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**SUPPLY CHAIN MANAGEMENT IMPACT ON
COMPETITIVENESS OF BUSINESS ORGANISATIONS**

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ANNOTATION

The economic development of globalization has forced companies to look for more effective ways to coordinate the flow of material, information and money into and out of the company and between companies. Companies are striving for ways to achieve and sustain competitive advantage. Today's business challenges are rapidly changing factors like the price of oil and other commodities, natural disasters (e.g. earthquakes), and political turmoil imposing huge volatility and uncertainty on an organization's supply chain. One of the approaches to cope with the challenges is to manage the entire supply chain end to end to reduce costs and improve performance, creating higher levels of competitiveness and sustaining long term business success for all stakeholders involved. This can be achieved if Supply Chain Management (SCM) is fully aligned with corporate strategy as part of strategic management. The purpose of this dissertation is to investigate through field studies how SCM affects the competitiveness of a company. The parameters for the evaluation of SCM impact on competitiveness were defined by a study of the literature and existing case studies and aggregated in a comprehensive conceptual model that relates customer orientation, SCM maturity (strategic view of SCM and operative view of SCM) leadership elements, supply chain performance in terms of qualitative performance, financial criteria and customer satisfaction to competitive objectives. The field study was conducted by interview via a semi-structured questionnaire and covers European industry sectors. Through the use of factor analysis, the research variables were analyzed in terms of loading of the components of the conceptual model. The model itself was tested by 14 sub-hypotheses about the relations among the model components. The relations among the selected components of the model were also conducted by a multiple regression analysis. The analysis and synthesis validated the developed conceptual model and provided a set of SCM factors that are causal for competitiveness in a specific environment for the industrial sectors covered by the study. The study confirms that there is a strong correlation between supply chain management and its building blocks and the competitiveness of companies. The components of the model explain the SCM impact on competitiveness of business organizations to a high degree. Thus the model is highly valuable for managerial use by organizations for supply chain analysis and supply chain design. SCM must be part of strategic management to be supported throughout the organization and implemented successfully across functions.

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ABBREVIATIONS

AMR	American research institute
C2C	Cash-to-cash
CEO	Chief executive officer
CPFR	Collaborative planning, forecasting and replenishment
CSMP	Customer satisfaction measurement program
EBIT	Earnings before interest and taxes
ERP	Enterprise resource planning
Etc.	Et cetera
EVA	Economic value added
GFI	Goodness-of-Fit-Index
ISO	International standardization organization
IT	Information technology
KPI	Key performance indicator
MIT	Massachusetts Institute of Technology
MLQ	Multifactor leadership questionnaire
MRP	Material resource planning
PRTM	Pittiglio, Rabin, Todd & McGrath - consulting group
R&D	Research and development
RMSE	Root mean square error of approximation
ROCE	Return of capital employed
S&OP	Sales and operations planning
SC	Supply chain
SCC	Supply chain council
SCM	Supply chain management
SCOR	Supply chain operation reference model
SEM	Structural equation modeling
TLI	Tucker-Lewis-Index
TQM	Total quality management
VMI	Vendor managed inventory
VNL	Verein Netzwerk Logistik - Austrian logistics association
WC	Working capital

INTRODUCTION

This dissertation investigates through field studies how supply chain management affects the competitiveness of business organizations. The parameters of supply chain management's impact on competitiveness were defined by a study of the literature and existing research case studies and aggregated in a conceptual model. The SC impact parameters on competitiveness of the model are customer orientation, SCM maturity, and leadership, supply chain performance in terms of qualitative performance, financial criteria and customer satisfaction of the end customer receiving a company's services or products. The field study was conducted by interview via a semi-structured questionnaire and covers European industry sectors. Construct validity and reliability were evaluated by factor analysis and the factor loadings confirmed high validity and reliability of the factors. The relations among the selected variables were conducted by a multiple regression analysis. The analysis and synthesis validated the developed conceptual model with data captured by the interviews and provided a set of supply chain management factors that are causal for competitiveness in a specific environment for the industrial sectors covered by the study. In addition, the study also gives an impression of how far SCM has been implemented in the industrial sectors. This chapter serves as an introduction to the dissertation.

Topicality of the theme

As global competition and advancing technology render borders irrelevant and link companies more closely, supply chains, which are the network of suppliers, production plants, distributors, retailers, and others that participate in the sale, delivery, return and production of goods and services, are becoming increasingly complex.¹

The globalization of supply chains has forced companies to look for more effective ways to coordinate the flow of material, information and money into and out of the company. Companies are striving for ways to achieve and sustain competitiveness. "*Competitiveness is the ability of an organization to secure and expand market share sustainably.*"² This formulation shows that the analysis of competitiveness has also a dynamic component. For the

¹ Cf. Christopher, 2011, pp.15 and pp. 161.

² Cf. Martin/Westgren/Duren, 1991, p.1456.

evaluation of the competitiveness of an organization not only the current market share is relevant but also the future potential market share is of relevance. This means which SCM-factors and results have an impact on current and future market share. Today's business challenges are rapidly changing factors like the price of oil and other commodities, natural disasters (e.g. earthquakes), or political turmoil imposing huge volatility and uncertainty on an organization's supply chain.³ Companies in particular and supply chains in general compete more today on the basis of time and quality. Getting a defect-free product to the customer faster and more reliably than the competition is no longer seen as a competitive advantage, but simply as a requirement of being in the market.⁴

Key priorities are aligning the supply chain with company strategy, aligning incentives across functions and with external parties, empowerment, arming people with the right data so they can make holistic decisions, and building flexibility to quickly respond to demand rather than relying only on forecasts.⁵

This has certainly brought about new challenges for the integration of legally distinct firms and the coordination of materials, information and financial flows not previously experienced to this magnitude. The global orientation and greater performance-based competition, combined with rapidly changing technology, economic conditions and instant changes in the environment, all contribute to marketplace uncertainty. This uncertainty requires greater flexibility on the part of individual companies and supply chains, which in turn need better coordination to deliver customer value and lead to customer satisfaction.⁶ One of the approaches is to manage the entire supply chain to reduce costs and improve performance in order to support competitiveness and sustain long-term business success for all stakeholders involved. This requires a good understanding of SCM factors impacting an organization's competitiveness and how to measure and manage them to enhance the organization's competitiveness. Another important issue is the varying definitions of SCM. Some authors

³ Cf. Simchi-Levi, 2010, pp.3.

Cf. Christopher, 2011, pp.2.

⁴ Cf. Mentzer/DeWitt/Keebler/Min/Nix/Smith/Zacharia, 2001, p.2.

⁵ Cf. Cohen/Roussel, 2005, pp.20.

⁶ Cf. Cohen/Roussel, 2005, pp.186.

define Supply Chain Management in operational terms involving the flow of materials and products⁷, others view it as a management philosophy⁸, and still others view it in terms of a management process⁹. “Supply Chain Management (SCM) has been poorly defined and there is a high degree of variability in people’s minds about what is meant by Supply Chain Management¹⁰.” With so many different views of the concept of SCM, it seems reasonable that managers and researchers have become suspicious of whether SCM really exists, or whether the term is, or should be, used differently in different situations. In fact, some have questioned even the existence and the benefits of supply chain management. For example, Bechtel and Jayanth ask, “*Is the concept of Supply Chain Management important in today’s business environment or is it simply a fad destination to die with other short-lived buzzwords*¹¹?”

This skepticism suggests the need to examine the phenomenon of supply chain management more closely in order to clearly define the term and the concept, to identify those factors that contribute to effective supply chain management, and to suggest how the adoption of a supply chain management approach can affect business strategy and an organization’s competitiveness.

As firms strive for ways to manage competitiveness and achieve competitive advantage, they are looking for new ideas and solutions that could support them in their undertaking.

One of the first researchers to propose a theoretical framework for understanding a firm’s performance is Porter. He takes a strategic and analytical approach to understanding competitive strategy, and argues that, “*Every firm competing in an industry has a competitive strategy, whether explicit or implicit*”.¹²

A theory that has gained momentum in the last decade is the concept of supply chain management. In recent years, there have been numerous advances and developments in supply

⁷ Cf. Tyndall/Gopal/Partsch/Kamauf, 1998, p.10.

⁸ Cf. Ellram/Cooper, 1990, p.2.

⁹ Cf. LaLonde/Pohlen, 1997, p.1.

¹⁰ Cf. Burgess/Singh/Koroglu, 2006, p.704.

¹¹ Bechtel/Jayanth, 1997, p.15.

¹² Porter, 1998, p.35.

chain techniques and management. One of the reasons is that as trade barriers drop and markets open, competition has become more intense. The environment has become more volatile. This means companies need to be more competitive, cost effective, flexible and agile – acting faster while consuming fewer resources. An initiative to help achieve this goal is a supply chain management program. Supply chain management is the management of upstream and downstream activities, resources, and relationships with suppliers and customers that is required to deliver products and services.¹³ In theory, if this is done well it will lead to competitive advantage through differentiation and lower costs.¹⁴ Moreover, some researchers claim that effective supply chain management can reduce costs by several percentage points of revenue.¹⁵

Novelties

There is a strong impact of “supply chain management” on the “competitiveness” of business organizations, with statistically strong significance, which is in line with earlier research work; however, this study contributes the following findings to theory development:

1. The model developed by the author is the most comprehensive model in the area of SCM impact on competitiveness, combining customer orientation, strategic and operative SC capabilities of an organization and leadership in one model, to explain the impact of SCM on competitiveness of organizations.
2. The author is one of the first researchers to identify that SCM strongly impacts a firm’s competitiveness positively, if it is part of strategic management and supported by leadership. Prior research was mainly focusing on SC practices and their impact on performance despite SC practices (operative view of SCM) having a much lower impact on competitiveness.
3. The author’s key contribution to science is that leadership and top management support have a major impact on how supply chain management is implemented and lived in a business organization. This view, developed by the model and evaluated with the observed data, is fundamentally different to previous research, as identified by the

¹³ Cf. Mentzer/DeWitt/Keebler/Min/Nix/Smith/Zacharia, 2001, pp.3.

¹⁴ Cf. Porter, 1980, p.38.

¹⁵ Cf. Cohen/Roussel, 2005, pp.267.

author in an in-depth analysis of models. Most authors previously focused on ideal practices and strategies and analyzed their impact on competitiveness. This study in contrast analyzed the impact of supply chain management in terms of behavioral aspects and leadership criteria necessary for the impact of SCM on competitiveness. The statistical analysis supports the view that SCM impact on competitiveness is given, but needs top management support in terms of strategy formulation, performance target alignment across functions, alignment of incentives and support for supply chain managers on the way of implementation, through individual consideration and support.

4. The author is one of the first researchers to identify that SC maturity, as the capability of supply chain management within business organizations, impacts indirectly on competitiveness through other performance impacts (customer satisfaction, operational performance, financial performance).
5. The author's work shows for the first time that a higher level of SCM maturity leads to lower volatility of financial results.

Thesis for defense

1. Supply Chain Management has to be supported by top management and trusted leadership to create a positive impact on competitiveness of business organizations.
2. The Supply Chain Management capabilities of business organizations do indirectly impact competitiveness of business organizations through operative performance, customer satisfaction and financial performance.
3. Higher levels of Supply Chain Management maturity lead to lower volatility of financial results
4. Strategic Supply Chain Management has a higher impact on competitiveness of business organizations than operative Supply Chain Management

Aim of research

There are many theories and empirical studies on competitiveness. However, the empirical studies, using mathematical models, tend to be limited in scope, and do not include supply chain management parameters.¹⁶

The purpose of this dissertation is to explore and investigate how business organizations should scope, design and successfully implement supply chain management in order to achieve higher levels of competitiveness and what the critical success factors are for supply chain management to provide higher levels of competitiveness.

Main objectives

In order to achieve the purpose of the dissertation, the following tasks were defined:

Provide a model and concept that shows to what extent supply chain management impacts on the competitiveness of business organizations and identify and synthesize the key success factors of supply chain management's impact on current and future competitiveness of business organizations. Give an indication to what extent these critical success factors are implemented in the industries that were considered in the study.

Provide a conceptual model that can be used for diagnosis, analysis, scoping and design of a competitive supply chain model or business model for a specific organization with specific customer needs.

Make the key success factors on the overall strategy and performance available to an extent that they can be used as well to identify the need for change and adaptation based on signs of a changing environment.

The research object covers Western European business organizations in the field of process industry, mechanical and plant engineering industry, automotive industry, chemical and pharmaceutical industry, food industry and retail industry.

The research subject covers supply chain management impact on competitiveness.

¹⁶ Cf. Montgomery/Porter, 1991, p.11.

To achieve this goal the work was structured in the following way:

The first step of dissertation development was an extensive study of the literature on existing supply chain management, leadership, competitiveness and competitive advantage theory. In the next phase, models and studies of supply chain management and competitiveness were evaluated and clustered. Based on these two steps, model development took place, grounded strongly on existing literature and including pre-tests to ensure content validity. In the next step, the author developed a semi-structured questionnaire to validate the model with real data. Prior to interviews with senior supply chain managers, the questionnaire was reviewed by two professors of supply chain management. After adaptation, 12 initial interviews with members of the VNL (Austrian logistics association) supply chain expert group, senior supply chain managers of leading companies, were conducted. The results of the 12 interviews were evaluated with descriptive methods and discussed in detail with the senior managers of the expert group in a feedback loop (four workshops). The first interview discussions brought two major topics to the surface – first, the sharing of financial information could be an issue, and second, explanation of terms and questions during the interview. The open discussion with the senior managers further improved content validity and reliability in three ways. On one hand, these companies were prepared to share financial figures from 2007 to 2010; on the other hand, in discussion it became obvious that top management support and leadership, along with aligned performance figures and incentives, are key drivers of successful SCM implementation; and thirdly, financial figures are not related to supply chain management. Based on this input, the author adapted the questionnaire in the area of financial figures to also ask about financial performance relative to competitors, and approached further companies fitting the defined selection criteria for interviews. The collected data were evaluated by three steps: by confirmatory factor analysis, checking for internal consistency, one-dimensionality, construct validity, and discriminant validity; by exploratory factor analysis, to test the construct validity using exploratory factor analysis (varimax-rotation with Kaiser normalization); and by testing for criteria-related validity of the model using structural equation modeling. Finally, the findings were interpreted into suggestions and novelties generated by this dissertation and how they could be used for future research and business purposes.

Research hypothesis

Hypothesis: SCM and its implementation has a positive impact on business organization's competitiveness

The author developed a whole set of sub-hypotheses that appears in chapter three. The hypotheses were developed by a study of the literature on SCM concepts and SCM definitions. The author identified as well on a study of literature the key impact factors of SCM on business organization's competitiveness and developed a model to identify how they impact a business organization's competitiveness. According to definitions and existing concepts, the core of SCM is always about external and internal relationships between organizations and between functions, with the aim of maximizing benefits for all parties involved and achieving superior customer satisfaction. Therefore one key element is about understanding customer requirements (requirements of end customers receiving a company's service or product) which requires a high degree of customer orientation (what are customers' expectations and priorities?). As the concept of SCM is also a tradeoff between service, efficiency and asset utilization, which in turn has a huge influence on financial performance in terms of EBIT and capital returns, it has to be aligned with corporate strategy and channel strategy and therefore needs to be part of strategic management to effectively contribute to the competitive position of a company. SCM has an operational part and a strategic part, which have different influences on competitiveness and are therefore analyzed separately. Last but not least, the concept of SCM has already existed for decades and the success impact was already proven by various authors, but what was missing in most of the studies was questioning why it fails to be implemented and why it fails to deliver success when implemented. This is the reason why the author also defined leadership & trust – from a completely different discipline – as a key topic critical to the successful impact of SCM on the competitiveness of firms.

Methods and research process

This study employs a literature-based study on theory, theoretical models and research case studies to understand constructs of supply chain management and how they impact the competitiveness of organizations.

The parameters for the evaluation of supply chain management impact were defined by a study of the literature and existing case studies and aggregated in a conceptual model. The conceptual model relates customer orientation, strategic view of supply chain management, operative view

of SCM (supply chain practices), leadership & trust to operational performance, financial performance, customer satisfaction and competitive objectives. The author developed a questionnaire to measure the unobserved latent variables by indicators (manifest variables) at the observable level. This standard questionnaire was evaluated by academic and professional experts. The research was carried out by semi-structured interviews with senior supply chain managers, or senior managers responsible for supply chain management, within the companies chosen randomly according size and industry. As the questionnaire has an explorative character, the author decided to conduct the questionnaire in an interview form. This methodology ensures validity in three ways:

- It is possible to uncover important information beyond the semi-structured questionnaire with narrative parts because there is the possibility of explaining terms of the questions if the interviewee asks for clarification.
- Different industry specifics can be understood and discussed to make sure that the result reflects the right context.
- Interviews will be conducted by different people to make sure that the results are not influenced by the author's own bias.

Through the use of a factor analysis, the loading of the research variables to the model components was identified. In order to test the causal relationships of the structure of the model and the variables within the structure, multivariate methods (structural equation, path analysis) were used.

Development of the dissertation via public presentations & discussions

The main parts of the dissertation were developed in a dialogue with the scientific community. The main findings were prepared and presented at the following conferences:

- International Research Conference on Current Issues in Management of Business and Society Development - 2011, 5-7th of May, Latvia, Riga, University of Latvia
- International Research Conference on Current Issues in Economics and Management Sciences - 2011, 10-12th of November, Latvia, Riga, University of Latvia
- International Conference on Global Business Management Research - 2011, 2-4th of December, Germany, Fulda, University of Applied Sciences of Fulda
- International Scientific Conference on New Challenges of Economic and Business Development - 2012, 10-12th of May, Latvia, Riga, University of Latvia

- International Scientific Conference on International Business & Economic - 2012, 3-5th of August, Austria, Kufstein/Tyrol, University of Applied Sciences Kufstein/Tyrol
- International Research Congress on Logistics and SCM Systems – 2013, 5-7th of August, The International Federation of Logistics & SCM Systems (IFLS) and The Asian Pacific Federation of Logistics & SCM Systems (APFLS), Japan, Tokyo, Waseda University of Tokyo

Publications

- Venus, K.: Supply chain management and the impact on the competitiveness of firms, Conference Proceedings, University of Latvia, Latvia, Riga, ISBN 978-9984-45-348-4, 5/2011, pp. 822-832.
- Venus, K.: Supply chain management maturity and the impact on performance of firms, Conference Proceedings, University of Latvia, Latvia, Riga, ISBN 978-9984-45-417-7, 11/2011, pp. 656-668.
- Venus, K.: The role of leadership and trust and the impact on supply chain management strategy implementation, Discussion Papers in Business and Economics, University of Applied Sciences Fulda, Germany, Fulda, ISSN: 2194-7309, Vol. 8, 12/2013, pp. 87-95.
- Venus, K., Gerschberger, M.: Forecasting and its effect on performance indicators, International Research Congress on Logistics and SCM, Conference proceedings, Waseda University in Japan, Japan, Tokyo, 8/2013, pp. 341-346.
- Venus, K.: Supply chain management – a multidisciplinary approach for competitiveness in volatile times, Academy of Contemporary Research Journal, ISSN: 2305-865X, Vol. 3, 01/2014, pp. 1-9.
- Venus, K.: Supply chain management – part of strategic management, Journal of Business and Economics, ISSN: 2155-7950, Vol. 5, 07/2014, pp. 1052-1067.

Structure of the dissertation

Table 0.1: Structure of the Dissertation¹⁷

	Chapter		Objectives
Theoretical issues 25 pages	Chapter 1	<ul style="list-style-type: none"> • Supply Chain Management • Strategic Management • Leadership & Trust • Competitiveness 	Review of relevant literature
Review of existing models 8 pages	Chapter 2	<ul style="list-style-type: none"> • Review of conceptual models for assessing supply chain factors and the relationship with determinants of competitiveness 	Review of existing research models with focus on SCM impact on firms' competitiveness
Empirical design 25 pages	Chapter 3	<ul style="list-style-type: none"> • Construct development • Sub-hypotheses development • Questionnaire content (variables definition) • Preparation for data gathering • Sample size and spread of companies in a specific industry and size (validity of sample) • Data gathering • Exploration of methods of analysis • Methods to reduce data and methods for building relationships between factors within a conceptual model • Decision about most suitable method • Description of chosen method 	<p>Define a conceptual model for assessment. Information about design and execution of empirical data gathering.</p> <p>Explore analytical methods and come up with an explanation of why a specific analytical method is most suitable</p>
Research results & managerial implications 48 pages	Chapter 4	<ul style="list-style-type: none"> • Operationalize and analyze the data • Synthesize and bring empirical results into a logical order (path empirical results) • Results and managerial implications 	Presentation of results of quantitative analysis
Summary, conclusions & suggestions for practice 10 pages		<ul style="list-style-type: none"> • Summary of the findings • Conclusion and outlook for practice and research • Recommendations for use in supply chain management practice 	Summarize the results and make conclusions and provide suggestions for managerial practice

Source: Own figure - structure of dissertation.

In addition to this introductory chapter, the dissertation consists of four chapters.

Chapter 1 reviews the relevant literature, addresses the disciplines under investigation, and provides an overview of competitiveness, supply chain management and leadership & trust.

