questions (Figure 3-3) to keep the momentum in the interview-situation. In quantitative interviews function based questions are not recorded or do only influence the result-tracking if discrepancies in definitions are observed.

Well known areas of weakness of the interview methodology are on the one hand based in the typing of questions: (1) Open questions might become too unspecific, (2) filtering questions might not be seen as such, (3) "Yes/No" questions might be perceived as suggestive, and (4) allusions might not be understood or even over-emphasized. On the other hand general method limitations might reduce the validity of the outcome: (1) lack of time – not specific enough detailed questions, (2) ignoring relevant topics, (3) over-guiding the interviewee, and (4) target shortfall caused by to open discussion and leaving the story-line.

Many socio-methodical researchers propose to either record the interview or take structured notes based on the pre-preparation work (Linderman, A. 2011) (Mayer, O.H. 2008) (Gläser, J. & Laudel, G. 2009).

3.3.1 Discussion of methodical limitations on Expert Interviews in the context of this dissertation:

A structured questionnaire – in paper – was examined prior to the interviews containing only *fact based questions* and *reality based questions* intentionally to eliminate most method-based weaknesses by design. Functions-aspect based questions were formally not asked and recorded. A quantitative result could be examined by questioning the basic impact of operationalization-criteria to the variables and ranking the impact strength, the author of this dissertation chose a "Likert-5 scale" per question. The advantage of using a structured questionnaire is to eliminate uncontrolled answers, it is even seen as advantage if the investigator is present during answering (Friedrichs, J. 1990). Another advantage of fixed questionnaires is to use well defined wording and sequence of the questions, and indicate a clear scale of meaning and understanding of the answers range. By this, questions can be formulated accurate to generate answers to the hypothesis precisely and exclusively without leaving too much room for different interpretation. In this sense the author only formulated closed and fully standardized questions (Closed questions are pre-formulated questions – equal for any interviewee). For this case scholars have developed a vast amount of theories which are plausible, prove, and tested about the rules and scales to be used (Friedrichs, J. 1990). Most prominently the so called "Likert-Scale" is used to measure the attitude of an individual concerning a specific object in a specific situation. All statements are formed in a positive or negative way. The idea of the Likert-scale is the fact that the more strongly the test subject refuses a statement, the further his attitude differs from the formulation of the statement itself.

On-top to the common way of measuring the level of agreement or disagreement, in the expert-interviews also the area of significance for the four variables as a measurement item was questioned per question-set with a simple multiple choice shown in the Appendix.

It has to be noted, that Likert-Scaled answers are interpreted as equidistant ranges, in the case of a Likert-5-Scale the equidistance of each answer is equal to 20% of the total possible range. The interviewees were actively reminded about this fact – also in the opening of the interviews there was clear agreement, that in case the applicability for the chosen area of significance would differ in case of multiple selection from each other, it would be actively noted – in none of the interviews this was the case.

Recap: The need for this intermediate step of conducting Expert-Interviews lies in the novelty of the topic of IRM itself. As discussed earlier, there is a serious risk to get invalid answers from average business professionals if just asking the precise IRM terminology based

questions, because the know-how, definition and background in IRM is not clear or distinct enough.

The primary goals of the expert interviews therefore are to achieve three goals: (1) Confirm the 4 pre-chosen Variables characterizing solid Information-Risk-Management holistically in the light of decision making improvement (qualitatively) (2) allocate and confirm measurement items (operationalization) for the latent exogenous variables qualitatively, and (3) generate an empiric norm for the further investigation steps (quantitatively).

In summary 10 *Information-Risk-Management-Experts* were interviewed in personal F2F interviews. The selection of IRM Experts was conducted on their publicly known professional experience and career. In the interviews the confirmation about the used terminology was done verbally at any stage of the interviews to ensure high data quality and preciseness.

3.3.2 Quality and Validity of the Results of Structured Interview Method

All methodological scientifically aspects of *structured expert interviews* were formally followed: The CVs of the IRM-Experts were checked upfront – are publicly available. Only *fact-based* and *reality orientated* questions (Gläser, J. 2009) formed. The interview-results were self-reflected with the IRM-experts at the end on validity and could be confirmed as such by any of the 10 Experts. For the qualitative questions, all IRM-Expert could give valid and meaningful answers confirming the validity of the chosen variables in IRM. For the quantitative questions all IRM Experts answered all questions holistically – for all questions, 10 answers could be recorded as baseline.

The limitations or critics of this concept are examined and the reasoning is given as well to prove overall validity: Purely statistically seen, the number of 10 responses as such does not give a representative base for any further statistically calculation or quantitative analyses of the results– in general, it might indicate the direction only. In this particular case intentionally only *IRM-Experts* are interviewed. In methodical review, expert's statements have to be seen as valid. The used statistical approach helps to bring this question on a broader scale of knowhow and enables to rank the variables amongst each other and to give an Empiric-Norm for further testing. Resulting, it could be claimed, that the expert's review/replies are valid per definition and that the statistical approach of generating the mathematical mean out of 10 interviews has to be seen as a representative calibration of expert's views. Further on, the results on the measurement variables are not ranked amongst each other (no *load-factor* was generated out of

the answers) – here also the pure statistical possibility is given, but as this is not required intentionally (methodical design setup) for the further investigation the to not open the question on a hypothetical validity of these load-factors.

3.3.3 Intermediate Results on Expert-Interviews in the context of this dissertation:

The initial research question is not answered yet – neither confirmed nor denied with this intermediate results. The suggested implications resulting out of the literature review could be seen as fully supported, no contradictive statement was perceived, both methodically and result-based. For the latent exogenous variable *IRM-Awareness* in total 19 questions/criteria were identified and ranked, for variable *IRM Information Classification* in total 12 questions/criteria were identified and ranked, for the variable *IRM-Information-Protection* in total 12 questions/criteria were identified and ranked, and for the variable *IRM-Information-Controls* in total 13 questions/criteria were identified and ranked. Via result normalization the *Empiric-Norm* for the further planned steps could be synthesized.

3.4 Experimental Field and Case-Study with Structured Questionnaires – Setup and Organization

Traditional laboratory experiments in economics are composed of a goal, a system and the subject's behavior (Smith, V.L. 1982). The goal is the objective pursued by the experimental subjects, whereas the system is formed by the restrictions, institutions, and behavioral rules, among other specific conditions. The decisions made by the subjects of the experiment are known as subjects' behavior (Friedman, D. & Sunder, S. 1994). Also various meta-analyses based on the methodological approaches and differences were conducted – a comparing of Laboratory Experiments was performed by Arango Aramburo et al. (Arango Aramburo, S. et al. 2012) examining 28 further author's methods, strength and weaknesses of the setup.

For validity in this dissertation work it is necessary to address appropriate indicators to the variables which allow for measuring the characteristics as they are understood. This has already been laid out in more detail in Chapter 2 on how the author is going to measure the latent endogenous variables and discussed in previous chapter how to measure the latent exogenous variables allowing an intersubjective reconsideration. It is important to delimit the approach from classic variable-measurements. Due to the complexity and novelty of the topic

of IRM the author decided not to measure simply the endogenous and exogenous variables on its own to later on determine the strength and validity of the single relation. Here the author combined already the endogenous and exogenous variables in tuples (m:n – All to all) and asked the Mid-Level Managers directly on the strength of this tuple-relation in comparison to the others tuple-relations. The reason for this uncommon approach is the risk of the average missing understanding and ability of delimitating the single criteria amongst each other. This approach brings a clear definition of the relation itself which is context sensitive and therefore easier to understand and compare with the other relations.

Therefore it was important to generate and prove an *empiric-norm* for this relations of measurements which are state of the art and therefore the author believes this allows a valid measurement of the variables. The following four reasons guided the author to the decision to prefer and conduct an experimental field study with structured questionnaire which is supported by a case study as a methodical instrument compared to other options: (1) Control of influencing factors allows a more accurate result in the light of the definition of the variables and measurement indicators, (2) low complexity – compared to open field-experiments – allow focusing on measurement variables without interfering effects, (3) reproducibility of tasks and experiment setup over more sessions with different groups of attendees can be achieved by the clear questionnaire setup, and (4) Observers presence during the case-study reading and answering the questionnaire guarantees preciseness of used element's definitions or descriptions especially on the definition and descriptions of the variables and measurement factors of Information-Risk Management. It is important to transfer the knowledge and delimitation of expressions to the attendees to ensure high sematic quality of results.

For accurate reproducibility and accurate definitions of the used variables, expressions, and terms the author invented a fictive case-study – *Latt-Bikes-Case-Study* – see Appendix – where a hypothetical but possibly real case of an M&A situation for contrary companies is described. Within the description, but also at the end of the text, clear definitions and supportive comments for understanding are disclosed to the readers. The method follows completely the common case-studies from Harvard Business Review (e.g. Piper's Case Studies). It consists out of a storyline and appropriate and relevant detail descriptions and stops, before conclusions are drawn or real results are published. The aim is to describe a complex and not simple to decide set of questions in relation to circumstances known, derived or even assumed where necessary. Other than in real cases, the fictive story-line was developed exactly to cover all earlier examined exogenous variables, endogenous variables, and measurement items. The risk of

artificial case-studies is to be synthetic and therefore influencing the reader already in one or other direction while not considering real world interfering variables.

The *structured-questionnaire-method* (examined in principal already in Chapter 3.3) was used to place the questions and to collect the answers from the participants in a Likert-5-Scale style. The questions are formed as two-dimensional tuples consisting out one exogenous variable and one measurement criteria of the endogenous variables. While drawing by that all theoretically possible concatenations the focus of the question was laid on the hypothetical relation between the two criteria. The attendees need to decide only on the strength of the explicit one-to-one relation by the Likert-5-Scale ("Fully agree, Agree, Neither, Disagree, Fully Disagree"). This is seen as very important precondition to help participants in comparing pairs of answers and overseeing the differences on the different points of references.

For ensuring a wide reach of attendees this second questionnaire was combined also with questions from another doctoral student (Mr. Richard Mayr). Only the Blocks 1, 3, 5, and 7 are relevant questions for this dissertation. The Blocks 2, 4, 6, and 8 are independent and do not belong to this dissertation work – see Annexes – they are also not considered for any analysis within this dissertation work. The four relevant blocks are set up as described in Table 3-1

Table 3-1 Overview of Content Areas of Business Professional's Questionnaire

Area / Criteria	Description	Type of Data Collected / Scale
Exogenous Variable	Text, description formed as level of influence on the measurement criteria of the endogenous variable (measurement criteria of exobenous variables are not explicitly asked, only the variables itself – definition on the variables are give through the case-study	Likert-5-Scale (equidistant): • Strongly Agree, • Agree, • Neither, • Disagree, • Strongly Disagree
Measurement Criteria of each endogenous variable	Text, precisely following the descriptoin of former scholars introducing this measurement criteria for the endogenous variables	

Source: Author's construction

During the reading-phase of the case study and during the answer-phase of the questionnaire attendees were allowed to only ask questions of understanding terminology – questions about results or content were not accepted and not answered by the observer.

The author decided to choose the attendees for the field-study only out of experienced Business Professionals intentionally to avoid any implications, limitations, and discussion or weakness in the result pointing back to the question of similarity of answers of different groups or even young students with less business experiences. In fact only experienced post graduated

participants of MBA- and Doctorial Programs with multiple years of business experience and an economical background were selected. The formalized sample is the numerous decisions made and represented by those Mid-Level-Manages. The formal sampling is therefore *non-probability sampling* in particular *judgmental sampling* which is a purposive sampling method.

The criteria of sampling was *significant management-experience* in particular *professional decision making experience*. As exactly the *decisions* made are the research object this sampling method seems to be the most effective. The most dangerous potential error in this method – the judgement-error of the researcher (Black, K. 2010) – could be seen as minimal, as by purpose only candidates with management- and decision making background have been considered. In fact only experienced post graduated participants of MBA- and Doctorial Programs with multiple years of business experience, decision making experience and an economical background were selected.

In total 131 Business Professionals (Mid-Level-Managers) were tested in particular from three countries, (1) Germany, (2) Austria, and (3) Switzerland. All candidates returned valid and comprehensive answers/fully filled questionnaires. To be able to ensure same level of information given, surrounding parameters, and potentially further explanation on the definitions of IRM, a number of sessions were conducted all under same conditions. Group-size per session was not bigger than 28 participants maximum to ensure proper setup.

In the beginning the participants received an explanation on how the experiment works with no hidden parameters – in the following the story-book for each session in temporary and logical sequence:

1. Participants receive the Case Study “Latt-Bikes” – see Annex.
2. Participants are reminded on the interpretation of the Likert-5-Scale as being seen equidistant (5 × 20% range) and not being a Gaussian-Distribution-Curve
3. Participants are instructed to bear in mind direct comparison of pairs – while seeing the one result more or less important than the others and therefore also derive a personal ranking amongst all questions and answers
4. Participants are instructed to read the Case-Study – no time-limit
5. Participants are motivated to ask questions about definitions read, context, and understanding – but not about preferences and rationale of solutions scenarios
6. Participants are asked to fill the questionnaire based on their individual background and with the considering the explicit definitions in the case study

7. Questions on definitions, context, and understanding were answered by observers also during phase of answering the questionnaire – also, no indications are given on solution-scenarios.
8. No time-limits for the answering phase as participants explicitly should consider personal experience and newly learned topics abut IRM – without stress-factors or other interfering and competing factors – in a way, that the ideal end-result provided by any participant would be equal independently from timing, location based on conditions, even with time for rethinking. With this, spontaneity explicitly was a matter of being excluded.

Each of the session was budgeted with about two hours in total, in particular ten minutes of introduction, twenty to thirty minutes of reading the case study, about ten minutes of question and answers, and about one hour for filling the questionnaire. After returning the filled questionnaires in some cases a short discussion was initiated by individuals, but not monitored or considered for any further analysis.

3.5 Statistical Analysis Method: Mann-Whitney U Test and One Sample T-Test

In the specific scientific setting of this dissertation it first has to be discussed whether to use parametric-testing method or non-parametric-testing method. The arguments for both methods for validity of the method but also the reasons against are evaluated in the coming chapter. Ultimately both testing-methods are used and the results are calculated and compared. From this, the final resulting interpretations are done.

The statistical manuals used by working researchers generally hold that parametric statistical methods are more powerful than non-parametric methods, but rely on more confining assumptions about the data. In particular, assumptions are made about the normality of distributions and the equality of variances (the problem of heteroscedasticity, or Behrens-Fisher problem). If these assumptions do not hold, then the parametric tests are considered to be less robust than non-parametric tests, i.e. more likely to report the null hypothesis to be false when, in fact, it is true - a type I error (Stonehouse, J.M. & Forrester, G.J. 1998).

Therefore two Methods are chosen to test the results (1) within the non-parametric tests the *Mann-Whitney-U* Test, and (2) as a parametric method the *One Sample T-Test*. Both methods of data-analysis belong to the *group of tendency-analyses* which examine differences in samples. In the following both methods are described and discussed with their applicability in the given scientific setup. Also in chapter 4 all results of both methods are shown and

interpreted accordingly. Various testing done by other scholars were done to compare the results of both test methods, it could be found, that the results of both methods will give quite similar results on the rankings of the data (Conover,W & Iman, R. 1981)

3.5.1 The Mann-Whitney-U-Test – Description, Conditions and Reliability

The Mann-Whitney-U-Test is a non-parametric test that is equally likely that a randomly selected value from one sample will be less or greater than a randomly selected value from a second sample. The test was developed by Henry Mann and Donald Whitney in 1945 but the central ideas go back on Gustaf Deuchler 1914 (Kruskal, W.H. 1957). The Mann-Whitney-U test seems best logical choice when the data are ordinal but not interval scaled and where the spacing between adjacent values cannot be assumed as equidistant / constant (Conover, W. 1980). It tests two independent samples on their difference, if the requirement for T-test are not given. The requirements for the Mann-Whitney-U-Test are (1) the variables are at least ordinal scale, and (2) there is one independent variable on which the two groups which need to be compared, could be built on. A special distribution set is not required – distribution-free.

The Mann-Whitney-U-Test is based on the idea of ranking the result data, which means, not the results themselves are used for any further calculation, only their ranks will be used for further testing. The calculation is therefore based only on the order of the ranks (greater than, smaller than). The distances between the results are not considered – this, because ordinal-scale does not allow to compare the distances, it could be assumed equidistance between the values without any further condition. The mathematical calculation and the formula are further shown in the annex only.

In the Laboratory Experiment performed in this dissertation, two groups are compared. The group of Mid-Level-Managers with in total 131 candidates, randomly distributed over various industries and organizational setup and on the other hand the group of IRM-Experts, represented by the previous calculated *empiric-norm*. Statistically the group size of 131 is to be seen representative (Barrett, J.P. & Goldsmith, L. 1976). The *empiric-norm* was generated to eliminate all effects of the comparably small group size of the IRM-Experts of 10. In the testing statistics, the group size of the *empiric-norm* was decided to also be 131 with exactly the value of the empiric norm itself, as the U-test is doing a rank-comparison. Noting at that point, that the Mann-Whitney-U-Test is very error-tolerant against any skewed distribution. The test was performed for each of the independent variables accordingly. With this limitations, it was noted, that the Mann-Whitney-U-Test would give valid result for the tested group comparisons.

It could be criticized, that some value adding preconditions of the experiment are not considered by the Mann-Whitney-U-Test and might even make the results too blurred or would not consider known information. One example is the fact of given equidistance of the initial ordinal scaled setup – this was explicitly pre-given to be able to have interval scale for being able to also calculate with the results themselves and put more accuracy into the differences of the single values their means and standard deviation – and not just into the ranks. With this, the results of the Mann-Whitney-U-Test are expected to be more distinct and showing less proliferation (Stonehouse, J.M. & Forrester, G.J. 1998).

By this, the author of this dissertation decided also to run a one-sample T-Test and to further compare the results which are shown combined in Chapter four for each concatenation, too.

3.5.2 The T-Test – Description, Conditions and Reliability

William Sealy Gosset (Gosset, W.S. 1908) published under the nick-name "Student" in 1908 in *Biometrika* the initial proposal for the *T-Test*. In this initial proposal the sample-size was *four*. Once the sample-size reaches about *forty*, the results does not differ essentially from those from *Z-Test* which was already introduced in 19th century. The difference is, that the *Z- Test* requires the known variance of the population underlying whereas the *T-Test* estimates it from the sample itself. The *T-Test* is more robust especially on smaller sample size < 30 sample size than the *Z-Test*

By the literature review and by generating an *empiric-norm* for the mean of the dependencies of IRM and Decision Making Improvements in the relation of SDM-improvement, the *one-sample T-Test (student's – T-Distribution)* is the other possible statistical instrument to measure significant differences between this *empiric-norms* and the results of the Business Professionals' lab-in-the-field study. Statistically the *T-Test* is used in cases, where for all participants individual measurement values exists (Zabell, S.L. 2008), which will then be compared to a single value – the population mean / *empiric-norm* – under the underlying *student's t-distribution* (by William Sealy Gosset – nickname "student" – accepted and proven in 1908). The *one-sample T-Test* is a special instance of the general *T-Test* with the condition, that only one sample exists, the other is set to null by definition (Hanley, J. 2008). While presenting the mathematical formula for the *T-Test* in the Annex, it is most important to discuss the application, limitation and validity conditions for the current research question and the setup of this dissertation in the following.

All parametric statistics have a set of assumptions that must be met in order to properly use the statistics to test hypotheses. The three assumptions resp. preconditions to be met for the one-sample *T-Test*, (1) Random sampling from a defined population(Johnson, N.J. 1978), (2) an interval or ratio scale of measurement, and (3) Population is nearly normal-distributed (Bowman, K.O. et al. 1977)

Random sampling is required for all statistical inference because it is based on probability. Random samples are difficult to find, however, and psychologists and researchers in other fields use inferential statistics and discuss the concrete sampling limitation (Martin, R. Liu, C. 2015). Psychologists will apply parametric statistics like the *T-Test* for dependent means on approximately interval scales even though the tests require interval or ratio data (Little, R. 2015).

Finally, the assumption of normal distribution in the population is considered "robust". This means that the statistic has been shown to yield useful results even when the assumption is violated. The central limit-theorem requires that even if the population distribution is unknown, it could be assumed that the sampling distribution of the mean will be approximately normally distributed if the sample size is large. The robustness of the t-test when the sample sizes are equal and moderately large is also confirmed; when both sample sizes are 30, the test is for practical purposes insensitive to violations of the usual assumptions (Stonehouse, J.M. & Forrester, G.J. 1998). Further on, the used measurement method of results was as discussed in Chapter 3.4 an equidistant Likert-5-Scale, which fulfills the precondition of being *interval or ratio scaled*. As a precaution the variances even of 131 samples are ignored and assumed as unknown – and following the *T-Test* "estimated" within the test itself by the *T-Test* Method

This helps to contribute to the *T-Test* being robust for violations of normal distribution. There are conditions to be encountered when the *T-Test* should not be used for dependent means: If conducting a directional test and sample data are highly skewed, non-parametric alternatives should be considered (Martin, R. Liu, C. 2015).

Based on the previous mentioned and the studies from Bartlett (Bartlett, B.A. 1935) and further on Boneau (Boneau, C.A. 1960) the *T-Test* Method could also be seen a statistically valid and reliable method for the used Business-Professionals' Lab-in-the-Field-Study by using the earlier developed *empiric-norm* based on the IRM-Experts-Interviews and the Literature-Research results.

4 RESEARCH RESULTS IN THE RELATIONSHIP BETWEEN INFORMATION RISK MANAGEMENT AND DECISION MAKING

The goal of this chapter is to report the results and the data analysis amongst all steps undertaken. First, the detailed results in the IRM-Expert-Interviews are examined, including the distribution of variables after aggregation of items to variables (median, mean, standard-deviation). Second, the results from the Business Professional Field Study are examined in particular. Any relation trail from the measurement items of the latent endogenous to the exogenous variables is examined specifically in tuples. Thirdly the results of the theses tests are summarized and discussed drawing on differences between Literature and IRM-Experts, and Business Professionals. Due to the rather specific research focus of this dissertation work, the size of the IRM-Experts does not allow for advanced statistical analysis, such as structural equation modeling itself. Finally, the main conclusions of the study are advanced.

4.1 Structured Expert Interview Results

The goal of the Structured IRM-Expert-Interview was to confirm qualitatively the proposed exogenous variables, to rank and prove the measurement items of the exogenous variables qualitatively, and to examine an *Empiric-Norm* of the single relations between IRM-Variables and SDM in tuples, to further *T- Test* quantitatively. In the following, the detailed results for the four exogenous variables are examined. In Table 4-1 the overall results are shown for all four exogenous variables in the relation to Strategic Decision Making Improvements contribution:

Table 4-1 Overview on Statistical Results IRM-Expert-Interviews

Latent Exogenous Variable	Information (IRM) Awareness	Information Classification	Information Protection	Information Controls
No. of valid Experts interviews	10	10	10	10
No. of confirmed measurement criteria	19	12	12	13
Mean over all per variable (normalized)	0,817	0,791	0,817	0,742
Standard deviations per varialbe total (over all measurement items per variable)	0,150	0,184	0,162	0,180
Variance per variable total (over all measurement items per variable)	0,114	0,169	0,134	0163

Source: Author's results

The examined values in Table 4-1 are calculated on the bases of the IRM-Experts-Interviews based and examined as single result calculation in Annex 1 "Structured Expert Interview – Questionnaire and Comprehensive Result – as basis.

4.1.1 Exogenous Variable IRM-Awareness in Relation to SDM Improvements

In the area of IRM-Awareness twelve of the chosen measurement criteria were confirmed by the IRM-Experts as important with different averages (=mean) and also different variances on the samples. Detailed results of IRM-Expert-Interviews are shown in the Annex. The results – Table 4-2 – are sorted first order by the calculated Mean and second order by the minimum Variance. The highest mean is at a level of 4,9 out of theoretical maximum of 5,0 with a comparably small standard deviation of 0,316 which indicates a very homogenous answer and therefore a strong validity of the criteria. Even the lowest average Mean for IRM Awareness lies at a level of 3,4 with a median of 3,5 and a standard deviation of 0,699 which also proves the validity of the statement made. Looking at the whole number of Means it is interesting to mention, that from a total number of 19 criteria, 14 having a mean of 4,0 or higher. Also looking at the standard deviations, it is worth to mention, that 14 out of 19 criteria do have a standard deviation less than 0,7 where the overall standard-deviation is at 0,75 at all – which proves an extremely high consistency in the answers of the IRM Experts.