¹⁷ Own table.

The chapter then provides a detailed review of the current literature and practices of supply chain management's impact on competitiveness.

Chapter 2 continues into identifying gaps in the literature and provides the rationale for selecting the research topic and issues. This is done by an analysis of models dealing with supply chain impact on a firm's competitiveness.

Chapter 3 discusses the empirical research design which includes the research model development, a discussion of preparation of the questionnaire, and the data gathering process, including detailed description of sample selection and validity of the sample for the process used to generate recommendations from the data, and discusses the research and analysis methodology used for this study.

Chapter 4 summarizes the data collected through interviews and aims to interpret the data in relation to the research objective. Each of the research issues is analyzed and interpreted, and the detailed findings are presented. The chapter concludes with a summary of the research findings.

The summary chapter covers the findings and conclusions of the research objective and issues, discusses the contribution of the research findings to the literature and theory, reviews the implications of the findings, discusses the limitations of the research, and concludes with recommendations for managerial practice.

Identification of limitations of the study

Validity for different industries is limited to the industries captured by the study. Validity and reliability of the conceptual model is limited in terms of parameters taken into consideration.

The study only covers companies in developed countries and would therefore need further research for a different economic environment. From a cultural background, the study is valid only for the cultures in which the companies analyzed are operating.

The interviewees were only Supply Chain managers and logistics or operations managers, due to the fact that the matter especially in terms of Supply Chain maturity requires deep knowledge of sales and operations planning processes.

The model is only valid for companies operating in polypolistic environment.

The model was validated based on 34 interviews, which, of course was rather low in terms of statistical validity, but it was not feasible to conduct a higher number of interviews for this study with reasonable effort and time. Validity was increased by a triangulation with a group of supply chain managers of top-performing companies, in which questionnaire results were discussed in detail concerning their operative and financial figures and the impact on competitiveness. Due to the interview approach, all questionnaires except one were 100% completed in good quality. The key challenge was finding interview partners who were prepared to answer a questionnaire containing 167 questions in about one to one and a half hours. The interview method also delivered insights that certainly could not have been identified if the questionnaire had been online.

Main results

Overall, the correlations show that the model has a good convergent and discriminant validity. The model validity is high, as most of the p-values show statistical significance.

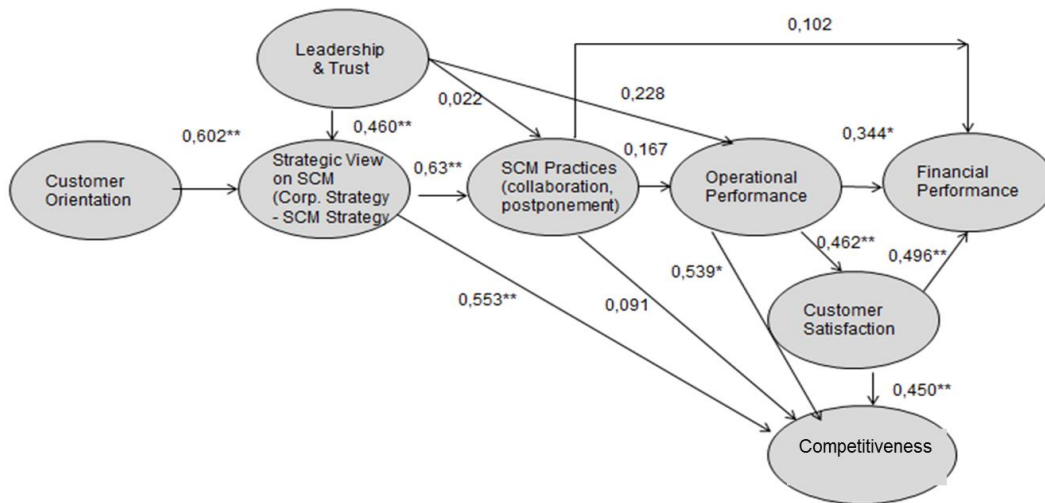


Figure 0.1: Results of SCM impact on firm’s competitiveness¹⁸

Source: Own figure - statistical analysis SPSS.

Notes: *p< 0.05; **p< 0.01

¹⁸ Own figure.

The figure shows, first, that there is a correlation between customer orientation and strategic view of SCM and there is a correlation between strategic view of SCM and competitiveness – and both are significant – meaning customer orientation has a significant influence on competitiveness through the influence on strategic view of SCM. This result suggests that a customer-oriented strategy can help a firm. Therefore it is important to focus its management on satisfying customer needs, which is especially important in highly competitive markets. Second, leadership & trust correlates with strategic view of SCM and strategic view of SCM correlates with competitiveness – again, both correlations are significant – meaning that strategic view of SCM needs leadership support to impact competitiveness. As key decisions are made by top management, only strong management support is able to mobilize and allocate resources to enhance a firm's supply chain capabilities. SCM capabilities focus on cross-functional, cross-company collaboration, goal measurement and alignment across supply chain partners, and maximizing benefits for all involved partners with maximum customer satisfaction – these capabilities can only be built if supported by top management. Third, the operative view of SCM has a significant correlation with the strategic view of SCM – reflecting the alignment between strategy and practices – but practices and processes alone are insufficient to gain higher levels of competitiveness. The practices have to fit and enhance the SC strategy. Fourth, the performance measures impacting competitiveness are mainly customer satisfaction, operational performance – having high correlation factors – meaning, if customer requirements are met to a high extent, customers are more satisfied and this creates higher loyalty, which in turn creates a higher level of competitiveness. There is as well a positive correlation between customer satisfaction and financial results, as longer term partnership allows for optimization and transaction cost reductions.

Fifth, the causal relations of the model explain the impact of SCM on competitiveness to a degree of 72.4%. The highest correlation on 'competitiveness' has 'leadership & trust' with 0.431 and it is statistically highly significant with a p-value < 0.015 and 'supply chain performance overall compared to peers' with 0.333 and a p-value of < 0.02. Nevertheless, goodness of fit measures showed weak results, as they do not work with such small sample sizes. A sample of 34 is definitely too few and we would need a sample of 100 or more interviews.

Overall, the interpretation and recommendations to management are that supply chain management significantly impacts a firm's competitiveness through the alignment of corporate strategy, channel strategy, service strategy and supply chain strategy (strategic management).

Top management support is key to SCM strategy execution/implementation across functions and in the extended network of relations, by aligning goals and incentives (leadership & trust). As the independent variables are reflected by supply chain capabilities and organizational behaviors, the model reflects to what extent an organization is realizing the impact of supply chain management on competitiveness. This means that the model can be used by firms for supply chain analysis, to understand the extent to which supply chain management impacts competitiveness in this specific organization, and how better supply chain management would impact competitiveness.

The results confirm the hypothesis that SCM and its implementation has a positive impact on business organization's competitiveness.

Main conclusions

The author made the following conclusions:

1. The critical success factors of SCM that were determined have an impact on competitiveness and shall be applied by companies as they can provide higher level of competitiveness. The most important critical success factors are 'customer orientation', 'strategic view of SCM', 'leadership & trust', and 'customer satisfaction'.
2. Top management support in companies is necessary to effectively implement SCM in terms of vision, mission, strategy, and leadership behavior.
3. The model developed by the author shall be applied by companies for Supply Chain analysis and design as it shows a high convergent and discriminant validity and the significance of the correlations among the components of the model is high.
4. The components of the model explain to a degree of 72.4% the SCM impact on the competitiveness of organizations. Thus the model is highly valuable and shall be used by companies for supply chain analysis and supply chain design
5. Existing literature overrates the operative view (processes and practices) of SCM and underrates the strategic view of SCM, companies should therefore focus on strategic SCM instead on SCM practices.
6. Companies need to identify market, channel and customer requirements as they are highly important for SCM impact on competitiveness.
7. Supply Chain managers need solid financial knowledge as it is crucial to SCM impact on competitiveness.

8. SCM strategy formulation is important for companies as missing SC strategy formulation leads to lower impact of SCM on competitiveness.
9. Companies need a high level of SC maturity to keep financial volatility low as the volatility of financial results over the period 2007-2010 shows a high correlation with supply chain maturity.
10. Companies shall implement SCM as competitiveness can be increased through SCM, as a set of activities that sustainably differentiates a company from its peers.

In general, it can be said that organizations with higher levels of SCM maturity and higher leadership & trust from management, design and implement supply chain management in a way that supports competitiveness of organizations positively.

Main recommendations

The author provides the following recommendations for managerial use:

1. Organizations have to understand supply chain management as a management philosophy and that its implementation can contribute substantially to competitiveness.
2. Organizations need to build SCM as part of the strategic management of the organization.
3. Organizations should capture customer and market requirements properly, document them, measure them, take action and communicate their performance to customers explicitly.
4. Based on market/customer requirements, organizations should develop a strategy that is in line with their own asset network and set strategic priorities for the triangle of – responsiveness, efficiency and asset utilization – to deliver maximum benefits for the company and value to the customer.
5. Organizations should develop a limited set of performance indicators (only about 10 to 12 figures maximum), fitting into a performance pyramid/system, to steer and monitor SCM strategy implementation and align incentives of involved stakeholders across functions and across the chain.
6. Organizations should develop and use/implement the right SC practices to successfully deliver the strategy.

7. Organizations should use the model developed on a managerial basis for supply chain analysis/diagnostics/design and implementation projects or for adaptation of existing supply chain models.
8. Organizations should install a fully trusted supply chain manager with solid financial knowledge and good access to financial data, as they are important to the impact of SCM on competitiveness.
9. Organizations should develop a leadership culture with a clear vision, trust, and empowerment, alignment of targets and incentives and collaboration across functions and across the company.
10. Organizations should understand/use SCM as a competitive instrument/weapon in a highly competitive and volatile market environment, and develop it as a set of activities that differentiates a company sustainably from its peers, because it is very difficult to copy or imitate.

Main sources used

For the theoretical development of the model, the author mainly used papers published during the last 10 years dealing with SCM, leadership and competitiveness. The development of the competitiveness factors is mainly based on Porter's publications and books. The interview questionnaire was reviewed with two SCM professors before starting the interviews. The interviews were conducted with senior supply chain managers of European companies. SPSS was used as the main tool for the statistical analysis.

1 THEORETICAL ISSUES ON SUPPLY CHAIN MANAGEMENT, LEADERSHIP, COMPETITIVENESS

This chapter reviews the relevant literature, addresses the disciplines under investigation, and provides an overview of competitiveness, supply chain management and the key building blocks of supply chain management and how they are impacting the competitiveness of firms.

Supply Chain Management (SCM) first emerged in an early form less than 30 years ago. It was introduced in 1982 by the two consultants Oliver and Webber, but quickly attracted interest from researchers, academics and practitioners.¹⁹ The concept matured and has gained acceptance in academia and practice as a new name for logistics, as a wide-spanning umbrella that includes logistics, a new attribute of logistics, or as integrating aspects from other disciplines.²⁰ The confusion between logistics and supply chain management probably is

*“due to the fact that logistics is a functional silo within companies and is also a bigger concept that deals with the management of material and information flow across the supply chain”.*²¹

But there was not just the confusion between logistics and SCM research, SCM as an alternative concept to vertical integration. Already in the 1980s, SCM was identified as an important and essential instrument to increase competitiveness.²² This statement shows already the conflict of disciplines and content of supply chain management.

However, the objective of this research is to understand how supply chain management with its three core tasks based on first, configuration and allocation (strategic view of SCM), second, coordination and integration (leadership & trust), and third, adaptation and development (flexibility and agility and dynamic capabilities) can impact and improve competitiveness in terms of service, price, costs, responsiveness to environmental change and innovation (performance measurements).

¹⁹ Cf. Oliver/Webber, 1982, pp.76.

²⁰ Cf. Larson/Halldórsson, 2004, p.21.

²¹ Lambert/Cooper/Pagh, 1998, p.2.

²² Cf. Porter/Kramer, 2006, pp.8.

The origins of Supply Chain Management can be traced back into the 1950s, when the dynamics of industrial production-distribution systems were already being studied.²³ Even so, parts of the concept were earlier used in the late 18th century in the Scottish steel industry²⁴ and by Henry Ford in producing the legendary T-model. The multi-disciplinary evolutionary development of SCM over the past 30 years has led to the dilemma that most of the research was done in an empirically descriptive or prescriptive way.²⁵ Only a little theoretical work has been identified, and where existing, it is largely concerned with the dynamics of inventory systems (material flows and stock). In the author's opinion, the SCM discipline requires more rigorous and structured research as theoretical development is critical to the development of SCM. Also of concern to the author is the lack of a significant body of a priori theory. The battle over definitions has also not helped the development of consent theory. The unit of analysis is internal, dyadic or based on networks. Looking into existing research and theory, the author picked up that the central underpinning parts relate to alignment and integration, while another important concept is to include core competencies, supplier and customer segmentation, strategic integration, and drive win-win relations between partners in the supply chain, goal congruence, avoidance of opportunistic behavior, development of strategic alliances, and the sharing of risks and rewards.

Sub-theories include the seamless flow from initial sources to final customer, demand-led supply chain (only produce what is pulled through), shared information across the whole chain (end-to-end pipeline visibility), collaboration and partnership (mutual gains and added value for all, win-win, joint learning and joint design, and development), IT-enabled, all products direct to the shelf, batch/pack size configured to rate of sale, customer responsive, agile and lean, mass customization, market segmentation. Taking the SCM practice and reality, we can identify a number of organizational and behavioral barriers to the realization of the idealistic description. All theories aimed to control variation, but this no longer holds true in a turbulent environment where such rigid structures will struggle to cope with unexpected demand and supply changes. Yet there is a silver bullet: the tools on hand to manage supply chains remain

²³ Cf. Forrester, 1958, p.44.

²⁴ Cf. Bremner, 1869, p.37.

²⁵ Cf. Croom/Romano/Giannakis, 2000, pp.74.

largely the same, but we need to apply them in a new mindset that considers the option value of flexibility. The latest theoretical developments show there is a need to move away from the control mind set and embrace volatility as an opportunity for a temporary competitiveness.²⁶

Customer orientation as a highly important element, as fragmentation and variety in customer-driven product and service offerings has to be understood by companies to build and design the supply chain(s) in a way that effectively supports customer needs and corporate strategy. For the author, this means instead having one set-up of supply chain, companies have multiple supply chains based on customer and channel requirements to maximize customer satisfaction with minimal cost. The author sees SCM as a strategic matter, as decisions about outsourcing, collaboration, and network design have to be taken on a strategic level to fully support channel strategy and corporate strategy. This requires a strategic approach towards configuration of SCM to maximize the impact on competitiveness, with a clear supply chain strategy. Successful implementation of the supply chain strategy requires full top management commitment as it cuts across all business functions.

According to Christopher and colleagues, the controlling of variations will no longer work in a turbulent environment, which we see currently, so there is a need to move away from the control mind set and embrace volatility as an opportunity for higher temporary competitiveness, which has not just an influence on the current and future theory of SCM but also on current and future use of SCM in a real world. The author's conclusion is that supply chain models need to be designed for more flexibility to increase reactivity during volatile times and gaining higher competitiveness, regardless of which direction the fluctuations go.

1.1 Philosophy and research theory in the area of Supply Chain Management

The author recognizes that developments in our understanding of SCM require a multi-disciplinary approach to address the contrasting antecedents. The importance of transaction cost economics and inter-organizational theory has been recognized by a number of researchers.

Figure 1 shows the key impact theories on SCM, such as management theory, transaction cost theory and inter-organizational theory and a number of other key antecedent disciplines, namely

²⁶ Cf. Christopher/Holweg, 2011, pp.69.

systems thinking, information theory, industrial dynamics, production economics, social theory, game theory and production engineering: 11 different subject literatures that have an impact on Supply Chain Management. There are hybrid fields such as strategic management and marketing in which it is apparent that the subject is being explored from a multiplicity of perspectives. A number of antecedent disciplines can be summarized under “leadership topics”.

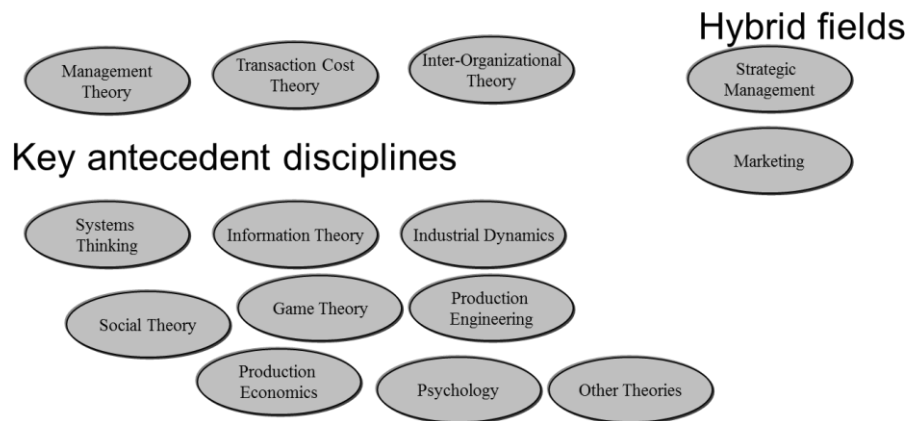


Figure 1.1: SCM Influencing Theories - Multidisciplinary View²⁷

Therefore researchers need to be aware of complementary studies outside of their own domain of expertise.²⁸ In the battle over definitions and descriptions, part of the agenda is undoubtedly an attempt to re-position functions and quasi-professions such as operations management, procurement and logistics. Rather than try here to determine the precise construct, the author acknowledges the value of adopting a constructivist approach and explores how relevant actors construe their prime objectives, the scope of their activities, the allocation of responsibilities, the barriers to desired practice and the enablers - descriptive. Looking at this, problems arise when the shift from description to prescription is relatively covert. Some prescriptions stem from observed superior practice in particular domains. This can be valuable, but the author’s opinion is that for the discipline to advance, there also needs to be rigorous testing – serious exploration of the causes of failure. The literature develops rather imperceptibly between description, prescription and new trend identifications. One trend was the shift from an

²⁷ Own figure based on literature review.

²⁸ Cf. Croom/Romano/Giannakis, 2000, p.67.

“antagonistic” model to a collaborative model.²⁹ Another trend is the concern with the impacts on various functions such as purchasing.³⁰ While one would expect that trend analysis implies progress, Hines and Fischer claim that despite all the technology and the new techniques, supply chain performance in many instances has “never been worse³¹”. This leads to a situation in which managers lack a framework for determining which methods are appropriate. This implies that managers tend to adopt far more of a contingent rather than a “best practice” approach.³²

A variety of theories – among them structural inertia theory³³ and threat rigidity theory³⁴ -- have emerged to explain the frequently observed resistance to organizational transformation. Lewin’s force field analysis was, however, the first widely accepted framework for understanding the nature of organizational transformation.³⁵ Because they freeze an organization in its entrenched behaviour, resisting forces (cultural resisters – social dilemma theory, structural resisters – constituency-based theory) debilitate the strategy-implementation and organizational-transformation process. Improving the ability to collaborate requires better insight into motives, mechanics, impediments, and desired outcomes of the transformation process at the end.³⁶

1.2 Historical development of supply chain management

Figure 1.1 shows the development stages of SCM, based on macro- and micro-economic developments. The x-axis shows the productivity increases and y-axis the timeline. Explaining the figure from left to right, it starts with Taylor: business at that time was mainly vertically

²⁹ Cf. Matthyssens/Van den Bulte, 1994, p.79.

³⁰ Cf. Anderson/Rask, 2003, pp.1.

³¹ Cf. Hines/Holweg/Rich, 2004, p.1007.

Cf. Fisher, 1997, p.105.

³² Cf. Storey/Emberson/Godsell/Harrison, 2006, pp.755.

³³ Cf. Hannan/Freeman, 1984, pp.149.

Cf. Kelly/Amburgey, 1991, p.591.

³⁴ Cf. Staw/Sandelands/Dutton 1981, pp.501.

³⁵ Cf. Lewin, 1951, pp.202.

³⁶ Cf. Fawcett/Waller/Fawcett, 2010a, p.520.

integrated, meaning all parts for manufacturing products were in one place, increasing productivity by tailoring work. The roles between producer and customer were very clearly split – the customer could buy what was offered by the company. The next development happened from the 1950s to the 1970s when automation was used to increase productivity. In the 1980s and 1990s, new waves of productivity increase came on stream (CIM = computer integrated manufacturing and TQM = total quality management). In the 1990s, trends like outsourcing and off-shoring were introduced, which led to higher productivity but also to more network complexity and imposed the need to coordinate the flow of material and information across functions and organizations. Due to these developments a new philosophy of management was needed, called supply chain management. A subsequent micro-economic wave that influenced the development of SCM was the development of horizontal alliances, in which competitors start using the same platforms of products to increase productivity, like VW and Ford with the Sharan and Galaxy models. The current and future trends impacting SCM will be a diffusion of roles between company and customer, where the customer has an influence on product design during the ordering process, and which will also require new strategies for supply chain management.