Table 4-2 IRM-Awareness Measurements and Results

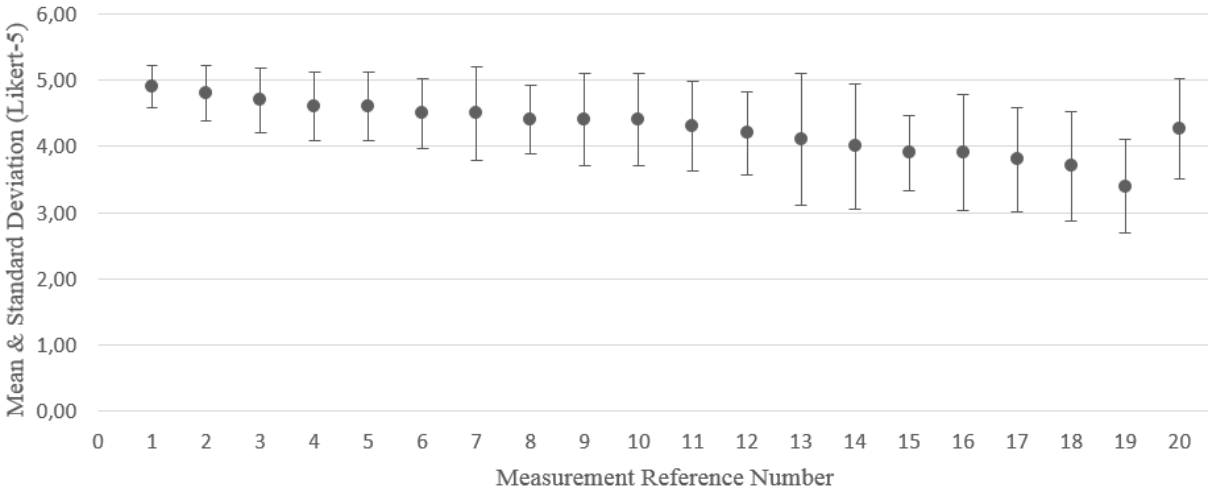
Criteria No.	Basic Question and Measurement Criteria	Mean (Likert 5)	Median (Likert 5)	Maximum	Minimum	Standard Deviation (Sample- non-normalized)	Variance (Sample – non-normalized)
1	The "NSA Affair" (disclosure of many secrets by Mr. Snowden in Summer 2013) proved that "Information Risks" are only relevant for Military and Government etc. only	4,90	5,0	5	4	0,3162	0,1000
2	Because of the rules and guidelines are formally in place and could be read at any time, it is NOT important to actively train employees affected by the business controls	4,80	5,0	5	4	0,4216	0,1777
3	Formal "business controls" need to be agreed and sponsored by the executive board of the company to ensure that they are taken serious and are executed	4,70	5,0	5	4	0,4830	0,2333
4	An EXTERNAL information crisis would cause a significant negative impact to the company (e.g. Information Breach, stolen intellectual property)	4,60	5,0	5	4	0,5163	0,2666
5	It is important to distinguish between information, that could be stored on public storage locations and information that should be stored on restricted storage locations	4,60	5,0	5	4	0,5163	0,2666
6	To ensure better awareness /preparedness in "Information Risk Management" within companies, it is important to have a formally implemented communication and decision map (defined communication streams and mandates for decision making in crises)	4,50	4,5	5	4	0,5270	0,2778
7	To ensure better awareness /preparedness in "Information Risk Management" within companies, it is important to do good "Information Security and/or Management" awareness programs to all associates	4,50	5,0	5	3	0,7071	0,5000
8	Regarding "Information Risk Management" it is important to ensure, that the executive board is playing "a significant role" in this (general management buy in – e.g. as part of the crises team etc.)	4,40	4,0	5	4	0,5163	0,2666
9	"Time/Costs" constraints could be a reason for not fully implemented "Information Risk Management" Awareness / Preparedness	4,40	4,5	5	3	0,6992	0,4889
10	"New-joiners" should be trained automatically if applicable for their new role	4,40	4,5	5	3	0,6992	0,4889
11	A lack of transparency in particular on "Information Risks" on executive management level could be a reason for not fully	4,30	4,0	5	3	0,6749	0,4555

	implemented “Information Risk Management” Awareness / Preparedness						
12	Regarding “Information Risk Management” it is important to have a “crises Team” implemented – being able to respond immediately to any threats	4,20	4,0	5	3	0,6324	0,4000
13	To be transparent to the executive board, a register of ALL CRITICAL information assets and all related risks should be in place and up to date at any time	4,10	4,0	5	2	0,9944	0,9889
14	Smaller groups are more effective in risk assessment then bigger groups	4,00	4,0	5	2	0,9428	0,8889
15	To ensure better awareness /preparedness in “Information Risk Management” within companies, it is important to have a formal “Learning and Training System” in place	3,90	4,0	5	3	0,5676	0,3222
16	To ensure, that the controls are executed in an appropriate way, this should be part of the “role description” of the employees affected	3,90	4,0	5	2	0,8755	0,7667
17	An INTERNAL information crisis would cause a significant negative impact to the company (e.g. loss of relevant information, non-integer information etc.)	3,80	4,0	5	3	0,7888	0,6222
18	An INTERNAL information crisis is less negative impacting the company than an EXTERNAL information crisis	3,70	4,0	5	2	0,8232	0,6778
19	The value of risk analysis results increases with the company affiliation of the employee	3,40	3,5	4	2	0,6992	0,4889
20	Mean of 1-19	4,27	4,0	5	2	0,7535	0,5677

Source: Author’s results

A more comprehensive illustration of the results of the IRM-Expert Interview on the IRM- Awareness is illustrated in a bar-chart showing the means as dots and the standard – deviations as bar above and below the mean value in the Figure 4-1

Figure 4-1. Mean and Standard-Deviations for IRM-Awareness Measurements



Source: Author’s results

In the following, of the second exogenous variable being IRM-Information Classification are set in relations to strategic decision making.

4.1.2 Exogenous Variable IRM-Information Classification in Relation to SDM Improvements

In the area of IRM-Information Classification twelve of the chosen measurement criteria were confirmed by the IRM-Experts as important with different averages (=mean) and also different variances on the samples. Detailed results of IRM-Expert-Interviews are reflected in Table 4-3. The results in Table 4-3 are sorted first order by the calculated Mean and second order by the minimum Variance. The highest mean is at a level of 4,80 out of theoretical maximum of 5,0 with a comparably small standard deviation of 0,421 which indicates a very homogenous answer and therefore a strong validity of the criteria. Even the lowest average Mean for IRM Awareness lies at a level of 3,2 with a median of 4,0 and a standard deviation of 1,22 which also proves the validity of the statement made. Looking at the whole number of Means it is interesting to mention, that from a total number of 12 criteria, 10 having a mean of 4,0 or higher. Also looking at the standard deviations, it is worth to mention, that 11 out of 12 criteria do have a standard deviation less than 0,7 where the overall standard-deviation is at 1,1 at all – which proves also a high consistency in the answers of the IRM Experts

Table 4-3 IRM-Information Classification Measurement Results

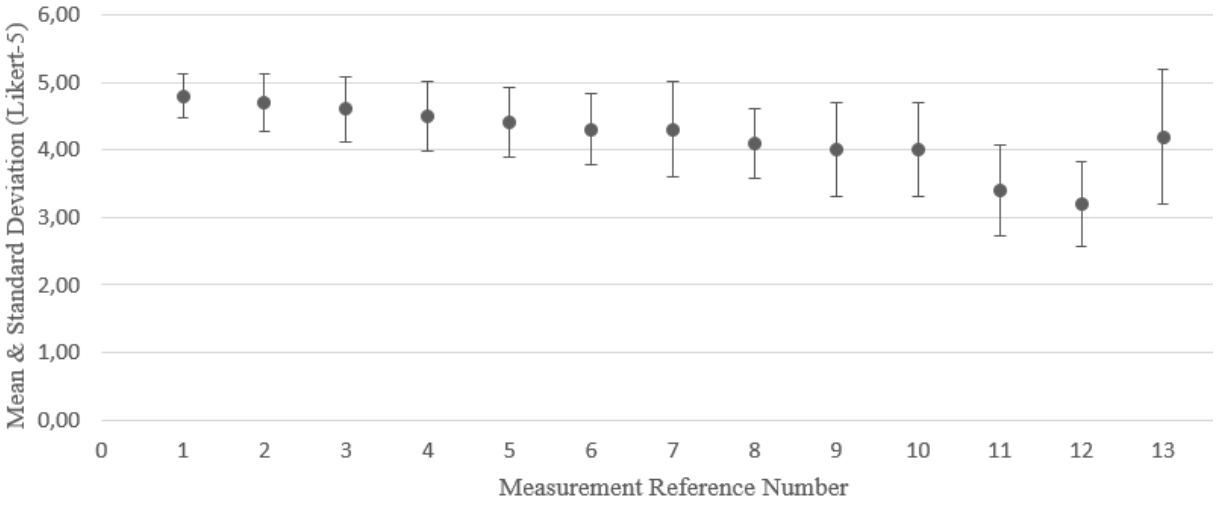
Criteria No.	Basic Question and Measurement Criteria	Mean (Likert 5)	Median (Likert 5)	Maximum	Minimum	Standard Deviation (Sample- non-normalized)	Variance (Sample – non-normalized)
1	Because of the rules and guidelines are formally in place and could be read at any time, it is NOT important to actively train employees affected by the business controls	4,80	5,0	5	4	0,4216	0,1777
2	It is important that these professionals do have a good inside in the local organization and processes and are not only "headquarters functions"	4,70	5,0	5	4	0,4830	0,2333
3	An EXTERNAL information crisis would cause a significant negative impact to the company (e.g. Information Breach, stolen intellectual property)	4,60	5,0	5	4	0,5163	0,2666
4	However classified information should be only accessible by limited number of people	4,50	4,5	5	4	0,5270	0,2777
5	A consistent and sustainable "information classification" scheme is KEY to identify Information related risks at all (e.g. Confidentiality/Integrity/Availability/Privacy/Legal requirements)	4,40	4,0	5	4	0,5163	0,2666
6	It is important to have exact definitions on how to classify each of this dimensions (e.g. for confidentiality: public use, internal use, confidential, strictly confidential)	4,30	4,0	5	3	0,6749	0,4555
7	There is NO need to have a number of professional people (e.g. Information Risk Managers) helping the information asset owners with the classifications to ensure an enterprise wide well balanced and calibrated classification over all asset types	4,30	5,0	5	2	1,0593	1,1222
8	To be transparent to the executive board, a register of ALL CRITICAL information assets and all related risks should be in place and up to date at any time	4,10	4,0	5	2	0,9944	0,9888
9	In general, there is NO need to have an overview on enterprise level on all classified information asset types (the types only, not the instanced assets themselves!)	4,00	4,0	5	3	0,8164	0,6666
10	It is important to distinguish in particular between this different dimensions (e.g. Confidentiality/Integrity/Availability/Privacy/Legal requirements)	4,00	4,0	5	2	1,0540	1,1111
11	It is good to involve these professionals in the classification process with a formal approval of all classifications to also ensure the "mandatory involvement"	3,40	3,0	5	2	1,0749	1,1555

12	Also for critical applications it is possible to outsource this to 3rd party vendors – unauthorized information theft is covered/avoided by contractual terms and conditions	3,20	4,0	4	1	1,2292	1,5111
13	Mean of 1-12	4,19	4,0	5	1	0,9194	0,8453

Source: Author's results

A graphical illustration of the results of the IRM-Information Classification Criteria is illustrated in a bar-chart showing the means as dots and the standard –deviations as bar above and below the mean value in Figure 4-2. It has to be noted, the overall results for IRM-Information Classification Measurements compared with those for IRM-Awareness are slightly below. Whereas the range between a four and a five indicates a strong agreement (in Likert Scale "Agree" and "Strongly agree"). Concluding, the results can be accepted as being still on a high level of agreement at all on the IRM-Experts side.

Figure 4-2. Mean and Standard Deviation of IRM-Information Classification



Source: Author's results

In the following, of the third exogenous variable being IRM-Information Protection are set in relations to strategic decision making

4.1.3 Exogenous Variable IRM-Information Protection in Relation to SDM Improvements

In the area of IRM-Information Protection twelve of the chosen measurement criteria were confirmed by the IRM-Experts as important with different averages (=mean) and also different variances on the samples. Detailed results of IRM-Expert-Interviews are reflected in Table 4-4. The results in Table 4-4 are sorted first order by the calculated Mean and second order by the minimum Variance. The highest mean is at a level of 4,80 out of theoretical maximum of 5,0 with a comparably small standard deviation of 0,421 which indicates a very

homogenous answer and therefore a strong validity of the criteria. Even the lowest average Mean for IRM Awareness lies at a level of 3,2 with a median of 4,0 and a standard deviation of 1,22 which also proves the validity of the statement made. Looking at the whole number of Means it is interesting to mention, that from a total number of 12 criteria, 10 having a mean of 4,0 or higher. Also looking at the standard deviations, it is worth to mention, that 11 out of 12 criteria do have a standard deviation less than 0,7 where the overall standard-deviation is at 1,1 at all – which proves also a high consistency in the answers of the IRM Experts

Table 4-4 IRM-Information Protection Measurement Results

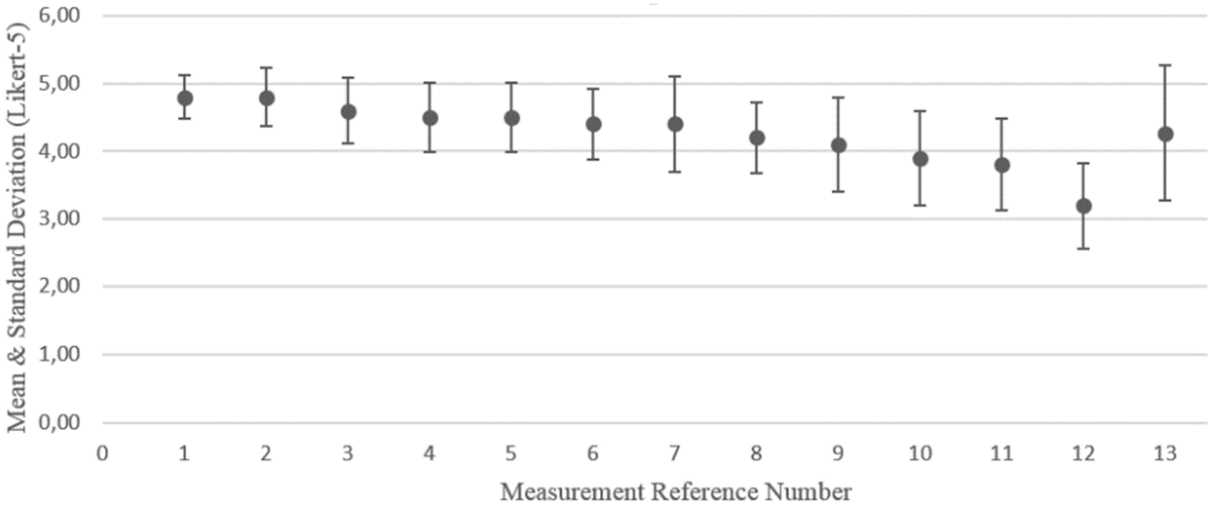
Criteria No.	Basic Question and Measurement Criteria	Mean (Likert 5)	Median (Likert 5)	Maximum	Minimum	Standard Deviation (Sample- non-normalized)	Variance (Sample – non-normalized)
1	It is essential for companies, that IT department provides an up to date IT security back-bone (anti-virus, Intrusion detection, fire-wall etc.)	4,80	5,0	5	4	0,4216	0,1777
2	If office doors are not locked in big companies, it is important NOT to leave classified information on the work desks	4,80	5,0	5	4	0,4216	0,1777
3	It is important to distinguish between information, that could be stored on public storage locations and information that should be stored on restricted storage locations	4,60	5,0	5	4	0,5163	0,2666
4	However classified information should be only accessible by limited number of people	4,50	4,5	5	4	0,5270	0,2777
5	For mobile devices there is NO need to encrypt the hard drive because all employees are trained and reliable in handling critical information (to avoid unauthorised information access in case of theft)	4,50	4,5	5	4	0,5270	0,2777
6	Employees should not have “local administrative” accounts on their PCs	4,40	4,5	5	3	0,6992	0,4888
7	To avoid unauthorised access to PCs, it is important to lock the PCs logically (Screensaver with password) and physically (fix the PC to the desk with e.g. a steel cable)	4,40	4,5	5	3	0,6992	0,4888
8	Regarding “Information Risk Management” it is important to have a “crises Team” implemented – being able to respond immediately to any threats	4,20	4,0	5	3	0,6324	0,4000
9	IT department should implement an automated “backup” for specific local (on local PC) folders to avoid data-loss in case of hardware-crashes etc.	4,10	4,0	5	2	0,9944	0,9888
10	The “information asset owner” should be the person to define the group of people which should have access to the information	3,90	4,0	5	2	0,8755	0,7666
11	Formal “business controls” (like SOX, etc.) help to manage “Information Risk Management” activities in an appropriate way in big enterprises	3,80	4,0	5	3	0,6324	0,4000
12	Also for critical applications it is possible to outsource this to 3rd party vendors – unauthorized information theft is covered/avoided by contractual terms and conditions	3,20	4,0	4	1	1,2292	1,5111
13	Mean of 1-12	4,27	4,0	5	1	0,8171	0,6677

Source: Author’s results

The graphical illustration of the results of the IRM-Information Protection Criteria is illustrated in a bar-chart showing the means as dots and the standard –deviations as bar above and below the mean value in Figure 4-3. The results for IRM-Information Classification and IRM-Information Protection are approximately at the same level as those from IRM-

Information Classification. Also, as mentioned above, the range between a four and a five indicates a strong agreement (in Likert Scale “Agree” and “Strongly agree”). The results can be accepted as still being on a high level of agreement with a comparably small standard-deviation / variance.

Figure 4-3. Mean and Standard Deviation of IRM-Information Protection



Source: Author’s results

In the following, of the fourth and last chosen exogenous variable being IRM-Information Controls are set in relations to strategic decision making

4.1.4 Exogenous Variable IRM Information Controls in Relation to SDM Improvements

In the area of IRM-Information Controls thirteen of the chosen measurement criteria were confirmed by the IRM-Experts as important with different averages (=mean) and also different variances on the samples. Detailed results of IRM-Expert-Interviews are reflected in Table 4-5. The results in Table 4-5 are sorted first order by the calculated Mean and second order by the minimum Variance. The highest mean is at a level of 4,70 out of theoretical maximum of 5,0 with a comparably small standard deviation of 0,483 which indicates a very homogenous answer and therefore a strong validity of the criteria. The lowest average Mean for IRM Information Controls lies at a level of 2,3 with a median of 2,5 and a standard deviation of 1,25 which does not indicate a clear confirmation for this criteria. Looking at the whole number of Means it is interesting to mention, that from a total number of 13 criteria, 10 having a mean of 3,8 or higher. Also looking at the standard deviations, it is worth to mention, that 10 out of 13 criteria do have a standard deviation less than 0,69 where the overall standard-deviation is at

1,00 at all Experts. The result turns significantly while accepting the last two criteria as not confirming or non-characterizing IRM Information Controls (interpreting it also as statistical outliers) the overall result turns. The assumed Mean would be at 4,25 with an overall standard-deviation of only 0,666 which would reflect a very reliable result at all.

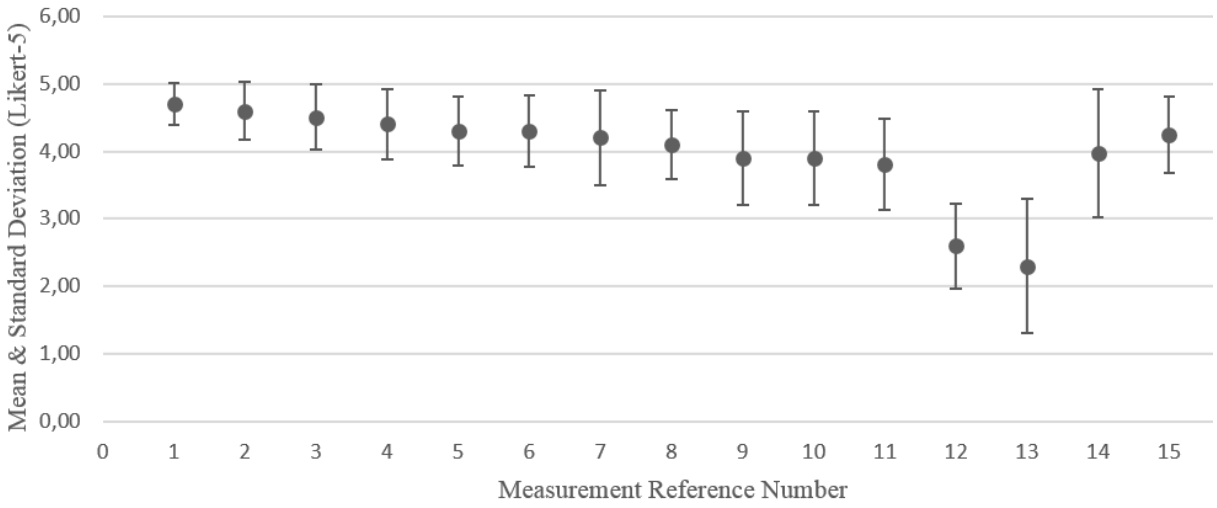
Table 4-5 Mean and Standard Deviation of IRM-Information Controls

Criteria No.	Basic Question and Measurement Criteria	Mean (Likert 5)	Median (Likert 5)	Maximum	Minimum	Standard Deviation (Sample- non-normalized)	Variance (Sample – non-normalized)
1	Formal "business controls" need to be agreed and sponsored by the executive board of the company to ensure that they are taken serious and are executed	4,70	5,0	5	4	0,4830	0,2333
2	The information controls should be up to date (according laws etc.) but not changed too often – to avoid confusions and demotivation at the employee level	4,60	5,0	5	4	0,5163	0,2666
3	To ensure better awareness /preparedness in "Information Risk Management" within companies, it is important to have a formally implemented communication and decision map (defined communication streams and mandates for decision making in crises)	4,50	4,5	5	4	0,5278	0,2777
4	"Time/Costs" constraints could be a reason for not fully implemented "Information Risk Management" Awareness / Preparedness	4,40	4,5	5	3	0,6992	0,4888
5	A good "tracking system" on the fulfillment level of the "business controls" should be in place	4,30	4,0	5	4	0,4830	0,2333
6	A lack of transparency in particular on "Information Risks" on executive management level could be a reason for not fully implemented "Information Risk Management" Awareness / Preparedness	4,30	4,0	5	3	0,6749	0,4555
7	Regarding "Information Risk Management" it is important to have a "crises Team" implemented – being able to respond immediately to any threats	4,20	4,0	5	3	0,6324	0,4000
8	Formal rules and guidelines (Standard Operating Procedures and e.g. "how-to" guidelines) need to be in place to ensure that "business controls" are understood and executed in the correct way	4,10	4,0	5	4	0,3162	0,1000
9	To ensure, that the controls are executed in an appropriate way, this should be part of the "role description" of the employees affected	3,90	4,0	5	2	0,8755	0,7666
10	The "information asset owner" should be the person to define the group of people which should have access to the information	3,90	4,0	5	2	0,8755	0,7666
11	Formal "business controls" (like SOX, etc.) help to manage "Information Risk Management" activities in an appropriate way in big enterprises	3,80	4,0	5	3	0,6324	0,40000
12	A review on the fulfillment-level could also be done by the people being responsible for the execution	2,60	2,5	4	1	1,1737	1,3777
13	A reason for not fully implemented "Information Risk Management" Awareness / Preparedness could be that there are no significant risks at all (as an outcome of a formal evaluation within the company)	2,30	2,5	4	1	1,2516	1,5666
14	Mean of 1-13	3,97	4,0	5	1	1,0033	1,0067
15	Mean of 1-11 (without the outliner cases 12 &13)	4,25	4,0	5	2	0,6661	0,4437

Source: Author's results

The Figure 4-4 shows the Means and Standard-Deviations of the 13 measurement items graphical also the overall mean and Standard-Deviation (14) and the corrected values (15) for cutting of the cases eleven and twelve as outliers.

Figure 4-4.Mean and Standard Deviation of IRM-Information Controls



Source: Author's results

Having statistically examined the results and relations of all four chosen exogenous variables and their relations to Strategic Decision Making a discussion of the results is presented in the following chapter.

4.1.5 Intermediate Discussion and Conclusion on the IRM Expert Interviews Results

As already mentioned in Chapter 3 the quantitative aspects of the detailed results of the measurement criteria for the latent exogenous variables are not used further on in the *T-Test* or in any correlation analysis. The detailed values are not considered as such as the statistical base of any further modelling is not given.

It is important to examine the correctness and the validity of the aggregated results by considering the total mean values in combination with their standard-deviation qualitatively. The purpose of the IRM-Experts interview was to (1) prove the latent exogenous variables as such qualitatively – which could be fully accepted by the above results. (2) The second goal was to prove the applicable measurement items for the latent exogenous variables qualitatively – which could be accepted by the above results with two exceptions, the criteria 12 and 13 of the IRM-Information Controls measures which was not fully confirmed and will therefore not be used further on to characterize the Latent Exogenous variable of IRM-Information Controls, Finally (3) it was the goal to generate a quantitative *Empiric Norm* for the further *T-Test*. The arithmetical mean of each relation represents the best method as a *Calibration-Result* out of 10 IRM-Experts opinions. Literature (Linderman, A. et al. 2011) (Ganzach, Y. 2000) showed that for a number of 3-8 Experts views could be accepted at all. Considering in this dissertation (1)

the number of 10-Expert interviews on the one hand combined with the (2) comparably homogenous view of the IRM-Experts – the very low standard-deviation – and finally (3) the only usage of the "mean" function without any further sophisticated statistical methods, the ***results out of the IRM-Expert-Interviews are accepted as*** **empiric-norm**.

4.2 Business Professional Field Study Results

In the following chapter the results of the quantitative analyses of the Lab-in-the-Field Study with 131 Mid-Level Managers are examined in detail. All results of all concatenations of the relations of the latent exogenous- and latent endogenous variables are reflected in pairs and are compared to the *empiric-norm* of the according relation – overall this results in particular in 3×4=12 cases which will be looked into in particular.

As per detailed description in chapter 3.5 the *Mann-Whitney-U-Test* and the *T-Test* tests were performed against *significant difference* between the *empiric-norm* and the calculated *U* and t-value. In particular the basic parametric results of *N = 131, Mean*, *Standard-Deviation* and *Standard-Error-Mean, T-Value,* d*f, Mean-Difference,* the *95% Confidence according T-Test,* but also the non-parametric results of the Mann-Whitney-U-Test in particular the *U-Value, 95% Confidence of M-W-U-Test* are examined and could be found in detail in the Annex for each concatenation. In the following both test results are shown (1) graphically to examine the relation in focus, and (2) further discussed according all parameters of relevance and being interpreted as well. For both tests it is important to understand the calculation and the interpretation of the results technically, which is as the following:

Result < 1- 0, 99 $\overset{\text{def}}{=}$ "Highly Significant Difference" between the view of the 10 *IRM-Experts* and the view of the 131 *Midlevel Managers* tested

Result < 1-0, 95 $\overset{\text{def}}{=}$ "Significant Difference" between the view of the10 *IRM-Experts* and the view of the 131 *Midlevel Managers* tested

Result ≥ 1- 0, 95 $\overset{\text{def}}{=}$ "Significant Conformity" between the view of the 10 *IRM-Experts* and the view of the 131 *Midlevel Managers* tested marked with a "*ch*" (="confirming hypothesis")

As the Mann-Whitney-U-Test is performed against the ranks (mean rank) of the results of both groups not only the test-result itself has to be considered, but also the comparison of the two groups' mean ranks. In case the Mann-Whitney-U-Test shows significant difference of both groups, but the mean-rank of the tested Mid-Level-Managers group is higher than the mean-rank of the empiric-norm, this would also confirm the hypothesis, which is single side

where as the Mann-Whitney-U-Test also tests on both sides around the empiric norm. It would on-top mean that the perception of the Mid-Level-Managers is even much higher than the empiric-norm, which could be interpreted as a potential risk of seeing too much impact into the applicable relation. All cases, where the hypothesis could be confirmed, either by a proven conformity by the Mann-Whitney-U-Test, or by the fact of higher rank-means at the Mid-Level-Managers' results this will be marked with a "*ch*", meaning "*confirming hypothesis*"

Similar to the Mann-Whitney-U Test, it has to be noted, that the *T-Test* is testing the weight of an estimated correlation against a mean of an already constructed relation, the support or reject of the criteria depends not only on the "significant conformity" of the *T- Test* result. There is also one special case where the *T-Test* result would be < 1-0, 95 (="Significant Difference") or even lower but the mean-value of the relation is even higher than the *empiric-norm*. In this case, as like as in the Mann-Whitney-U-Test, the hypothesis would also be confirmed acknowledging, that the result is significant different and higher than the *empiric-norm* of the IRM-Experts. This cases are also marked in the following with a "*ch*" (="confirming hypothesis"). The statistical background is, the used *T-Test* method is 2-tailed, which means, it also measures differences above the value. Whereas the Hypothesis is single side, which means, once the *empiric-norm* is reached conformity is reached even if the value significantly differs on the top-end side.