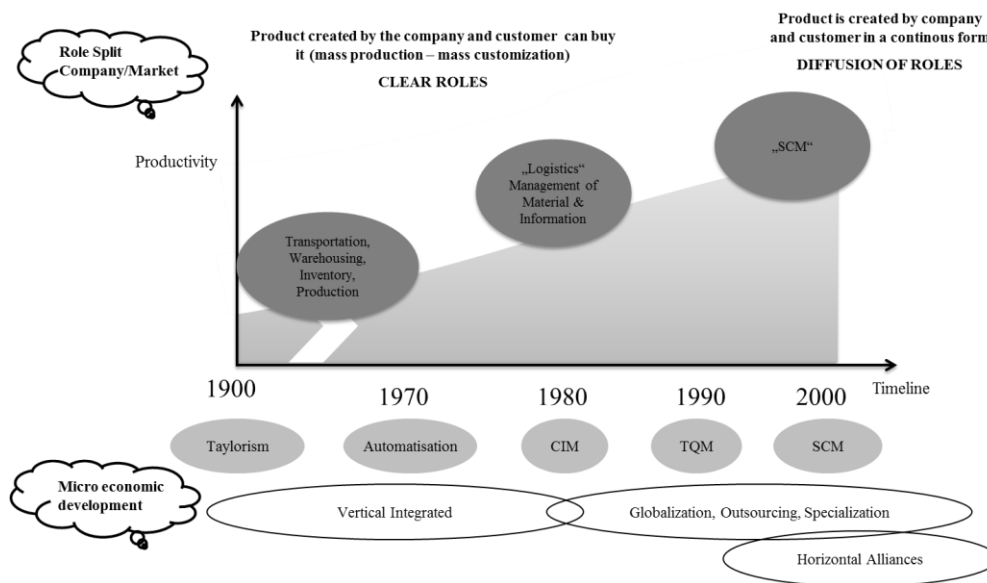


Figure 1.1: Development stages of SCM, based on macro- and micro-economic developments³⁷

The historical perspectives: In the period from the 1960s to the mid-1970s, corporations had vertical organization structures and optimization of activities was focused mainly on functions. Relationships with vendors were win-lose interactions, and often adversarial. Manufacturing systems were focused on materials requirements planning (MRP).

From 1975 to 1990, corporations were still vertically aligned but several were involved in process mapping and analysis to evaluate their operations. There was a realization by organizations of the benefit of integration of functions such as product design and manufacturing. Various quality initiatives, such as total quality (TQM)³⁸, and ISO standards for quality measurement were initiated by many organizations. From 1990 onwards, corporations have been experiencing increasing national and international competition. Strategic alliances between organizations were developing. Organizational structures are starting to align with processes. Manufacturing systems in organizations have been enhanced with information technology tools such as enterprise resource planning (ERP). There has been

³⁷ Own figure, developed by using as well the following input papers.

Cf. Lambert, D. M./Cooper, M. C./Pagh, J. D, 1998, pp.1

Cf. Langley, Jr./Allen./Colombo, 2003, p.28.

Cf. Yazdanparast/Manuj/Swartz, 2010, pp.376.

³⁸ Cf. Deming, 2000, pp.23.

a growing appreciation in many firms of total cost focus for a product from the source to consumption, as opposed to extracting lowest price from the immediate vendor. There has been also increased reliance on purchased materials and outside processing with a simultaneous reduction in the number of suppliers and greater sharing of information between vendors and customers. A shift from mass production to customized products has taken place. This resulted in greater organizational and process flexibility, as well as a response to competitive pressure by introducing new products more quickly, cheaply and of improved quality. The SCM philosophy has developed along these trends.³⁹ According to the author, the latest development is a strong increase in complexity due to outsourcing and off-shoring and a dramatic increase of volatility. As one can see in this historical background development, most of the SCM practices developed in a quite stable environment compared to the current turbulence and volatility. Historically, the approach to SCM was to reduce costs through increased control, which in a stable environment certainly improves profitability. In a volatile world, control efforts result in rigidity of supply chain structures and interactions. This rigidity may result in amplifying rather than dampening variability. Thus the greater the variation present in the input parameters, the less effective our control models tend to become. The variability which hurts performance and is related to supply chain design can emanate from a wide range of factors: from the demand side (e.g. shift in customer demand for products), the supply side (e.g. hikes of oil, steel, and gold prices), regulation (e.g. shift in customer perception towards climate), political (e.g. North Africa, East Asia,...), energy costs (electricity and transport costs), financial (e.g. currency hikes and credit crunch), and technology (e.g. shifts in dominant designs, disruptive innovations).

In conclusion, based on these factors we need a generic strategy that anticipates turbulence. There is a need to move from a dynamic to a structural flexibility. A new mental model for how to deal with turbulence in the supply chain, by shifting away from a single-minded quest for efficiency towards a balanced view of how to create adaptable supply chain structures, is called for. From the author's perspective, this development is a move from efficiency-based models, to a model able to cope with dynamic distortions (using CPFR, VMI, and information sharing), to a supply chain that is able to adapt structurally as a natural transition.

³⁹ Cf. Chandra/Kumar, 2000, p.100.

This shift requires a fundamentally different design (elements are: dual sourcing, asset sharing, separating base from surge demand, postponement, flexible labor arrangements, rapid manufacture, outsourcing) – a design that embraces rather than fights volatility. As mentioned by Christopher and colleagues, SCM has to move away from controlling variation and strategically change our mindset to embrace volatility and not fight it, because this can provide a temporary competitiveness.⁴⁰ Embracing volatility as something positive and making it a positive differentiator in terms of competitiveness is a key challenge for current and future SCM. This mind shift works only if imposed from the top of the company – meaning SCM as part of strategic management, supported by transformational leadership to make it happen.

1.3 Classifications and characterizations

Definitions adopted by researchers are often not uniform and therefore key terms are defined to establish positions taken in this dissertation.⁴¹ This will ensure that subsequent research, undertaken at a later stage, will better measure and compare what this dissertation has set out to accomplish.

- *“Logistics is the management and movement of product and services, including storage and warehousing, and their transport via air, land, and water”*.⁴²
- *“A supply chain is defined as a network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customers”*.⁴³
- *“Supply chain management is defined as the systemic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within this supply chain, for the purpose of improving*

⁴⁰ Cf. Christopher/Holweg, 2011, pp.64.

⁴¹ Cf. Creswell, pp.39.

⁴² Coyle/Bardi/Langley/Gibson/Novack, 2009, p.34.

⁴³ Christopher, 1998, p.15.

*the long-term performance of the individual companies and the supply-chain as a whole”.*⁴⁴

*“There are two broad means for improving competitiveness of a supply chain. One is a closer integration of the organizations involved and the other is a better coordination of material, information, and financial flows”.*⁴⁵

- *“Supply Chain agility or agile supply chain is one that is flexible and has a business-wide capability that embraces organizational structures, information systems, and logistics processes”.*⁴⁶
- As the outcome of a study of 173 definitions, Stock and Boyer synthesized the following definition of SCM:

*“The management of networks of relationships within and between interdependent organizations and business units consisting of material suppliers, purchasing, production facilities, logistics, marketing, and related systems that facilitate the forward and reverse flow of materials, services, finances and information from the original producer to final customer with the benefits of adding value, maximizing profitability through efficiencies, and achieving customer satisfaction”.*⁴⁷

The definition consists of three major themes:

- activities,
- benefits,
- constituents/components, and
- six core elements.

This definition combines the collective thinking and wisdom of numerous individuals with varying perspectives and viewpoints. Thus the definition is more a consensus of existing definitions than the addition of a new definition.

- *“Supply Chain practices are defined as the set of activities undertaken by an organization to promote effective management and supply chain. The practices of*

⁴⁴ Mentzer/DeWitt/Keebler/Min/Nix/Smith/Zacharia, 2001, p.18.

⁴⁵ Lee, 2000, pp.30.

⁴⁶ Christopher, 2011, pp.112.

⁴⁷ Cf. Stock/Boyer, 2009, pp.698.

SCM are proposed to be a multidimensional concept, including the downstream and upstream sides of the supply chain.”⁴⁸

- *“Process orientation, aims at coordinating all the activities involved in customer order fulfilment in the most efficient way. It starts with an analysis of the existing supply chain, the current allocation of activities to its members. Key performance indicators can reveal weaknesses, bottlenecks and waste within a supply chain, especially at the interface between its members.”⁴⁹*
- *“Strategy is the creation of a unique and valuable position, involving a different set of activities. Strategy requires you to make trade-offs in competing - to choose what not to do. Strategy involves creating ‘fit’ among a company’s activities, fit has to do with the ways a company’s activities interact and reinforce one another.”⁵⁰*
- *“Strategic positioning attempts to achieve sustainable level of competitiveness by preserving what is distinctive about a company. It means performing different activities from rivals, or performing similar activities in different ways.”⁵¹*
- *“Competitiveness is the ability to sell”⁵² according to Balassa’s definition. “Competitiveness is the ability of an organization to secure and expand market share sustainably.”⁵³ This formulation shows that the analysis of competitiveness has a dynamic component. For the evaluation of the competitiveness of an organization is not only the current market share relevant but also the future potential market share is of relevance. This means which SCM-factors and results have an impact on current and future market share.*
- *“Competitive advantage grows out of the entire system of activities. The fit among activities substantially reduces costs or increases differentiation. Beyond that, the competitive value of individual activities - or the associated skills, competencies, or*

⁴⁸ Li/Ragu-Nathan/Subba Rao, 2006, pp.107.

⁴⁹ Stadtler/Kilger, 2002, p.16.

⁵⁰ Cf. Porter, 1996, p.64.

⁵¹ Porter, 1996, pp.65.

⁵² Balassa, 1962, p.29.

⁵³ Martin/Westgren/Duren, 1991, p.1456.

resources - cannot be decoupled from the system or the strategy. Thus in competitive companies it can be misleading to explain success by specifying individual strengths, core competences, or critical resources. The list of strengths cuts across many functions, and on strength blends into others. Strategic fit and sustainability among many activities is fundamental not only to but also to sustainability of that advantage. Positions built on systems of activities are far more sustainable than those built on individual activities."⁵⁴

- *"Operational effectiveness means performing the myriad activities that go into creating, producing, selling, and delivering a product or service are the basic units of competitiveness, better - that is, faster, or with fewer inputs and defects - than rivals."*⁵⁵
- *"Critical success factors: critical success factors are those few things that must go well to ensure success for a manager or organization, and therefore may represent those managerial or enterprise areas that must be given continual attention. Critical success factors include issues vital to an organization's current operating activities and to its future success."*⁵⁶
- *"Performance measurement is about putting in place the right metrics (a metric is defined as a basis or standard of comparison, so by definition a standalone number or value is not a metric - Merriam-Webster Dictionary) to assess the health of your supply chain."*⁵⁷
- *"Performance management uses the metrics to support your company's strategic objectives."*⁵⁸
- *"Sales & Operations Planning (S&OP) is a collaborative decision-making process used to develop and align time-phased demand, supply, and financial plans in support of the overall business plan. S&OP is, by its nature, a cross functional process that*

⁵⁴ Porter, 1998, pp 33.

⁵⁵ Porter, 1998, pp.62.

⁵⁶ Boynton/Zmud, 1984, p.17.

⁵⁷ Cohen/Roussel, 2005, p.186.

⁵⁸ Cohen/Roussel, 2005, p.187.

involves individuals from sales and marketing, supply chain, finance, procurement, logistics, even research and development and capital projects.”⁵⁹

The integration, collaboration, coordination, and synchronization of the supply chain are critical for creating an agile and responsive supply chain.⁶⁰ Customers demand shorter lead times and higher product availability, while at the same time they require lower prices.

1.4 General characterization of competitiveness and competitive advantage

According to Balassa, “competitiveness is the ability to sell.”⁶¹ He sees the ability to sell as competitiveness, because if there is no advantage an organization has to offer to their customers the organization will not be able to sell. “Competitiveness is the ability of an organization to secure and expand market share sustainably.”⁶² This definition shows that the analysis of competitiveness has a dynamic component. For the evaluation of the competitiveness of an organization is not only the current market share relevant but also the future potential market share is of relevance. This means which SCM-factors and results have an impact on current and future market share. Factors like lead time, time to market, delivery reliability, responsiveness, flexibility, innovative service offerings, customer service and costs at which the organization is capable to deliver the above mentioned factors, which may impact on pricing. Besides SCM-factors there are other factors, like products, production and service innovation, pricing, etc. It comprises capabilities that allow an organization to differentiate itself from its competitors and is an outcome of critical management decisions. The literature has been quite consistent in identifying price/cost, quality, delivery, and flexibility as important competitive capabilities⁶³. As markets are getting more and more transparent and commodity driven, competitiveness has to be seen relatively to competitors. How important which factor is, depends on customer expectations and on competitor performance, this means is the factor important to customers and is the organization in focus performing better than competitors in this factor. As markets and customers are getting more and more demanding the relative positions of factor importance

⁵⁹ Prokopets, 2012, p.28.

⁶⁰ Christopher, 2005, p.29.

⁶¹ Balassa, 1962, p.29.

⁶² Martin/Westgren/Duren, 1991, p.1456.

⁶³ Cf. Dedrick/Kraemer, 2005, p.130.

and relative difference to competitors or new market entrance may change and therefore it is important to continuously develop performance and screen markets if any new technology could change the position substantially. If the organization is performing better in the described sense it can secure current and future potential market share. Competitive advantage is a position that an organization occupies in its competitive landscape. Michael Porter posits that a competitive advantage, sustainable or not, exists when a company makes economic rents, that is, their earnings exceed their costs (including cost of capital). That means that normal competitive pressures are not able to drive down the firm's earnings to the point where they cover all costs and provide only minimum sufficient additional return to keep capital invested. Most forms of competitive advantage cannot be sustained for any length of time because the promise of economic rents drives competitors to duplicate the competitive advantage held by any one firm.⁶⁴ Competitiveness grows out of the entire system of activities. The fit among activities substantially reduces costs or increases differentiation and competitiveness.

Beyond that, the competitive value of individual activities – or the associated skills, competencies, or resources – cannot be decoupled from the system or the strategy. Thus in competitive companies it can be misleading to explain success by specifying individual strengths, core competences, or critical resources. The list of strengths cuts across many functions, and on strength blends into others. Strategic fit and sustainability among many activities is fundamental not only to competitiveness but also to sustainability of that advantage. Positions built on systems of activities are far more sustainable than those built on individual activities.⁶⁵

Strategy is the creation of a unique and valuable position, involving a different set of activities. Strategy requires you to make trade-offs in competing – to choose what not to do. Strategy involves creating “fit” among a company's activities: fit has to do with the ways a company's activities interact and reinforce one another.⁶⁶

⁶⁴ Cf. Porter, 1996, p.70.

⁶⁵ Cf. Porter/Kramer, 2006, p.4.

⁶⁶ Cf. Porter/Kramer, 2006, p.10.

Strategic positioning attempts to achieve sustainable higher levels of competitiveness by preserving what is distinctive about a company.

It means performing different activities from rivals, or performing similar activities in different ways.⁶⁷

Operational effectiveness means performing the myriad activities that go into creating, producing, selling, and delivering a product or service are the basic units of competitiveness, better - that is, faster, or with fewer inputs and defects - than rivals.⁶⁸

The advantage can arise in four ways:

- in a transaction-based view,
- in a resource-based view,
- in a knowledge-based view, and
- in view of organizational learning, including both intra and inter-organizational learning, which is an important component of co-creating services and value⁶⁹.

The service-dominant logic in contrast to the goods-dominant role changes traditional roles in which the producer produces and delivers the goods. The role of the customer has traditionally been viewed as the consumption of those goods and services. The key difference is that goods derive their value through the service they provide.⁷⁰

Therefore, application of knowledge to deliver a unique, customized logistics service to the customer is a powerful source of competitiveness.

The framework of co-creation works in four phases:

- the learning phase,
- the innovation phase,
- the execution phase and

⁶⁷ Cf. Porter/Kramer, 2006, p.10.

Cf. Porter, 1998, p.47.

⁶⁸ Cf. Porter/Kramer, 2006, p.6.

⁶⁹ Cf. Porter/Kramer, 2006, p.10

⁷⁰ Cf. Yazdanparast/Manuj/Swartz, 2010, p.380.

- the outcome phase

since organizational capabilities emerge over time and through learning, the capacity to learn faster than competitors could be a source of sustained competitive advantage.⁷¹

A firm possesses a sustainable competitiveness when it has value-creating processes and positions that cannot be duplicated or imitated by other firms that lead to the production of above-normal rents. Sustainable competitiveness is different from competitiveness in that it provides a long-term advantage that is not easily replicated. But these above-normal rents can attract new entrants who drive down economic rents. A competitive advantage is a position a firm attains that leads to above-normal rents or a superior financial performance. The processes and positions that engender such a position are not necessarily non-duplicable or inimitable.

Analysis of the factors of profitability is the subject of numerous theories of strategy including the five forces model.⁷²

To be sustainable, the advantage must be:

1. distinctive and
2. proprietary.

Different views of value chain impact the strategic management level:

- value-based view⁷³,
- market-based view⁷⁴ and
- resource-based view⁷⁵.

Competitiveness discusses the notion of fit: when a group of activities all support a chosen competitive strategy. Any single activity can be copied, but taken together they form a system

⁷¹ Cf. Senge, 1990, p.236.

⁷² Cf. Porter, 1980, p.10.

⁷³ Cf. Rappaport, 1986, pp.3.

⁷⁴ Cf. Porter, 1998, p.11.

⁷⁵ Cf. Prahalad/Hamel, 1990, pp.8.

that is virtually impossible to duplicate. The same concept holds true for supply chain management.

1.5 General classifications of leadership & trust

The author's purpose is to examine transformational and charismatic leadership⁷⁶ and employees' trust in top management⁷⁷ and how they affect employees' SCM strategy implementation behavior. A review of literature by Klein and Knight⁷⁸ has identified several factors that play a critical role in influencing new practices and principles implementation behavior: the teams or organizations for innovation implementation⁷⁹, management support for SCM strategy implementation, and managerial patience⁸⁰. By reviewing the above described key situational factors, leaders' behaviors may substantially influence employees' SCM strategy implementation behavior. Transformational leadership theory has captured the interest of many researchers in the field of organizational leadership over the past three decades. This theory was developed by Burns⁸¹ and later enhanced by Bass⁸² and others⁸³. The major premise of the transformational leadership theory is the leader's ability to motivate the follower to accomplish more than what the follower planned to accomplish.⁸⁴ The author's conclusion is that transformational leaders typically have the ability to develop a collective attitude and spirit among their employees and to foster collaboration, which is one of the building blocks of SCM. As a boundary condition the positive affective tone has an impact on transformational

⁷⁶ Cf. Bass, 1999, pp.9.

Cf. Bass, 1990b, p.21.

⁷⁷ Cf. Whitener/Brodthorn/Korsgaard/Werner, 1998, pp.513.

⁷⁸ Cf. Klein/Knight, 2005, p.244.

⁷⁹ Cf. Klein/Knight, 2005, p.245.

⁸⁰ Cf. Repenning/Sterman, 2002, p.291.

⁸¹ Cf. Burns, 1978, p. 36.

⁸² Cf. Bass, 1999, p.9.

⁸³ Cf. Bass/Avolio, 1994, p.12.

⁸⁴ Cf. Krishnan, 2005, p.443.

leadership effectiveness. Positive affective tone reflects the collective feeling of a group.⁸⁵ Transformational leadership has been shown to contribute to cohesion among laboratory groups⁸⁶, light infantry platoons⁸⁷, and work groups in Korean firms⁸⁸. Social bonds or cohesion among members of a unit lead to higher motivation to perform well. In addition, due to their social bonds, they are better able to coordinate activities for successful performance.⁸⁹

Transformational and charismatic leadership & trust

Trust has been defined as a willingness to be vulnerable to others, based on the prior belief that others are trustworthy.⁹⁰ Research demonstrates that trust in top management provides employees with an understanding of management's good intentions.⁹¹ Employees who trust their top management believe in the value of SCM strategy and think that they and the organization will benefit from it; consequently, trust in top management should enhance followers' affective commitment to change. According to the social exchange theory, the relationship between the organization and followers consists on one hand of followers' perceptions of organizational obligations such as advancement opportunities, training and job security, and on the other hand of their perceived obligation such as loyalty, hard work, and commitment.⁹² When followers feel high trust in top management, they are more willing to cooperate within and have greater attachment to this exchange relationship⁹³, leading to higher levels of affective commitment to change which is a key factor for successful SCM strategy implementation and execution. The author therefore sees leadership as one of the most important factors for SCM impact on competitiveness.

⁸⁵ Cf. George/Zhou, 1990, pp.694.

⁸⁶ Cf. Hoyt/Blascovich, 2003, pp.707.

⁸⁷ Cf. Bass/Avolio/Jung/Berson, 2003, pp.207.

⁸⁸ Cf. Jung/Sosik, 2002, p.313.

⁸⁹ Cf. Cartwright, 1968, p.91.

⁹⁰ Cf. Mishra, 1996, p.265.

⁹¹ Cf. Harvey/Kelloway/Duncan-Leiper, 2003, pp.306.