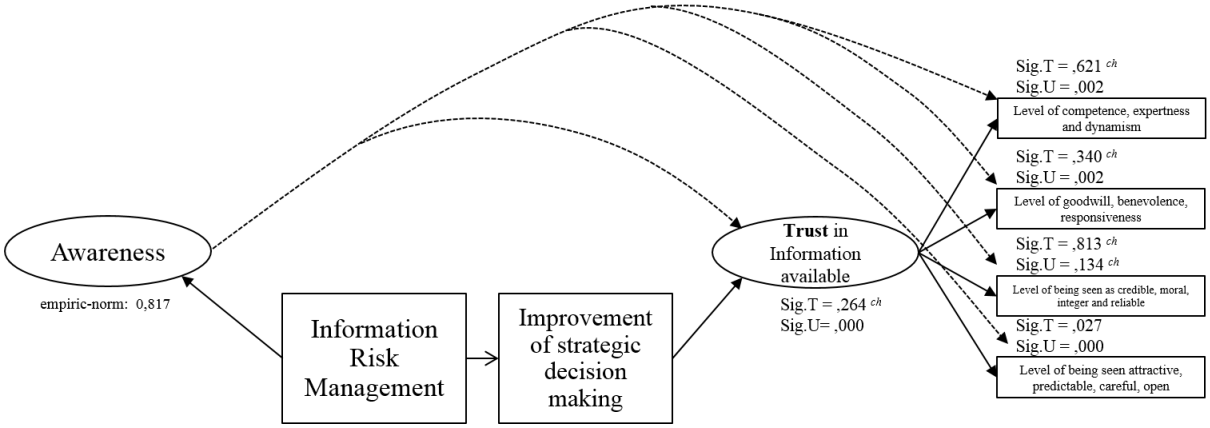
In the following sub-chapters the results of the comparison of the *empiric-norm* and the correlation estimation of the IRM-Experts are examined, and the implications are discussed in particular – statistical definitions are not given again in the sub-chapters.

4.2.1 Results in the Relation between IRM-Awareness to SDM-Improvement-Trust

In the first case the relation between IRM-Awareness and the Strategic-Decision-Making variable *Trust* is examined – see Figure 4-5. The detailed parametric and non-parametric test results are reflected in the annex.

The *T-Test* results shows a significant overall conformity in the relation of IRM-Awareness and the *Trust* on both sides with the IRM-Experts and the Mid-Level Managers. The only significant difference is seen in the measurement criteria of *Trust* in the need to be seen as credible, integer, moral, and reliable.

Figure 4-5. Test Results of Trust against the Empiric Norm of IRM-Awareness



Source: Author's results based on own statistic results

Mid-Level Managers view is significantly different to the *empiric-norm* given through the IRM-Experts. Interesting to also consider the comparably high mean of this measurement criteria in relation to the highest standard-deviation-value and the smallest mean-difference in this context. In this measurement criteria also the comparably highest standard-deviation of all *Trust*-Measurements could be observed with 0,216 which also shows the highest inhomogeneity within this correlations.

The Mann-Whitney-U-Test results for this case show in two out of four criteria also conformity of in the perception of the Mid-Level-Managers to the empiric-norm of the IRM-Experts. In the case of the measurement of the impact on the "Level of Goodwill, benevolence and responsiveness" it could be noted, that even the M-W-U-test shows significant difference, the result is quite borderline while looking into the ranks of the means, which are very close to each other (145 and 118). For the measurement of the "level of being seen as attractive, predictable, careful, and open" the M-W-U-Test confirms significant difference in the perception of the Mid-Level-Managers with the empiric-norm of the IRM-Experts. The spread of the mean-rank is much higher with 151 and 112.

Test Results: Following the notion of the two tests' results it can be examined, that the T-Test clearly confirm three out of four relations being seen as conform to the empiric-norm, whereas the Mann-Whitney-U-Test shows two cases out of four confirming the conformity.

Interpretation of Test Results: The test results show in both cases a tendency of conformity between the Mid-Level-Managers perception on the causal relation between IRM-Awareness and SDM-Trust. In other words, the Mid-Level-Mangers would see the causal

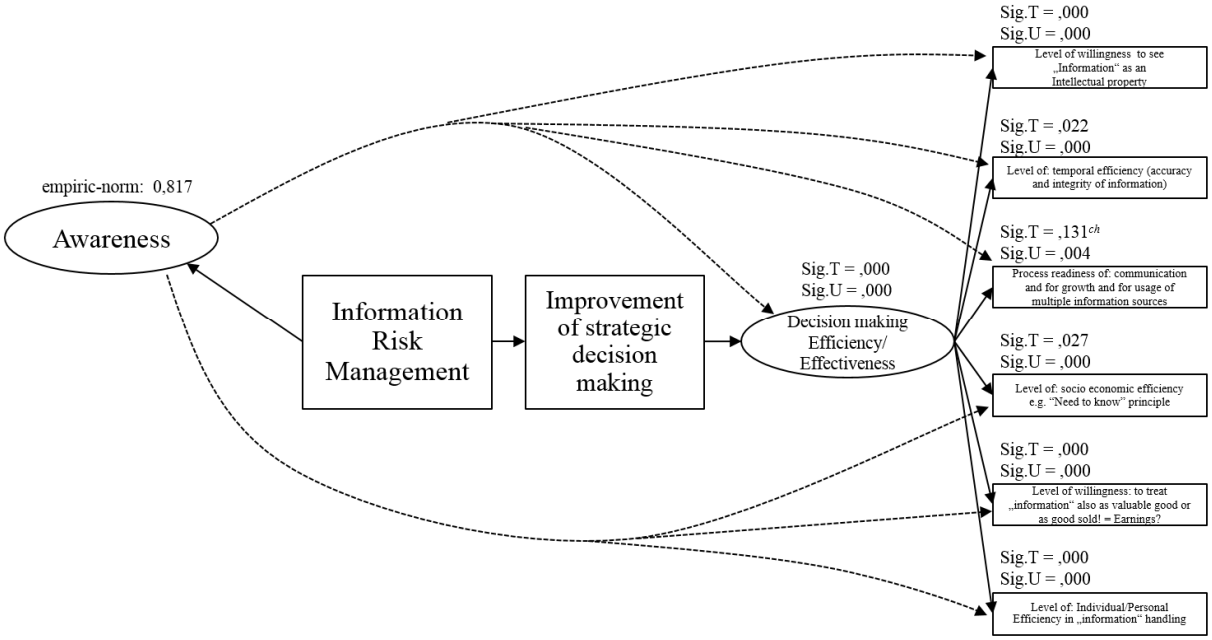
relation with the almost similar strength that IRM-Awareness would contribute to SDM-Trust as a causal relation.

Impact for Business Organizations: Corrective actions are not proposed with top priority, as the perception is on a fairly equal level to the empiric-norm. But of course the IRM-Awareness is an ongoing topic, where the momentum needs to be kept and also adapted to the rapid changes in information-economy. Long-term, the Awareness should become a central part of the organization, institutionalize and mandatory for all employees, where especially with the IRM-Awareness the trust into the individual decision making processes could be kept but also iterated up into strategic decision makings – from and to the inside and outside the organizations.

4.2.2 Results in the Relation between IRM-Awareness to SDM-Improvement Efficiency and Effectiveness

In this case the relation between IRM-Awareness and the Strategic-Decision-Making variable *SDM-Efficiency and Effectiveness* is examined – see Figure 4-6. The detailed parametric and non-parametric test results are reflected in the annex.

Figure 4-6. Test Results of *Decision Making Efficiency and Effectiveness* against the *Empiric Norm* of IRM-Awareness (*empiric-norm*: 0,817)



Source: Author's results based on own statistic results

The T-Test-result shows only one single significant conformity between the IRM-Experts view and the Mid-Level Managers in the T-Test. Also the aggregated view of the T-Test on the relation between IGM Awareness and Decision Making Efficiency and Effectiveness could be accepted as significantly different. Looking into the detailed numbers it could be observed that the overall mean is at 0,728 so almost at the "neither" level, whereas the empiric-norm is at 0,817. The standard deviation average is about 0,1661 comparably small for the average, which indicates a high homogeneity of the answers and therefore a high validity of the results – even the individual standard-deviations are at a comparably lower level, none is smaller than 0,237. Quite interesting to observe, especially the *Process-readiness for communication and for growth and for usage of multiple information sources* conforms with the IRM-Experts view being seen with the highest mean and lowest standard-deviation in this section.

The Mann-Whitney-U-Test results show in all measurement cases significant difference. The rank means of the Mid-Level-Managers are consistently lower for all individual cases. This means, that the hypothesis is not confirmed. Quite interesting also, that the rank means are clearly differing from each other pairwise.

Test Results: Following the notion of the two tests' results, (1) both methods show similar results, and (2) it can be examined, that the T-Test clearly reject five out of six relations being seen as conform to the empiric-norm, whereas the Mann-Whitney-U-Test shows all six cases out of six reject the conformity

Interpretation of Test Results: The test results show in both cases clear tendency of difference between the Mid-Level-Managers perception on the causal relation between IRM-Awareness and SDM-Efficiency/Effectiveness. In other words, the Mid-Level-Mangers would see the causal relation with significantly lower strength in a way that IRM-Awareness would not contribute as strong to SDM- Efficiency/Effectiveness as IRM Experts' empiric-norm was set to.

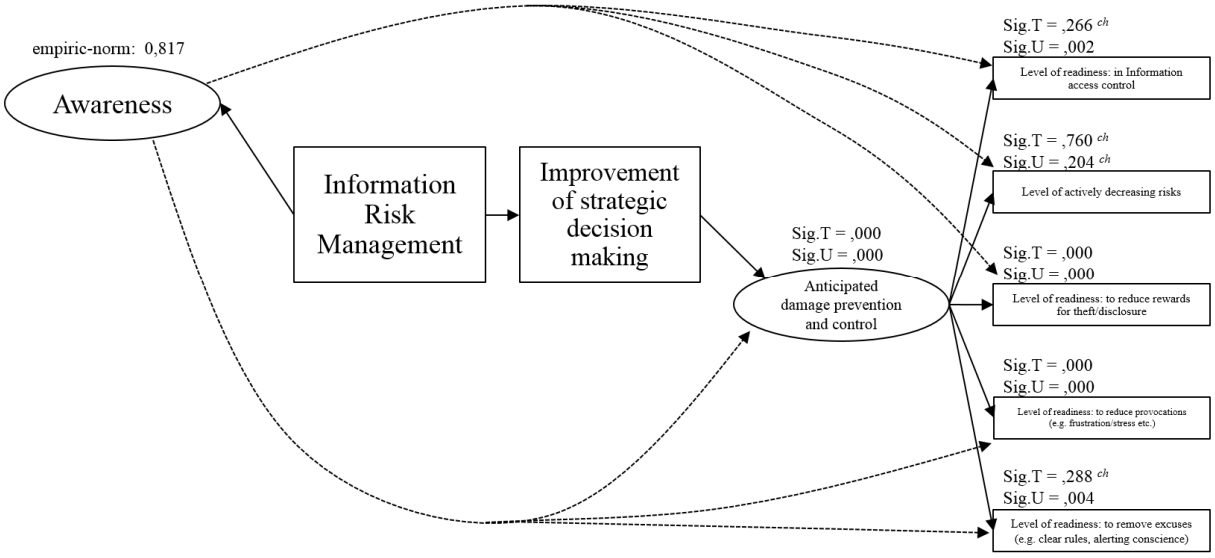
Impact for Business Organizations: Corrective actions are proposed with high priority, as the perception is on a different level than the empiric-norm. It seems important to show and prove practically, that IRM-Awareness also drives SDM-Efficiency and Effectiveness. In business organizations efficiency and effectiveness are the key success factors for competitive advantage. The linkage and causal relation is one key element for further success in (strategic-) decision-making. IRM-Awareness is an ongoing topic, where the momentum needs to be kept and also adapted to the rapid changes in information-economy. Short-term, immediate trainings for decision-makers, but also general awareness campaigns should be performed to catch-up to the required level. Long-term, the IRM-Awareness should become an integral part of the

organization, institutionalized and mandatory for all employees, where especially with the IRM-Awareness the efficiency and effectiveness of the usage of *Information* in the day to day business increases – this gets even more important over time for all employees in their individual decision making processes but also iterated up into strategic decision makings – from and to the inside and outside the organizations.

4.2.3 Results in the Relation between IRM-Awareness to SDM-Improvement Anticipated Damage Prevention and Control

In this case the relation between IRM-Awareness and the Strategic-Decision-Making variable *SDM-Anticipated Damage Prevention and Control* is examined – see Figure 4-7. The detailed parametric and non-parametric test results are reflected in the annex.

Figure 4-7. Test Results of *Decision Making Anticipated Damage Prevention and Control* against the *Empiric Norm* of IRM-Awareness



Source: Author's results based on own statistic results

The T-Test results show, that three out of five measurement criteria are seen as significantly conforming to view of the IRM Experts *empiric norm* – the (1) *Level of readiness in Information Access Control*, (2) *the Level of actively decreasing Risks*, and (3) *the level of readiness to remove excuses*. Whereas (1) *the level of actively decreasing risks*, and (2) *the level of readiness to reduce provocations* are significantly differing from the IRM-Experts view. Quite interesting, that the *aggregated T-Test-result* for all measurement criteria is statistically

clearly highly significant different from IRM-Experts view. While looking into the detailed statistical results it could be observed, that the three conforming measurement variables are very close around the 0,8 value (0,7977; 0,8225;0,7977) which is very close to the empiric norm of 0,8171. Also the standard deviation of this 3 values is at a level of about 0,2 (0,1988; 0,2021;0,2082) compared to the non-conforming results which are comparably higher at 0,2597 and 0,2675 – which proves also the higher level of homogeneity of the conforming results. Overall, it would be debatable on how to accept the overall *mean-result* and the overall *T-Test* result for the variable of Damage Prevention and Control in the relation of IRM-Awareness as three out of five criteria are significantly conform to the IRM-Experts empiric-norm from out of the *T-Test* results.

The Mann-Whitney-U-Test result shows four out of five results as significantly differing from the *empiric-norm* of the IRM-Experts. The only confirming criteria is the "Level of activity decreasing risks" where the mean rank is 126 against the empiric norm rank of 137 – it shows that even the test result is confirming conformity, that the result (mean rank) is still below the empiric-norm mean rank. With this, it is mapping also to the *T-Test* result, which also shows in this criteria conformity. Also 2 out of the 4 differing criteria showing tendency to be close to conformity – even they are not. Also here the differences in the mean rank is comparably small which also overlaps with the tendency of the *T-Test* results, e.g. for criteria (1) "level of readiness in information access control" – which was tested as conform in the T-Test – the mean rank difference is comparably small with 145 to 118 but also (2) the criteria of "readiness to remove excuses" even shows a negative M-W-U-test result, but a comparably small difference of the mean rank (153 to 119). The other two of four differing criteria do have a significantly higher mean rank difference (166 to 97 and 156 to 107) – which also overlaps with *T-Test* result for those to criteria. Quite interesting to mention that also the aggregated test-result in the Mann-Whitney-U-test shows clear non-conformity with a mean rank of 153 to 110, as like the T-Test shows in the aggregated result clear non-conformity.

Test Result: The two Methods of Mann-Whitney-U-Test and T-Test show same tendency of results, where the Mann-Whitney-U-Test shows even a lower baseline, but same "behavior" of only partly confirming the relation of IRM-Awareness and SDM Damage Prevention and Control as being seen by the Mid-Level-Managers on the same level as the empiric-norm of the IRM-Experts. It has to considered that through the usage of 131 times the same value of the empiric norm for the comparison in the Mann-Whitney-U-Test, the corridor for the results is statistically very small, in other words, very error-intolerant with a narrow distribution.

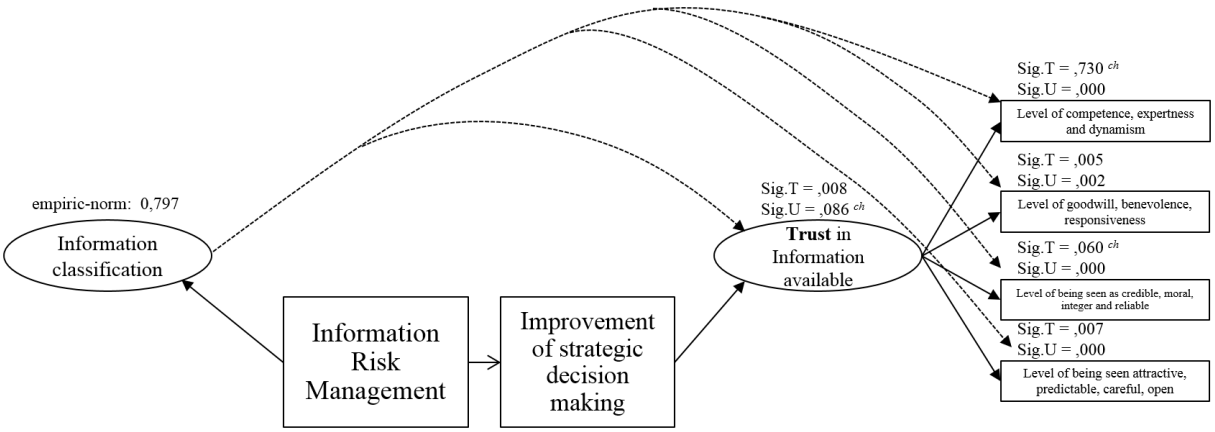
Interpretation of Test Results: The test results show in both cases a slight tendency of conformity between the Mid-Level-Managers perception on the causal relation between IRM-Awareness and SDM Damage Prevention and Control. In other words, the Mid-Level-Mangers would see the causal relation with the lower but almost similar perception that IRM-Awareness would contribute to SDM Damage Prevention and Control as a causal relation.

Impact for Business Organizations: the mentioned tendency of being below the *empiric-norm* in this relation is calling for action. IRM-Awareness is currently not seen on an appropriate level as being an essential contributor to successfully manage (1) information access controls properly, (2) reduce rewards for theft/disclosure, (3) reduce provocations, and (4) remove excuses. In all four areas organization on all levels needs to be made fully aware, to leverage any information-risks according access management, to actively reduce rewards and provocations – in other words, to keep secrets secret, but also implement a clear tone of the top, that excuses are not accepted and are followed up in any case with consequences for the organization.

4.2.4 Results in the Relation between IRM-Information-Classification to SDM-Improvement Trust

In this case the relation between IRM-Information Classification and the Strategic-Decision-Making variable *SDM-Trust* is examined – see Figure 4-8 .

Figure 4-8. Test-Results of *Decision Making Trust* against the *Empiric Norm* of IRM-Information Classification



Source: Author's results based on own statistic results

The detailed parametric and non-parametric test results are reflected in the annex.

The T-Test results show, that the Mid-Level Managers view differs on this relation between Information Classification and Trust also from the IRM-Experts view. In two out of four T-Test results conformity was proven. For two criteria the significant difference was proven (1) *the level of goodwill, benevolence, responsiveness*, and (2) *the level of being attractive, predictable careful and open* – whereas (1) *the level of competence, expertness and dynamism*, and (2) *the level of being credible, morale, integer and reliable* is conforming with IRM-Experts empiric-norm in this relations. The overall *T-Test* result for this relation is in average calculated as being significantly different. Further it was observed that for the two accepted conform measurement criteria the mean is comparably high at a level of 0,7920 and 0,7634 each with a comparably small standard deviation of about 0,2 which shows a high homogeneity of the results in this two cases. Whereas in the other two cases of significant difference the mean values are comparably low at a level of 0,7385 each with a standard deviation of 0,2399 and 0,2497 which indicates a higher distribution of the results around a lower confirmation level. The aggregated result for the mean and the standard-deviation of this relation is interesting close to the acceptance level but statistically clearly showing a non-conformity at all. The mean lies at a level of 0,7581 with a comparably very low standard deviation over all of 0,1699 which also proves the overall validity of the aggregated result.

The Mann-Whitney-U Test shows in all five measurement criteria significant difference of the Mid-Level-Managers-Perception to the empiric norm of the IRM-Experts. Even in those two cases, where the *T-Test* is proving conformity, the Mann-Whitney-U test does clearly deliver significant difference as a result. Statistically quite interesting, that especially the aggregated result in the Mann-Whitney-U-test shows conformity and the mean ranks are 139 to 124 – where even the Mid-Level-Managers mean rank is below that of the empiric-norm, proving the tendency, that in this case the Mid-Level-Managers perception of the strength of the relation is below the empiric-norm of the IRM-Experts as a clear tendency for this causal relation.

Test Result: The two Methods of Mann-Whitney-U-Test and T-Test show same tendency of an overall significant difference between the perceptions of the Mid-Level-Managers in relation to empiric-norm of the IRM-Experts. Also in this case, the Mann-Whitney-U tests shows more aggressive results but with exact same tendency / semantics of non-conformity.

Interpretation of Test Results: The test results show in both cases a clear tendency of difference between the Mid-Level-Managers perception on the causal relation between IRM-Information Classification and SDM Trust. In other words, the Mid-Level-Mangers would see

the causal relation with clearly lower importance that IRM-Information Classification would contribute to SDM Trust as a causal relation.

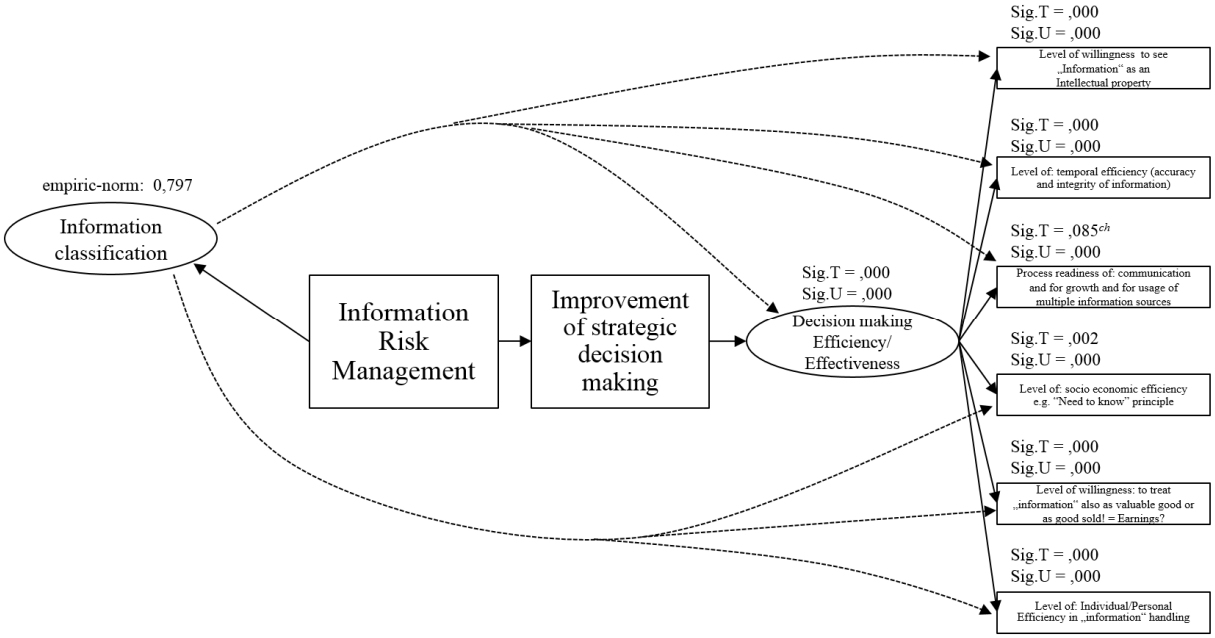
Impact for Business Organizations: the mentioned tendency of being clearly below the *empiric-norm* in this relation is calling for action. IRM-Information Classification is currently not seen on an appropriate level as being an essential contributor to successfully contribute in SDM-Trust variables. Within Business organizations but also in relations to other organizations it is key to establish an atmosphere of trust. The fact, that an information classification matrix of all relevant information assets is established properly in the business organization would increase the trust factors for any decision makings, as those classifications are set and not out for interpretation or discussion internally. With that, clear internal norms and comparison could be performed even more comparable and mechanically in decision making processes, resulting in less risks because of a better quality of information. The (1) competence/expertness, the (2) goodwill and responsiveness, (3) the integrity and reliability, and (4) predictability factors for trust could be shaped in business organizations by starting implementing a proper classification scheme for all relevant information assets.

4.2.5 Results in the Relation between IRM-Information-Classification to SDM-Improvement Efficiency and Effectiveness

In this case the relation between IRM-Information Classification and the Strategic-Decision-Making variable *SDM-Efficiency and Effectiveness* is examined – see Figure 4-9. The detailed parametric and non-parametric test results are reflected in the annex.

The T-Test results show, that the IRM-Experts *empiric-norm* could not be reached by the Mid-Level Managers in this particular case, only in one measurement criteria conformity could be proven – the *temporal efficiency*. In all other cases the *T-Test* result shows highly significant difference. In particular the mean values for the measurement criteria are comparably low – from 0,4943 up to u,7233 with a comparably high standard deviation of up to 0,3092 which shows a low level of confirmation and a high level of spread of the results of the Mid-Level Managers. Also the aggregated mean only reaches a level of 0,652 which is just 0,05 higher than the “Neither” answer in average. Mid-Level-Managers’ view on the need of Information Classification to improve SDM Effectiveness and Efficiency at the same high level as the IRM-Experts – to recap, the *empiric norm* of the IRM-Experts is at 0,7979.

Figure 4-9. Test Results of *Decision Making Efficiency and Effectiveness* against the *Empiric Norm* of IRM-Information-Classification



Source: Author's results based on own statistic results

The Mann-Whitney-U-test shows in all six measurement criteria significant difference of the Mid-Level-Managers-Perception to the empiric norm of the IRM-Experts. In this light also the mean rank differences are comparably high e.g.178 to 85. All mean ranks of the empiric norm are higher than the mean ranks of the Mid-Level-Managers, which proves a clear and significant difference of the measured values. The aggregated test-result shows also clear difference and high spread of the mean rank. With this, the Mann-Whitney-U-test shows similar results as the T-Test.