⁹² Cf. Robinson/Kraatz/Rousseau, 1994, pp.137

⁹³ Cf. Whitener/Brodt/Korsgaard/Werner, 1998, p 513.

1.6 Supply Chain Management a strategic matter

SCM has received increasing attention from academics, consultants and business managers. Many organizations have begun to recognize that SCM is the key to building sustainable competitive edge for their products and/or services in an increasingly volatile and complex business environment.⁹⁴ Supply Chain Management is a capability that connects operational levels, where innovation actually occurs, with strategic levels and synchronizes the strategic and operational factors when managing resources strategically. Financial, human and social capitals are the critical resources and capabilities that need to be managed strategically in a manner that supports both entrepreneurial and strategic actions.⁹⁵ A valuable resource portfolio is a necessary but insufficient condition for creating higher levels of competitiveness. In fact, it is the management's capability to bundle and leverage the resources in its resource portfolio that differentiates it from its similarly endowed competitors.⁹⁶ "Rightsizing" the organizational 'processes', 'products' and 'people' is crucial to the firm's ability to compete during hypercompetitive times.⁹⁷

Strategic Supply Chain Management

Strategic supply chain management means that supply chain management is not merely a function that supports business strategy but a key part of strategy⁹⁸ and strategy implementation⁹⁹.

In fact, strategic supply chain management is defined as

"the strategic, operational, and technological integration of supply chain organizations and activities through relationships, processes, and information sharing to provide member organizations a competitive advantage".¹⁰⁰

⁹⁴ Cf. Li/Ragu-Nathan, B./Ragu-Nathan, T.S./Rao, 2006, p.107.

⁹⁵ Cf. Ireland/Hitt/Sirmon, 2003, pp.963.

⁹⁶ Cf. Sirmon/Gove/Hitt, 2008, pp.919.

⁹⁷ Hitt/Keats/Harback/Nixon, 1994, pp.18.

⁹⁸ Cf. Hult/Ketchen/Slater, 2004, p.241.

Cf. Ketchen/Hult, 2007, p.574.

⁹⁹ Cf. Ketchen/Rebarick/Hult/Meyer, 2008, pp.236.

¹⁰⁰ Upson/Ketchen/Ireland, 2007, p.78.

Moreover, strategic supply chain management can

“both drive and enable the business strategy of many firms, rather than performing only a part of the operations strategy”.¹⁰¹

The term strategic supply chain management obviously encompasses all previous definitions mentioned so far for managing the supply chain, such as supply chain management, demand chain management, supply and/or demand network management.

These three macro supply chain processes encompass the primary and support value chain activities. According to Porter, primary activities include inbound logistics, operations, outbound logistics, marketing, and sales and service.¹⁰² And support activities include firm infrastructure, human resource management, technology development, and procurement. Manage the value chain by integrating, coordinating, and collaborating among these primary and support activities in order to synchronize and smoothly operate the value chain processes. “Customer Relationship Management” practices focus on the interactive processes between the firm and its customers: for example, order management and service are key processes under customer relationship management. While design collaboration, sourcing, negotiating, buying and supply collaboration are key processes under “Supplier Relationship Management”, which focus on the interactive processes between the firm and its suppliers. And “Internal Supply Chain Management” focuses on all the processes internal to the firm carried out to fulfill the customer demand, such as strategic planning, demand planning, supply planning, order fulfillment and field service.¹⁰³

These SCM activities are:

- integrated behavior (Supply Chain Orientation),
- mutually sharing information,
- mutually sharing risks and rewards,
- cooperation,
- congruence of servicing the customer goal,
- integration of the processes, and

¹⁰¹ Evans/Danks, 2000, p.34.

¹⁰² Cf. Porter, 1985, pp.39.

¹⁰³ Cf. Chopra/Meindl, 2007, pp.10.

- building and maintaining long-term relationships between partners.¹⁰⁴

Organizational boundaries decision and strategic flexibility

Organizational boundaries also play a role in the firm's strategic flexibility.

Therefore, not only do the transaction costs, resources and capabilities' endowments play a role in determining a firm's boundary but so does the knowledge-base and knowledge-absorptive capacity of the firm, as Peter Senge has already mentioned in the 1990s.¹⁰⁵

In summary, a firm's boundary decisions are clearly critical to a firm's ability to attain and sustain competitiveness. Knowing when to vertically integrate and when to disintegrate is a competitive capability that can lead to successive temporary competitiveness, adding up to sustained.¹⁰⁶ Moreover, a firm's boundary at the product level is not necessarily identical to its capabilities and knowledge boundaries because firms often need to know how their products and processes fit with complementary components or processes even if they were produced or carried out externally.¹⁰⁷ Thus, it is important to be able to manage the boundaries dynamically and know how different capabilities complement one another.

This means the ability to decide which set of capabilities to develop internally and which ones to outsource in the process of designing the supply chain (i.e. demand & supply network) is the ultimate core competency in a fast-changing world (leadership and supply chain strategy). This competency also means (re)designing and (re)configuring the supply chain on a continuous basis in order to gain a series of temporary higher levels of competitiveness in pursuit of a sustainable competitiveness.¹⁰⁸ Vertical integration and outsourcing are not the only forms of organizing. In fact, they represent the two extremes of centralization and decentralization along a continuum that includes other forms of organizing, such as alliances, taper integration, strategic outsourcing, joint ventures and long-term contracts. Integration and outsourcing processes require the involvement and coordination of various strategic business units that often

¹⁰⁴ Cf. Mentzer/DeWitt/Keebler/Min/Nix/Smith/Zacharia, 2001, pp.8.

¹⁰⁵ Cf. Cohen/Levinthal, 1990, pp.128.

¹⁰⁶ Cf. Fine, 1998, p.5.

¹⁰⁷ Cf. Araujo/Gadde/Dubois, 2003, pp.1255.

¹⁰⁸ Cf. Fine, 1998, p.7.

work to meet their individual objectives, which at times conflict with other strategic business units' best interests. Therefore, the vertical integration strategy is a corporate strategy that rests in the hands of the corporate CEO (chief executive officer) and top management who solely can, at times, dictate and push for coordination among the business units.¹⁰⁹ A firm involved in multiple value chains can have multiple boundaries depending on the stage it occupies on a certain product's value chain.¹¹⁰ Although SCM capability holds much potential, many executives are still hesitant to surrender the control of their operations to a total SCM function that tries to optimize the entire supply chain rather than an individual organization's operations. Because the resource reconfiguration capability is the goal process of dynamic capabilities enabled by the sensing and learning capabilities, and the coordinating and integrating capabilities, it has clear implications for the SCM capabilities. The sensing capability is not only important in times of instability but is also as important in times of stability because a firm must scan and sense new opportunities at all times, both inside and outside the firm, in order to be able to improve on and sustain its operational excellence and competitiveness.

Technological change can affect the capabilities of the organization and of its "co-opetitors" (cooperation and competition at the same time) directly or indirectly by affecting one or all members of a network.¹¹¹ Thus, an organization must constantly scan the environment for changes or opportunities that might affect itself, its suppliers, customers and even competitors. SCM by definition has the goal of delivering products and services of higher quality, demanded by the market, at lower costs and at higher speed than rivals and this has a positive impact on a firm's competitive position.

1.7 Summary of strategic supply chain management, leadership and competitiveness

The economic trends of the last five to 10 years such as business globalization, ever more demanding customers, commoditization of products, new entrance into established industries, outsourcing, disintegration and off-shoring of products and services lead to a fundamental

¹⁰⁹ Cf. Harrigan, 1984, pp.638.

Cf. Harrigan, 1985a, pp.914.

¹¹⁰ Cf. Fisher, 1997, pp.105.

¹¹¹ Cf. Afuah, 2000, p.388.

increase of complexity, uncertainty and volatility. Whereby volatility, over the past three years, is additionally driven by extreme commodity price volatility, currency volatility and sudden unexpected events like earthquakes, tsunamis, or radical political changes. SCM as a management philosophy and its implementation are also seen by the author as a fundamental concept to respond to these developments and gain temporary and sustainable competitiveness. SCM is a system-theoretical construct, influenced in multiple ways by other disciplines such as accounting, marketing, logistics, operations management, mathematics, systems dynamics, game theory, psychology, behavioral theory and many others. Nevertheless, a core theory is missing due to the fact that this multi-faceted influence led to ever new evolving theories but rather hindered a positivistic approach of the philosophy by testing existing constructs instead of developing new ones. Therefore, a consistent definition is missing. For this study the author used the definition of Stock and Boyer. They synthesized a consensus definition as a result of a study of 173 definitions. This definition combines the collective thinking and wisdom of numerous individuals with varying perspectives and viewpoints. The constructs of the definition were used in the paper selection for the state-of-the-art models/studies. Supply chain management is no longer just about efficient flow of material, money and information, as defined originally by Oliver and Webber, but instead about improving the performance of the entire value chain or network with the aim of gaining or maintaining temporary or sustainable competitiveness. SCM starts with the ability and will to understand and incorporate customer desires, meaning it is oriented to customer priorities (channel and customer requirements). Based on corporate strategy, channel and customer requirements (service and channel strategy), the supply chain requirements can be defined. These requirements now form the basis for supply chain strategy development, covering the customer service strategy, channel strategy, asset network strategy, operations strategy and outsourcing strategy. This means, finally, that integrating and managing heterogeneous resources (customers, suppliers, service partners) with different target and incentive systems from different supply chain members to meet the customer demand (meeting expectations leads to higher customer satisfaction) in the most efficient and effective way is the objective (maximize benefits) of supply chain management. Achieving this requires an aligned set of performance figures, financial and non-financial, to manage and steer successful execution. SCM practices are used to implement SCM strategy, involve interactions among interdependent yet independently owned networks of organizations, and interactions among the employees of the network organizations. This philosophy of management requires trust to build relationships of networks and therefore has to be supported by leadership (top management) to be implemented successfully. According to Peter Senge,

because organizational capabilities emerge over time and through learning, the capacity to learn faster than competitors could be a source of sustained competitiveness.¹¹² How do supply chains now deliver temporary or sustainable competitiveness? Competitiveness is a dynamic concept consisting of factors that matter for customers and where the organization possesses capabilities that differentiate them in order to sustain and retain current market share and gain future market share. A firm possesses a sustainable competitiveness when it has value-creating processes and positions that cannot be duplicated or imitated by other firms that lead to the production of above-normal rents. Sustainable competitiveness is different from competitiveness in that it provides a long-term advantage that is not easily replicated. The processes and positions that engender such a position are not necessarily non-duplicable or inimitable. Supply Chain Management is a capability, difficult to imitate, that connects operational levels where innovation actually occurs with strategic levels, and synchronizes the strategic and operational factors when managing resources strategically (integration). Lack of trust, misalignment of incentives¹¹³, fear of opportunism, or of hold up¹¹⁴ and fear of being locked in to a low-quality supplier, “inter-organization rivalry¹¹⁵” and other such obstacles make the coordination of two independent organizations more challenging and may even lead to supply chain failure. For the author, this means leadership and trust are key building blocks for the success of SCM and the level of impact on competitiveness.

In summary, the supply chain management impact on competitiveness is evident according to theory. The key impact factors are: Customer orientation, meaning: is the supply chain design based on corporate strategy and channel requirements? How mature is the organization in terms of supply chain management, meaning, is there a supply chain strategy? Is there a supply chain organization? Do supply chain metrics exist (financial, non-financial)? Do supply chain practices fit with corporate strategy? Are supply chain practices implemented? And how is supply chain management supported by leadership, meaning is supply chain management part of strategic management? Does the company have a supply chain strategy and aligned

¹¹² Cf. Senge, 1990, p.236.

¹¹³ Cf. Narayanan/Raman, 2004, pp.102.

¹¹⁴ Cf. Dyer/Nobeoka, 2000, p.345.

¹¹⁵ Cf. Park/Ungson, 2001, pp.37.

performance measures across functions (financial and non-financial)? It became evident for the author when studying the current literature that most of the research focuses on inter-organizational relationships, practices and process improvements, and their effects on financial and non-financial performance measures, but only very few studies focus on leadership and social factors necessary for successfully implementing SCM. This was already evaluated by Burges and his literature review, based on 100 articles of referenced journals, in 2006.¹¹⁶ Shedding light onto this topic is a key focus of this study – how leadership influences and enhances the SCM impact on a firm’s competitiveness.

¹¹⁶ Cf. Burgess/Singh/Koroglu, 2006, p.710.

2 REVIEW OF EXISTING MODELS

This chapter provides a detailed review of the current literature on models of supply chain management and its impact on firm performance and competitiveness.

2.1 Literature review

The review covered the literature of the past 15 years with a special focus on the development of the last 10 years and used 34 peer-reviewed papers to identify the state of the art and identify gaps not yet evaluated by research models to date. The author has clustered the key models and studies on supply chain management and its impact on competitiveness, based on findings in the theoretical part of this work, in three ways:

- Which impact parameters were evaluated by the model/study
 - Customer orientation
 - Strategic view of supply chain management
 - Operative view of supply chain management (practices and processes)
 - Leadership & trust
 - Operational performance
 - Financial performance
 - Customer satisfaction
 - Competitiveness
- How the data for evaluation were captured
 - Literature study
 - Case study
 - Mail questionnaire
- Which methods were used to analyse the data
 - Case research
 - Conceptual research
 - Correlation analysis
 - Factor analysis and structural equation or path analysis
 - Simulation

The majority (twenty) of the models were generated by a study of the literature and evaluated with data captured through a mail questionnaire. The analysis methods were in this case mainly factor analysis, regression analysis and structural equation modeling (18 models). The second

biggest group of studies was case studies (nine models) and the third biggest group was pure literature studies (five studies). Analysis methods used for the rest of the models included conceptual research, case research, correlation analysis and mathematical simulations.

Table 2.1: Supply Chain model analysis clustered by SCM impact parameters on competitiveness¹¹⁷

Researcher	Customer Orientation	Strategic view on SCM	Operative view on SCM	Leadership & Trust	Operational Performance	Financial Performance	Customer Satisfaction	Competitiveness
Ballou (2007)	x	x	x	x	x	x		
Barber (2008)	x	x	x			x	x	
Beamon (1998)	x	x	x		x	x	x	
Bhatnagar et. Al. (2005)	x	x			x	x		x
Bhatnagar et. Al. (2009)	x	x	x		x	x	x	x
Bratic (2011)	x		x		x	x		x
Chen et. Al. (2004)	x	x	x	x	x	x	x	
Cigolini et. Al. (2004)	x	x	x		x	x	x	
Christopher et al (2011)	x	x	x		x	x	x	x
Fawcett et. Al. (2010)		x	x	x	x	x		x
Fawcett et. Al. (2010)	x	x	x	x	x	x	x	x
Goldsbey et. Al (2006)	x	x	x		x	x	x	x
Gonzalez-Benito (2010)		x	x		x	x	x	x
Green et. Al (2008)	x	x			x	x	x	x
Handfield et. Al. (2002)		x		x	x			
Handfield et. Al. (2009)		x	x		x	x		
Harrison et. Al (2002)	x	x			x	x		x
Hofman D. (2011)	x	x	x	x	x	x	x	x
Jones et. Al. (2010)		x		x	x	x		x
Kim (2006)		x	x	x	x			
Lapide (2005)	x	x	x		x	x	x	
Lau et. Al. (2010)	x	x			x	x		
Lee et. Al. (2007)	x	x	x		x	x	x	
Li et. Al. (2006)	x	x	x		x	x	x	x
Liao et. Al. (2011)	x	x	x		x	x		x
Malik et. Al. (2011)	x	x	x		x	x	x	x
Coranado Mondragon et. Al. (2011)	x		x		x	x	x	
Narasimhan et. Al. (1998)	x		x		x	x	x	x
Ou et. Al (2010)	x	x	x	x	x	x	x	x
Prokopets (2012)	x		x	x	x	x	x	x
Rainer (2005)	x		x		x	x	x	
Swafford et. Al. (2006)	x	x			x	x	x	x
Vickery et. Al (2003)	x	x	x		x	x	x	
Yusuf et. Al (2003)	x	x	x		x	x		x
Number of impact parameters	28	29	27	10	33	32	22	20
Total number of articles	34	34	34	34	34	34	34	34
Percentage of impact parameters	82,4%	85,3%	79,4%	29,4%	97,1%	94,1%	64,7%	58,8%

Table 2.1 shows a clustering, done by the author, of the articles reviewed, covering the researcher, the year of research, the supply chain impact parameter on competitiveness (customer orientation, strategic view of SCM, operative view of SCM, leadership & trust) and

¹¹⁷ Own table - literature study done by the author.

the performance measurement (financial, operational performance, customer satisfaction, higher level of competitiveness) used in the study. Strategic view of SCM is covered by 85.3% of the studies, customer orientation is covered by 82.4% of the studies, operative view of SCM is covered by 79.4% of the studies, operational performance is covered by 97.1%, and financial performance is covered by 94.1% of the studies, customer satisfaction by 64.7% of the studies and competitiveness by 58.8% of the studies. Leadership & trust is covered only by less than one third of the studies with 29.4%.

Table 2.2: Articles clustered on main impact parameters and performance parameters¹¹⁸

Performance Parameters	Impact Parameters			Total number of articles	
	Leadership & trust	Operative view on SCM	Strategic view on SCM		
competitiveness		1	5	7	13
Financial		1	1		2
Financial and non financial		3	8	7	18
non-financial		1			1
Total number of articles		6	14	14	34

For further analysis and review, the articles were clustered by the author according their impact parameters on competitiveness (supply chain impact on competitiveness, leadership & trust, operative view of SCM, strategic view of SCM, (customer orientation was not separated as it was used in most of the articles as key input factor) and according to the performance parameters used in the study (financial, non-financial, financial and non- financial, competitiveness). As the table shows, the number of articles on operative view and strategic view of SCM is equal with fourteen, and the number of articles on leadership & trust impact is much lower, with just six articles. From a measurement perspective, most of the articles aimed to measure financial and non-financial results, with 18, and the second largest group, with thirteen, aimed to measure the impact on competitiveness of firms. There were only a few articles measuring only a single performance: financial or non-financial. Based on this overview, the review of the articles will be carried out on the groups of impact parameters on competitiveness, strategic view of SCM, operative view of SCM, and leadership & trust.

Figure 2.1 illustrates a two-dimensional framework. On the vertical axis, information reach extends from person to person through to global. On the horizontal axis, the range of activities

¹¹⁸ Own table - Clustering of articles developed by the author.

widens from electronic messaging to internet-based integration. Accordingly, the degree of freedom in supply chain integration widens from bill of material controls through purchasing efficiency to planning and control of supply chain operations.

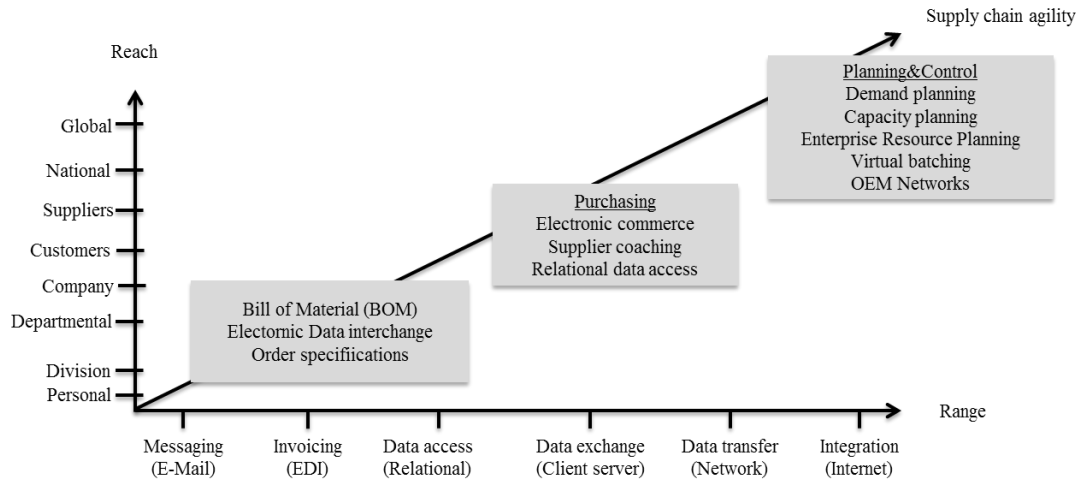


Figure 2.1: Reach and range analysis of supply chains¹¹⁹

An agile supply chain should extend to the highest levels on both dimensions of reach and range. At the highest levels of the two dimensions, the conduct of internal operations will be transparent to suppliers and customers. Also, local teams of employees can think globally and take virtual initiatives with teams in other companies within the supply chain. To this extent, responsiveness to changing competitive requirements becomes easier to master as a matter of routine, and with little penalties in time, cost and quality. In addition to the reach and range approach, agility and capability of a supply chain can be assessed in terms of the stage attained on three interdependent dimensions of supply chain maturity.¹²⁰ Supply chain agility is gaining more attention as the world becomes more volatile, and therefore the capability of responding to a fast-changing environment has become a vital lever of competitiveness. How to achieve flexibility, and how to align flexibility, among the three main supply chain processes is still left open by the study.

¹¹⁹ Cf. Kehoe/Boughton, 2001, p.520.