Test Result: The two Methods of Mann-Whitney-U-Test and T-Test show same tendency of an overall significant difference between the perceptions of the Mid-Level-Managers in relation to empiric-norm of the IRM-Experts. Also in this case, the Mann-Whitney-U tests shows more aggressive results but with exact same tendency / semantics of non-conformity. The T-Test proves in one case conformity where the Mann-Whitney-U test does not. But for the other five out of six cases both methods came to similar result.

Interpretation of Test Results: The test results show in both cases a clear tendency of difference between the Mid-Level-Managers perception on the causal relation between IRM-Information Classification and SDM Efficiency/Effectiveness.

In other words, the Mid-Level-Mangers would see the causal relation with clearly lower importance that IRM-Information Classification would contribute to SDM Effectiveness / Efficiency as a causal relation.

Impact for Business Organizations: the mentioned tendency of being clearly below the *empiric-norm* in this relation is calling for action. IRM-Information Classification is currently not seen on an appropriate level as being an essential contributor to successfully contribute in SDM-Efficiency / Effectiveness variables. Within Business organizations but also in relations to other organizations it is key to establish Efficiency and Effectiveness.

The fact, that an information classification matrix of all relevant information assets is established properly in the business organization would increase the efficiency and effectiveness factors for any decision makings, as those classifications are set and not out for interpretation or discussion internally. The clarity on how information is classified and how it needs to be treated consequently has a strong impact on the efficiency and effectiveness. If information needs to be questioned on correctness, applicability, availability this does not result in an efficient and effective decision making process. Vice versa, the implementation of a proper Information Classification Framework for all relevant Information assets is a key success factor for driving faster and solid decisions. The clear call for action to business organizations is to ensure proper classification schemes for all parts in the business organization, governed centrally to keep the classifications leveraged amongst other departments but also with a strong stewardship from top-management as this would be seen as an "extra" exercise with the departments possibly interfering the current day-to-day and project work with a risk of being de-prioritized.

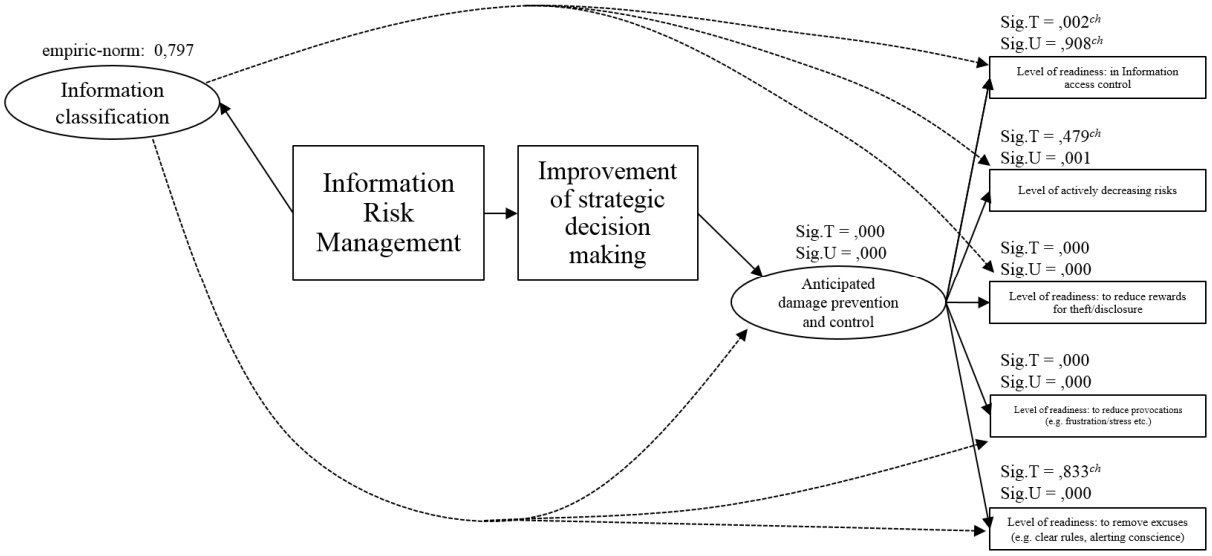
4.2.6 Results in the Relation between IRM-Information-Classification to SDM-Improvement Anticipated Damage Prevention and Control

In this case the relation between IRM-Information Classification and the Strategic-Decision-Making variable *SDM-Efficiency and Effectiveness* is examined – see Figure 4-10. The detailed parametric and non-parametric test results are reflected in the annex.

The result of the *T-Test* shows two out of five measurement criteria for the anticipated damage prevention and control are seen at the level of the *empiric norm* of the IRM-Experts. Especially the (1) *level of decreasing risks*, and (2) *the level of removing excuses* conform to the IRM-Experts *empiric norm* – the aggregated *T-Test* for all measurements for the *Anticipated*

Damage Prevention and Control is highly significantly different to the empiric norm. Even more interesting, the first criteria *Level of readiness in information access control* shows on the one hand a significant difference in the *T-Test* result, but the mean value is much higher than the *empiric-norm*, which indicates, that this criteria supports the hypothesis.

Figure 4-10. Test Results of *Decision Making Anticipated Damage Prevention and Control* against the *Empiric Norm* of IRM-Information Classification



Source: Author's results based on own statistic results

Looking into the detailed results it could be observed, that for two of the non-conforming results the mean lies comparably low even below "neither" (0,4637 up to 0,5382) with a comparably high standard-deviation of 0,3055 and 0,3029. One single non-conforming case requires attention – the *level of readiness in information access control* lies with a mean of 0,8473 even higher than the *empiric norm* of the IRM Experts. Statistically the *T-Test* results with this high values in a non-conformity – whereas it has to be clearly stated, that in this case the Mid-Level Managers confirm to a higher level than the IRM-Experts the necessity and need of information control to contribute on the improvement of SDM Anticipated Damage Prevention and Control.

The Mann-Whitney-U-test results show only conformity of one out of five measurement criteria – the "Level of readiness in information access control". Here also the rank means of are quite identical with 132 to 131. In the other four cases the Mann-Whitney-U test shows significant difference in the perception of the Mid-Level-Managers perception compared to the empiric-norm of the IRM-Experts. The aggregated result of all five criteria also does not show any conformity between the two tested result groups.

Test Result: The two Methods of Mann-Whitney-U-Test and T-Test show same clear tendency of an overall significant difference between the perceptions of the Mid-Level-Managers in relation to empiric-norm of the IRM-Experts. Also in this case, the Mann-Whitney-U tests shows more aggressive results but with exact same tendency / semantics of non-conformity. The T-Test proves in one case "over-conformity" where the Mann-Whitney-U test does prove conformity with almost equal mean ranks. The T-Test proves conformity in two further cases, where the Mann-Whitney-U-test does prove difference. Once more it has to be mentioned that due to the usage of 131 times similar empiric norm, the corridor of results is clearly smaller with a lower level of distribution. In cases, where the standard deviation – or spread – of the results on the one side (Mid-Level-Managers) is comparably high, the overall result in comparison to the distinct value of the empiric norm is giving a drift to the results.

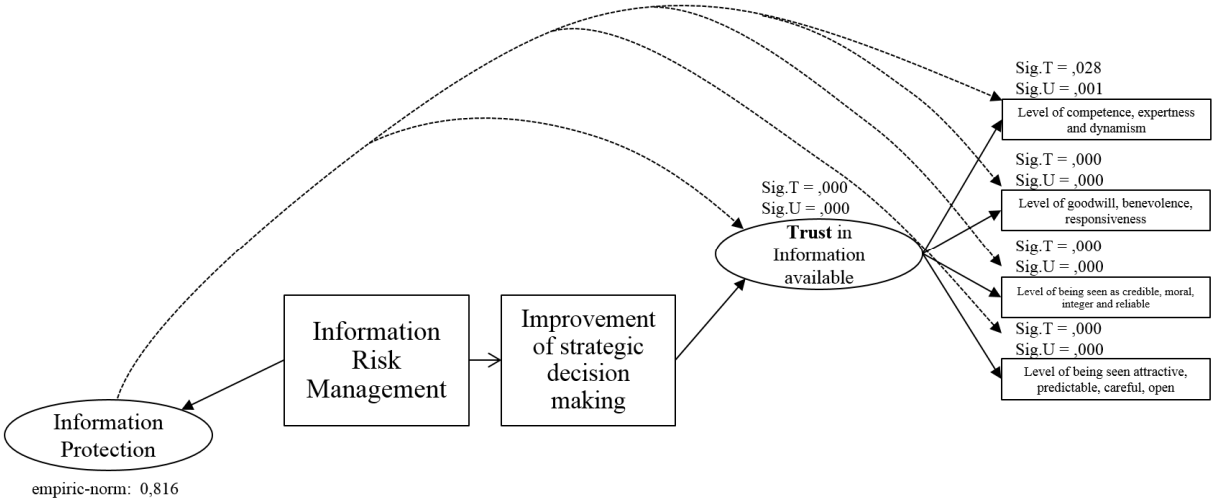
Interpretation of Test Results: The test results show in both cases a clear tendency of difference between the Mid-Level-Managers perception on the causal relation between IRM-Information Classification and SDM Damage Prevention and Control. In other words, the Mid-Level-Mangers would see the causal relation with clearly lower importance that IRM-Information Classification would contribute to SDM Anticipated Damage Prevention and Control as a causal relation. It has to be noted as an exceptionally case, that the relation between Information Classification and its impact on Information access control was quite well understood with a tendency of even overstressing this up to a higher level of importance than the empiric norm would be. In other words, Mid-Level-Managers would agree with tendency of over interpreting the relevance compared to the empiric norm and esp. in comparison to the other criteria which are all comparably far below the empiric norm.

Impact for Business Organizations: the mentioned overall tendency of being clearly below the *empiric-norm* in this relation is calling for action. IRM-Information Classification overall is currently not seen on an appropriate level as being an essential contributor to successfully contribute in SDM-Damage Prevention / control variables. Within Business organizations but also in relations to other organizations it is key to establish a solid information asset classification. The fact, that an information classification matrix of all relevant information assets is established properly in the business organization would increase the anticipated damage control and prevention holistically. With the ability to decrease information risks, reduce rewards for theft/disclosure, reduced provocations, and finally the removal of the possible excuses increases the quality of any information used in strategic decision makings and will consequently increase the quality of the decision itself.

4.2.7 Results in the Relation between IRM-Information-Protection to SDM-Improvement Trust

In this case the relation between IRM-Information Protection and the Strategic-Decision-Making variable *SDM-Trust* is examined – see Figure 4-11. The detailed parametric and non-parametric test results are reflected in the annex.

Figure 4-11. Test Results of *Decision Making Trust* against the *Empiric Norm* of IRM-Information-Protection



Source: Author's results based on own statistic results

The T-Test results show, that all four measurement criteria do not meet the *empiric-norm* of the IRM-Experts. Also not the aggregated *T-Test* result. All test-results are showing highly significant results in this particular relation. Looking into the detailed results a comparably high standard-deviation of all results could be observed – the values lye between 0,2541 and 0,3212 which shows a comparably inhomogeneous distribution with a comparably low mean – which lies between 0,6183 and 0,7672. The mean values in combination with the standard-deviation show values that are slightly above the "Neither" answer, but not close to the *empiric-norm* of 0,8166 of the IRM-Experts on this relation. Even the aggregated mean lies at 0,6932 on an average "Agree" level but not in a "Fully Agree" level – therefore the *T-Test* result is 0,000 indication non-conformity at all.

The Mann-Whitney-U-test also shows for all four measurement criteria significant non-conformity between the tested Mid-Level-Managers group and the empiric norm. All mean ranks of the empiric norm are comparably spread with values from pairs of 146 to 117 up to 168 to 95, which indicates a quite clear difference in the perception level of the Mid-Level-

Managers compared to the IRM-Experts. Also the aggregated result indicates significant difference between the groups. Here the mean ranks are most spread as they are 168 to 95.

Test Result: The two Methods of Mann-Whitney-U-Test and T-Test show same clear tendency of an overall significant difference between the perceptions of the Mid-Level-Managers in relation to empiric-norm of the IRM-Experts. Also in this case, the Mann-Whitney-U tests shows slightly more aggressive results but with exact same tendency / semantics of non-conformity. The T-Test proves also in none of the cases case conformity similar to the Mann-Whitney-U test.

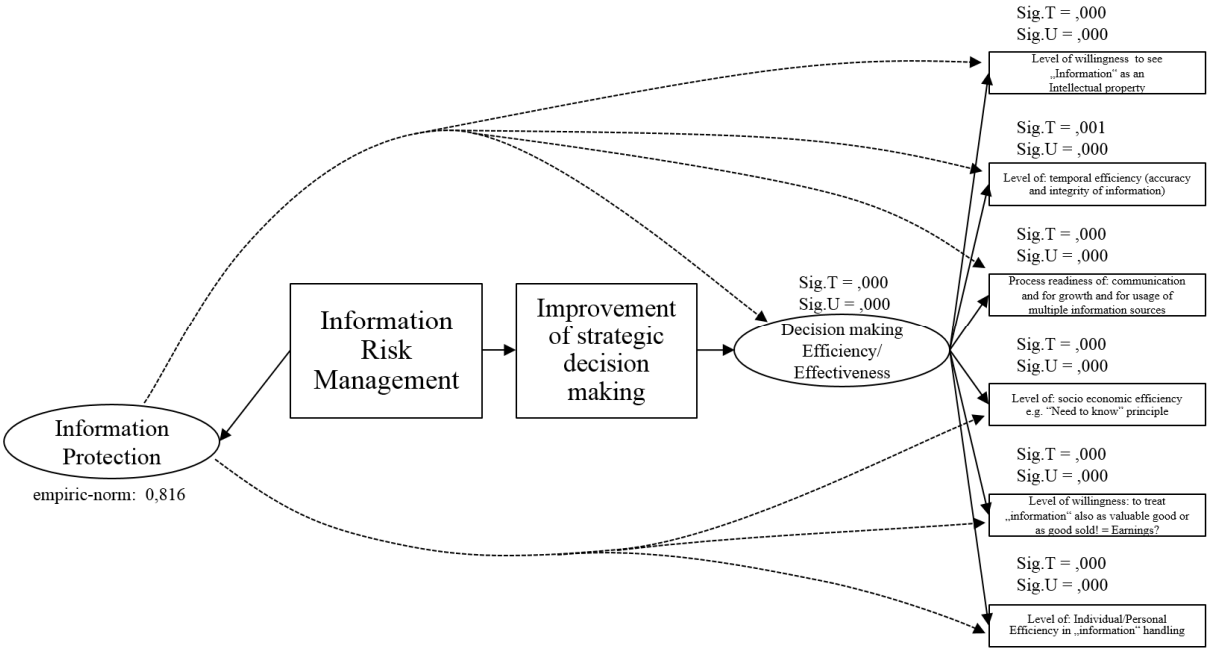
Interpretation of Test Results: The test results show in both cases a clear and consistent tendency of significant difference between the Mid-Level-Managers perception on the causal relation between IRM-Information Protection and SDM Trust. In other words, the Mid-Level-Mangers would see the causal relation with clearly lower importance that IRM-Information Protection would contribute to SDM Trust as a causal relation. In other words, Mid-Level-Managers perception that SDM Trust would be a result of a causal relation beginning also with IRM Information protection measures is on a significantly lower level than it is seen by the IRM-Experts.

Impact for Business Organizations: the mentioned overall tendency of being clearly below the *empiric-norm* in this relation is calling for action. IRM-Information Protection overall is currently not seen on an appropriate level as being an essential contributor to successfully contribute in SDM-Trust variables. In this particular case it seems quite interesting, that the SDM Trust is comparably week seen as an effect of IRM Protection, as it seems quite consequent / causal / natural, that protected assets – not limited to information assets for the moment – raise a higher level of trust into their integrity. Vice versa, for unprotected assets it seems obvious, that they could be compromised and not fully trusted as such, and therefore only used with care or even not used at all in critical situations because of the lack of reliability. Here it seems that business organizations need to actively also create awareness of this relation – top down – to ensure proper protection handling of critical information assets. It is proposed to do proper reoccurring trainings, check the current status of the protection implementation, and adjust where necessary. Even if this seems speculation, based on the current results, it seems as majority of current business organizations do not do enough effort to achieve an appropriate level of information protection – consequently there is still space for improving with this the SDM trust in all day-to-day decision processes but even more in the aggregated strategic decision making processes.

4.2.8 Results in the Relation between IRM-Information-Protection to SDM-Improvement Efficiency and Effectiveness

In this case the relation between IRM-Information Protection and the Strategic-Decision-Making variable *SDM-Trust* is examined – see Figure 4-12. The detailed parametric and non-parametric test results are reflected in the annex.

Figure 4-12. Test Results of *Decision Making Efficiency and Effectiveness* against the *Empiric Norm* or IRM-Information-Protection



Source: Author's results based on own statistic results

The T-Test shows, that all six measurement criteria do not meet the *empiric-norm* of the IRM-Experts. Also not the aggregated *T-Test* result. All test-results are showing highly significant results in this particular relation far below the *empiric norm* of 0,816.Looking into the detailed results in Figure 4-12 it could be examined, the means of the individual measurement criteria are between 0,566 (which is indicating a "Neither") up to only 0,746. Also the standard deviation results are comparably high from 0,248 up to 0,298 which also shows a comparably high spread of answers around a comparably lower mean each not meeting in the *T-Test* the *empiric norm.* Out of the T-Test there is a clear view of the Mid-Level Managers that Information Protection would not contribute to SDM Effectiveness and Efficiency on the same level as IRM-Experts would see.

The Mann-Whitney-U-test also shows for all six measurement criteria significant non-conformity between the tested Mid-Level-Managers group and the empiric norm. All mean ranks of the empiric norm are comparably spread with values from pairs of 152 to 111 up to 173 to 90, which indicates a quite clear difference in the perception level of the Mid-Level-Managers compared to the IRM-Experts. Also the aggregated result indicates significant difference between the groups. Here the mean ranks are most spread as they are 170 to 93.

Test Result: The two Methods of Mann-Whitney-U-Test and T-Test show same clear tendency of an overall significant difference between the perceptions of the Mid-Level-Managers in relation to empiric-norm of the IRM-Experts. Also in this case, the Mann-Whitney-U tests shows slightly more aggressive results but with exact same tendency / semantics of non-conformity. The T-Test proves also in none of the cases case conformity similar to the Mann-Whitney-U test.

Interpretation of Test Results: The test results show in both cases a clear and consistent tendency of significant difference between the Mid-Level-Managers perception on the causal relation between IRM-Information Protection and SDM Efficiency / Effectiveness. In other words, the Mid-Level-Mangers would see the causal relation with clearly lower importance that IRM-Information Protection would contribute to SDM Efficiency / Effectiveness as a causal relation. In other words, Mid-Level-Managers perception that SDM Efficiency / Effectiveness would be a result of a causal relation beginning also with IRM Information protection measures is on a significantly lower level than it is seen by the IRM-Experts / the empiric norm. It has to be noted, that this case is showing comparably lower level of perception than the previous discussed relation of IRM Information Protection to SDM Trust.

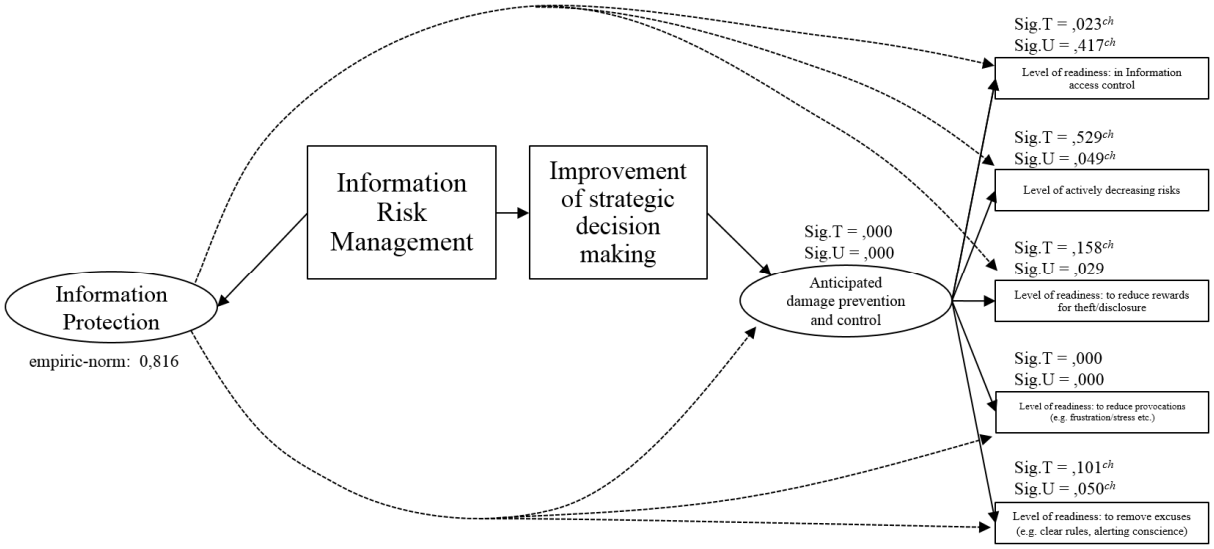
Impact for Business Organizations: the mentioned overall tendency of being clearly below the *empiric-norm* in this relation is calling for action. IRM-Information Protection overall is currently not seen on an appropriate level as being an essential contributor to successfully contribute in SDM- Efficiency / Effectiveness variables. In this particular case it seems quite interesting, that the SDM Efficiency / Effectiveness is comparably seen week. The result might be a logical consequence based on the same perception as discussed in previous causal relation of IRM Information Protection to SDM Trust that guides Mid-Level-Managers perception. Increasing the SDM Efficiency and Effectiveness by doing solid Information Protection seems to give some organizational needs, (1) starting with the creation of awareness of this relation – top down – to ensure proper protection handling of critical information assets, and (2) to do proper reoccurring trainings, check the current status of the protection implementation, and adjust where necessary. Even if this seems speculation, based on the

current results, it seems as majority of current business organizations do not do enough effort to achieve an appropriate level of information protection – consequently there is still space for improving with this the SDM Efficiency and Effectiveness in all day-to-day decision processes but even more in the aggregated strategic decision making processes.

4.2.9 Results in the Relation between IRM-Information-Protection to SDM-Improvement Anticipated Damage Prevention and Control

In this case the relation between IRM-Information Protection and the Strategic-Decision-Making variable *SDM-Anticipated Damage Prevention and Control* examined – see Figure 4-13. Test Results of *Decision Making Anticipated Damage Prevention and Control* against the *Empiric Norm* of IRM-Information-Protection. The detailed parametric and non-parametric test results are reflected in the annex.

Figure 4-13. Test Results of *Decision Making Anticipated Damage Prevention and Control* against the *Empiric Norm* of IRM-Information-Protection



Source: Author's results based on own statistic results

In this particular case the *T-Test* shows three out of five criteria are being significantly identical, and meet the *empiric-norm.* The aggregated result for the SDM Anticipated Damage Prevention and Control obviously does also not meet the *empiric norm* according to the *T-Test.* Looking into the details of the *T-Test* and the parametric test results it could be observed, that the mean-result for the *Level of readiness in information access control* is seen much higher than the *empiric norm* which conforms the need and correctness of this criteria itself even if the

T-Test correctly examines a significant difference. The highest value of the accepted parameters has a Standard Deviation between 0,175 and 0,2500. For the not conforming result the Standard Deviation is at a higher level at 0,282 – which underlines the variety even as well as the lower level of importance for the Mid-Level-Managers. Again it is interesting to observe that the most correlating mean values – in the relation to the *empiric norm* – shows the lowest Standard-Deviation values. In essence this also proves the high validity of the results.

The Mann-Whitney-U-test also shows for three out of five measurement criteria significant conformity between the tested Mid-Level-Managers group and the empiric norm and on a fourth criteria a test result which is quite close to the significant acceptance but is slightly below. Comparing the mean rank it is interesting, that for the measurement criteria of "Level of readiness in Information access control" it figured out, that here the mean rank of the Mid-Level-Managers is with 135 higher than the empiric norm's with 128. For the other confirming criteria, the mean rank of the Mid-Level-Managers are lower, but still very close to the empiric norm (both 140 to 123). The aggregated result of the Mann-Whitney-U-Test shows significant differences. Here the mean ranks are most spread as they are 151 to 112.

Test Result: The two Methods of Mann-Whitney-U-Test and T-Test show same clear tendency in the measured results of an overall conformity and difference between the perceptions of the Mid-Level-Managers in relation to empiric-norm of the IRM-Experts. For the criteria of "Level of readiness in Information access control" both tests show a conformity with a tendency that the Mid-Level-Managers perception is even slightly higher than the empiric-norm. In the two criteria where the Mann-Whitney-U test shows conformity, also the T-Test showed conformity. In one result, the "Level of readiness to reduce rewards for theft/disclosure" the two test methods slightly differ, the T-Test shows clear conformity, whereas the Mann-Whitney-U-Test shows slightly below the threshold a non-conformity Also in this case, the Mann-Whitney-U tests shows slightly more aggressive results but with exact same tendency / semantics. Interesting also to observe, that for the fifth criteria, the "Level of readiness to reduce provocations" both tests showed identically absolute clear non-conformity.

Interpretation of Test Results: The test results show in both Test Methods a clear and consistent tendency of significant confirmation between the Mid-Level-Managers perception on the causal relation between IRM-Information Protection and SDM Damage Prevention/Control. In other words, the Mid-Level-Mangers would see the causal relation with almost similar importance that IRM-Information Protection would contribute to SDM Efficiency / Effectiveness as a causal relation. Mid-Level-Managers perception that SDM Damage Prevention/Control would be a result of a causal relation beginning also with IRM

Information protection measures is on a significantly equal level than it is seen by the IRM-Experts / the empiric norm. It has to be noted, that this case is showing a comparably higher level of perception than the previous discussed relation of IRM Information Protection to SDM Trust and to SDM Efficiency/Effectiveness. It needs to be pointed out, that with both test methods the only measurement criteria that is not met on the comparably equal level is the "Level of readiness to reduce provocations" – this might be a special and quite logic case, where any case of obvious and strong protection for any asset, might point automatic any intruders attention to.

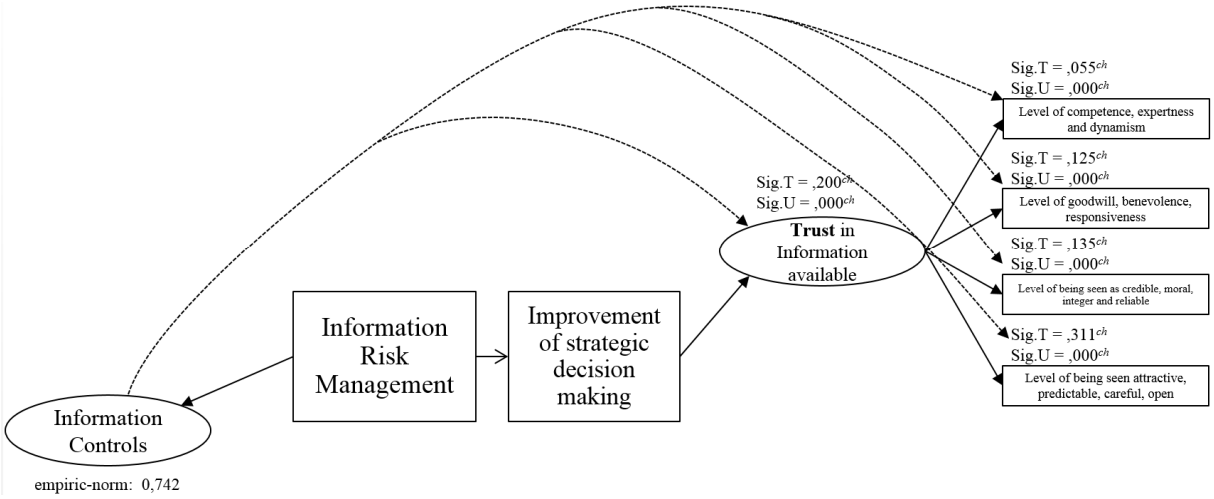
Impact for Business Organizations: the mentioned overall tendency of being most likely on the same level as the *empiric-norm* in this relation is not immediately calling for action. It seems that only for this one exceptional case of non-conformity further investigation / changes in Business Organizations are required ("level of readiness to reduce provocations"). For business organizations it is important to reduce any potential provocation for intruders. Consequently, it is also key to treat secrets secret. This means, that on a certain level, the information of what information-asset does exist and how it needs to be protected needs be kept as a secret itself – newer developments show, that even the "list-of-secrets" is part of this list itself and is only available to a very limited number of people within business organizations. On the other hand, it has to be mentioned, if this prerequisite is correctly and consistently managed, IRM-Information-Protection has this relation to the measurement criteria of "readiness to reduce provocations" as it could be seen on a much higher level – as the empiric norm is – than it is currently the perception of the Mid-Level-Managers.

4.2.10 Results in the Relation between IRM-Information-Controls to SDM-Improvement Trust

In this case the relation between IRM-Information Controls and the Strategic-Decision-Making variable *SDM-Trust* is examined – see Figure 4-14. The detailed parametric and non-parametric test results are reflected in the annex.

The T-Test results show, that particularly in this case all four criteria chosen are meeting the *empiric norm* of 0,742 and in consequence also the aggregated variable of trust at all with a high conformity to the IRM-Experts view.

Figure 4-14. Test Results of *Decision Making Trust* against the *Empiric Norm* of IRM-Information Controls



Source: Author's results based on own statistic results

Looking into the statistical details it could be observed, that the mean of the criteria and also the aggregated mean over all measurements is within a range of 0,721 up to 0,781 while the *empiric-norm* is at 0,742. The Standard Deviation of all measurement criteria is within a tight range of 0,226 up to 0,233 – which indicates homogeneity over all criteria and therefore a good validity for the aggregated measurement result of the *T-Test* of a mean value of 0,762 and a Standard-Deviation of 0,174 only. With this overall homogenous result the confirmation of the Mid-Level-Managers to the IRM-Experts *empiric-norm* could be seen as comparably good statistical prove.

The Mann-Whitney-U test results in combination with the rank means shows that the perception of the Mid-Level-Managers is consistently even on a higher level than the empiric norm. The Mann-Whitney-U test results are first-hand all at 0,000 which indicates a significant difference in the perception, but it has to be considered, that all rank means of the Mid-Level-Managers groups are higher than those of the empiric norm on 175 to 88 and even the mean ranks for the aggregated result is on 149 compared to the empiric norm on 114.

Test Result: The two Methods of Mann-Whitney-U-Test and T-Test show same clear tendency in the measured results of an overall conformity of the perceptions of the Mid-Level-Managers in relation to empiric-norm of the IRM-Experts. While the results of the T-Test show also the tendency of the Mid-Level-Managers to be over the empiric norm, the Mann-Whitney-U test even stronger proves this tendency for all measured results with no exception. It is quite interesting to see, that again the Mann-Whitney-U-Test is giving a more lean result corridor – taller scatter – and therefore a tendency to more aggressive results compared to the T-Test

results where the test result itself is proofing still the conformity while the means are higher than those of the empiric norm, the Mann-Whitney-U test results are also above (mean rank is higher) but the test result itself is showing already a 0,000 that equals highly significant difference.

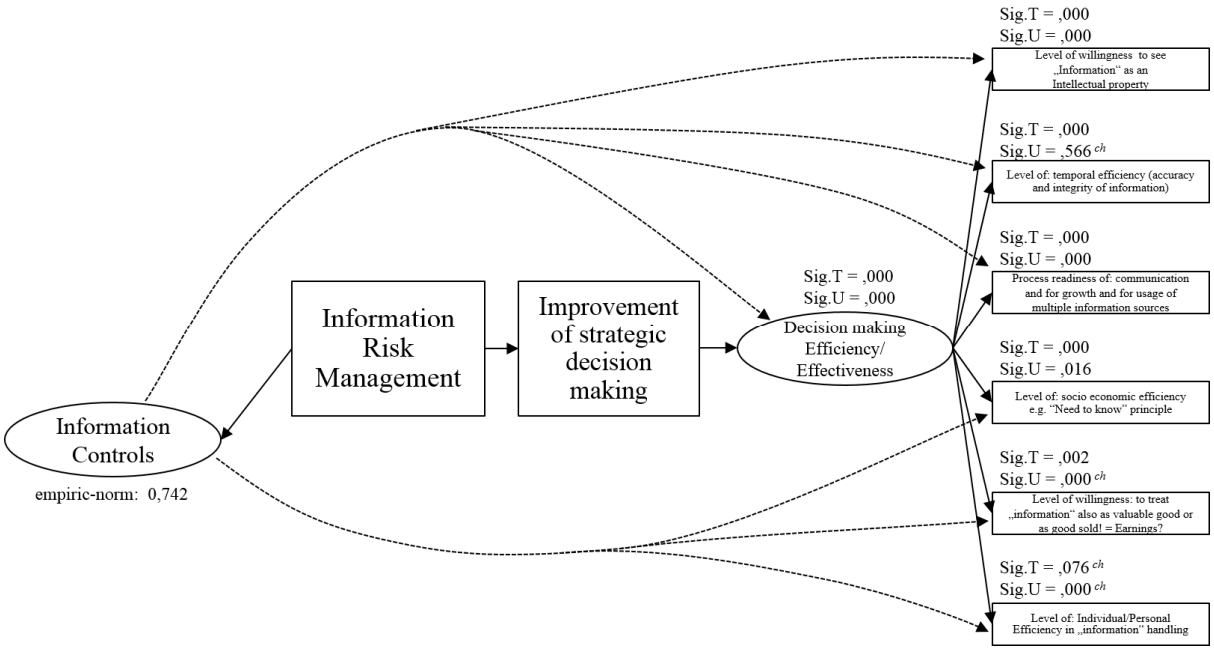
Interpretation of Test Results: The test results show in both Test Methods a clear and consistent tendency of significant confirmation between the Mid-Level-Managers perception on the causal relation between IRM-Information Controls and SDM Trust. In other words, the Mid-Level-Mangers would see the causal relation with almost similar but higher importance that IRM-Trust would contribute to SDM Information Controls as a causal relation. Mid-Level-Managers perception that SDM Trust would be a result of a causal relation beginning also with IRM Information Controls measures is confirming the hypotheses. It has to be noted, that with IRM Information Controls criteria this is the first criteria observed, which is leading on the strategic decision making in an "over-perception" compared to the other three variables – in particular here the case of the relation between IRM Information Controls and SDM Trust.

Impact for Business Organizations: the mentioned overall tendency to "over-confirm" the empiric norm in all measures could be interpreted as (1) Mid-Level-Managers tend to understand the necessity of control-frameworks and are maybe already in other areas used to this methodology, (2) compared to the other IRM Measures this is seen on the highest rank compared to the empiric norm. The consequence for business organizations is to take this momentum of conformity and also motivation to keep the level on the one hand, but also ensure to not only focus on this, even not doing too much compared to the other investigated IRM measures. For this balance, both, the right tone of the top and also a clear governance within the organizations is required to keep the different levels balanced and support / consult where necessary in a consistent way across the whole business organization independently.

4.2.11 Results in the Relation between IRM-Information-Controls to SDM-Improvement Efficiency and Effectiveness

In this case the relation between IRM-Information Controls and the Strategic-Decision-Making variable *SDM-Efficiency and Effectiveness* is examined – see Figure 4-15. The detailed parametric and non-parametric test results are reflected in the annex.

Figure 4-15. Test Results of *Decision Making Efficiency and Effectiveness* against the *Empiric Norm* of IRM-Information Controls



Source: Author's results based on own statistic results

The T-Test results show, that in this case five out of six criteria chosen are not meeting the *empiric norm* of 0,7423 and in consequence also the aggregated variable of SDM-Efficiency and Effectiveness is statistically not confirmed by the Mid-Level-Managers. Also the aggregated *T-Test* result is highly significant different from the *empiric norm*. Looking into the statistical details of the parametric T-Test results it could be observed that the mean values of the significantly different measurement criteria are between a level of 0,527 up to 0,672 which even indicates an average answer of "neither" agree or disagree – which is far from the view of the IRM-Experts empiric norm. The Standard-Deviations are also comparably high with values between 0,250 up to 0,301 which shows also in the distribution some inhomogeneity. Again interesting, the lowest standard-distribution value is in the one criteria which was confirmed being not significantly different – the "level of individual Efficiency in information handling" here the Standard-Distribution is comparably low at 0,256. With this result the T-Test indicates an almost clear non-conformity of the Mid-Level-Managers perception in relation to the IRM-Experts view.

The Mann-Whitney-U-Test interestingly results into one out of six criteria where the test itself shows conformity, for the others it does result in significant differences. While also considering the mean ranks, it figures out, that two further criteria do even have higher mean

ranks than the empiric norm, which would also result into a confirmation of the hypothesis. The two cases are the measures of (1) the "Level of willingness to treat information also as valuable good or as good sold!" and (2) the "Level of individual Efficiency in information handling. The mean rank comparison shows that Mid-Level-Managers mean rank is at 155 to 108 of the empiric norm for both criteria. Looking further into the single values of the criteria of the "level of willingness to treat information also as valuable good or good sold" it can be figured out that 4 Mid-Level-Managers ranked with very extreme choices on the "fully disagree" and also 15 on "disagree", 23 on "neither" 65 on "agree" and 24 on "fully agree". Almost similar for the other special case of the criteria of "Level of individual and personal efficiency in Information handling", with the following ranking of the Mid-Level-Managers, 3 on "fully disagree", 13 on "disagree" 26 on "neither", 53 on agree, and 36 on "fully agree". Here the distribution to the top-end is even more flat than in the other criteria. All in all this represents a comparably strong distribution in the answers of the Mid-Level-Managers. The test against the aggregated values of all six measures is resulting in a clear different perception of the Mid-Level-Managers compared to the empiric norm.

Test Result: The two Methods of Mann-Whitney-U-Test and T-Test show for four out of the six criteria similar tendency in the results, where three of the four are showing similar significant difference, and the fourth showing same tendency of conformity in both test methods. Even more interesting to investigate are the two cases of different result tendencies of the two test-methods. As mentioned in this two special cases the distribution of the single values is quite spread down to also a few "fully disagree" (around 4) and "disagree" (around 13) – in the calculation of the means in the T-Test and further on it would heavily bring the means down. On the other hand the total of only 4+13 = 17 ranks that are at the far-end in the Mann-Whitney-U test do not impact the high number of 114 values around "neither", "agree", and "strongly agree". In other words, it seems quite obvious, while comparing ranks, this would differently impact the result than the mean calculations in the T-Test. As a result out of this for further interpretation, it might be to debate, if three out of six conforming results (out of the Mann-Whitney-U-Test) or only one out of six conforming result out of the T-Test makes a difference, as the overall tendency of both tests shows in total not a really conform perception of the Mid-Level-Managers compared to the level of the empiric norm over all. In both ways, the tendency is quite clear indicating further actions of improvement / corrective actions, discussed in the next sub-section

Interpretation of Test Results: The test results show in both Test Methods a clear and consistent tendency of significant differences between the Mid-Level-Managers perception on

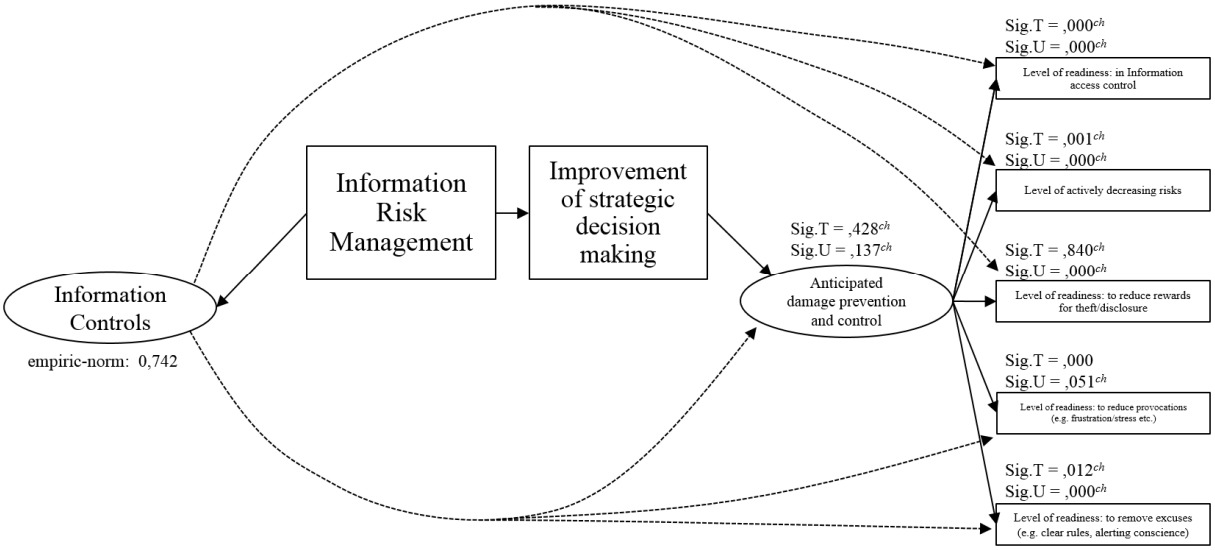
the causal relation between IRM-Information Controls and SDM Efficiency/Effectiveness. In other words, the Mid-Level-Mangers would see the causal relation with the tendency of lower importance that IRM-Effectiveness/Efficiency would contribute to SDM Information Controls as a causal relation. Mid-Level-Managers perception that SDM Effectiveness/Efficiency would be a result of a causal relation beginning also with IRM Information Controls measures is non-confirming the hypotheses. It has to be noted, with the two "over-confirming" results of the Mann-Whitney-U-test it could be discussed controversy, because it shows that the perception of the Mid-Level-Managers is statistically over-confirming the empiric norm for "the level of individual personal efficiency" and the "willingness to see information as valuable good / good sold". While the T-Test confirms the opposite, this cases have to be on the spot for further treatment in business organizations in the next subchapter.

Impact for Business Organizations: as both test show overall similar tendency of non-conformity of the perception compared to the empiric norm, but also in two criteria controversy it is even most important for business organizations to put this onto the spot. An applicable and balanced level of perception needs to be reached – here even more, this calls for detailed and reoccurring review of the business organizations to either improve on the on hand side, but also to balance down the perception where it is seen as too high. As potential concrete corrective actions a solid training/awareness campaign is proposed, accompanied by a setup of an independent experts-organization, which can help the departments to leverage activities and efforts on a balanced level. Especially this case shows clearly, that there might be a highly inconsistent view onto the relation of "IRM information controls" triggers "SDM Efficiency/effectiveness" in current business organizations which means, that even in same Enterprises different departments do different effort to achieve. This consequently might end up in a risk of highly inconsistent information treatment on which aggregated /strategic decisions are built on. Business organizations need to be aware also of the potentially different internal organizational treatments. This only could be improved in a very individual applicable treatment of the different parts of the organization.

4.2.12 Results in the Relation between IRM-Information-Controls to SDM-Improvement Anticipated Damage Prevention and Control

In this case the relation between IRM-Information Controls and the Strategic-Decision-Making variable *SDM-Anticipated Damage Prevention and Control* is examined – see Figure 4-16. The detailed parametric and non-parametric test results are reflected in the annex.

Figure 4-16. Test Results of *Decision Making Anticipated Damage Prevention and Control* against the *Empiric Norm* of IRM-Information Controls



Source: Author's results based on own statistic results

The *T-Test* results show a significant difference of four out of five measurement criteria results in relation to the *empiric norm*. Here also the aggregated view of the variable itself shows a high conformity to the *empiric norm*. While looking also into the parametric test results it could be observed, that those four out of five mean-values of the measurement criteria are even higher than the *empiric norm*. Even more interesting to see, that the standard-deviations are homogenous and comparably low with values between 0,195 and 0,201. Whereas the only one criteria being far below the *empiric-norm,* with a mean value of 0,613 having a standard-deviation of 0,290 seems comparably in-homogenously.

The Mann-Whitney-U-Test firsthand shows in four out of five criteria measured significant difference to the empiric norm, one case showing significant conformity. Looking into the mean ranks, of the measurements, it could be observed, that for the four non-conforming criteria, all according mean ranks are higher than the mean rank of the empiric norm, which leads to the result, that the hypothesis could be confirmed. It has to be noted, while the Mann-Whitney-U-test shows significant difference, that for this four cases the perception of the Mid-Level Managers is significantly on a higher level than the empiric norm. Instead, the aggregated test result for all five measurement criteria is showing significant conformity according the Mann-Whitney-U test.

Test Result: The two Methods of Mann-Whitney-U-Test and T-Test show for all five cases similar tendency of conforming / over-conforming to the hypothesis. In particular, three out of the five criteria show even similar tendency in the results, where both test show firsthand

non-conformity, but while looking into the means and mean-ranks, it an "over-conforming" could be shown. With one criteria, the "level of readiness to reduce awards for thefts/disclosure" the T-Test shows conformity to the empiric norm, whereas the Mann-Whitney-U-test shows "over-conformity". This might be result of the detailed results for this relation which are also showing a few number of extremes, in particular it shows for "Strongly disagree" one case, for "Disagree" even 5 matches, for "neither already 30 cases, for "agree" 54 cases, and for "strongly agree" 41 cases. In summary this is a comparably flat distribution over the three values of "neither", "agree", and strongly agree, with even a few outliers which might not influence the mean ranks in the Mann-Whitney-U-test as the calculation of the means in the T-Test. In the other special case/measurement of the "level of readiness to reduce provocations", the T-Test shows a significant difference with not conforming the hypothesis where the Mann-Whitney-U Test shows conformity of the test-results within the range. Also looking here into the particular answers of the Mid-Level-Managers, which are: 8 votes for "strongly disagree", 23 for "disagree", 26 for "neither", 50 for "agree", and 24 for "fully agree". With this a similar trigger as the above discussed reason might lead to the different test-results between the two test methods. The comparable wide and flat distribution might leads in the rank-comparison to a confirming result whereas the calculated means of the T-Test would "drift" down comparably far and not confirm conformity.

Interpretation of Test Results: The test results show in both Test Methods a clear and consistent tendency of significant conformity to the hypothesis between the Mid-Level-Managers perception on the causal relation between IRM-Information Controls and SDM Damage Control/Prevention. In other words, the Mid-Level-Mangers would see the causal relation with the tendency of importance that IRM- Damage Control/Prevention would contribute to SDM Information Controls as a causal relation even on a higher level than the empiric norm of the IRM-Experts. Mid-Level-Managers perception that SDM Damage Control/Prevention would be a result of a causal relation beginning also with IRM Information Controls measures is confirming the hypotheses.

Impact for Business Organizations: as both test show overall similar tendency of over-conformity of the perception compared to the empiric norm an applicable and balanced level of perception needs to be reached – here even more, this calls for detailed and reoccurring review of the business organizations to carefully limit the engagement in a well-balanced and individual way. As potential concrete corrective actions a solid training/awareness campaign is proposed, accompanied by a setup of an independent experts-organization, which can help the departments to leverage activities and efforts on a balanced level. Especially this case shows

clearly, that there is a general perception of Mid-Level-Managers on Information Risk-Management but seemingly limited to only this special case, which is in tendency over-stressed.

This consequently might end up in a risk of highly inconsistent information risk management treatment which is focused too much on technical controls, which seem to be the way of doing IRM at all. Also here aggregated /strategic decisions are built on this behavior – consequently, there is a risk in current business organizations that out of this, the focus even on executive level is too limited in this aspect and potentially too much attention (and money) is given to it compared to the other triggers in IRM modelled in this scientific work.

While having iteratively elaborated all pairs of relations between the exogenous and endogenous variables, in the following chapter a comprehensive view over all cases is provided.

4.3 Result View on Variables Aggregated

In the following the overall results are aggregated on a broader scale based on the details from last section. The discussed details are compared amongst e.g. the estimated means of the relations will be shown as well as the mean rank compared. Special cases will be examined in detail and the overall results will be elaborated – in particular, where the IRM-Experts *empiric-norm* is met by the Mid-Level Managers View, and where not. Indications or potential reasons for this results will be reflected back to the literature review and are examined in the next section of conclusion. In Table 0-1 the results of the T-Test are reflected in a cross-table style sorted, as also the results of the Mann-Whitney-U-test are shown in Table 0-2, each by the latent exogenous and latent endogenous variables. Results which are supporting the hypothesis are marked in both tables with a "*ch*" (= confirming hypothesis) as in the previous chapters.

In the following sub-sections, the results out of both test procedures for the four IRM-Variables are examined and compared, and overall interpretations of the results measured are elaborated. At the end of each sub-chapter the impact for business organizations is concluded, as well as proposed corrective and preventive actions.

4.3.1 IRM-Awareness Acceptance Level of Mid-Level Manager and Impact in Strategic Decision Making

For the exogenous variable of IRM-Awareness the correlation and importance to strategic decision making improvements is partly confirmed by the Mid-Level-Managers. Esp. by the endogenous variable of Trust, here both test procedures, the Mann-Whitney-U and T-Test show partly confirming results. The relation in the light of the variable SDM-Efficiency / Effectiveness shows a significant different view of the Mid-Level-Managers than the IRM-Experts. Here both test procedures, the Mann-Whitney-U and T-Test show rarely confirming results. The mean ranks comparisons in the Mann-Whitney-U are much lower than those of the empiric norm and also the mean values or the T-Test procedure are comparably lower than the *empiric norm* on a level between 0,675 which means in the Likert-scale a "Neither" decision in average – it goes up to maximum 0,769 which represents a weak (only 0,069) above the boarder of the "Agree" side of the Likert scale. Looking further into the T-Test-Results, it seems to be significantly that also the standard distributions are higher than for the SDM-Trust criteria. Which indicates in summary a more inhomogeneous result on top. The relation according the endogenous variable SDM Anticipated Damage Prevention and Control shows that three out of five measurement criteria show proven conformity by the *T-Test* whereas the aggregated view does not indicate conformity as the two differing measurement criteria results do strongly deviate from the *empiric-norm*. Here the Mann-Whitney-U-Test shows a slightly different result, which only shows conformity in one out of five measurements criteria. In the T-Test results, the mean values are in this two cases at the level of "Neither" in Likert scale (0,667) and in a weak "agree" at 0,725 which represents a slight "Agree" in the Likert scale (only 0,025 deviating from the boarder of "Neither), whereas looking into the mean ranks of the Mann-Whitney-U-Test, the difference is comparably high.

Over all as an interpretation it seems to be feasible to conclude, that the IRM-Awareness criteria is seen as being partly confirmed but not fully confirmed by the Mid-Level-Managers as a significant contribution to the relation to improvement of strategic decision making.

Hypothesis H_{02}: The higher the IRM-Awareness in companies, the higher the level of decision making improvements with respect to the information used for strategic decision makings

The result out of the literature review and in particular the IRM-Expert interview – this result could be confirmed by the results referenced in Chapter 4.1.1 which already confirmed this hypothesis on a theoretical level. By far not fully, but in some parts, also the Mid-Level Managers results confirms this correlation on the same level as the IRM-Experts via the Mann-Whitney-U Test and the T-Test results are significantly conform for the endogenous variables

for SDM Trust and SDM Anticipated Damage Prevention and Control. It is interesting to observe that the Mid-Level Managers do not see a significant correlation between IRM-Awareness and SDM Efficiency / Effectiveness (Mann-Whitney-U Tests' mean ranks differences and T-Test mean 0,728 with a standard deviation range of 0,244 up to 0,251) – in other words, IRM-Awareness would not support the SDM Efficiency / Effectiveness in Mid-Level-Managers view. Here clear further corrective and preventive actions are required.