¹²⁰ Cf. Venkatraman/Henderson, 1998, pp.33.

2.2 Supply Chain maturity and performance measurement

The performance measurement systems

The first constructs were developed in the early 1990s, modeling supply chain management and linking the overarching management emphasis on performance.¹²¹ The first generation of performance-measuring frameworks connected financial with non-financial measures.

The second generation extended the first framework and involved linkages between intangible and tangible assets such as intellectual capital and business.¹²²

The third generation now takes into account the changes in industries and dynamics of the business environments and these are the ones to have been adopted for use in SCM.¹²³

In summary, the objective of SCM is to create the most value, not just for some participants along the supply chain but for the whole supply network including the end customers. Consequently, supply chain metrics have to focus on the whole network and not just on single elements.

A holistic system perspective is quite common to measure SCM performance in order to overcome traditional functional and organizational boundaries. Still, the challenge is to link and align the indicators.

The essence of all performance measurement models in SCM is covered by the following elements:

- segment customers based on service needs of distinct groups – customer focus,
- design the logistics network to service requirements – strategic focus (design management)
- align demand planning to market signals – operative forecast management (forecast accuracy),
- differentiate products closer to the customer – supply chain practices and processes (postponement),

¹²¹ Cf. Gopal/Cypress, 1993, p.15.

¹²² Cf. Slobodow/Omer/Babuschak, 2008, pp.77.

¹²³ Cf. Beamon, 2008, p.16.

- manage supply sources strategically – strategic decision on network management (supplier and customer relationship management)
- develop holistic technology strategy that supports multiple levels of decision making across the flows of products, services and information, and
- adopt channel-spanning performance measures to gauge collective success in reaching the end-user both effectively and efficiently end-to-end.

In the second half of the 1990s, research also progressed into the area of different set-ups of supply chains based on the characteristics of customer demand.

Fisher identified two types of supply chains based on different goals, namely,

- efficiency and
- responsiveness.

Respectively, their performance metrics would be different.

The next model generation focused on linking supply chain performance to financial performance, looking as well into strategic, tactical and operational levels, the aspect of changing environments, Supply Chain Management as an area of competitive differentiation, governance and performance of the extended supply chain.¹²⁴

Performance measurement systems are typically evolving from a system based on measurement and cost control, referred to as traditional performance measurement systems, to a system based on the measurement and creation of value using so-called non-cost performance measures: those that are not economic or explicitly financial, referred to as innovative performance measurement system.¹²⁵

In this sense, companies are becoming more aware that value means much more than cost efficiency and profit orientation. This means that evaluating performance on only financial indicators points to results and does not consider its determinants, providing a myopic approach for long-term results.

The development of performance measurement systems, mainly related to the processes in the supply chain, supply chain operation reference model (SCOR) has gained increasing visibility

¹²⁴ Cf. Gunasekaran/Patel/Tirtiroglu, 2001, p.73.

¹²⁵ Cf. De Toni/Tonichia, 2001, pp.46.

in business and academic communities as an innovative approach. By offering a standardized way of viewing the supply chain, the SCOR model has also contributed to the development and evolution of different supply chain maturity models.

Maturity model and supply chain management capabilities

A maturity model represents a methodology with components related to definition, measurement, management and business processes control. These have been shown to be very similar to management approaches/concepts of BPR (Business Process Reengineering), thus attracting growing interest not only from companies but also from researchers.¹²⁶

Although its origins are not directly linked to supply chain processes, there has been a growing amount of research in recent years that represents the use of maturity models based on KPI (Key Performance Indicators) to analyze the activities of supply chains.¹²⁷

The following section presents a leading maturity model currently used by companies to analyze the performance of their supply chain processes: specifically, the Supply Chain Maturity Model developed by PRTM.

This self-assessment model has been used since 2001 to evaluate over 1,000 companies in Europe and North America. This model is also the SCOR-based, comprehensive model whose components, but not the model as a whole, have been statistically examined and their relationship to performance established. To cope with today's business volatility and to meet the performance levels demanded by today's customers in terms of quantitative and qualitative flexibility of service in demand fulfillment, delivery consistency and reduction of lead times related to fulfilling orders, firms have developed repertoires of abilities and knowledge that are used in their organizational process.¹²⁸ Since the 1980s, supply chain (including logistical and planning) processes have evolved because of these new demands from a departmental

¹²⁶ Cf. McCormack/Ladeira/Valadares de Oliveira, 2008, p.280.

¹²⁷ Cf. Chan/Qi, 2003, p.212.

¹²⁸ Cf. Day, 1994, pp.38.

Cf. Lockamy/McCormack, 2004, p.272.

perspective (extremely functional and vertical) to a holistic organizational level of integrated horizontal processes oriented to providing value to intermediate and end customers.¹²⁹

This development of supply chain process management has focused on the development and application of different maturity models and performance metrics useful in helping define a strategy and facing tradeoffs as well as identifying items that are critical to improvement of supply chain processes.

The first models were developed in the early 1990s with titles such as “*the next source of competitive advantage*”.¹³⁰ In the past two decades, a growing amount of research, much of which is anecdotal, has been dedicated to investigating maturity model development and performance measurements for the strategic management of supply chain processes.¹³¹ The process maturity concepts, including supply chain processes, derive from the understanding that processes have life cycles or developmental stages that can be clearly defined, designed, managed, measured and controlled and continuously improved throughout time. Higher levels of maturity in any business process result in:

- better control of results,
- improved forecasting of goals, costs and performance, and
- greater effectiveness in reaching defined goals and improving management’s ability to propose new and higher targets for performance.¹³²

2.3 Summary of the state-of-the-art SCM model research

The author has evaluated the key models and studies developed in the last ten years on supply chain management and its impact on competitiveness. The models were clustered on the basis of SCM impact parameters, customer orientation, strategic view of SCM, operative view of

¹²⁹ Cf. Mentzer/DeWitt/Keebler/Min/Nix/Smitz/Zacharia, 2001, pp.16.

¹³⁰ Cf. Stalk, 1988, p.41.

¹³¹ Cf. Supply Chain Council, 2010, <http://supply-chain.org/f/SCOR-Overview-Web.pdf>.

Cf. Chan/Qi, 2003, p.209.

Cf. Gunasekaran/Patel/Tirtiroglu, 2001, p.71.

¹³² Cf. Lockman/McCormack, 2004, p.275.

SCM, leadership & trust, and on financial and non-financial measures and competitiveness measures.

The majority of the models cover customer orientation, strategic view of SCM, operative view of SCM, while only a limited number of articles cover leadership & trust as an impact factor of SCM on competitiveness. In the same way, the majority of performance measures cover financial and non-financial measures, and there is a limited amount of research measuring competitiveness.

The impact of supply chain management on competitiveness is measured through financial and non-financial, operative, and performance measures. The supply chain capability/maturity of an organization and its impact on competitiveness is not measured by any of the models evaluated. The supply chain impact factors of existing models are described rather as practices than as a state of the organization in terms of capabilities of the organization.

The performance, design, and analysis of the SC as a whole are more important than single-stage optimization models. Nevertheless, most of the studies focused only on specific parts of the supply chain. According to Cigolini, strategic fit between strategy and supply-demand characteristics is important. This means that SCM strategy has to fit the overall business model, which is driven by the product and by the market requirements. Based on SCM strategy, some practices and processes deliver value only if they fit perfectly with the strategy and the demand pattern¹³³. SCM strategy has to be formulated explicitly with targeted performance measures that are aligned across functions. Performance measurement and management has to be in place to steer and monitor implementation success. The deployment of customer requirements that clusters (customer segmentation) and translates customer requirements into manufacturing goals is a key process (customer service levels). In summary, this leads to the following conclusions: supplier integration, strategic integration, and customer integration across the supply chain determine customer responsiveness. According to Lau, there is already an influence on supply chain management in the design phase of the product, as this defines how the supply chain looks later on. Therefore, early involvement of supply chain managers in the product development phase helps to develop modular products more effectively and to execute

¹³³ Cf. Cigolini/Cozzi./Perona, 2004, pp.9.

later in the supply chain in an efficient way¹³⁴. The key finding of the studies shows that effective management leadership not only communicates the importance of SCM to suppliers and customers, but also conveys the goals and philosophy of SCM implementation to employees. This means that successful SCM implementation comes from effective leadership communicating with and directing those working below the top management to improve performance. According to Malik, supply chain resilience might not be the most efficient means of supply chain management over time, but it is the most competitive due to the high flexibility in adapting to environmental change, which is key in volatile environments.¹³⁵ The proposed solution is to build structural flexible options into the SC design to meet challenges of turbulent business environments. Based on Yusuf, external competencies have a higher impact on competitive performance than internal competencies.¹³⁶ Although agile supply chain concepts are seen as an ideal means of collaboration, studies show that leadership & trust factors are missing to exploit the opportunities.

The impact of supply chain strategy on business performance is obvious for the author. The methods used to identify the impact of SC strategies can be of relative importance that senior SCM functions assign to different generic competitive objectives (i.e. quality, cost, dependability, and flexibility). The commercial performance, on the other hand, can be evaluated by the factors of sales growth, reputation and image, customer satisfaction, market share, success of new product launches, and the financial performance can be evaluated by the factors of return on investment, profit as a percentage of sales, and labor productivity. All studies measure the commercial factors with the above mentioned factors. According to Green Jr. and colleagues, SCM has an impact on competitiveness and on financial performance, where financial performance is measured by return on investment and return on sales, profit growth over the past three years, marketing performance measured as market share growth, sales volume growth and average sales growth over the past three years, and logistics performance is measured by delivery reliability, capability and flexibility.¹³⁷

¹³⁴ Cf. Lau/Yam/Tang/Sun, 2010, pp.952.

¹³⁵ Cf. Malik/Niemeyer/Ruwadi, 2011, pp.62.

¹³⁶ Cf. Yusuf/Gunasekaran/Adeleye/Sivayoganathan, 2004, pp.379.

¹³⁷ Cf. Green/Whitten/Inman, 2008, pp.318.

Although SCM promotes coordination, integration, relationship building, and collaboration throughout the entire supply channel, SCM currently takes place to a very limited degree.¹³⁸ The key questions for the author are why this is the case and what can be done to improve it. The sales and operations planning process, as a key practice, is the link between supply chain strategy and its effective execution on a continuous basis. The process works only when it is supported by senior management, which is a fundamental leadership commitment to sales and operations planning as a process. The question for the author is why this process, though so powerful, is not implemented to a greater extent. This question can only be answered when organizational and leadership questions are answered, meaning if the performance targets and incentives across functions are not aligned it will be difficult to get them effectively working (incentive still drives behavior). So what is missing are the answers to why it is it not implemented to a greater extent and why it does not work properly and effectively in some organizations.

The evaluation of supply chain leaders covers key topics missing in most of the literature study models reviewed in this study. Topics such as culture, top management understanding and top management support, integration of finance and supply chain management, and hierarchy of metrics, are seen a success factors. This shows that supply chain management is much less about technicalities and much more about communication, transparency and culture, commitment, relationships, and leadership.

¹³⁸ Cf. Ballou, 2007, p.341.

3 EMPIRICAL DESIGN: MODEL DEVELOPMENT, RESEARCH METHODOLOGY AND PROCESS

The empirical design includes the means of model development and the relationships among the components of the model. It also includes a discussion of the preparation of the questionnaire and the data gathering process, as well as a detailed description of the selection of the sample and the validity of the sample for the process used to generate recommendations from the data. Further, it covers the analytical methodology.

The author developed a model that was tested in business reality and based on a review of the literature on SCM looking into the topic from various viewpoints – prescriptive and inductive from case studies and deductive from theory to cases.

3.1 Development of the model framework

The first part of this section starts with the main inputs into the development of a model that identifies the impact of supply chains on competitiveness (defined in Chapter 1.3 and developed further in Chapter 1.4). There is a causal effect between SCM strategy and strategy execution/implementation and financial results such as EVA and ROCE as top financial indicators. The ranking of the strategic triangle triggers certain practices and processes that best fit and support the SCM strategy. The practices and processes reflect operative strategy execution/implementation. The fit, alignment and integration of these parts has a positive impact on competitiveness if top management supports the SCM strategy (understanding SCM as a field in which to differentiate and gain competitiveness), if the execution is cross functional and cross company (cross functional performance indicators, incentive alignment, etc.), and if the supply chain manager adheres to his mission (he is trusted). The conceptual model is developed on the basis of these key elements. The assumed causal linkage between the constructs is developed through 14 sub-hypotheses.

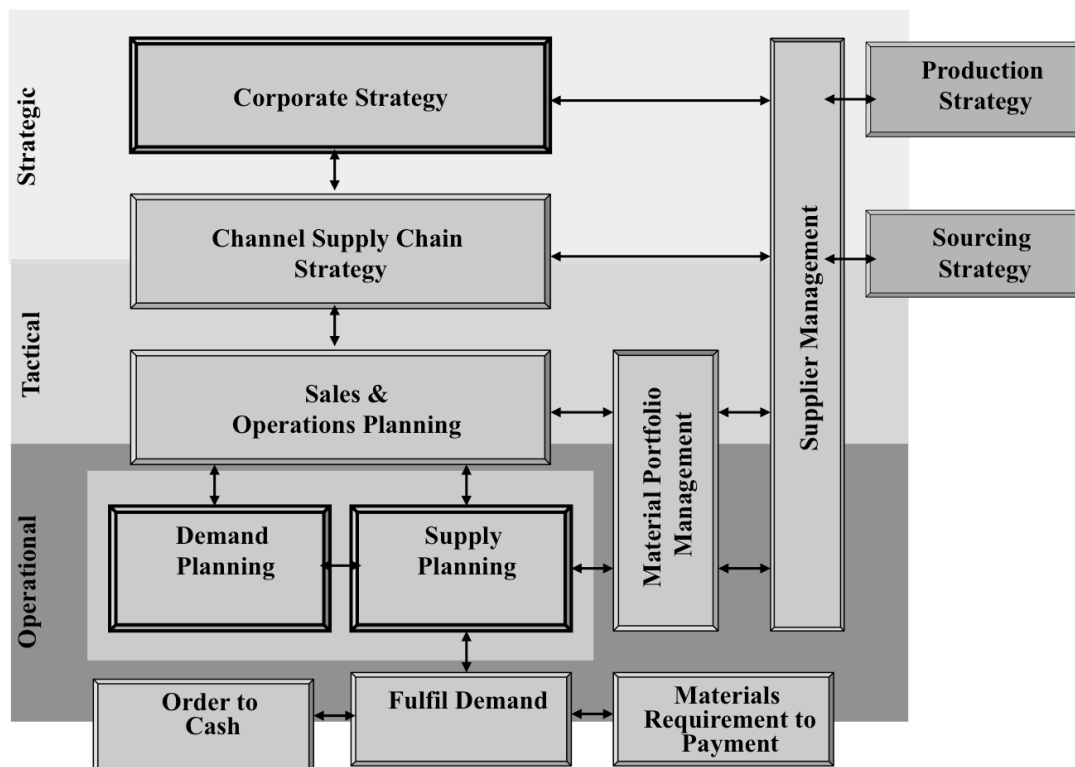


Figure 3.1: Supply Chain Management model and link to corporate strategy¹³⁹

Figure 3.1 shows the beginning of the alignment among SCM strategy, corporate strategy and channel strategy, and how strategy is broken down and integrated with tactical and operational execution levels. This is important because the effectiveness of strategy is only secured through alignment and integration down to execution – from SCM strategy over configuration down to foundation. The next part of the framework development covers the strategic tradeoffs between customer response, efficiency and asset utilization in SCM. The strategic question of this tradeoff is how well the priority ranking, among the three, supports corporate strategy, channel strategy and service strategy and how well it fits the asset network of the company. The validation measurements are on one hand strategic priorities and on the other hand operational, financial performance figures and soft facts such as maturity and customer satisfaction (the value created by the developed SCM strategy).

¹³⁹ Own figure, based on Cohen/Roussel, 2005.

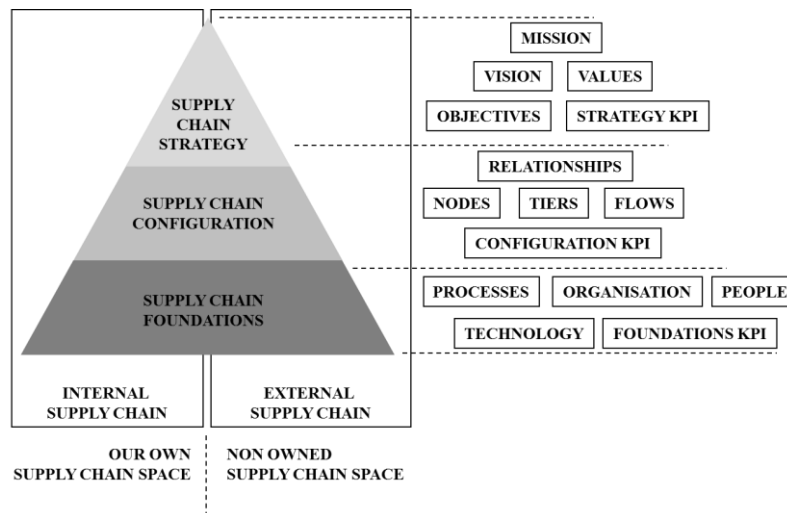


Figure 3.2: Measuring effectiveness and efficiency of Supply Chain Management¹⁴⁰

Figure 3.2 shows the layers of decisions on supply chain management implementation and how to measure effectiveness and efficiency at each level. On the top is the corporate strategy with its strategic measures including mission, vision, values and strategic KPIs (key performance indicators) defining the strategic requirements of the supply chain strategy. On the next level are the relationships (which networks of relationships are necessary to realize the supply chain strategy), nodes, tiers and configuration KPIs, and on the lowest level there are the foundation elements of process, people and the organization with the foundation KPIs (practices, processes necessary to materialize the strategy). In addition, we have an external part (collaboration with suppliers, customers and other supply chain members) and an internal part of supply chain management (cross-functional) as we involve customers and suppliers on several tiers.

¹⁴⁰ Own figure based on literature study.

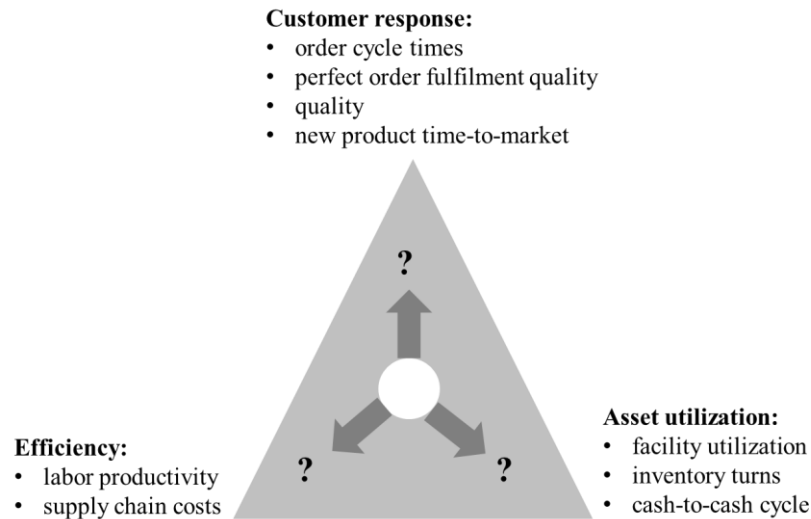


Figure 3.3: The four habits of highly effective supply chains¹⁴¹

Figure 3.3 describes the strategic choices concerning Supply Chain Management. Based on corporate strategy, the channel requirements, production capabilities and other elements of strategy priorities have to be aligned. A strategic decision has to be made between customer responsiveness, efficiency and asset utilization. The ranking of the three parameters is one of the most important and fundamental strategic decisions because it defines where the priority lies when tradeoff decisions have to be made. There is a direct impact on a company's profitability (impact on ROCE and EVA), because the priority ranking should be made in a way to maximize the competitiveness of a business. The link between supply chain priorities and their impact on financial performance is given by the tradeoff between the three elements. The model was developed in a study of the literature by Larry Lapide in 2005¹⁴². Competitive strategy elements are supported and enhanced by specific supply chain operating model characteristics to build a sustainable competitiveness. Executing well against a balanced set of competitive operational performance objectives, that is, in which all customer-facing and internal key performance indicators are aligned to achieve the competitive positioning desired.

¹⁴¹ Lapide, 2006, p.23.

¹⁴² Cf. Lapide, 2006, p.23.