4.3.2 IRM-Information-Classification-Level of Mid-Level Manager and Impact in Strategic Decision Making

For the exogenous variable of IRM-Information-Classification the correlation and importance to strategic decision making improvements is only in few single criteria confirmed by the Mid-Level-Managers. Esp. by the endogenous measure criteria of Trust, the Mann-Whitney-U-Test shows no conformity whereas the T-Test result shows two conforming results. Pointing to the influence of the (1) *Trust level of competency, expertness and dynamism* and (2) the *Trust level of being seen as credible, moral, integer and reliable*. Quite interesting on a broader scale, the aggregated test result for this test variable results in the Mann-Whitney-U-Test in conformity, whereas aggregated test result of the T-Test shows overall no conformity with the *empiric norm* of the IRM Experts. In the T-Test the aggregated mean for the four measurement criteria is at a level of 0,758 with is only a difference to the *empiric-norm* of 0,0398 – but it also quite remarkable to point out that esp. the two non-conforming measurement criteria are at a comparable low level of 0,738 and therefore significantly different to the *empiric-norm*. Also remarkable, the standard-deviations for the confirming measurement criteria is comparably lower (0,196 and 0,208) than for the deviating ones (0,239 and 0,249) which also indicates a comparably higher level of inhomogeneity of in the view of the Mid-Level-Managers in esp. the non-conforming measurement criteria at all. For the exogenous variable SDM-Efficiency and Effectiveness the Mann-Whitney-U test shows non-conformity and the T-Test shows only one out of six measurement criteria was conform to the IRM-Experts *empiric-norm* – in particular an improvement of IRM-Information-Classification to the *Readiness for communication and for growth and for usage of multiple information sources.* Also the aggregated results for both test methods show that SDM-Efficiency and Effectiveness confirms significant difference in the view of Mid-Level Managers on this contributing relation – even the mean (of the T-Test results) of the aggregated result is on a level of 0,652 being significantly lower than the *empiric-norm*, the standard deviations of the six measurement criteria are comparably high between 0,240 up to 0,309 which even indicates a higher level of

inhomogeneity in the view of the Mid-Level-Managers. To recap the mean result of 0,652 is in fact in the Likert-5-Scale area of "Agree" but very close to the "Neither" answer – only 0,0520 deviating from this result. The mean rank difference of the Mann-Whitney-U-Test is also showing a comparably high difference, underlining the significance of the difference. For the correlation of the exogenous variable of IRM-Information-Classification and the importance to SDM-Anticipated Damage prevention and Control the *T-Test* examines two conforming measurement criteria out of total five. Here a quite remarkable case could be identified, for the measurement criteria *Level of readiness in information access control* the mean (T-Test) of the Mid-Level-Managers is significantly higher than the *empiric-norm* of the IRM Experts on the level of 0,847 with a comparably low standard deviation of only 0,179 showing a very homogenous result – indeed this confirms content wise the correlation between IRM-Information-Classification and this measurement criteria is seen as highly important – even the T-Test shows a non-conformity to the *empiric-norm* – which is statistically correct as in this particular case the result "deviates" statistically to the upper end. In this special correlation also the Mann-Whitney-U-test shows a significant conformity with ,908 on a very strong level. Two further measurement criteria could be confirmed by the T-Test but not by the Mann-Whitney-U-test. The criteria of (1) *Level of actively decreasing risks* and (2) the *Level of readiness to remove excuses*. Both T-Test-means are very close at the *empiric-norm* (0,793 and 0,784) with a comparably low standard-deviation of 0,2187 and 0,2181 – showing a higher level of homogeneity than the two non-conforming results (0,538 and 0,463) for the mean values with comparably higher standard deviations of 0,305to 0,302 showing higher inhomogeneity in the results. Quite interesting also the details of the Mann-Whitney-U-test which could not show conformity. Looking into the details of the raw data, it could be observed, that there are a number of extremes in the results, which might not influence the calculation of the means in the T-Tests as it does while comparing and counting the ranks in the Mann-Whitney-U-test. So, all in all only one out of five correlations is showing conform result by the Mann-Whitney-U-test. Compared to the other two endogenous variables the improving influence of IRM-Information-Classification on the improvement of SDM on the variable of anticipated Damage Prevention and Control could be seen as mostly conforming the IRM Experts view to the overvaluing on the criteria of *readiness in information access control,* but overall, the result must be interpreted as non-conformity.

Over all, the IRM-Information-Classification criteria is seen as being not confirmed for all cases by the Mid-Level-Managers as a significant contribution to the improvement of strategic decision making.

Hypothesis H_{03}: The higher the IRM-Information-Classification-Level in companies is developed, the higher the level of decision making improvements with respect to the information used for strategic decision makings

The result out of the literature review and in particular the IRM-Expert interview – this result could be confirmed by the results in Chapter 4.1.2 – and was already confirmed on a theoretical level. Not at all, the Mid-Level Managers results does not confirm this correlation on the same level as the IRM-Experts tested via the Mann-Whitney-U-test and the T-Test results. All three variables *SDM-Trust* and *SDM-Efficiency and Effectiveness* and *SDM Damage Prevention and Control* do not reach the *empiric-norm.* In short this means that Mid-Level Managers would not see the importance for *IRM-Information-Classification* to improve the *SDM-Trust* and *SDM-Efficiency and Effectiveness* on the level as being examined by the IRM-Experts. Compared to all other correlations examined, this is the only case – IRM-Information-Classification – where the perception of the Mid-Level-Managers compared to the empiric norm is in all correlations to the SDM-variables significantly below – this also as a heads-up for the coming sub-chapters. In other words, IRM-Information Classification needs to get the highest attention for business organizations.

4.3.3 IRM-Information-Protection-Level of Mid-Level Manager and Impact in Strategic Decision Making

For the exogenous variable of IRM-Information-Protection the correlation and importance to strategic decision making improvements is only in few single criteria confirmed only in the area of *Anticipated Damage Prevention and Control.* In the areas of *SDM Trust* and *SDM Efficiency and Effectiveness* none of the Mann-Whitney-U-Test and none of the *T-Test* results proves conformity. In particular, neither the Mann-Whitney-U-Test nor the *T-Test* result for the endogenous measure criteria of SDM-Trust shows any conforming results at all. The aggregated test results of both test methods show overall no conformity with the *empiric norm* of the IRM Experts the values are at a comparably low level between 0,618 and 0,767 in the T-Test result. The aggregated mean for the four measurement criteria in the T-Test is at a level of 0,693, the standard distributions are of the individual values are between 0,196 and 0,249 comparably low, which could be interpreted as a comparably homogenous result. The mean-rank difference of the Mann-Whitney-U-Test is smallest from 117 to 146 and highest from 100 to 163 showing a comparably clear difference. For the second dependent variable of SDM-Efficiency and Effectiveness the Mann-Whitney-U-Test and the *T-Test* results also show non

conformity to the *empiric-norm* of the IRM-Experts view. The mean values of the T-Test are even on a lower level as for SDM-Trust in a range of 0,566 up to 0,746. Quite interesting that the highest mean of the *Level of temporal efficiency* with 0,746 has the highest standard-standard distribution value of 0,354 which indicates a comparably very high inhomogeneity in the results. Whereas the other measurement values' mean is lower than 0,675 with a standard-deviation range of 0,240 up to 0,268 also comparably high and therefore indicating medium level of inhomogeneity in the answers. Similar to that the mean rank comparison of the Mann-Whitney-U-test shows an even bigger difference in all measurement-criteria compared to the former case. Here the mean rank difference is from lowest 111 to152 for one criteria, but for all others higher than 94 to 163, which shows same tendency as in the T-Test of being more far away from the empiric norm. The aggregated mean of the T-Test of the variable SDM-Efficiency and Effectiveness is on a level of 0,652 which is very close to a Likert-5-Scaled "Neither" statement. Also the mean rank difference of the aggregated variable is comparably high at a difference from 93 to 170 – meaning, there is absolutely no signal for any conformity. For third dependent variable of SDM-Anticipated Damage Prevention and Control, the Mann-Whitney-U-Test shows conformity in three out of five measurement criteria. It has to be noted that one of the three as conforming accepted results is at a level of 0,049 which formally would not prove conformity at a 0,95% probability level, but seen from a semantic point of view it is very close to 0,05 which would be a conformity with a probability of 0,95 – so for this work, it would be accepted in this single case to treat this result as conform. Also, the *T-Test* result shows conformity for three out of five measurement criteria. Interesting to observe, the criteria *level of readiness in information access control* the mean value is significantly above the empiric norm of the IRM-Experts on a level of 0,853 with a comparably low standard-distribution of 0,179 indicating a clear and homogenous but even stronger agreement to this relation than the IRM-Experts have provided by an *empiric-norm* of 0,816. Also interesting to observe that the only remaining measurement criteria which fits not to the IRM-Experts view is the *Level of readiness to reduce provocations* with a mean in the T-Test of 0,561 and a standard-deviation of 0,305 which indicates in the light of the Likert-5-Scale a clear "Neither" decision with a comparably high inhomogeneity of the results. Also the Mann-Whitney-U-Test shows here clear non-conformity with the highest mean rank difference of 86 to 177. In essence this means, the Mid-Level Managers do not see the Level of Information Protection as it would be contributing significantly to support to reduce the level of readiness to reduce provocations. In individual non quantitative conversations with Mid-Level-Managers the reason for this specific and in the beginning unexpected result could be examined. Some of the Mid-Level-Managers would strongly agree to the fact that IRM information protection would reduce the

provocations, simply because people might not know what they don't know – in other words, well protected information is not obvious existing for anybody. Other Mid-Level Managers claimed that esp. security measurements on IT-Systems might invite users to explore the limits of security and therefore would even kick-off the idea of penetrating and hacking the systems and looking for weaknesses to simply check out to what extend this is limited – in other words, it is seen as an invitation to check the limits of the systems and processes. With this, it could be stated, that for this specific case the measurement criteria might not be adequate and does not give clear meaning and indication in this correlation. All in all, both the Mann-Whitney-U-Test and the *T-Test* show conformity in three criteria with mean values in the T-Test between 0,780 and 0,826 for the accepted conformity plus the discussed exception of a mean of 0,853 for the fourth criteria, it could be accepted that for the IRM Information Protection the view of the IRM-Experts and the Mid-Level Managers correlates and is seen as significant in both groups

Over all, the IRM-Protection criteria is seen as being confirmed for only one endogenous variable (SDM-Anticipated Damage Prevention and Control) by the Mid-Level-Managers as a significant contribution to the improvement of strategic decision making.

Hypothesis H_{04}: The higher the IRM-Information-Protection-Level in companies is developed, the higher the level of decision making improvements with respect to the information used for strategic decision makings

The result out of the literature review and in particular the IRM-Expert interview – this result could be confirmed by the results referenced in Chapter 4.1.3 – already confirmed this hypothesis on a theoretical level. Not fully, but in one significant part also the Mid-Level Managers results confirms this correlation on the same level as the IRM-Experts via the T-Test results. Also the result examines significant difference between the IRM-Experts view and the Mid-Level Managers view. The variables *SDM-Trust* and *SDM-Efficiency and Effectiveness* do not reach the *empiric-norm.* In short this means that Mid-Level Managers would not see the importance for *IRM-Protection* to improve the *SDM-Trust* and *SDM-Efficiency and Effectiveness* on the level as being examined by the IRM-Experts.

4.3.4 IRM-Information-Controls-Level of Mid-Level Manager and Impact in Strategic Decision Making

For the exogenous variable of IRM-Information-Controls the correlation and importance to strategic decision making improvements both, the Mann-Whitney-U-Test and the *T-Test* results show in particular for the exogenous variable of SDM-Trust in all cases significant conformity to the *empiric-norm* (0,742) of the IRM-Experts. The overall range of the mean values in the T-Test is between 0,721 and 0,780 with a range in the standard-deviations of 0,225 to 0,235 which indicates a comparably homogenous and well-fitting result to the *empiric-norm.* The Mann-Whitney-U-Test results confirm also the Hypothesis in all five measurement criteria, but as they show firsthand a non-conformity, while looking into the mean rank differences it could be figured out, that the ranks of the measurement criteria of the Mid-Level-Managers are all higher in all measures than those of the empiric norm. This proven non-conformity of the Test-Results must be interpreted as already explained previously as conforming the hypothesis but with the tendency of over-conformity. In this particular case the Mann-Whitney-U-test even stronger shows this tendency of over-conformity than the T-Test results, which are all within the test-metric on a conforming level. Also the aggregated *T-Test* result shows a mean of 0,761 also conforming clearly the *empiric-norm.* The aggregated result of the Mann-Whitney-U-Test shows also clear tendency of over-conforming the result as the single values do with a mean rank difference of 149 to 114. For the second endogenous variable, the SDM-Efficiency and Effectiveness the interpreted Mann-Whitney-U-test results show conformity of three out of six measurement variables whereas two of the three are on an over-conforming level, the (1) *Level of willingness to treat information also as valuable good or as good sold*, and (2) *Level of individual Personal Efficiency in Information-handling.* Interesting to observe, in this context the *Level of temporal efficiency (accuracy and integrity of information)* lies exactly in the corridor of being confirmed at the level of the Mid-Level-Managers empiric norm. The *T-Test* only proves one significant measurement criteria – the *Level of individual/personal efficiency and effectiveness* – similar to the Mann-Whitney-U-test – only with a mean of 0,702and a standard deviation of 0,255 which is comparably high and proves the inhomogeneity even of this test result. All other five measurement criteria do show significant difference in the T-Test to the *empiric-norm* with comparably low mean values between 0,526 up to 0,671 and standard deviations between 0,250 up to 0,301 also proving comparably high inhomogeneity in the parametric results. The aggregated test-result also shows in both test methods no conformity here the Mann-Whitney-U-test shows a mean rank difference of 94 to 169 which is comparably high. Also the aggregated *T-Test* result shows a mean of 0,592 which still is in the Likert-5-

scale area of “Neither”. With this results, the IRM-Information Controls measure result according SDM Efficiency and Effectiveness shows in summary significant difference to the IRM-Experts view on a much lower mean level. For the third endogenous variable of SDM-Anticipated Damage Prevention and Control, significantly difference could be examined by the Mann-Whitney-U-test and the *T-Test.* The Mann-Whitney-U-test shows that four out of five measurement criteria are non-conforming results. Again looking into the mean rank differences it could be stated that all four non-conformity results have to be interpreted as over-conformity as in all cases the rank of the mean of the Mid-Level-Managers are higher than those of the empiric norm. The fifth result of the Mann-Whitney-U-test shows with 0,51 clear conformity. With this, the interpreted results of the Mann-Whitney-U test show clear conformity with a very strong tendency of over conformity. Almost similar results in the T-Test show for four out of five measurement criteria. Very specifically in this correlation it could be observed, that in three out of the four non-conforming criteria the mean values are significantly above the *empiric-norm* (0,742) of the IRM experts. The mean values are at a level between 0,793 and 0,813 with a comparably tight standard deviation from 0,194 up to 0,231 which indicates a comparably high homogeneity in the results. Even the *T-Test* result shows significant difference – it must be noted, that basically the Mid-Level-Managers content wise confirm this relation at all – even by putting more empathies on this specific relation. With these results out of both test methods it could be clearly stated, that the IRM-Information Controls measurement criteria would be seen as conforming / contributing to the improvement of the SDM anticipated damage prevention and control, even more by the Mid-Level-Managers as by the IRM-Experts.

Over all, the IRM-Protection Controls is seen as being confirmed for tow out of three endogenous variable (SDM-Trust and SDM-Anticipated Damage Prevention and Control) by the Mid-Level-Managers as a significant contribution to the improvement of strategic decision making.

Hypothesis H_{05}: The higher the IRM-Information-Controls-Level in companies is developed, the higher the level of decision making improvements with respect to the information used for strategic decision makings

The result out of the literature review and in particular the IRM-Expert interview – this result was already confirmed by the results referenced in Chapter 4.1.4 on a theoretical level. Not fully, but in two significant parts also the Mid-Level Managers results confirms this correlation on the same level as the IRM-Experts via the Mann-Whitney-U-test and the T-Test results. Also the result examines significant difference between the IRM-Experts view and the Mid-Level Managers view. The variable *SDM-Efficiency and Effectiveness* does not reach the

empiric-norm. In short this means that Mid-Level Managers would see the importance for *IRM-Protection* to improve the *SDM-Trust* and *SDM-Efficiency and Effectiveness* on an acceptable equal or even higher level as being examined by the IRM-Experts.

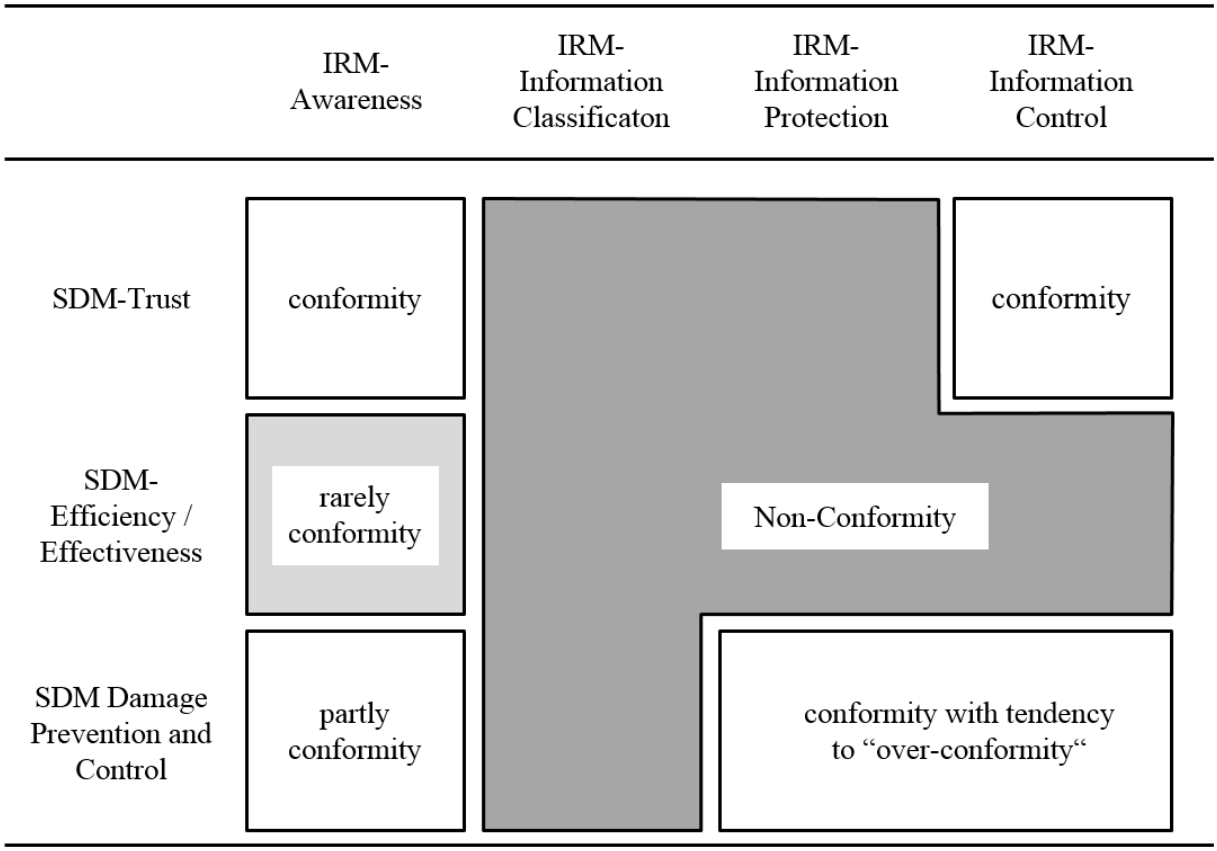
4.4 Testing Proposed Causal Model and Summarizing/Interpreting Examined Results

In the following section the overall result will be derived and discussed, reflecting the particular and intermediate results from the former section and will be pointed back to the *Main Hypothesis* H_0 and Sub-*Hypothesis* H_{01}*:* in a holistic view. It will be examined, in which areas the Mid-Level-Managers view conforms to the *empiric-norm* of the IRM experts, in which areas the *empiric-norm* is not meat, and also the areas where the *empiric-norm* is more than meat significantly (different = too high). Resulting out of this, potential corrective actions are proposed.

Conformity between the *empiric-norm* of the IRM-Experts and the Mid-Level-Managers could be proven by the non-parametric results of the Mann-Whitney-U-test almost fully overlapping to parametric results of the *T-Test* in five out of twelve measured relations whereas two out of this five results even over-conform semantically – the result shows non-conformity because of significantly higher mean values (T-Test) and also mean rank differences (Mann-Whitney-U-test). Borderline/partly conformity could be examined for one relation out of the twelve. In six relations clear non-conformity to the *empiric-norm* of the IRM-Experts could be examined. In particular, these are three relations out of four of *SDM-Efficiency and Effectiveness* – which means, the Mid-Level-Managers would see the effect of solid Information Risk Management on *SDM-Efficiency and Effectiveness* on a quite lower level than the IRM-Experts In particular the areas of *IRM-Information Classification, IRM-Information-Protection,* and *IRM-Information Control* are at a quite lower level seen to contribute to *SDM-Efficiency and Effectiveness* – only the *IRM-Trust* is partly seen to improve *SDM-Efficiency and Effectiveness.* On the other hand the areas of *IRM-Information Classification* and *IRM-Information Protection* are seen at a significant lower level than the *empiric-norm* for impacting the *SDM-Trust.* To recap the Main-Hypothesis H_0:

Hypothesis H_0*: There is no difference in perception between IRM Professionals and Midlevel-Managers /Business-Professionals of the correlation between Information-Risk-Management* and *Improvement of Strategic Decision Making*

Figure 4-17. Mid-Level Managers Conformity Matrix



Source: Author's results aggregated from statistical results

With the overall results discussed in the previous chapters and aggregated in this chapter – and also visualized in Figure 4-17 – the *Main-Hypothesis H_0* could *NOT BE ACCEPTED* holistically. Only in parts, there is conformity between the IRM-Experts *empiric-norm* and the Mid-Level-Managers perception on the impact of Information Risk Management on the Improvement of Decision Makings. The potential reasons of this mismatch and the resulting conclusions are discussed in the next Chapters. Concluding with answering the sub-Hypothesis H_{01}: *"Improving Information-Risk-Management in business organizations will significantly improve their Strategic Decision Making results" as a result of all Literature Research and IRM-Expert Interview's results could be fully confirmed. Improving Information-Risk-Management in business organizations will significantly improve Strategic Decision Making.*

In combination with the Main-Hypothesis H_0 results, showing in many parts significant difference in perception and gaps between the IRM-Professionals view and the Mid-Level-Managers view, there is a *strong need for corrective and preventive action*, as well in management perception as in organizational-setup and management-theory.

In Management-Theory the Information Risk Management component has to be added into all layers of management awareness and obligations. Non-performing single areas/departments in an enterprise exposes the whole company to risks in decision making processes and consequently in strategic decision making processes. This fact and logics has to be recognized and considered by senior executives when driving strategic decisions in the future. But also organizationally it needs to be accepted, to obligate mid-level-managers to seriously run information risk management in their area of responsibility in the day to day business as a base of "information quality" at the ground and source for any internal decision making quality but also as base for aggregated strategic decision upwards in the hierarchy.

Detailed corrective and preventive actions (CAPA) per area are reflected in Figure 4-18.

Figure 4-18: Resulting Proposed Immediate Corrective/Preventive Action Matrix

	IRM-Awareness	IRM-Information Classificaton	IRM-Information Protection	IRM-Information Control
SDM-Trust	conformity	• IRM Experts to setup solid classification scheme, train and act as consultant in the departmental actions. • Explicate the value of information itself.	• IRM Experts to setup solid protection portfolio, train and act as consultant in the departmental actions. • Explicate the value of information itself.	conformity
SDM-Efficiency / Effectiveness	• IRM-Experts to setup tangible an visible awareness campaigns • Leaders & employees to actively see this offers as opportunities and improve own efficiency and effectiveness	• Focus on efficiency and effectiveness esp. in performing classifications in the light of 'value add' for departments • Enable opportunities instead of blocking	• Focus on efficiency and effectiveness esp. in applying protection mechanism in the light of 'value add' for departments • Enable opportunities instead of blocking	• IRM Experts to setup solid Information Controls, train and act as consultant in the departmental actions. • Enable opportunities instead of blocking
SDM Damage Prevention and Control	conformity	• Leaders & employees to balance and rethink current classification on potential over-classification • IRM-Experts to act as consultants and balance across the whole enterprise	• Leaders & employees to balance and rethink current protection on potential over-securing • IRM-Experts to act as consultants and balance across the whole enterprise	• Leaders and employees to balance execution on potential over-securing and controlling • IRM-Experts to act as consultants and balance across the whole enterprise

Source: Author's proposal for Corrective and Preventive action per case

CONCLUSIONS

1. The analyses of literature has contributed to an understanding of the rapid changes in Computer Mediated Communication, based on new tools and styles of communication and information gathering as well as the socio-psychological impact of communication channels, their use, and the implications for interaction.
2. This research work provides a conscientious overview on the approaches of improving Strategic Decision Making, gives insides on the models published, requirements, and limitations based on the principal lack of information which causes and results out of ambiguous and incomplete information-base. Ultimately it was examined, that the key success factor for improving Strategic Decision Making Processes is the quality of information.
3. The newly developed model for measuring Information Risk Management was precondition for the comparison of IRM-Experts perception and Mid-Level-Managers
4. Thus, the lack of IRM-Models and the highly increased information available – driven by new media and technologies – generates the Hypothesis H_{01} of a correlation between the level of IRM conducted in companies and improvement of Strategic Decision Making resulting in the newly proposed causal model.
5. In Literature no indications were given/found on the current business organizations' practice of IRM in the light of strategic decision making, neither the level of need and conformity to theoretical norms or subsequent models. There was a lack on proposed corrective and preventive actions which was filled first time by this dissertation.
6. Following the notion of *Strategic Decision Making* in the context of significantly increasing information available, being managed, aggregated, processed, and used – the dissertation has **proposed a new theoretical model that specifies 'Information-Risk-Management' as a significant improvement factor**.
7. The notion of 'Information Risk Management' was derived, defined and operationalized and ultimately proven by qualitative and quantitative IRM-Expert-Interviews
8. Based on the literature and the IRM-Expert-Interviews a **wide spectrum of influences** was opened, covered, factored and aggregated to (1) *human factors* being reflected on both sides of the causal model – SMD-Trust and IRM-Awareness, (2) *economic factors* being reflected in SDM Efficiency and IRM-Information Classification, (3) *mechanical factors* being SDM Damage-Prevention and Control and IRM-Information-Protection, and (4) a *controlling element above* being reflected in the IRM-Information-Control.
9. An essential part of the **Model Development** is also the strategy and method on **how** to scientifically and statistically **prove the model itself in a meaningful scientific way**.

An uncommon **five-method-mix was developed**, proposed and proven to be scientific meaningful to elaborate methodically valid results for the proposed model.

10. The result of the literature review and the IRM-Expert-Interviews confirm **full support of supportive Hypothesis H_{02}.. H_{05} full support to the Sub-Hypothesis H_{01}**: Improving Information-Risk-Management in business organizations will significantly improve their Strategic Decision Making results. Information Risk Management can be considered as a vital contribution factor for improvement of Strategic Decision Making in an environment of highly increasing 'information' being available and where newer and faster technical channels and systems influencing significantly the business world. Only if companies are able to manage 'information' and the underlying risks appropriately they will gain competitive advantage and turn risks into opportunities. This is intentionally not only limited to the improvement of IT-capabilities – even more it points to the readiness of the whole organization to actively contribute to this process of overall change.
11. The result of the data analysis for the **Main Hypothesis H_0**: There is **no difference in perception between IRM Professionals and Mid-Level-Managers / Business-Professionals** of the correlation between Information-Risk-Management and Improvement of Strategic Decision Making **is N O T supported**. In certain areas the view of the Mid-Level-Managers is significantly different compared to the theoretical *empiric-norm* examined by the IRM-Experts. **Only if this deviation will be resolved, an optimal improvement of Strategic Decision Making will be reached**.