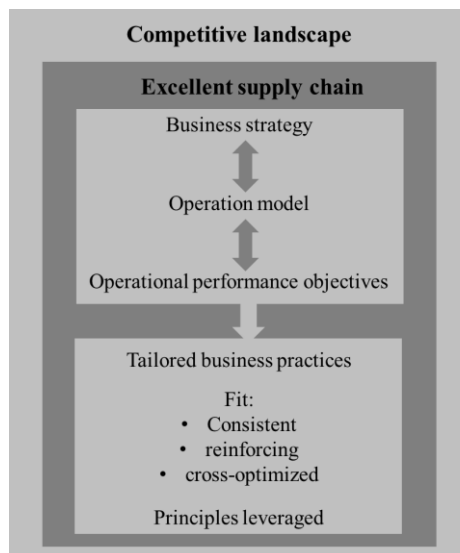


Figure 3.4: The four habits of highly effective supply chains¹⁴³

Figure 3.4 shows how supply chain strategy is operated. Leveraging operating principles rather than “best practice” is one of the key findings of an extensive analysis of literature and case studies. The operating principles include expanding the sphere of influence, increasing transparency, relaxing constraints, matching supply with demand, tradeoffs of inventory versus cycle times, using supply contracts and mitigating disruptions.¹⁴⁴

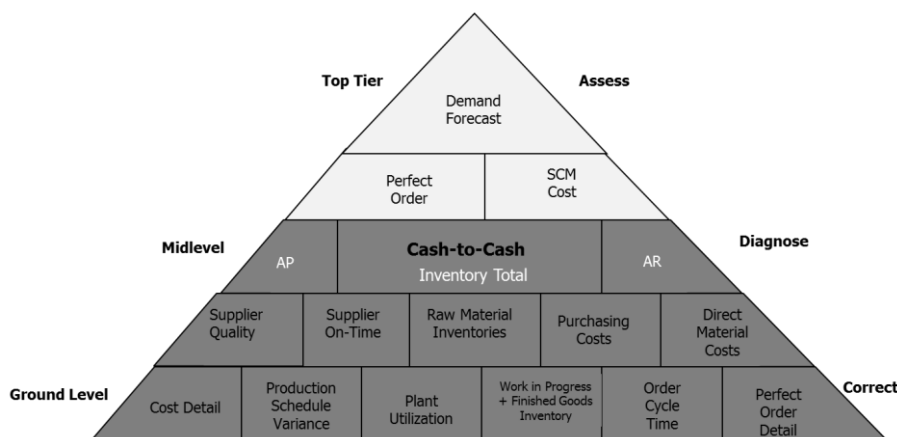


Figure 3.5: Achieving supply chain excellence¹⁴⁵

¹⁴³ Lapide, 2006, p.20.

¹⁴⁴ Cf. Lapide, 2006, pp.23.

¹⁴⁵ Cf. Hofman, 2004, p.21.

Cf. Hofman, 2008, pp.5.

Figure 3.5 describes the hierarchy of supply chain key performance indicators (KPIs). On top of the pyramid, accuracy of forecasting customer demand, supply chain costs and service are reflected as perfect order fulfilment. This is the assessment level. The mid-level KPIs reflect the cash-to-cash cycle as the diagnostic level, and the ground level is the level of correction, with supplier relationships, logistics provider relationships and customer relationships. The dependencies of different supply chain measures impact the economic success of a business.

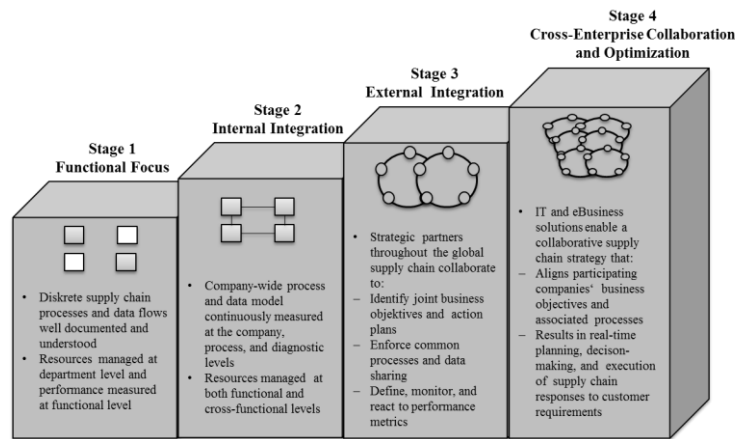


Figure 3.6: Strategic Supply Chain Management¹⁴⁶

Figure 3.6 shows, that the supply chain maturity stage model categorizes companies according to their capabilities into four stages of maturity in terms of SCM. Stage 1 is functional optimization of departments (no cross-functional cooperation), stage 2 reflects the existence of cross-functional collaboration within the company, stage 3 also includes external collaboration and stage 4 is cross-enterprise collaboration and optimization.



Figure 3.7: The Supply-Chain Operations Reference-model (SCOR)¹⁴⁷

¹⁴⁶ Cf. Cohen/Roussel, 2004, p.231.

¹⁴⁷ Cf. Supply Chain Council, 2010, p.6.

Figure 3.7 shows the supply chain operations reference model developed by the supply chain management council. The Supply Chain consortium was formed in 1994 by a group of industry's early adopters, together with sponsors and participants in early benchmarking studies by PRTM, MIT, Stanford University, and Pennsylvania State University. Its aim was to promote the success of supply chain integration and implementation efforts across industries. In 1995, PRTM joined forces with AMR and founded the SCC (Supply Chain Council), which initially had 69 member companies and developed the SCOR model (Supply Chain Operations Reference-Model) with the mission of facilitating supply chain management across industries and benchmarking. (Level one of the standard model consists of the elements plan, make, source, deliver and return, which consists of four sub-levels, becoming more detailed from level to level. The reference model can be used for the design and analysis of supply chains.)

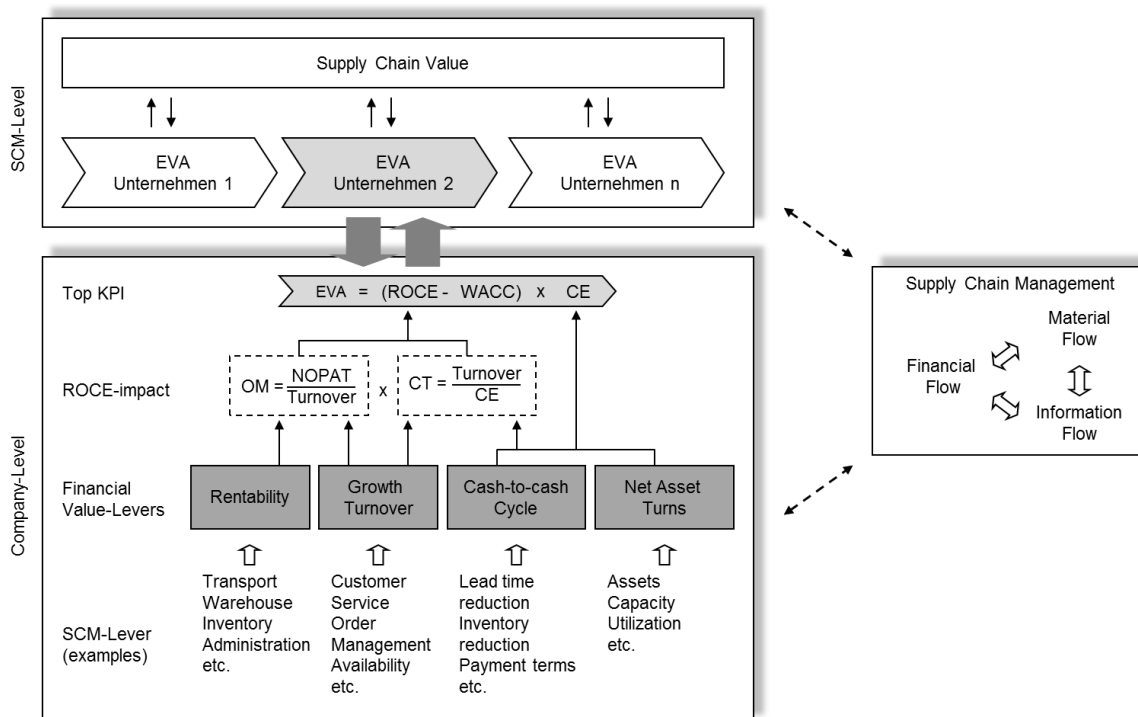


Figure 3.8: Measuring the value of SC: linking financial performance and SC decisions¹⁴⁸

Figure 3.8 shows the link of Supply Chain Management activities to the financial performance of an organization. This demonstrates how supply chain management impacts the financial flow

¹⁴⁸ Cf. Rothböck, 2009, p. 116.

Cf. Camerinelli, 2009, p.124.

with the flow of information and material. The impact of SCM on turnover growth comes through differentiation and performance and the impact on profitability comes through cost of service, influencing the profit and loss side of the business. On the other hand there are impacts of SCM on the balance sheet side through long lead times on inventory and through poor capacity utilization on asset returns.

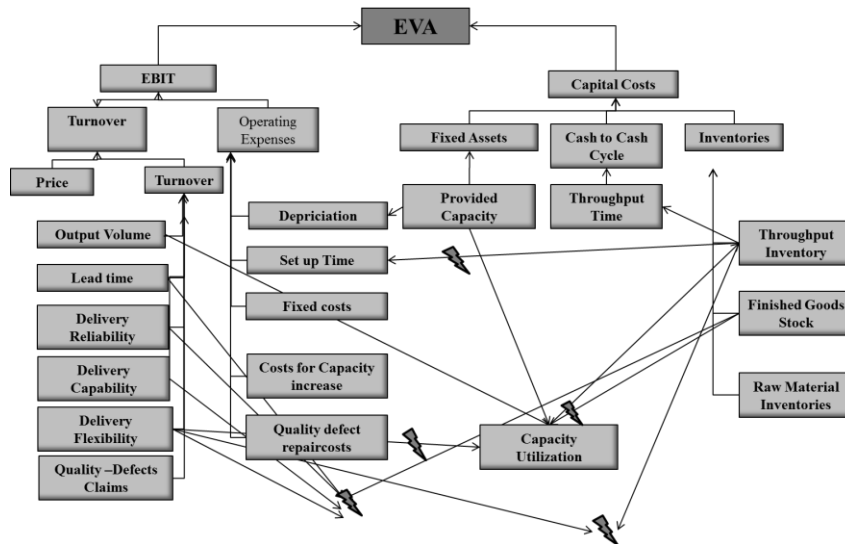


Figure 3.9: Causal effects of SCM on Economic Value Added (EVA)¹⁴⁹

Figure 3.9 shows the dependencies of decisions and their effects on the economic value added an organization delivers to its stakeholders. The dependencies also reflect tradeoffs that have to be balanced on the right levels to maximize the economic value added in total. The throughput time, as an essential element within SCM, impacts financial results. Short lead times drive lower capacity utilization, through higher set-up frequency and thus impact costs and asset utilization. Longer lead times drive higher inventories, lower levels of response to demand and thus impact turnover and working capital. The right tradeoff decision must be made on the basis of corporate strategy and channel requirements.

The graph serves as an example of how the contradicting targets of functions interact and how important it is to align the single function targets with strategy to achieve the targeted success.

¹⁴⁹ Cf. Häusler, 2002, p.344.

3.2 Sub-hypotheses development - development of the conceptual model

Based on SCM theory and on a review of the model literature, the most relevant factors that are the key driving forces behind effective implementation of SCM, contributing to competitiveness, were identified. This was used as framework for the development of the conceptual model.

These factors consist of the following independent variables:

- customer orientation,
- strategic view of SCM, and SCM practices.
- Leadership & trust as factor impacting the level of SCM implementation and its impact on competitiveness.

And of the dependent variables:

- operational performance,
- financial performance,
- customer satisfaction, and competitiveness.

Figure 3.10 shows the building blocks of the conceptual model, and how the constructs of the conceptual model relate to one another.

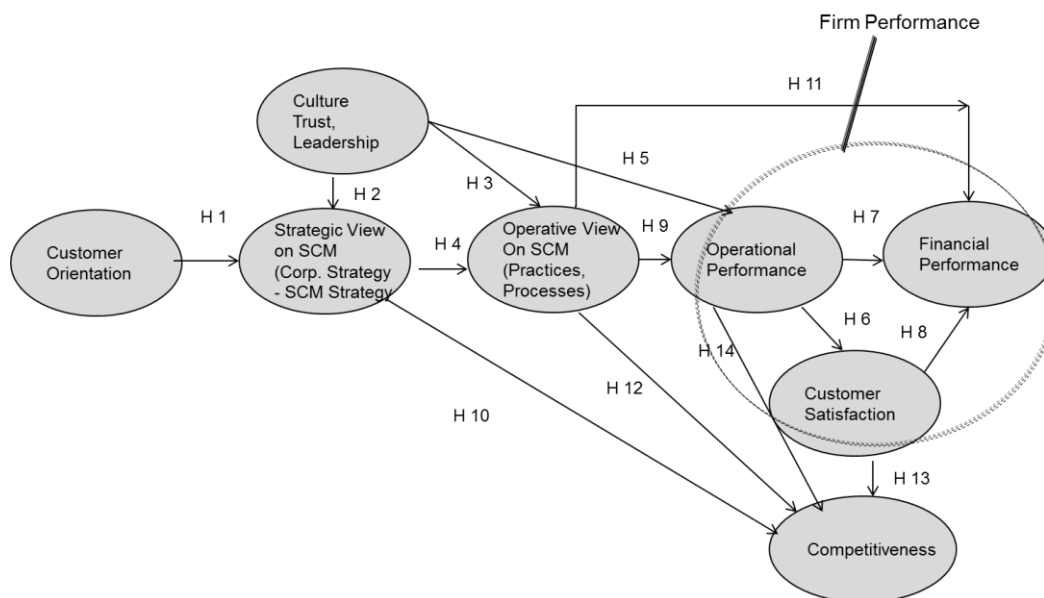


Figure 3.10: Key parameters of the model¹⁵⁰

¹⁵⁰ Own figure.

Customer orientation

The starting point for firms is to identify customer needs of the final customer in order to develop internal processes and determined performance based on input of customer needs. Harrison and New maintained that in a supply chain environment, the organizational structure affects the movement of products, services and information. Harrison and New found in their survey that one of the top four management priorities in term of SCM was to increase the level of customer service offered.¹⁵¹ Quality management principles, such as ISO 2010 including current and future customer needs, meet customer requirements and strive to exceed customer expectations.¹⁵² When customer expectations are identified, a firm can develop a common mission and mobilize its resources through leadership to satisfy them.

Strategic view of supply chain management

The strategic view of Supply Chain Management reflects the management commitment to SCM in terms of senior management responsibility and resource deployment in terms of financial and human resources. It reflects the alignment between corporate strategy and SCM strategy, specification of SCM goals, and SCM performance measurement systems.¹⁵³

In a more recent work on SCM practices¹⁵⁴, Li and others cite many practices from previous literature, in addition to the above mentioned practices, such as agreed vision and goals, cooperation, process integration, agreed supply chain leadership¹⁵⁵, and internal integration¹⁵⁶.

¹⁵¹ Cf. Harrison/New, 2002, p.268.

¹⁵² URL: www.quality.nist.gov/ [23.11.2012].

¹⁵³ Cf. Ahire/Dreyfus, 2000, pp.579.

¹⁵⁴ Cf. Li/Ragu-Nathan, B./Ragu-Nathan, T. S./Rao, 2006, p.109.

¹⁵⁵ Cf. Min/Mentzer, 2004, p.3.

¹⁵⁶ Cf. Pagell, 2004, pp.459.

The six dimensions of SCM practices and research that lead to enhanced competitiveness are: strategic supplier partnership, customer relationship, information sharing, information quality, internal lean practices, and postponement.¹⁵⁷

It is the foundation upon which coordinative and collaborative decisions can be made among supply chain members.¹⁵⁸

Trust between partners develops more effectively when incentives and purposes of the partners are aligned and a shared identity is created.

SCM orientation is also an important element of the strategic view of SCM, reflecting behavioral aspects of an organization. The next set of SCM activities: integrated behavior, integration of processes, cooperation, and congruence and alignment of goals that connect the three macro processes and are essential for postponement and other important supply chain initiatives. These activities represent the supply chain orientation that promotes network alignment.¹⁵⁹ Strategic planning is necessary to optimally use and deploy the resources available internally and in the supply network. Strategic decisions such as which markets to serve, which facilities to build and where to build them, and how to allocate production and distribution among facilities, significantly affect a firm's competitive abilities.

Order fulfillment processes, on the other hand, can be considered part of the supply planning practice because they are concerned with outlining each order's resources and logistics requirements. The manufacturing and service flow management process can be considered part of supply planning as well.

In addition to the above mentioned topics, postponement – keeping generic inventory and delaying the final product configuration until more precise customer demand requirements are known – is another practice that has gained in popularity as means for achieving flexibility and lowering costs.¹⁶⁰

¹⁵⁷ Cf. Li/Ragu-Nathan, B./Ragu-Nathan, T. S./Rao, 2005, p.109.

¹⁵⁸ Cf. Hult/Ketchen/Slater, 2004, p.243.

¹⁵⁹ Cf. Mentzer/DeWitt/Keebler/Min/Nix/Smith/Zacharia, 2001, p.11.

¹⁶⁰ Cf. Cvsa/Gilbert, 2002, pp.526.

Cf. Feitzinger/Lee, 1997, p.119.

The demand network orientation, or in other words the integrated system-wide view and behavior, is defined as

“the recognition by an organization of the systemic, strategic implications of the tactical activities involved in managing the various flows in a supply chain”.¹⁶¹

By emphasizing a total system and holistic approach in managing the supply chain, by emphasizing cooperative efforts to synchronize internal and external supply chain operations and capabilities, and by emphasizing the creation of unique value for the end customer, this integrative philosophy is clearly a critical prerequisite to any effective SCM effort.

All definitions promote the holistic system approach and allude to the supply chain management’s significance for supporting the firm’s strategy in order to attain and sustain competitiveness.

Even so, over the years SCM has evolved into a much broader definition of value chain or value system management.¹⁶² Beyond that, some authors¹⁶³ use supply or demand network management instead of supply chain management or demand chain management because firms usually belong to multiple chains at the same time.

Importantly, it also includes coordination and collaboration with channel partners, which can include suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies.

Moreover, the CSCMP states that supply chain management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-performing business model. It includes all of the logistics management activities noted above, as well as manufacturing operations, and it drives

¹⁶¹ Cf. Mentzer/DeWitt/Keebler/Min/Nix/Smith/Zacharia, 2001, p.11.

¹⁶² Cf. Christopher, 2005, p.37.

¹⁶³ Cf. Croxton/Lambert/Garcia-Dastugue/Rogers, 2002, p.51.

Cf. Frohlich/Westbrook, 2001, p.196.

coordination of processes and activities with and across marketing, sales, product design, finance, and information technology.¹⁶⁴

These calls were further encouraged by the new competitive landscape characterized by hyper-competition and network-versus-network competition. Thus, the field of strategy, with its emphasis on gaining and sustaining competitiveness, and SCM, with its emphasis on managing processes spanning organizational boundaries, stand to benefit greatly by this integration.

It was considered by logistics practitioners and academics as an extension of logistics outside the firm to include suppliers and customers.¹⁶⁵ Nonetheless, in 1998 the Council of Logistics Management noted that logistics is only a part of supply chain management, and that supply chain management is broader in scope because it takes into account the effect of more than just the logistics function, on processes that span the supply chains of member firms.¹⁶⁶

Supply chain practices - operative view of supply chain management

This is related to the bundle of activities undertaken in an organization for effective management of its supply chain. Li proposes SCM practices as a multidimensional concept including strategic supplier partnership, customer relationship, cross-functional collaboration level of information sharing, quality of information sharing and postponement¹⁶⁷. Strategic supplier partnership is the long-term relationship between the organization and its suppliers. It is designed to leverage the strategic and operational capabilities of individual participating organizations to help them achieve significant ongoing benefits.

Customer relationship is the entire array of practices that are employed for the purpose of managing long-term customer relationships and improving customer satisfaction including early design involvement.

¹⁶⁴ URL: <http://cscmp.org/aboutcscmp/definitions.asp> [16.08.2012].

¹⁶⁵ Cf. Handfield/Nichols, 1999, p.42.

Cf. Simchi-Levi/Kaminsky/Simchi-Levi, 2004, pp.1.

¹⁶⁶ Cf. Lambert/Pohlen, 2001, p.4.

¹⁶⁷ Cf. Li/Ragu-Nathan, B./Ragu-Nathan, T. S./Rao, 2006, p.109.

Cross-functional collaboration is reflected to which extent an organization works in functions or in processes with roles and responsibilities having clear process owners.

The level of information sharing is defined by the extent to which critical and proprietary information is communicated to one's supply chain partners. Quality of information sharing refers to the accuracy, timeliness, adequacy, and credibility of information exchanged.

Postponement is the practice of moving forward the customer decoupling point to a much later point in the supply chain.¹⁶⁸

Firm performance

This is reflected through financial performance, operational performance and customer satisfaction.

Business performance is measured and evaluated by financial indicators such as return on investment and gross profit ratios. The chain of cause and effect should pervade all four perspectives of the balanced scorecard, internal operational performance such as short production cycles and efficient processes contribute to customer satisfaction directly and thus improve financial performance as well.