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SUGGESTIONS

1. In consequence **this dissertation opens the request of multiple required changes to drive corrective and preventive action in the Organization** by considering the interfering scientific fields of (1) overall risk management, (2) the way of managing the massive increase of information available, (3) the massive increase of CMC, and (4) the obvious human behaviour change**. This requires in essence changes (1) at the executive level, (2) in day to day processes of each department, and (3) in the attitude of individuals on how to deal with 'information' in the day to day work** – details will be examined in the next section of Suggestions
2. **Senior Executive Level** – **Information Risk Management** needs to be seen as increasingly **mission critical obligation** to avoid additional threats and competitive disadvantages in any decision making situations, but also **as opportunity to gain competitive** advantage by smart and efficient decisions.
3. **Senior Executive Level** – Top-down in hierarchy, all management-levels have to actively support and incorporate IRM and have to show to all associates that it is 'good and valuable – but also nonnegotiable' and acting personally as **role-model** in day to day work
4. **Organizationally** – Information Risk Management **needs to be incorporated into standard-business processes** rigorously – not being seen as an extra coming on-top. Mid-Level-Managers might be in an **conflict of interest**, where IRM is only seen as burden – only time and resource consuming with no immediate value – **IRM success has to be measured** and being essential **part of individuals objectives**
5. Organizationally – to achieve continuity and high quality over time, IRM needs to become an explicit part of the organizational setup like 'Quality-Assurance', ensuring – independent from business functions with own reporting-line – homogenous implementation, adaptation, consultancy, and control. IRM-Professionals might form a dedicated organization or being part of an existing organization like 'Enterprise Risk Management' directly reporting up to the CEO to also avoid any conflict of interest at any management level.
6. **Decision Making** – Decisions are prepared and made on individual, departmental, and corporate level. There is **no change in authority / mandate** to drive the decisions on the applicable level. **IRM-Experts need to act as consultants/partners bringing in IRM-know-how** at any stage of the decision process e.g. as early-warning system up to a 'post-decision' analysis of information impact analysis.

7. **Interaction** – **Risk/Opportunity-based-approach**: Strong interaction with existing business-intelligence organization, IT, marketing, R&D, and finance required, where precise and holistic, correct, in-time information is already crucial success-factor. Hierarchy of **importance evaluated by IRM-Risk-Assessments** and applicable classification of information assets.
8. **CAPA on the ground –** resulting out of this dissertation's setup and modelling in particular, the main **immediate corrective and preventive actions** are were generated – never the less all general previous mentioned changes have **to be implemented to ensure stability, homogeneity, effectiveness in IRM**

FURTHER RESEARCH

1. More research needs to be conducted in the interdependencies of structural elements in decision making processes (opportunities, risk, procedures, etc.) and in the influence of constantly changing 'Information-Situation' for decision makers (availability, correctness, relevance, weight, confidentiality, aggregation methods, life-cycle, storage, intelligence etc.). The researched group of 131 Mid-Level-Managers was not further distinguished into their industry background, company sizes, cultural background, personal type and personal characteristics e.g. age, gender, etc. The aim is to give an overall view, without single special cases to be elaborated – which might be subject of further scientific investigation.
2. Never the less, there might be differences in the current level of perception from industry to industry sector. The level of need and in consequence the relative level of perception might vary from low knowledge industry (e.g. steel manufacturing) to high intellectual property industry e.g. IT, semi-conductor, aeronautics, etc. and in consequence the level of need is lower. This dissertation does not indicate a "per industry" baseline – it shows the overall trend in economics – further specific scientific work has to be performed for specific industry fields to shape differences.
3. There might be differences between European, American, and Asian perception. Shaping differences and similarities on cultural factors is room for further scientific investigation.
4. No differentiation on "highly regulated" vs. "low regulated" work background was researched. There might be also a different perception of people working in a highly regulated (legally, legislative) environment e.g. pharmaceutical industry, finance etc. compared to other fields like e.g. marketing, artwork, design. Also a group-comparison might be target of further scientific investigations.
5. Personal-Types (in accordance to e.g. MBTI) are not distinguished – e.g. there might be personal types being per-se more risk-affine than others, and therefore having different perception on the Information Risk Management measures. The current study work does not differentiate any social characteristics e.g. gender, age, ethnic group etc. With this, a whole set of scientific works might be triggered to differentiate the variety of different perceptions on the proposed model out of this doctoral theses in future scientific works. This might be room for further scientific investigation – the current work does not compare any "personal-type" sub-groups perceptions.

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APPENDIX

Structured Expert Interview – Questionnaire and Comprehensive Result

	IRM				Result Counting						
Question	Awareness	Information Classification	Information Protection	Information Controls	Strongly Agree	Agree	Neither	Dissagree	Strongly Dissagree	Not answered	Checksum
To be transparent to the executive board, a register of ALL CRITICAL information assets and all related risks should be in place and up to date at any time	x	x			4	4	1	1			10
Because of the rules and guidelines are formally in place and could be read at any time, it is NOT important to actively train employees affected by the business controls	x	x						2	8		10
An EXTERNAL information crisis would cause a significant negative impact to the company (e.g. Information Breach, stolen intellectual property)	x	x			6	4					10
Regarding "Information Risk Management" it is important to have a "crises Team" implemented – being able to respond immediately to any threats	x		x	x	3	6	1				10
It is important to distinguish between information, that could be stored on public storage locations and information that should be stored on restricted storage locations	x		x		6	4					10
Formal "business controls" need to be agreed and sponsored by the executive board of the company to ensure that they are taken serious and are executed	x			x	7	3					10
A lack of transparency in particular on "Information Risks" on executive management level could be a reason for not fully implemented "Information Risk Management" Awareness / Preparedness	x			x	4	5	1				10
To ensure, that the controls are executed in an appropriate way, this should be part of the "role description" of the employees affected	x			x	2	6	1	1			10
To ensure better awareness /preparedness in "Information Risk Management" within companies, it is important to have a formally implemented communication and decision map (defined communication streams and mandates for decision making in crises)	x			x	5	5					10
"Time/Costs" constraints could be a reason for not fully implemented "Information Risk Management" Awareness / Preparedness	x			x	5	4	1				10
The value of risk analysis results increases with the company affiliation of the employee	x					5	4	1			10
An INTERNAL information crisis is less negative impacting the company than an EXTERNAL information crisis	x				1	6	2	1			10
An INTERNAL information crisis would cause a significant negative impact to the company (e.g. loss of relevant information, non-integer information etc.)	x				2	4	4				10
To ensure better awareness /preparedness in "Information Risk Management" within companies, it is important to do good "Information Security and/or Management" awareness programs to all associates	x				6	3	1				10
"New-joiners" should be trained automatically if applicable for their new role	x				5	4	1				10
Smaller groups are more effective in risk assessment then bigger groups	x				3	5	1	1			10
To ensure better awareness /preparedness in "Information Risk Management" within companies, it is important to have a formal "Learning and Training System" in place	x				1	7	2				10
Regarding "Information Risk Management" it is important to ensure, that the executive board is playing "a significant role" in this (general management buy in – e.g. as part of the crises team etc.)	x				4	6					10

The "NSA Affair" (disclosure of many secrets by Mr. Snowden in Summer 2013) proved that "Information Risks" are only relevant for Military and Government etc. only	x							1	9		10
However classified information should be only accessible by limited number of people		x	x		5	5					10
Also for critical applications it is possible to outsource this to 3rd party vendors - unauthorized information theft is covered/avoided by contractual terms and conditions		x	x			6	2		2		10
It is important that these professionals do have a good inside in the local organization and processes and are not only "headquarters functions"		x			7	3					10
It is good to involve these professionals in the classification process with a formal approval of all classifications to also ensure the "mandatory involvement"		x			2	2	4	2			10
A consistent and sustainable "information classification" scheme is KEY to identify Information related risks at all (e.g. Confidentiality/Integrity/Availability/Privacy/Legal requirements)		x			4	6					10
In general, there is NO need to have an overview on enterprise level on all classified information asset types (the types only, not the instanced assets themselves!)		x					3	4	3		10
There is NO need to have a number of professional people (e.g. Information Risk Managers) helping the information asset owners with the classifications to ensure an enterprise wide well balanced and calibrated classification over all asset types		x				1	1	2	6		10
It is important to distinguish in particular between this different dimensions (e.g. Confidentiality/Integrity/Availability/Privacy/Legal requirements)		x			4	3	2	1			10
It is important to have exact definitions on how to classify each of this dimensions (e.g. for confidentiality: public use, internal use, confidential, strictly confidential)		x			4	5	1				10
The "information asset owner" should be the person to define the group of people which should have access to the information			x	x	2	6	1	1			10
Formal "business controls" (like SOX, etc.) help to manage "Information Risk Management" activities in an appropriate way in big enterprises			x	x	1	6	3				10
It is essential for companies, that IT department provides an up to date IT security back-bone (anti-virus, Intrusion detection, fire-wall etc.)			x		8	2	0	0	0		10
For mobile devices there is NO need to encrypt the hard drive because all employees are trained and reliable in handling critical information (to avoid unauthorised information access in case of theft)			x					5	5		10
Employees should not have "local administrative" accounts on their PCs			x		5	4	1				10
If office doors are not locked in big companies, it is important NOT to leave classified information on the work desks			x		8	2					10
To avoid unauthorised access to PCs, it is important to lock the PCs logically (Screensaver with password) and physically (fix the PC to the desk with e.g. a steel cable)			x		5	4	1				10
IT department should implement an automated "backup" for specific local (on local PC) folders to avoid data-loss in case of hardware-crashes etc.			x		4	4	1	1			10
Formal rules and guidelines (Standard Operating Procedures and e.g. "how-to" guidelines) need to be in place to ensure that "business controls" are understood and executed in the correct way				x	1	9					10
A review on the fulfillment-level could also be done by the people being responsible for the execution				x		3	2	3	2		10
A reason for not fully implemented "Information Risk Management" Awareness / Preparedness could be that there are no significant risks at all (as an outcome of a formal evaluation within the company)				x		2	3	1	4		10
A good "tracking system" on the fulfillment level of the "business controls" should be in place				x	3	7					10
The information controls should be up to date (according laws etc.) but not changed too often – to avoid confusions and demotivation at the employee level				x	6	4					10

IRM Experts Interviewed

First Name	Name	Job Title	Reference to CV at "linkedin.com" and to "xing.com"
Johan	Wera	Global Head Information Governance and Management Assessment and Risk Management	http://www.linkedin.com/profile/view?id=4066050&locale=en_US&trk=tyah&trkInfo=tas%3AJohan%20wera%2Cidx%3A1-1-1
Anthony	Bramwell	Executive Director at Ernst & Young	http://www.linkedin.com/profile/view?id=3804156&locale=en_US&trk=tyah&trkInfo=tas%3Abramwell%20anth%2Cidx%3A1-1-1
Tim	Wulgaert	CEO at FJAM Consulting	http://be.linkedin.com/in/timwulgaert
Bostja	Senica	Regional IGM Head at LEK ltd.	http://www.linkedin.com/profile/view?id=146949582&authType=NAME_SEARCH&authToken=KwWD&locale=en_US&srchid=276646561389177524582&srchindex=1&srchtotal=3&trk=vsrp_people_res_name&trkInfo=VSRPsearchId%3A276646561389177524582%2CVSRPtargetId%3A146949582%2CVSRPcmpt%3Aprimary
Alexander	Sturz	Senior Consultant at Atos IT Solutions and Services GmbH	http://de.linkedin.com/pub/alexander-sturz/b/96/33a
Markus	Dreimann	Director Operations at Sennheiser Australia Pty Ltd	https://de.linkedin.com/in/markus-dreimann-a0464210
Marco	Wiolfrum	Partner and Senior Analyst	https://www.xing.com/profile/Marco_Wolfrum
Wilfried	Polin	Partner and Riskmanager	https://at.linkedin.com/in/wilfried-polin-1858bb52
Frank	Romeike	Funder and Partner at RiskNET	https://www.xing.com/profile/Frank_Romeike
Christian	Weissensteiner	Consultant at Avande	https://www.xing.com/profile/Christian_Weissensteiner6

Latt-Bikes – Case-Study (by Richard Mayr and Stefan Schwerd, Jan. 2014)

Richard Mayr and Stefan Schwerd, Jan. 2014

Latt-Bikes – Case Study

The Company

Latt-Bikes is a medium sized manufacturing company of all kinds of e-Bikes (City-e- bikes, Mountain-e-Bikes, etc.) and also for e-wheelchairs with all over 1500 employees in Europe and North America. The Headquarters with the Management board is in central Europe – The pre-fabrication of all Metal and Carbon Hardware is done in the North American sites –the final assembly and finishing is done in central Europe. Latt-Bikes is Market leader in Europe for both market segments.

At Latt-Bikes the hierarchy was grown organically and is very typically flat for a med-sized company. There are very direct and short communication and decision making processes paired with a high dynamic decision making culture. The focus is on Business success less on formalities. "We don't see threats neither from inside nor from outside of the company" – CEO and founder of Latt-Bikes- Josef Latt (58 Year old).

The R&D area of Latt-Bikes is led by Josef Latt's confidant – Guiseppe Petrocci (51 Years old). The CFO position was taken over 15 months ago by Margret Miller (38 years old), Margret was joining in from Latt-Bikes' most important supplier for "breaks and gear-shifting" to success Josef Latt in the nearer future (about 2-3 years) as CEO of the company.

Latt-Bike had a total revenue of 55 MUSD at a return of 2,3%, the total market share for e-bikes in Europe was 5,4% and for e-wheel chairs 7,9%. Because of the ongoing price pressure from far-east and the need for higher quantity of units sold, a more global setup (purchasing and Markets) has to be taken in consideration.

Present Situation on the other side of the Globe

Currently the Trans-APAC-Scooter Inc. is the world market leader for e-Scooter – Headquarters in Hong Kong and with a total number of employees of 16000 and a yearly revenue in 2012 of 320 MUSD in the key markets in Asia Pacific area. Trans-APAC Scooter is a typical stock exchange company with a well-defined internal organizational structure, standard processes and procedures, internal trainee programs, security infrastructure, a number of patents, a yearly SOX attestation and a very well developed PR-, Communication- and Marketing department.

The Idea

To cover up the price pressure Latt-Bikes is evaluating a strategy to extend the current portfolio to achieve the necessary synergy effects on the Cost of goods by opening a cooperation with Trans-APAC-

Scooter. In particular the focus is on a joint venture with Trans-APAC-Scooter to reduce the Cost of Goods for the e-engine and the power supply units of the e-Bikes as well as the further development, registration and marketing of the e-Scooters on the European market (where Trans-APAC-Scooter is currently not present).

The CEOs of both companies are convinced that this could be a "win-win" situation for both. The Idea is to found a "joint Venture company" through which all the cooperation is channeled.

THE CASE

Trans-APAC-Scooter had serious problems with information and data breach in the last years – including industry espionage on their intellectual property – so, they launched a series of initiatives to protect their intellectual property and reputation.

Awareness Program:

- Awareness activities and trainings for all employees on how to deal correctly with "Information" as a valuable asset of the company (e.g. how/where to store sensible information, training of new joiners, ongoing curriculum for all employees)
- Board Members took personally the responsibility for the implementation and control of all counter activities (the correct classification, the ongoing transparency and the adequate protection of critical information)
- Special security controls esp. for SOX were implemented
- All rules and procedures were made accessible to all employees
- Explicit communication plans and crises-plans were set up as well as crises team in the unlikely event of a new crises – equipped with the necessary decision making mandates
- The on top necessary resources were approved by the Executive Board and were seen as a reasonable investment

Information Classification

- Professional "Information Risk Managers" were onboarded to support all levels of the company with the applicable know-how
- A consistent "information classification scheme" (Confidentiality/Availability/Integrity/Privacy/ Legal) was introduced all over the company
- Information access was restricted physically and logically – the decision on this was given to the internal information asset owners based on a corporate policy framework

Technical Protection

- The IT-landscape was lifted to the newest security standards and baselines
- "local Admin" rights were taken away from the users PCs
- Simple protection measurements were implemented e.g. screensavers with password protection, steel cables to fix the PCs to the desks and "lock the door when you leave" policy

- Automated Back-up of defined data areas of the local PCs were implemented and is replicating the content to back-bone servers now on a daily base.

Controls Framework

- All introduced controls are checked regularly on their "up to date status" by the legal department
- The level of fulfilling of all controls is also checked and reported regularly to the Executive Board

Organization

- Intentionally "Steering Committees" were implemented on all levels in the organization
- The size of this groups was actively adjusted to the organizational structure
- The group composition is intentionally based on the professional background of the individuals as well as on the Personality type
- The age and the origin was also taken into account

All this was taken into consideration to achieve most effective and efficient decision making with a minimum of future risk in these groups.

THE JOB:

Margret Miller and the Lee Young (CFO of Trans APAC-Scooter) were appointed as PMs to come up with business and structural plans for the new Joint Venture company (3 Month Plan, next Year Plan).

This plans must contain explicit proposals for dealing in particular with the present situations in Enterprise (Information) Risk Management.

Survey

Improvement of Strategic Decision Making in Enterprise (-Information) Risk Management

- SURVEY -

Professional Background:

INSTRUCTIONS

Please indicate how much you agree or disagree with each of the following statements
Please respond as spontaneously as possible!
There are no correct or wrong answers.
Please make sure not to miss a statement.

No.	Questions:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
	Do you think, by also doing a structured "Awareness Program" in the new Joint Venture from the beginning on (as it was done in Trans-APAC-Scooter) would help the new JOINT VENTURE...					
1	... to be seen from the inside and outside as a company with more COMPETENCE, EXPERTNESS and DYNAMISM?	☐	☐	☐	☐	☐
2	... to improve the GOODWILL, BENEVOLENCE and RESPONISVENESS on customer/stakeholder side?	☐	☐	☐	☐	☐
3	... to be seen as more CREDABIL, MORAL, INTEGER and RELIABLE from the inside and outside?	☐	☐	☐	☐	☐
4	... to be seen as more ATTRACTIVE, PREDICTABE, CAREFUL, OPEN from the inside and outside?	☐	☐	☐	☐	☐
5	... to increase EARNINGS (indirect/in general)? = "information" also as "Good Sold"	☐	☐	☐	☐	☐
6	... to increase PROFITABILITY (indirect/in general) = better protect "information" as INTELECTUAL PROPERTY?	☐	☐	☐	☐	☐
7	... to improve EMPLOYEES' INDIVIDUAL/PERSONAL EFFICIENCY in information handling? = MORE EFFICIENT COMMUNICATION?	☐	☐	☐	☐	☐
8	... to improve TEMPORAL EFFICIENCY (speed up) in information processes? = improve ACCURACY/INTEGRITIY of INORMATION?	☐	☐	☐	☐	☐
9	... to improve flexibility in organizational processes according COMMUNICATION and GROWTH? = improve level of READYNESS for usage of MULTIPLE ADDITIONAL "information"-sources	☐	☐	☐	☐	☐
10	... to improve SOCIO-ECONOMIC EFFICIENCY = "need to know"-principal in information selection and information aggregation	☐	☐	☐	☐	☐
11	... to IMPROVE INFORMATION CONTROL ACCESS, (intrusion detection, supervisioning)	☐	☐	☐	☐	☐
12	... to DECREASE RISKS e.g. by utilizing managers, reducing anonymity, extending guard-ship, strengthening formal surveillance?	☐	☐	☐	☐	☐

13	... to REDUCE REWARDS FOR INFORMATION THEFT/DISCLOSURE by e.g. identifying/concealing/removing potential information TARGETS and denying potential benefits for it	☐	☐	☐	☐	☐
14	... to REDUCE PROVOCATIONS e.g. frustration and stress, avoid disputes, reduce emotional arousal, discourage imitations	☐	☐	☐	☐	☐
15	... to REMOVE EXCUSES e.g. by clear rules, alerting conscience, assisting compliance, controlling interfering variables	☐	☐	☐	☐	☐

	Latt-Bikes team members would like to do risk assessments normally alone; Trans-APAC-Scooter would like to form groups for each decision because of the joint venture. You are the Risk Manager and should rate the statements in regards to the risk assessment:					
16	Assessments in groups have, when compared to each other, less variance than individual assessments, when compared to each other	☐	☐	☐	☐	☐
17	Individual decisions are more accurate	☐	☐	☐	☐	☐
18	With groups there is the danger of having unnecessary, controversial discussions	☐	☐	☐	☐	☐
19	In group decisions, the decision will be made through the exchange between group members	☐	☐	☐	☐	☐
20	In group decisions, the use of power and influence on other group members is pronounced	☐	☐	☐	☐	☐
21	The decision maker follows more strongly their own personal goals during individual decisions, with group decisions the company goals are more strongly followed	☐	☐	☐	☐	☐
22	The time required to make an individual decision is shorter	☐	☐	☐	☐	☐
23	The decision maker spends more time searching for information than is the case with group decisions	☐	☐	☐	☐	☐
24	In group decisions, information is more thoroughly analyzed than in individual decisions	☐	☐	☐	☐	☐
25	In group decisions, irrelevant information has more influence than in individual decisions	☐	☐	☐	☐	☐
26	With higher budget impact, individual decisions are advisable	☐	☐	☐	☐	☐
27	With lower budget impact, individual decisions are advisable	☐	☐	☐	☐	☐
28	With medium budget impact, group decisions are advisable	☐	☐	☐	☐	☐
29	With high strategic impact, group decisions are advisable	☐	☐	☐	☐	☐
30	With lower strategic impact, individual decisions are advisable	☐	☐	☐	☐	☐
31	With medium strategic impact, individual decisions are advisable	☐	☐	☐	☐	☐
32	With greater personnel impact, individual decisions are advisable	☐	☐	☐	☐	☐
33	With little or no personnel impact, group decisions are advisable	☐	☐	☐	☐	☐
34	With middle personnel impact, individual decisions are advisable	☐	☐	☐	☐	☐

	Do you think, by also working on the Classification of "Information Assets" (=Information Classification) in the new Joint Venture from the beginning on (as it was done in Trans-APAC-Scooter) would help the new JOINT VENTURE ...					
35	... to be seen from the inside and outside as a company with more COMPETENCE, EXPERTNESS and DYNAMISM?	☐	☐	☐	☐	☐
36	... to improve the GOODWILL, BENEVOLENCE and RESPONISVENESS on customer/stakeholder side?	☐	☐	☐	☐	☐
37	... to be seen as more CREDABIL, MORAL, INTEGER and RELIABLE from the inside and outside?	☐	☐	☐	☐	☐
38	... to be seen as more ATTRACTIVE, PREDICTABE, CAREFUL, OPEN from the inside and outside?	☐	☐	☐	☐	☐
39	... to increase EARNINGS (indirect/in general)? = "information" also as "Good Sold"	☐	☐	☐	☐	☐
40	... to increase PROFITABILITY (indirect/in general) = better protect "information" as INTELECTUAL PROPERTY?	☐	☐	☐	☐	☐
41	... to improve EMPLOYEES' INDIVIDUAL/PERSONAL EFFICIENCY in information handling? = MORE EFFICIENT COMMUNICATION?	☐	☐	☐	☐	☐
42	... to improve TEMPORAL EFFICIENCY (speed up) in information processes? = improve ACCURACY/INTEGRITIY of INORMATION?	☐	☐	☐	☐	☐
43	... to improve flexibility in organizational processes according COMMUNICATION and GROWTH? = improve level of READYNESS for usage of MULTIPLE ADDITIONAL "information"-sources	☐	☐	☐	☐	☐
44	... to improve SOCIO-ECONOMIC EFFICIENCY = "need to know"-principal in information selection and information aggregation	☐	☐	☐	☐	☐
45	... to IMPROVE INFORMATION CONTROL ACCESS, (intrusion detection, supervisioning)	☐	☐	☐	☐	☐
46	... to DECREASE RISKS e.g. by utilizing managers, reducing anonymity, extending guard-ship, strengthening formal surveillance?	☐	☐	☐	☐	☐
47	... to REDUCE REWARDS FOR INFORMATION THEFT/DISCLOSURE by e.g. identifying/concealing/removing potential information TARGETS and denying potential benefits for it	☐	☐	☐	☐	☐
48	... to REDUCE PROVOCATIONS e.g. frustration and stress, avoid disputes, reduce emotional arousal, discourage imitations	☐	☐	☐	☐	☐
49	... to REMOVE EXCUSES e.g. by clear rules, alerting conscience, assisting compliance, controlling interfering variables	☐	☐	☐	☐	☐

	The policy makers at Latt-Bikes decide using already existing structures. Due to the company size and resulting fluctuation, Trans-APAC-Scooter takes professional background into consideration. You are the Risk Manager and should rate the statements in regards to the risk assessment:					
50	Groups made up of members with different professional backgrounds have, when compared to each other, less variance than groups made up of members with similar professional backgrounds, when compared to each other	☐	☐	☐	☐	☐
51	Groups made up of members with different professional backgrounds make less accurate decisions	☐	☐	☐	☐	☐
52	With groups made up of members with different professional backgrounds there is the danger of having unnecessary, controversial discussions	☐	☐	☐	☐	☐
53	Groups made up of members with different professional backgrounds discuss their decisions more than groups made up of members with similar professional backgrounds	☐	☐	☐	☐	☐
54	In groups made up of members with similar professional backgrounds, authority and influence will be used more so than in groups made up of different professional backgrounds	☐	☐	☐	☐	☐
55	Groups made up of members with different professional backgrounds concentrate more on the company goals, a group made up of members with similar professional backgrounds concentrate more on their own goals	☐	☐	☐	☐	☐
56	Less time is required to make a decision when a group is made up of members with similar professional backgrounds	☐	☐	☐	☐	☐
57	Groups made up of members with different professional backgrounds spend more time searching for information than is the case with groups made up of members with similar professional backgrounds	☐	☐	☐	☐	☐

58	When groups made up of members with different professional backgrounds make decisions, information is more thoroughly analyzed than by groups made up of members with similar professional backgrounds	☐	☐	☐	☐	☐
59	In groups made up of members with similar professional backgrounds, irrelevant information has a greater influence than in groups made up of members with different professional backgrounds	☐	☐	☐	☐	☐
60	With higher budget impact, groups should not be made up of members with different professional backgrounds	☐	☐	☐	☐	☐
61	With higher strategic impact, groups should be made up of members with different professional backgrounds	☐	☐	☐	☐	☐
62	With greater personnel impact, groups should not be made up of members with different professional backgrounds	☐	☐	☐	☐	☐