External customer satisfaction measured by standards such as quality of the ordered products and on-time, in-full delivery, could be the main driver of firm performance. In addition, the improvement of customer satisfaction and loyalty will contribute to market share growth, which can be transformed into better financial performance of the firm.¹⁶⁹

Competitiveness - competitive advantage

Competitive advantage is the extent to which an organization is able to create a defensible position over its competitors.¹⁷⁰ It comprises capabilities that allow an organization to differentiate itself from its competitors and is an outcome of critical management decisions. The literature has been quite consistent in identifying price/cost, quality, delivery, and flexibility as important competitive capabilities.¹⁷¹ Based on the literature of chapter one and

¹⁶⁸ Cf. Li/Chung/Goldsby/Holsapple, 2008, pp.408.

¹⁶⁹ Cf. Ahire/Dreyfus, 2000, p. 551.

¹⁷⁰ Cf. Tracey/Vonderembse/Lim, 1999, p.412.

¹⁷¹ Cf. Dedrick/Kraemer, 2005, p.130.

two, the author used the dimensions of the competitiveness price/cost, quality, delivery reliability, dependability, product innovation, and time to market.

The following sub-hypotheses were developed to statistically test the linkages between the construct elements of the conceptual model:

H1: Customer orientation relates positively to strategic view of SCM.

H2: Leadership & trust is positively related to strategic view of SCM.

H3: Leadership & trust is positively related to high-level supply chain practices.

H4: Strategic view of SCM is positively related to supply chain practices.

H5: Leadership & trust is positively related to operational performance.

H6: Operational performance is positively related to customer satisfaction.

H7: Operational performance is positively related to financial performance.

H8: Customer satisfaction is positively related to financial performance.

H9: High level of SCM practices is positively related to operational performance.

H10: Strategic view of SCM is positively related to competitiveness.

H11: High level of SCM practices is positively related to financial performance.

H12: High level of supply chain practices relate positively to competitiveness.

H13: Customer satisfaction relates positively to competitiveness.

H14: Operational performance relates positively to competitiveness.

With the fourteen sub-hypotheses developed by the author, the linkages among the variables of customer orientation, strategic view of SCM, operative view of SCM, leadership & trust, and their impact on operational performance, firm performance, customer satisfaction and competitiveness, were statistically checked.

Figure 3.11 shows the conceptual model in detail with all its components and how they shall be tested as hypotheses ranked by numbers from H1 to H14.

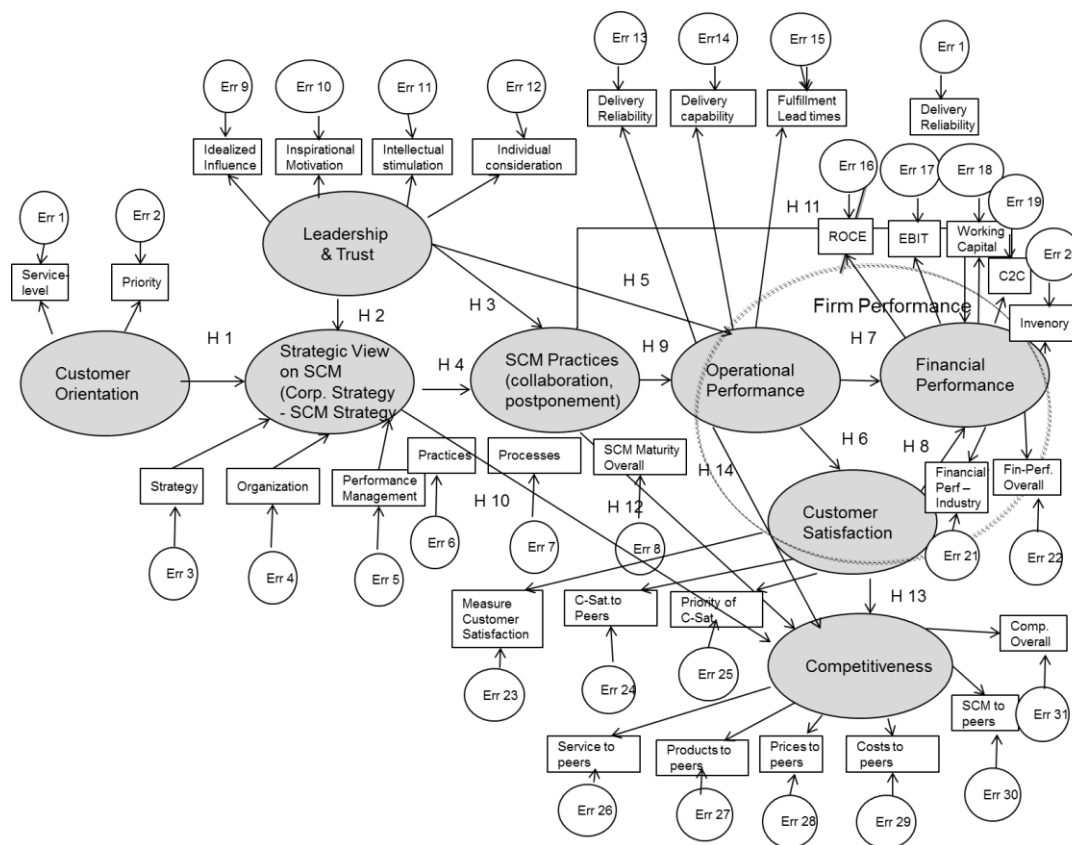


Figure 3.11: The Model with unobservable, latent variables and their respective observable parts¹⁷²

Independent variables and their measurement methods

Customer orientation was measured through five questions about service level agreements with customers. The measurement scale is a five-point Likert-scale (fully agrees, agree, don’t know, disagree, and fully disagree), where 5 means fully agree and 1 means fully disagree and with a priority rating of the following terms: productivity, costs, turnover, margins and customer satisfaction. The measurement was a ranking from 1 to 5, where 5 is the most important and 1 is the least important. For the measurement, the ranking of “customer satisfaction” was interpreted as on a Likert-scale measure.

The strategic view of supply chain management was measured by the parts:

- strategy 16 questions

¹⁷² Own figure - Conceptual model developed by author.

- organization 9 questions
- performance management 8 questions

The questions for each part are based on the developed (based on SCOR) supply chain maturity questionnaire. The measurement is a five-point Likert-scale (fully agree, agree, don't know, disagree, and fully disagree), where 5 means fully agree and 1 means fully disagree.

Supply chain practices were measured by the following parts:

- practices 20 questions
- processes 42 questions

The questions for each part are based on the developed (based on SCOR) supply chain maturity questionnaire. The measurement is a five-point Likert-scale (fully agree, agree, don't know, disagree, and fully disagree), where 5 means fully agree and 1 means fully disagree.

The leadership impact was measured by the following parts based on the full range leadership concept:¹⁷³

- idealized influence 8 questions
- inspirational motivation 3 questions
- intellectual stimulation 3 questions
- individualized consideration 6 questions

The questions were measured by a five-point Likert-scale (fully agree, agree, don't know, disagree, fully disagree), where 5 means fully agree and 1 means fully disagree

3.3 Sample size, spread of companies and data gathering

The author focused on companies in producing industries with their key operations in Europe. The size of the companies was not smaller than 500 employees. The turnover started with EUR 50 million up to more than EUR 20 billion. The size parameters for the companies were chosen because this size of company has different functional responsibilities for sales, marketing, production, logistics, procurement, innovation, construction and others, and therefore requires cross-functional coordination in the sense of SCM. As the conceptual model covers several

¹⁷³ URL: <http://www.mindgarden.com/products/mlq.htm> [30.06.2012].

aspects of SCM, and even leadership and behavioral aspects, the best means of data collection were semi-structured interviews to avoid misinterpretations and misunderstanding of questions. (These could be avoided as the interviewee could ask questions if the terms were not clearly understood.)

Due to this methodology, a small sample of 20 to 30 companies allows the identification of relationships among the constructs of the conceptual model.¹⁷⁴ The companies were selected randomly based on criteria mentioned. The questionnaires were conducted with the head of supply chain, logistics or operations of these companies. This further strengthens the validity, as we ensure that we talk with the right people in the organization who are responsible for SCM.

Data were gathered with a standard questionnaire. The standard questionnaire was carried out in a structured interview with supply chain management experts from the respective companies. The interviews covered only supply chain managers or an equivalent. As the questionnaire has an explorative character, the author decided to conduct the questionnaire in interview form. This methodology ensures validity in three ways:

- it is possible to uncover important information beyond the semi-structured questionnaire with narrative parts,
- there is also the possibility of explaining the terms of questions, as the interviewee can ask for clarification, and
- different industry specifics can be understood and discussed, to ensure that the result reflects the right context.

The interview data were filled into standard forms, and the whole interview was documented on paper.

Pilot testing: This testing is important to establish the content validity of an instrument and to improve questions, format, and scales.¹⁷⁵

Prior to the interviews with senior supply chain managers, the questionnaire was reviewed by two professors in the field of supply chain management. There were lessons learned from the pre-test that were incorporated into the full study process. After adaptation, 12 initial interviews

¹⁷⁴ Cf. Creswell, 2009, pp.1.

¹⁷⁵ Cf. Creswell, 2009, p.150.

with members of the VNL (Austrian logistics association) supply chain expert group, senior supply chain managers of leading companies, were conducted. The results of the 12 interviews were evaluated with descriptive methods and discussed in detail with the senior managers of the expert group in a feedback loop (four workshops). The first discussions during the interviews brought two major topics to the surface: first, sharing financial information could be an issue, and second, explanation of terms and questions during the interview. The open discussion with the senior managers further improved content validity and reliability in three ways. On one hand, these companies were prepared to share financial figures from 2007 to 2010, and on the other hand, through discussion it became obvious that top management support and leadership, along with aligned performance figures and incentives, are key drivers of successful SCM implementation, and third, that financial figures are not related to supply chain management. Based on this input, the author adopted the questionnaire in the area of financial figures by asking, in addition, about relative financial performance to competitors, and approached further companies fitting the defined selection criteria for interviews.

3.4 Research methodology

This section discusses the research methodology used in this study and includes the justification of the research methodology, the process used for data analysis and determining gaps, the process used to generate recommendations from the data, and concludes with a discussion of the limitations of the research.

Factor measurement validity and reliability and construct validity

Construct validity and reliability: To ensure construct content validity, a thorough review of the literature was carried out. To test the validity and reliability of the constructs of the measurement model, an exploratory factor analysis was done to test whether the proposed factors were consistent with the survey data. The interpretation involves the researcher examining which variables are attributable to a factor, and giving that factor a name or theme. For example, a factor may have included three variables, all of which relate to SCM maturity/plan; therefore the researcher would create a label of “collaboration” for that factor. Traditionally, at least two or three variables must weigh on a factor for it to be given a

meaningful interpretation¹⁷⁶. The labeling of factors is a subjective, theoretical, and inductive process. Henson and Roberts note, “the meaningfulness of latent factors is ultimately dependent on researcher definition”¹⁷⁷. The reason for thorough and systematic factor analyses is to isolate items with high loadings in the resultant pattern matrices. In other words, it is a search to find those factors that, taken together, explain the majority of the responses. If the observed variables measure the construct, it was tested with several quality-of-fit indicators as well.

Convergent and discriminant validity was tested to establish construct validity. For abnormal distributed or ordinal variables, the non-parametric correlation coefficient after Spearman (“Spearman’s Rho”) was used. As a normality-distribution-test for continuous variables, the Kolmogorov-Smirnov-Test with Lilliefors Correction was used.

Model validity: The next step was to examine how well the constructed model explains the observed data in terms of several quality-of-fit indicators. The absolute model fit was checked through the p-value. In addition, the root mean square error of approximation was used to check the level of internal consistency.¹⁷⁸

Model estimation: After performing the reliability and validity analyses, structural equation modeling procedures were implemented to estimate the model and test the proposed empirical sub-hypotheses.

In order to test the causal relations of the structure of the model and the variables within the structure, structural equation modeling (SEM) was used.

Model validity targets

Validity of measurement models were assessed in a process using first generation criteria in a first phase, and second generation criteria thereafter. If necessary, indicators reducing the validity could be eliminated. This was identified by the author through the use of exploratory factor analysis, item-to-total-correlation first, and the use of confirmatory factor analysis in the second phase. The Kaiser-Meyer-Olkin measure of sampling adequacy ought to yield values

¹⁷⁶ Cf. Henson/Roberts, 2006, p.28.

¹⁷⁷ Cf. Henson/Roberts, 2006, p.396.

¹⁷⁸ Cf. Hu/Bentler, 1999, pp.1.

exceeding 0.4 – otherwise indicators that show a low reliability have to be eliminated, respectively there is insufficient correlation among the indicators.

When analyzing the indicators of the construct with exploratory factor analysis, all indicators were loaded on one single factor to ensure convergent validity.

Additionally, the squared multiple correlations (R^2) showed the explanatory power with respect to each endogenous variable. It stated the degree to which their variance is explained by the variance of the exogenous variables.

Structural equation modeling

Most SCM research is managerial in nature. Despite the recent debate on SCM theories, research still lacks a focus on methodology and theory development and testing.¹⁷⁹ The structure of theory construction presents the concepts, constructs, hypothesis, observations and measures of a theory and their organization in an overall representation, whereas the process applies logical principles and scientific method. To model the structure, the concept of structural equation modeling has been introduced.¹⁸⁰ Structural equation modeling has its roots in the last century; however, it was not until the 1960s that sociologists in particular discovered the full potential of path analysis. Structural equation modeling was developed as a general concept applicable to all causal relationships.¹⁸¹ The author used SEM as it offers a holistic approach that aims to close the gap between philosophical and statistical traditions. It offers both theoretical and observational terms and their corresponding rules. At the same time, it accounts for the possibility of measurement errors in the variables and the equations. SEM incorporates *manifest variables as indicators* at the observable level, and unobserved, *latent or emergent variables* (theoretical construct) at the theoretical level.

The relationships between constructs and indicators are modeled by measurement models, which specify how the constructs are measured by the indicators. The theoretical relationships between the constructs are represented by equations in the structural model. Once formulated, a theoretical model can be confronted with empirical data (multivariate statistical analysis). It requires a theoretical basis and its contribution to theory construction lies in the ability to assess

¹⁷⁹ Cf. Mentzer/Kahn, 1995, p.231.

¹⁸⁰ Cf. Hu/Bentler, 1999, pp.1.

¹⁸¹ Cf. Jöreskog, 1973, pp.17.

the validity of measurement models, the discriminate validity of different constructs and the theoretical validity of causal relationships.

Advantage of structural equation modeling: The advantage of covariance-based structural equation modeling allows incorporation of theoretical constructs at latent variables, but also correlations between different exogenous variables, as well as causal effects and correlations between different endogenous variables. In comparison, multiple regression analysis requires independent exogenous variables and can only include one endogenous variable in each analysis. This means that in structural equation modeling, all hypotheses can be tested simultaneously and indirect effects on the endogenous variables can be separated. Additionally, structural equation modeling facilitates the explicit consideration of measurement errors and its separation from other sources of errors. Another advantage is that the model fit can be assessed using statistical tests and a variety of goodness of fit indicators.¹⁸²

The disadvantage of structural equation modeling is that it requires large sample sizes (in most cases exceeding 200) and it requires metrically scaled indicators and a multivariate normal distribution of analyzed data. The maximum likelihood estimation proves to be robust against violations of the later prerequisite.¹⁸³

In the first step, the measurement models are assessed with the objective of ensuring that each scale measures what it intends to measure.¹⁸⁴ In a second step, the structure is tested. All indicators ought to be truly reflective to ensure the validity of the measurement models.¹⁸⁵ To ensure validity of measurement, models should additionally be assessed in a process using first generation criteria in a first phase and second generation criteria thereafter. If necessary, indicators reducing the validity are to be eliminated. To identify this, the use of exploratory factor analysis is recommended.

The validity of the structural model is assessed with the same global fit indicators as factors are assessed. In addition, the squared multiple correlation (R^2) shows the explanatory power with respect to each endogenous variable. It states the degree to which their variance is explained

¹⁸² Cf. Wallenburg/Weber, 2005, pp.172.

¹⁸³ Cf. Bentler/Chou, 1987, p.89.

¹⁸⁴ Cf. Graver/Mentzer, 1999, pp.33.

¹⁸⁵ Cf. Eggert/Fassot, 2003, p.3.

by the variance of the exogenous variables. When the fit shows to be insufficient, this can be due to data quality, misspecifications within the model, or too high model complexity.

Misspecifications can be identified on the basis of the misspecification indices within the applications such as AMOS and EQS. For each fixed parameter and especially for relationships not included in the model, they estimate the change in Chi^2 when the parameter is estimated freely. Model fit can be improved by including not-modeled relationships. This, however, should only be done if justifiable from a theoretical standpoint, otherwise the risk is high that the model is tailored to fit the data without any chance of replicating results in later studies. Another way is to eliminate constructs from the structural model, either single endogenous variables or exogenous variables that offer very limited contribution to explaining the endogenous variables.

3.5 First and second generation criteria

Exploratory factor analysis

If indicators are eliminated in the first phase on the basis of item-to-total correlation, only convergent validity is taken into account. Therefore, second generation criteria are to be used in parallel. In this way, the reliability of each indicator can also be considered before deciding on elimination. All indicators should load on one single factor when analyzing the indicators of a construct, otherwise convergent validity is violated as the indicators do not measure the same, but rather different dimensions. The Kaiser-Meyer-Olkin measure ought to be minimum 0.4 and should ideally exceed 0.5. Otherwise, indicators have to be eliminated that show low reliability; respectively, there is insufficient correlation among the indicators.

Confirmatory factor analysis

A one factorial structure is assumed and analyzed. A large number of criteria to assess goodness of fit are available in the literature. An acceptable fit requires a Chi^2/df below 2.5, a root mean squared error of approximation as global fit indicator below 0.08 and both Tucker-Lewis-Index (TLI) and Goodness-of-Fit-Index (GFI) to exceed 0.9. Local fit indices ought to be considered with the aim of composite reliability exceeding 0.6 variance extracted exceeding 0.5. If multiple indices do not meet the requirements, indicators have to be eliminated from the measurement model.

4 RESEARCH RESULTS & MANAGERIAL IMPLICATIONS

This chapter summarizes the data collected through interviews and aims to interpret the data in relation to the research objective. Each of the research issues is analyzed, interpreted, and the detailed findings are presented. The chapter concludes with a summary of the research findings.

4.1 Survey data in general

The survey was carried out via interviews based on a structured questionnaire. This was decided based on the input of two supply chain experts and a test conducted with a group of supply chain experts. During this process, it became obvious that content validity can be increased with interviews based on the semi-structured questionnaire, due to the fact that some of the questions need additional explanation and that some of the questions even require further questions from the interviewer to make sure the answer really answers the question correctly: for example, the question, “We have clearly defined service levels”, and then as a follow-up question, “how exactly does this work?”.

The study covers 34 interviews across several industrial sectors in a Western European context (mainly companies with headquarters in Austria, Germany and the United Kingdom).

The 34 interviews were conducted within eight months and by two different interviewers to see if there was a personal bias based on the interviewer. The interviewees were SCM-managers and the companies were selected randomly based on the criteria of size and industry. The results showed that this was not the case.

Interviews were conducted with a group of 12 companies (VNL-supply chain expert group) out of the 34 as early as 2011. The results, also including the absolute numbers of financial success, were shared in an open benchmark as this group is a supply chain expert group headed by the author. Together, the group decided to share and discuss openly the results as a benchmark exercise. This was performed in four workshops beginning with the first quarter 2011 and ending with the last quarter 2011. The lessons learned from this testing were incorporated into the final questionnaire. The new parts of the questionnaire were also given to these 12 companies. With all other companies, financial results figures could be obtained only by internet research if the companies were publicly listed, and therefore it was decided to ask financial questions only on a Likert scale from 1 to 5 in relation to their competitors. This

approach gives deeper insights into one group of the survey than into the entire sample. The results of both areas will be combined in a triangulation. Due to the interview approach, all questionnaires except one were 100% completed in good quality. The key challenge was finding interview partners who were prepared to answer a questionnaire containing 167 questions in about one to one and a half hours. The interview method also delivered insights that certainly could not have been identified if the questionnaire had been online: for example, the SCM managers and logistics managers' knowledge of financial figures and overall company competitiveness, which will be elaborated upon later in the study.

Industrial split

Figure 4.1 shows the industrial split of companies within this study.

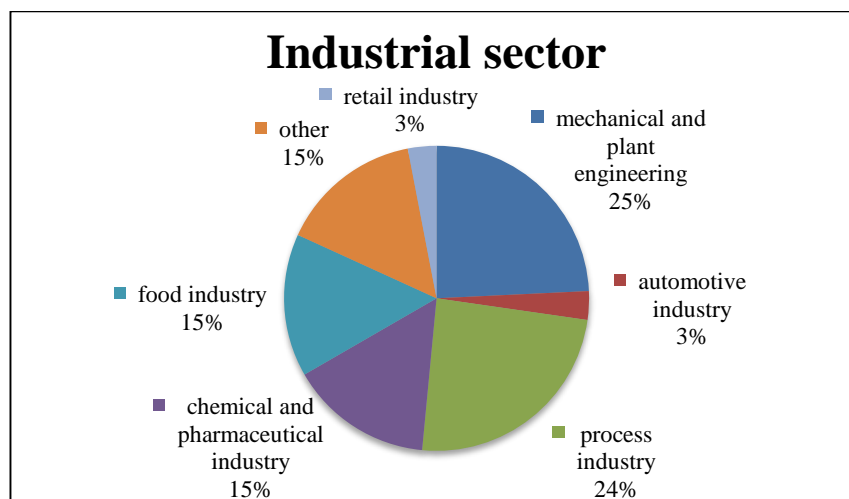


Figure 4.1: Industrial split¹⁸⁶

Companies in the industrial sectors “process industries” and in the “mechanical and plant engineering” are well covered. The “food industry” also has rather good coverage, whereas “automotive” and “retail” are covered only to a very low extent by the sample of this study. Companies that did not fit into the predefined groups were summed up in the sector “others”. This means that to generalize on industry-specific topics the study would have to be expanded in the sectors with lower coverage, but there is a good picture shown for the sectors mentioned above.