	Do you think, by implementing strong (technical) "Information Protection Mechanisms" in the new Joint Venture from the beginning on (as it was done in Trans-APAC-Scooter) would help the new JOINT VENTURE...					
63	... to be seen from the inside and outside as a company with more COMPETENCE, EXPERTNESS and DYNAMISM?	☐	☐	☐	☐	☐
64	... to improve the GOODWILL, BENEVOLENCE and RESPONISVENESS on customer/stakeholder side?	☐	☐	☐	☐	☐
65	... to be seen as more CREDABIL, MORAL, INTEGER and RELIABLE from the inside and outside?	☐	☐	☐	☐	☐
66	... to be seen as more ATTRACTIVE, PREDICTABE, CAREFUL, OPEN from the inside and outside?	☐	☐	☐	☐	☐
67	... to increase EARNINGS (indirect/in general)? = "information" also as "Good Sold"	☐	☐	☐	☐	☐
68	... to increase PROFITABILITY (indirect/in general) = better protect "information" as INTELECTUAL PROPERTY?	☐	☐	☐	☐	☐
69	... to improve EMPLOYEES' INDIVIDUAL/PERSONAL EFFICIENCY in information handling? = MORE EFFICIENT COMMUNICATION?	☐	☐	☐	☐	☐
70	... to improve TEMPORAL EFFICIENCY (speed up) in information processes? = improve ACCURACY/INTEGRITIY of INORMATION?	☐	☐	☐	☐	☐
71	... to improve flexibility in organizational processes according COMMUNICATION and GROWTH? = improve level of READYNESS for usage of MULTIPLE ADDITIONAL "information"-sources	☐	☐	☐	☐	☐
72	... to improve SOCIO-ECONOMIC EFFICIENCY = "need to know"-principal in information selection and information aggregation	☐	☐	☐	☐	☐
73	... to IMPROVE INFORMATION CONTROL ACCESS, (intrusion detection, supervisioning)	☐	☐	☐	☐	☐
74	... to DECREASE RISKS e.g. by utilizing managers, reducing anonymity, extending guard-ship, strengthening formal surveillance?	☐	☐	☐	☐	☐
75	... to REDUCE REWARDS FOR INFORMATION THEFT/DISCLOSURE by e.g. identifying/concealing/removing potential information TARGETS and denying potential benefits for it	☐	☐	☐	☐	☐
76	... to REDUCE PROVOCATIONS e.g. frustration and stress, avoid disputes, reduce emotional arousal, discourage imitations	☐	☐	☐	☐	☐
77	... to REMOVE EXCUSES e.g. by clear rules, alerting conscience, assisting compliance, controlling interfering variables	☐	☐	☐	☐	☐

	The Trans-APAC-Scooter team consists of employees of different ages, as does the Latt-Bikes team. In comparison to Trans-APAC-Scooter, Latt-Bikes gives more weight to risk assessments made by older employees. You are the Risk Manager and should rate the statements in regards to the risk assessment:					
78	Groups made up of members with different ages have, when compared to each other, less variance than groups made up of members with similar ages, when compared to each other	☐	☐	☐	☐	☐
79	Groups made up of members with different ages make less accurate decisions	☐	☐	☐	☐	☐
80	With groups made up of members with different ages there is the danger of having unnecessary, controversial discussions	☐	☐	☐	☐	☐
81	Groups made up of members with different ages discuss their decisions more than groups made up of members with similar ages	☐	☐	☐	☐	☐
82	In groups made up of members with similar ages, authority and influence will be used more so than in groups made up of different ages	☐	☐	☐	☐	☐
83	Groups made up of members with different ages concentrate more on the company goals, a group made up of members with similar ages concentrate more on their own goals	☐	☐	☐	☐	☐
84	Less time is required to make a decision when a group is made up of members with similar ages	☐	☐	☐	☐	☐
85	Groups made up of members with different ages spend more time searching for information than is the case with groups made up of members with similar ages	☐	☐	☐	☐	☐
86	When groups made up of members with different ages make decisions, information is more thoroughly analyzed than by groups made up of members with similar ages	☐	☐	☐	☐	☐
87	In groups made up of members with similar ages, irrelevant information has a greater influence than in groups made up of members with different ages	☐	☐	☐	☐	☐
88	With higher budget impact, groups should not be made up of members with different ages	☐	☐	☐	☐	☐
89	With higher strategic impact, groups should be made up of members with different ages	☐	☐	☐	☐	☐
90	With greater personnel impact, groups should not be made up of members with different ages	☐	☐	☐	☐	☐

	Do you think, by also implementing and following a formal "Controls Framework" in the new Joint Venture from the beginning on (as it was done in Trans-APAC-Scooter) would help the new JOINT VENTURE...					
91	... to be seen from the inside and outside as a company with more COMPETENCE, EXPERTNESS and DYNAMISM?	☐	☐	☐	☐	☐
92	... to improve the GOODWILL, BENEVOLENCE and RESPONISVENESS on customer/stakeholder side?	☐	☐	☐	☐	☐
93	... to be seen as more CREDABIL, MORAL, INTEGER and RELIABLE from the inside and outside?	☐	☐	☐	☐	☐
94	... to be seen as more ATTRACTIVE, PREDICTABE, CAREFUL, OPEN from the inside and outside?	☐	☐	☐	☐	☐
95	... to increase EARNINGS (indirect/in general)? = "information" also as "Good Sold"	☐	☐	☐	☐	☐
96	... to increase PROFITABILITY (indirect/in general) = better protect "information" as INTELECTUAL PROPERTY?	☐	☐	☐	☐	☐
97	... to improve EMPLOYEES' INDIVIDUAL/PERSONAL EFFICIENCY in information handling? = MORE EFFICIENT COMMUNICATION?	☐	☐	☐	☐	☐
98	... to improve TEMPORAL EFFICIENCY (speed up) in information processes? = improve ACCURACY/INTEGRITIY of INORMATION?	☐	☐	☐	☐	☐
99	... to improve flexibility in organizational processes according COMMUNICATION and GROWTH? = improve level of READYNESS for usage of MULTIPLE ADDITIONAL "information"-sources	☐	☐	☐	☐	☐
100	... to improve SOCIO-ECONOMIC EFFICIENCY = "need to know"-principal in information selection and information aggregation	☐	☐	☐	☐	☐

101	... to IMPROVE INFORMATION CONTROL ACCESS, (intrusion detection, supervisioning)	☐	☐	☐	☐	☐
102	... to DECREASE RISKS e.g. by utilizing managers, reducing anonymity, extending guard-ship, strengthening formal surveillance?	☐	☐	☐	☐	☐
103	... to REDUCE REWARDS FOR INFORMATION THEFT/DISCLOSURE by e.g. identifying/concealing/removing potential information TARGETS and denying potential benefits for it	☐	☐	☐	☐	☐
104	... to REDUCE PROVOCATIONS e.g. frustration and stress, avoid disputes, reduce emotional arousal, discourage imitations	☐	☐	☐	☐	☐
105	... to REMOVE EXCUSES e.g. by clear rules, alerting conscience, assisting compliance, controlling interfering variables	☐	☐	☐	☐	☐

	When forming working groups, Latt-Bikes try to include different personality types. Trans-APAC-Scooter does not believe this is necessary. You are the Risk Manager and should rate the statements in regards to the risk assessment:					
106	Groups made up of members with different personality types have, when compared to each other, less variance than groups made up of members with similar personality types, when compared to each other	☐	☐	☐	☐	☐
107	Groups made up of members with different personality types make less accurate decisions	☐	☐	☐	☐	☐
108	With groups made up of members with different personality types there is the danger of having unnecessary, controversial discussions	☐	☐	☐	☐	☐
109	Groups made up of members with different personality types discuss their decisions more than groups made up of members with similar personality types	☐	☐	☐	☐	☐
110	In groups made up of members with similar personality types, authority and influence will be used more so than in groups made up of different personality types	☐	☐	☐	☐	☐
111	Groups made up of members with different personality types concentrate more on the company goals, a group made up of members with similar personality types concentrate more on their own goals	☐	☐	☐	☐	☐
112	Less time is required to make a decision when a group is made up of members with similar personality types	☐	☐	☐	☐	☐
113	Groups made up of members with different personality types spend more time searching for information than is the case with groups made up of members with similar personality types	☐	☐	☐	☐	☐
114	When groups made up of members with different personality types make decisions, information is more thoroughly analyzed than by groups made up of members with similar personality types	☐	☐	☐	☐	☐
115	In groups made up of members with similar personality types, irrelevant information has a greater influence than in groups made up of members with different personality types	☐	☐	☐	☐	☐
116	With higher budget impact, groups should not be made up of different personality types	☐	☐	☐	☐	☐
117	With higher strategic impact, groups should be made up of different personality types	☐	☐	☐	☐	☐
118	With greater personnel impact, groups should not be made up of different personality types	☐	☐	☐	☐	☐

T-Test – Calculation and Formula

$$t = \sqrt{n}\,\frac{\bar{X} - \mu_0}{s}$$

where

$$\bar{X} = \frac{1}{n}\sum_{i=1}^{n} \mathrm{x}_i = \frac{x_1 + x_2 + \cdots + x_n}{n}, \qquad and \qquad s = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})}$$

μ_0 = specific test value

$\bar{X}$ = sample mean (X_1, X_2,…X_n)

s = sample standard deviation

n = size n of sample

n-1 = degree of freedom

Mann Whitney-U Test and Formula

$$U = n_1 n_2 + \frac{n_1(n_1 + 1)}{2} - R_1$$

Where:

n_1 = sample-size of group with higher rank-size

n_2 = sample-size of group with lower rank-size

R_1 = both groups' rank-size

Significance of the statistics

$$z = \frac{U - \mu_U}{\sigma_U} = \frac{U - \frac{n_1 n_2}{2}}{\sqrt{\frac{n_1 n_2 (n_1 + n_2 + 1)}{12}}}$$

Where:

μ_U = Mean of the U-Distribution (U-Value without difference of groups)

σ_U = Standard deviation of the U-Value

n_1 = sample-size of group with higher rank-size

n_2 = sample-size of group with lower rank-size

Detailed *T-Test* results and *Mann-Whitney-U-Test* results on conformity of the IRM-Experts and the 131 Mid-Level Managers perception according *IRM-Awareness*

IRM Exerts *empiric-norm: 0,817*	T-Test Results				Mann-Whitney-U Test Results	
	Mean	Standard-Deviation	T	Significance (2-Tailed)	Mann-Whitney-U	Significance
SDM Trust						
Trust: Level of competency, expertness, and dynamism	,824	,168	,496	,621 [ch]	6812	,002
Trust: Level of goodwill, benevolence, and responsiveness	,799	,208	-,958	,340 [ch]	6812	,002
Trust: Level of being seen as credible, moral, integer, and reliable	,813	,199	-,237	,813 [chv]	7729	,134 [ch]
Trust: Level of being seen as attractive, predictable, careful, and open	,774	,216	-2,23	,027	6026	,000
Trust – aggregated	,802	,144	-1,12	,264 [ch]	7074	,000
SDM Efficiency/Effectiveness						
Willingness to see Information as an intelectual property	,675	,251	-6,44	,000	3668	,000
Level of temporal efficiency (accuracy and integrity of information)	,769	,237	-2,31	,022	6288	,000
Process readyness for communication and for growth and for ussage of multiple information sources	,786	,232	-1,52	,131 [ch]	6943	,004
Level of socio-economic efficiency e.g. “Need to Know” principle	,723	,256	-4,19	,027	5240	,000
Level of willingness to treat information also as good sold or valuable good	,692	,251	-5,66	,000	4192	,000
Level of individual / personal efficiency in information handling	,723	,244	-4,38	,000	5764	,000
Efficiency / Effectiveness – aggregated	,728	,166	-6,11	,000	5502	,000
SDM Anticipated Damage Prevention and Control						
Level of readiness in information access control	,797	,198	-1,11	,266 [ch]	6812	,002
Level of actively decreasing Risks	,822	,201	,307	,760 [ch]	7860	,204 [ch]
Level of readiness to reduce rewards for theft / disclosure	,725	,259	-4,05	,000	5371	,000
Level of readiness to reduce provocations (frustration/stress etc.)	,667	,267	-6,38	,000	4061	,000
Level of readiness to remove excuses (clear rules, alerting conscience)	,797	,208	-1,06	,288 [ch]	6943	,004
Anticipated damage prevention and control aggregated	,762	,135	-4,62	,000	5764	,000

Source: Author’s calculation based on the performed lab-in-the-field experiment

Detailed *T-Test* results and *Mann-Whitney-U-Test* results on conformity of the IRM-Experts and the 131 Mid-Level Managers perception according *IRM-Information-Classification*:

IRM Exerts *empiric-norm: 0,797*	T-Test Results				Mann-Whitney-U Test Results	
	Mean	Standard-Deviation	T	Significance (2-Tailed)	Mann-Whitney-U	Significance
SDM Trust						
Trust: Level of competency, expertness, and dynamism	,7920	,1964	-,346	,730 [ch]	6026	,000
Trust: Level of goodwill, benevolence, and responsiveness	,7385	,2399	-2,83	,005	5109	,000
Trust: Level of being seen as credible, moral, integer, and reliable	,7634	,2087	-1,89	,060 [ch]	5109	,000
Trust: Level of being seen as attractive, predictable, careful, and open	,7385	,2497	-2,72	,007	5240	,000
Trust – aggregated	,7581	,1699	-2,68	,008	7598	,086 [ch]
SDM Efficiency/Effectiveness						
Willingness to see Information as an intelectual property	,4943	,3092	-11,2	,000	2489	,000
Level of temporal efficiency (accuracy and integrity of information)	,5573	,3543	-7,77	,000	4323	,000
Process readyness for communication and for growth and for ussage of multiple information sources	,7595	,2526	-1,73	,085 [ch]	6288	,000
Level of socio-economic efficiency e.g. “Need to Know” principle	,7233	,2672	-3,19	,002	5502	,000
Level of willingness to treat information also as good sold or valuable good	,6584	,2689	-5,93	,000	3406	,000
Level of individual / personal efficiency in information handling	,7195	,2402	-3,73	,000	4323	,000
Efficiency / Effectiveness – aggregated	,6520	,1669	-10,1	,000	2751	,000
SDM Anticipated Damage Prevention and Control						
Level of readiness in information access control	,8473	,1796	3,14	,002 [ch]	8515	,908 [ch]
Level of actively decreasing Risks	,7844	,2187	-,710	,479 [ch]	6681	,001
Level of readiness to reduce rewards for theft / disclosure	,5382	,3029	-9,81	,000	2620	,000
Level of readiness to reduce provocations (frustration/stress etc.)	,4637	,3055	-12,5	,000	2096	,000
Level of readiness to remove excuses (clear rules, alerting conscience)	,7939	,2181	-,211	,833 [ch]	6681	,000
Anticipated damage prevention and control aggregated	,6855	,1604	-8,01	,000	4847	,000

Source: Author’s calculation based on the performed lab-in-the-field experiment

Detailed *T-Test* results and *Mann-Whitney-U-Test* results on conformity of the IRM-Experts and the 131 Mid-Level Managers perception according *IRM-Information-Protection*

IRM Exerts *empiric-norm: 0,816*	T-Test Results				Mann-Whitney-U Test Results	
	Mean	Standard-Deviation	T	Significance (2-Tailed)	Mann-Whitney-U	Significance
SDM Trust						
Trust: Level of competency, expertness, and dynamism	,7672	,2541	-2,22	,028	6681	,001
Trust: Level of goodwill, benevolence, and responsiveness	,6947	,2726	-5,12	,000	4716	,000
Trust: Level of being seen as credible, moral, integer, and reliable	,6183	,3212	-7,06	,000	4716	,000
Trust: Level of being seen as attractive, predictable, careful, and open	,6927	,2567	-5,52	,000	4454	,000
Trust – aggregated	,6932	,2061	-6,85	,000	3799	,000
SDM Efficiency/Effectiveness						
Willingness to see Information as an intelectual property	,6927	,2567	-5,52	,000	4454	,000
Level of temporal efficiency (accuracy and integrity of information)	,7462	,2480	-3,25	,001	5895	,000
Process readyness for communication and for growth and for ussage of multiple information sources	,6050	,2858	-8,47	,000	3144	,000
Level of socio-economic efficiency e.g. “Need to Know” principle	,6374	,2579	-7,95	,000	3144	,000
Level of willingness to treat information also as good sold or valuable good	,5668	,2987	-9,57	,000	3144	,000
Level of individual / personal efficiency in information handling	,6756	,2607	-6,19	,000	3668	,000
Efficiency / Effectiveness – aggregated	,6539	,1839	-10,1	,000	3537	,000
SDM Anticipated Damage Prevention and Control						
Level of readiness in information access control	,8531	,1804	2,30	,023 *ch*	8122	,417 *ch*
Level of actively decreasing Risks	,8263	,1751	0,63	,529 *ch*	7467	,049 *ch*
Level of readiness to reduce rewards for theft / disclosure	,7901	,2144	-1,41	,158 *ch*	7336	,029 *ch*
Level of readiness to reduce provocations (frustration/stress etc.)	,5611	,2826	-10,3	,000	2620	,000
Level of readiness to remove excuses (clear rules, alerting conscience)	,7805	,2500	-1,65	,101 *ch*	7467	,050 *ch*
Anticipated damage prevention and control aggregated	,7622	,1426	-4,36	,000	6026	,000

Source: Author’s calculation based on the performed lab-in-the-field experiment

Detailed *T-Test* results and *Mann-Whitney-U-Test* results on conformity of the IRM-Experts and the 131 Mid-Level Managers perception according *IRM-Information-Controls*

IRM Exerts *empiric-norm: 0,742*	T-Test Results				Mann-Whitney-U Test Results	
	Mean	Standard-Deviation	T	Significance (2-Tailed)	Mann-Whitney-U	Significance
SDM Trust						
Trust: Level of competency, expertness, and dynamism	,781	,226	1,94	,055 *ch*	2882	,000 *ch*
Trust: Level of goodwill, benevolence, and responsiveness	,773	,227	1,55	,125 *ch*	3275	,000 *ch*
Trust: Level of being seen as credible, moral, integer, and reliable	,773	,233	1,50	,135 *ch*	3275	,000 *ch*
Trust: Level of being seen as attractive, predictable, careful, and open	,721	,235	-1,02	,311 *ch*	4454	,000 *ch*
Trust – aggregated	,762	,174	1,29	,200 *ch*	6288	,000 *ch*
SDM Efficiency/Effectiveness						
Willingness to see Information as an intelectual property	,527	,286	-8,62	,000	6288	,000
Level of temporal efficiency (accuracy and integrity of information)	,576	,287	-6,61	,000	8253	,566 *ch*
Process readyness for communication and for growth and for ussage of multiple information sources	,534	,295	-8,06	,000	6419	,000
Level of socio-economic efficiency e.g. “Need to Know” principle	,542	,301	-7,62	,000	7205	,016
Level of willingness to treat information also as good sold or valuable good	,672	,250	-3,23	,002	5502	,000 *ch*
Level of individual / personal efficiency in information handling	,702	,256	-1,79	,076 *ch*	5502	,000 *ch*
Efficiency / Effectiveness – aggregated	,592	,173	-9,95	,000	3668	,000
SDM Anticipated Damage Prevention and Control						
Level of readiness in information access control	,813	,195	4,16	,000 *ch*	2096	,000 *ch*
Level of actively decreasing Risks	,800	,195	3,37	,001 *ch*	2358	,000 *ch*
Level of readiness to reduce rewards for theft / disclosure	,746	,219	0,20	,840 *ch*	4716	,000 *ch*
Level of readiness to reduce provocations (frustration/stress etc.)	,613	,290	-5,13	,000	7467	,051 *ch*
Level of readiness to remove excuses (clear rules, alerting conscience)	,794	,231	2,56	,012 *ch*	2489	,000 *ch*
Anticipated damage prevention and control aggregated	,753	,155	0,80	,428 *ch*	7729	,137 *ch*

Source: Author’s calculation based on the performed lab-in-the-field experiment

Table 0-1 Overall T-Test Results, Mean and Standard-Deviation

Information Controls (empiric-norm: 0,7423)			Information Protection (empiric-norm: 0,8166)			Information Classificaton empiric-norm: 0,7979			Awareness (empiric-norm: 0,8171)			Measurement Criteria	Endogenous variable
Standard Deviation	Mean	T-Test (2-Tailed)	Standard Deviation	Mean	T-Test (2-Tailed)	Standard Deviation	Mean	T-Test (2-Tailed)	Standard Deviation	Mean	T-Test (2-Tailed)		
0,226	0,781	,055 [ch]	,2541	,7672	,028	,1964	,7920	,730 [ch]	,1689	,8244	,621 [ch]	Trust: Level of competency, expertness, and dynamism	
0,227	0,773	,125 [ch]	,2726	,6947	,000	,2399	,7385	,005	,2089	,7996	,340 [ch]	Trust: Level of goodwill, benevolence, and responsiveness	
0,233	0,773	,135 [ch]	,3212	,6183	,000	,2087	,7634	,060 [ch]	,1993	,8130	,813 [ch]	Trust: Level of being seen as credible, moral, integer, and reliable	Trust
0,235	0,721	,311 [ch]	,2567	,6927	,000	,2497	,7385	,007	,2167	,7748	,0270	Trust: Level of being seen as attractive, predictable, careful, and open	
0,174	0,762	,200 [ch]	,2061	,6932	,000	,1699	,7581	,008	,1442	,8029	,264 [ch]	Trust – aggregated	
0,286	0,527	,000	,2567	,6927	,000	,3092	,4943	,000	,2513	,6756	,000	Willingness to see Information as an intellectual property	
0,287	0,576	,000	,2480	,7462	,001	,3543	,5573	,000	,2374	,7691	,022	Level of temporal efficiency (accuracy and integrity of information)	
0,295	0,534	,000	,2858	,6050	,000	,2526	,7595	,085 [ch]	,2323	,7863	,131 [ch]	Process readiness for communication and for growth and for usage of multiple information sources	
0,301	0,542	,000	,2579	,6374	,000	,2672	,7233	,002	,2561	,7233	,000 [ch]	Level of socio-economic efficiency e.g. "Need to Know" principle	Efficiency / Effectiveness
0,250	0,672	,002	,2987	,5668	,000	,2689	,6584	,000	,2510	,6927	,000	Level of willingness to treat information also as good sold or valuable good	
0,256	0,702	,076 [ch]	,2607	,6756	,000	,2402	,7195	,000	,2446	,7233	,000	Level of individual / personal efficiency in information handling	
0,173	0,592	,000	,1839	,6539	,000	,1669	,6520	,000	,1661	,7283	,000	Efficiency / Effectiveness – aggregated	
0,195	0,813	,000 [ch]	,1804	,8531	,023 [ch]	,1796	,8473	,002 [ch]	,1988	,7977	,266 [ch]	Level of readiness in information access control	
0,195	0,800	,001 [ch]	,1751	,8263	,529 [ch]	,2187	,7844	,479 [ch]	,2021	,8225	,760 [ch]	Level of actively decreasing risks	
0,219	0,746	,840 [ch]	,2144	,7901	,158 [ch]	,3029	,5382	,000	,2591	,7252	,000	Level of readiness to reduce rewards for theft / disclosure	Anticipated Damage Prevention and Control
0,290	0,613	,000	,2826	,5611	,000	,3055	,4637	,000	,2675	,6679	,000	Level of readiness to reduce provocations (frustration/stress etc.)	
0,231	0,794	,012 [ch]	,2500	,7805	,101 [ch]	,2181	,7939	,833 [ch]	,2082	,7977	,288 [ch]	Level of readiness to remove excuses (clear rules, alerting conscience)	
0,155	0,753	,428 [ch]	,1426	,7622	,000	,1604	,6855	,000 [ch]	,1358	,7622	,000	Anticipated damage prevention and control aggregated	

[ch]) T-Test result proves significant conformity of IRM-Experts *empiric-norm* to the Mid-Level-Managers view, or
T-Test result proves significant difference of IRM-Experts *empiric-norm* to the Mid-Level-Managers view, but Mid-Level-Managers view (= mean value on the reation) on the importance is even significantly higher than the IRM-Experts *emiric-norm*

Source: Author's calculation based on own empiric results

Table 0-2 Mann-Whitney-U-Test Results

Information Controls (empiric-norm: 0,7423)		Information Protection (empiric-norm: 0,8166)		Information Classificaton empiric-norm: 0,7979		Awareness (empiric-norm: 0,8171)		Measurement Criteria	Endogenous variable
Asymp. Significance (2-	Mann-Whitney-U	Asymp. Significance	Mann-Whitney-U	Asymp. Significance	Mann-Whitney-U	Asymp. Significance	Mann-Whitney-U		
,000 [ch]	2882	,001	6681	,000	6026	,002	6812	Trust: Level of competency, expertness, and	
,000 [ch]	3275	,000	4716	,000	5109	,002	6812	Trust: Level of goodwill, benevolence, and responsiveness	
,000 [ch]	3275	,000	4716	,000	5109	,134 [ch]	7729	Trust: Level of being seen as credible, moral, integer, and reliable	Trust
,000 [ch]	4454	,000	4454	,000	5240	,000	6026	Trust: Level of being seen as attractive, predictable, careful, and open	
,000 [ch]	6288	,000	3799	,086 [ch]	7598	,000	7074	Trust – aggregated	
,000	6288	,000	4454	,000	2489	,000	3668	Willingness to see Information as an intellectual property	
,566 [ch]	8253	,000	5895	,000	4323	,000	6288	Level of temporal efficiency (accuracy and integrity of information)	
,000	6419	,000	3144	,000	6288	,004	6943	Process readiness for communication and for growth and for usage of multiple information	
,016	7205	,000	3144	,000	5502	,000	5240	Level of socio-economic efficiency e.g. “Need to Know” principle	Efficiency / Effectiveness
,000 [ch]	5502	,000	3144	,000	3406	,000	4192	Level of willingness to treat information also as good sold or valuable good	
,000 [ch]	5502	,000	3668	,000	4323	,000	5764	Level of individual / personal efficiency in information handling	
,000	3668	,000	3537	,000	2751	,000	5502	Efficiency / Effectiveness – aggregated	
,000 [ch]	2096	,417 [ch]	8122	,908 [ch]	8515	,002	6812	Level of readiness in information access control	
,000 [ch]	2358	,049 [ch]	7467	,001	6681	,204 [ch]	7860	Level of actively decreasing risks	
,000 [ch]	4716	,029 [ch]	7336	,000	2620	,000	5371	Level of readiness to reduce rewards for theft / disclosure	Anticipated Damage Prevention and Control
,051 [ch]	7467	,000	2620	,000	2096	,000	4061	Level of readiness to reduce provocations (frustration/stress etc.)	
,000 [ch]	2489	,050 [ch]	7467	,000	6681	,004	6943	Level of readiness to remove excuses (clear rules, alerting conscience)	
,137 [ch]	7729	,000	6026	,000	4847	,000	5764	Anticipated damage prevention and control aggregated	

Source: Author’s calculation based on own empiric results

[ch]) Mann-Whitney-U-Test result proves significant conformity of IRM-Experts *empiric-norm* to the Mid-Level-Managers view, or
Mann-Whitney-U-Test result proves significant difference of IRM-Experts *empiric-norm* to the Mid-Level-Managers view, but Mid-Level-Managers view (= mean-rank) on the importance is even higher than the IRM-Experts mean-rank.