¹⁸⁶ Own figure - Descriptive statistics.

Distribution of company size

Figure 4.2 is based on turnover and shows that with 47.1%, the majority of companies falls in the area of EUR 201-1000 million, and the second biggest groups with 23.5% are in the areas of EUR 51-200 million and greater than EUR 1000 million turnover. Only a small part of the sample has turnover of less than EUR 50 million.

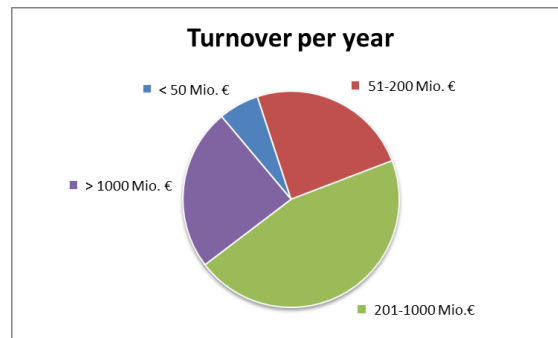


Figure 4.2: Turnover per year¹⁸⁷

Figure 4.3 shows that the majority of companies are in the area of 500-1000 employees and larger with 41.2% and with 47.1%, respectively. Small companies of fewer than 500 employees and fewer than 200 employees reflect only 5.9% each.

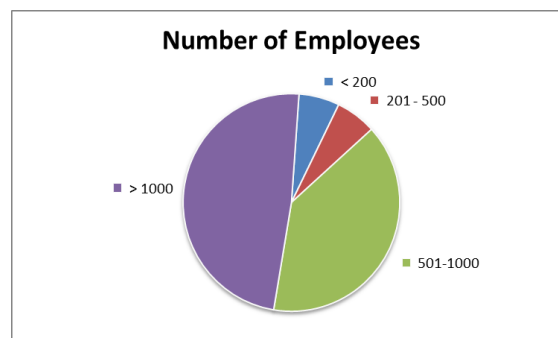


Figure 4.3: Number of employees¹⁸⁸

For the study in total, this means that we have good coverage of midsize and large companies but almost no coverage of small companies. Nevertheless, this seems to be a reflection of the state of implementation of supply chain management in smaller companies, because interviews

¹⁸⁷ Own figure - Descriptive statistics.

¹⁸⁸ Own figure - Descriptive statistics.

with smaller companies were requested, but they refused immediately with the argument that they don't have such a structure and such a function.

Distribution of functions that were interviewed

Figure 4.4 shows different names for the supply chain function in the companies where the interviews took place. While the majority of companies at 58.8% have a “supply chain function”, others with 29.4% call it “logistics” and only a smaller portion with 2.9% calls it “logistics and production planning”. With 8.8% of the sample, other names for the function were used; we summed these up in the section of “others”.

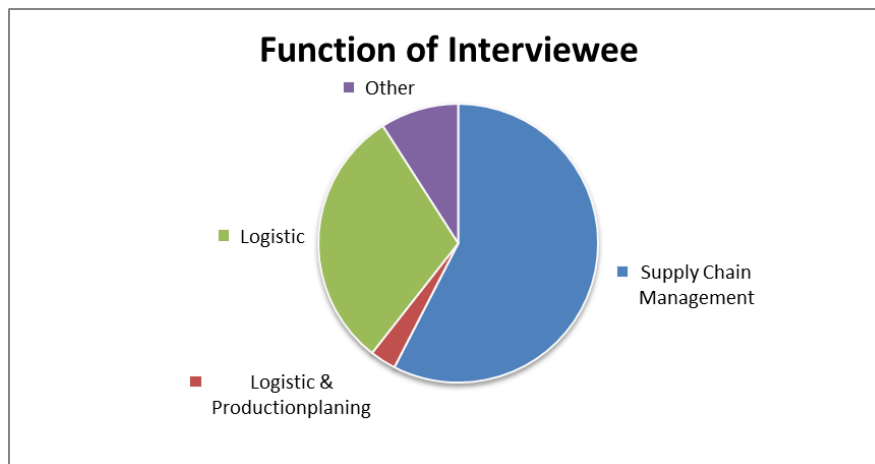


Figure 4.4: Function of Interviewee¹⁸⁹

Figure 4.5 illustrates that 94.1% of the functions have cross-functional responsibility and a high share at 82.4% also has a group role within a group of companies. This seems to be a result of the geographical coverage as many companies have their headquarters in Austria or in Germany and therefore group functions are placed in these areas.

¹⁸⁹ Own figure - Descriptive statistics.



Figure 4.5: Cross-functional role/group function¹⁹⁰

Distribution of age and gender of the interviewees

Figure 4.6 shows that the age of supply chain function holders is quite equally spread from age 25-40 with 32.4% of the sample, from 41-50 with 35.3% of the sample, and “over 50” with 32.4%. But even in the group 25-40 which is a quite big range, we had no interviewee younger than 35 years of age. So to sum up, supply chain managers are more senior people not just based on their function in the companies but also from an age perspective. This seems to be supported by the argument that they need a certain level of experience to be able to cover the cross-functional and group roles in a company or in a group of companies.

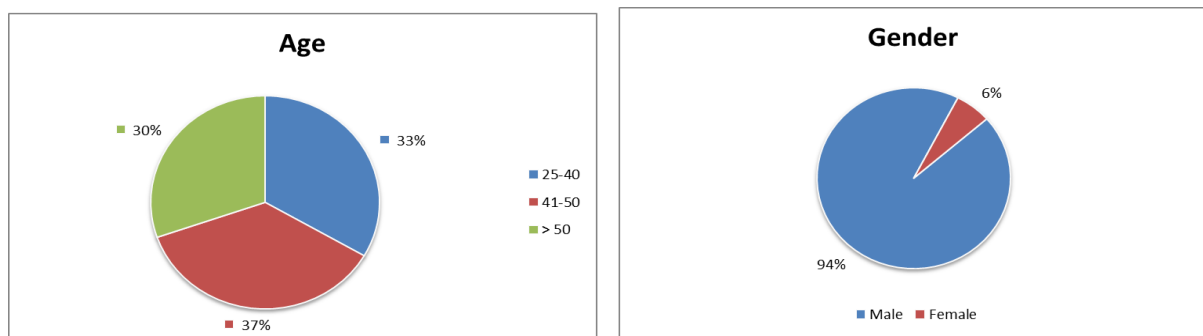


Figure 4.6: Age & gender¹⁹¹

The gender distribution shows very much a male domination with 97.5% of the interviewees. Here it would certainly be very interesting to explore why this strong dominance of men has developed and what would lead to a more equal distribution of male and female position holders.

¹⁹⁰ Own figure - Descriptive statistics.

¹⁹¹ Own figure - Descriptive statistics.

Statistical analysis of results

Overall Supply Chain Maturity = Mean (deliver, make, overall, plan, source).

Leadership & Trust = Mean (idealized influence, individual consideration, inspirational motivation, intellectual stimulation).

Financial Performance (Mean-Score) = Mean (financial performance in terms of 'ROCE, EBIT, WC, C2C, inventories', our financial performance overall, our financial performance within our industry).

Competiveness (Mean-Score) = Mean (competitiveness in terms of 'service, products, prices, costs, assortment', our competitiveness overall, our supply chain performance overall).

Table 4.1: Statistical analysis of results¹⁹²

	MIN	Q1	Median	Mean	Q3	MAX	SD	n
Deliver	2,08	2,63	2,85	2,80	3,04	3,17	,29	34
Make	1,63	2,31	2,63	2,58	2,88	3,25	,41	34
Overall	1,57	2,04	2,48	2,55	3,00	3,65	,54	34
Plan	1,63	2,25	2,53	2,59	3,00	3,56	,45	34
Source	1,56	2,31	2,66	2,60	2,88	3,38	,43	
Overall Supply Chain Maturity	1,82	2,39	2,65	2,62	2,77	3,36	,35	

Table 4.1 shows the biggest differences between companies in the building blocks of 'supply chain maturity' in the area of 'plan, make, overall and source', in which there is a standard deviation of more than 0.41. The spread is driven by the weakest companies on a level between 1 and 2 in their maturity.

¹⁹² Own table - Descriptive statistics.

Table 4.2: Operative and strategic view of SCM¹⁹³

	MIN	Q1	Median	Mean	Q3	MAX	SD	n
Operative view (Blocks of SCM)	1,82	2,32	2,59	2,57	2,76	3,26	,31	34
Strategic view (Blocks of SCM)	1,88	2,33	2,77	2,75	3,09	3,58	,46	34

Table 4.2 illustrates that the standard deviation of the ‘strategic view of SCM’ is much higher than the standard deviation of the ‘operative view of SCM’. This shows that principles and practices used in Supply Chain Management are common across companies, but the strategic area and the organizational area of SCM differs much more across the sample. Companies are using practices of SCM in principle, but still lack a formalized supply chain strategy and therefore also lack proper SC organization to drive strategy implementation. If this is missing, we also miss the right key performance indicators to measure progress and success of SCM.

Table 4.3: Mean Score (Operative View, Strategic View)¹⁹⁴

	MIN	Q1	Median	Mean	Q3	MAX	SD	n
Mean Score (Operative View, Strategic View)	1,84	2,37	2,66	2,63	2,78	3,37	,35	34
Organization	1,22	2,33	2,78	2,77	3,22	4,00	,68	34
Performance	1,63	2,25	2,63	2,55	2,88	3,63	,45	34
Practice	1,45	2,05	2,30	2,33	2,70	3,30	,42	34
Process	2,00	2,55	2,71	2,68	2,81	3,24	,29	34
Strategy	1,88	2,44	2,97	2,85	3,25	3,56	,48	34
Mean Score (Organization, Performance, Practice, Process, Strategy)	1,84	2,37	2,66	2,63	2,78	3,37	,35	34

As mentioned earlier, the constructs of ‘strategic view of SCM’ show higher standard deviations than the building blocks of ‘operative view of SCM’, as SCM processes seem to happen in all the companies. The biggest standard deviation we see in the area of the building

¹⁹³ Own table - Descriptive statistics.

¹⁹⁴ Own table - Descriptive statistics.

block ‘organization’ where we have a standard deviation of 0.68, meaning that companies with a score of 1.22 as a minimum have almost no SCM organization and companies with a maximum score of 4.0 have a perfect SCM organization. This shows the wide variety of status of implementation, which we still see in reality. In the area of ‘competitiveness’, we see in Table 4.3 the biggest deviation between leading companies and lagging companies and this is reflected as well by a standard deviation of 0.7.

Table 4.4: Overall competitiveness as single question and mean score of elements of competitiveness¹⁹⁵

	MIN	Q1	Median	Mean	Q3	MAX	SD	N
Overall Competitiveness	2,00	3,00	4,00	3,56	4,00	4,00	,70	34
Competitiveness (Mean Score)	2,47	3,40	3,60	3,48	3,87	4,00	,47	34

Table 4.5: Overall supply chain performance¹⁹⁶

	MIN	Q1	Median	Mean	Q3	MAX	SD	N
Overall Supply Chain Performance	2,00	3,00	4,00	3,53	4,00	4,00	,71	34

Table 4.5 shows that the overall supply chain performance has a similarly wide spread of results as competitiveness with 0.71.

Table 4.6: Customer satisfaction¹⁹⁷

	MIN	Q1	Median	Mean	Q3	MAX	SD	N
Customer Satisfaction	2,00	3,50	3,50	3,49	4,00	4,00	,62	34

¹⁹⁵ Own table - Descriptive statistics.

¹⁹⁶ Own table - Descriptive statistics.

¹⁹⁷ Own table - Descriptive statistics.

Table 4.6 points out a big standard deviation of 0.62 for ‘customer satisfaction’, which goes hand in hand with the standard deviation of ‘strategic view of SCM’ and ‘competitiveness’.

Table 4.7: Financial Performance¹⁹⁸

	MIN	Q1	Median	Mean	Q3	MAX	SD	N
Financial Performance in Terms of ROCE, EBIT, WC, C2C, Inventories	2,00	3,00	3,30	3,19	3,80	4,00	,65	34

Table 4.8: Overall financial performance¹⁹⁹

	MIN	Q1	Median	Mean	Q3	MAX	SD	N
Overall Financial Performance	2,00	3,00	4,00	3,41	4,00	4,00	,74	34

Table 4.8 displays a huge standard deviation for the ‘overall financial performance’, merely reflecting the summary of the mean of the building blocks of ‘overall financial performance’.

Table 4.9: Financial performance within industry²⁰⁰

	MIN	Q1	Median	Mean	Q3	MAX	SD	N
Our financial performance within our Industry	2,00	3,00	4,00	3,56	4,00	4,00	,70	34

Table 4.9 shows the picture in peer comparison is similar to the picture of financial results and shows a similar high standard deviation of 0.7. This means that the best companies perform much better than average and the worst companies perform much worse than average.

¹⁹⁸ Own table - Descriptive statistics.

¹⁹⁹ Own table - Descriptive statistics.

²⁰⁰ Own table - Descriptive statistics.

Table 4.10: Financial Performance (Mean Score)²⁰¹

	MIN	Q1	Median	Mean	Q3	MAX	SD	N
Financial Performance (Mean Score)	2,00	3,00	3,67	3,39	3,93	4,00	,63	34

Table 4.10 indicates that even the mean score of ‘financial performance’ shows a rather high standard deviation.

Table 4.11: Operative performance²⁰²

	MIN	Q1	Median	Mean	Q3	MAX	SD	N
Operative Performance	2,00	3,00	3,67	3,49	4,00	4,00	,52	34

Table 4.11 reflects on the ‘operative performance’ the non-financial figures of performance of the supply chain. The picture here is similar, with the categories of ‘SC maturity’, ‘competitiveness’ and ‘customer satisfaction’, reflecting the wide spread of performance and the diversity of companies interviewed.

²⁰¹ Own table - Descriptive statistics.

²⁰² Own table - Descriptive statistics.

Table 4.12: Idealized influence, individual consideration, inspirational motivation, intellectual stimulation²⁰³

	MIN	Q1	Median	Mean	Q3	MAX	SD	N
Idealized Influence	2,50	3,50	3,75	3,63	4,00	4,00	,39	34
Individual Consideration	3,00	3,50	3,92	3,74	4,00	4,00	,31	34
Inspirational Motivation	2,00	2,67	4,00	3,50	4,00	4,00	,68	34
Intellectual Stimulation	2,67	3,33	3,83	3,57	4,00	4,00	,51	34

Table 4.12 is about ‘leadership & trust’, one of the key elements that makes SCM work successfully in companies. We have measured it in terms of ‘idealized influence’, ‘individual consideration’, ‘inspirational motivation’ and ‘intellectual stimulation’.

Table 4.13: Leadership & Trust²⁰⁴

	MIN	Q1	Median	Mean	Q3	MAX	SD	N
Leadership & Trust	2,75	3,29	3,71	3,61	3,94	4,00	,37	34

Table 4.13 shows that ‘inspirational motivation’ and ‘intellectual stimulation’ have a higher standard deviation than the overall view of ‘leadership & trust’, meaning motivation and stimulation is the area where best-in-class companies are much better than average and lagging companies are much worse.

Table 4.14: Customer orientation²⁰⁵

	MIN	Q1	Median	Mean	Q3	MAX	SD	N
Customer Orientation	2,50	3,00	3,50	3,32	3,50	4,00	,53	34

Table 4.14 is about ‘customer orientation’ reflecting companies’ customer mindedness.

²⁰³ Own table - Descriptive statistics.

²⁰⁴ Own table - Descriptive statistics.

²⁰⁵ Own table - Descriptive statistics.

In the area of ‘customer orientation’, there was a big standard deviation of 0.53 which became evident as an interview detail: companies lacking written service level targets or failing to measure them on a regular basis.

4.2 Factor analysis and construct validity and reliability of the model

To test the validity and reliability of the model constructs of the measurement model, exploratory factor analyses using the principal component and Varimax approach were first conducted to check whether the proposed factors were consistent with the survey data. In a second step, a confirmatory factor analysis was used to check the specific factor loadings of each of the construct variables.

The 167 questions of the questionnaire, excluding 28 questions such as the ranking of company or customer priorities, were compressed to components (factors). Because of missing values, the following variables are excluded: F24, R120, R121, R123, R124, R125, R126, R127, R128, R129, W130, W131, W132, F136, F137, F138, F139, F140, F141, F142, F144, R145, R146, R147, R148, R149, R150 and R151.

The adding of these variables would reduce the sample size for the factor analysis too much, and these parts of the questionnaire also do not make sense for a correlation approach as most of them are absolute numbers or rankings of attributes. Factor analysis is stopped because the correlation matrix of all variables is not positive definite (main axis of the diagonal is zero). The reason for this is the large amount of variables in comparison to sample size. Sample size should be three times the amount of the variables.

The Varimax-rotation according Kaiser-Meyer-Olkin was used. Correlation exists only if the value of the factor loading is $|0.4|$ or higher. The measure of sampling adequacy should be above 0.5 (cut-off 0.5, criterion own value > 1 , varimax-rotation).

First step, exploratory factor analysis: The factor loadings for each question and for each component were analyzed. Factor loadings can be interpreted similarly to correlation coefficients. A concrete correlation exists only if the value of the factor loading is $|0.4|$ or higher. If a question loads on multiple components, the component with the highest factor loading is preferred. What we have seen here is that some components could be separated into 2 to 5 clusters, which was analyzed but not preferred, because we wanted to reduce components rather than expand them.

Second step, confirmatory factor analysis: Here a fixed number of components is extracted and the correlation of the questions with the component is represented by the factor loadings. If many factors load below $|0.4|$, this is a sign for the existence of another latent component. The components analyzed showed the following picture:

Customer orientation: 75% of the factors had a loading above $|0.4|$ and two out of eight factors had a lower loading due to the fact that one represented the ranking of company priorities, which is not fully in line with such a testing method. The Kaiser-Meyer-Olkin Measure of sampling adequacy was with 0.199 below 0.5, due to the small sample and the very different industries.

Supply Chain Maturity (covering “strategic view of SCM” and “operative view of SCM”): The single parts of the maturity factors, plan, source, make, deliver, overall, were tested separately. The Kaiser-Meyer-Olkin Measure of sampling adequacy showed values between 0.425 and 0.544 which is in range of 0.5, as a minimum for construct validity.

Leadership & trust had very high factor loadings. Only the operative parts of the questions, like “the sales and operations team is making decisions, or plans which are agreed in the sales and operations planning meeting get executed as agreed”, showed loadings below $|0.4|$. The Kaiser-Meyer-Olkin Measure of sampling adequacy was with 0.544 above 0.5, as here industry specifics obviously do not play an important role.

Operative Performance had 50% of the loadings below above $|0.4|$, due to the fact that we had combined here the absolute figures of delivery reliability with relative questions about performance, and here again absolute figures are not comparable among different industries, e.g. a delivery reliability of 98% is for a retail supplier rather average and in the steel industry a dream, as they perform on rates of 50% to 80%. The Kaiser-Meyer-Olkin Measure of sampling adequacy was with 0.216 below 0.5, as here industry specifics obviously had a huge impact. On financial performance, all loadings were far above $|0.4|$, due to the relative rating of the companies compared to peers, the problems experienced with operative performance were avoided here. The Kaiser-Meyer-Olkin Measure of sampling adequacy was with 0.709 above 0.5. On customer satisfaction, the Kaiser-Meyer-Olkin Measure of sampling was even negative, due to the fact that especially here in the ranking of customer priority, industry specifics had a huge impact, which led to poor results on this indicator of fit due to the small sample. But the main questions had high factor loadings above $|0.4|$.

Finally, competitiveness had high factor loadings, except the factors product and price, which can be explained as well by the variety of industries. The Kaiser-Meyer-Olkin Measure of sampling adequacy was with 0.562 above 0.5. This means that the factors overall show good validity and reliability of the corresponding constructs of the measurement model.

4.3 Results of open benchmarking with the 12 companies (SC expert group)

The model was tested with a group of 12 supply chain managers who are members of the VNL supply chain expert group, prior to the full interview study. The test was performed by interviews based on the questionnaire and with financial results from 2007 to 2010. The financial figures included turnover, working capital, earnings before interest and tax (EBIT), return on capital employed (ROCE). The results were discussed openly in four workshops with the managers.

The focus of this part of the research is on the findings made only with this group of senior managers, as the other 23 participants were not prepared to provide detailed financial figures. Figure 4.7 shows statistically the following results.

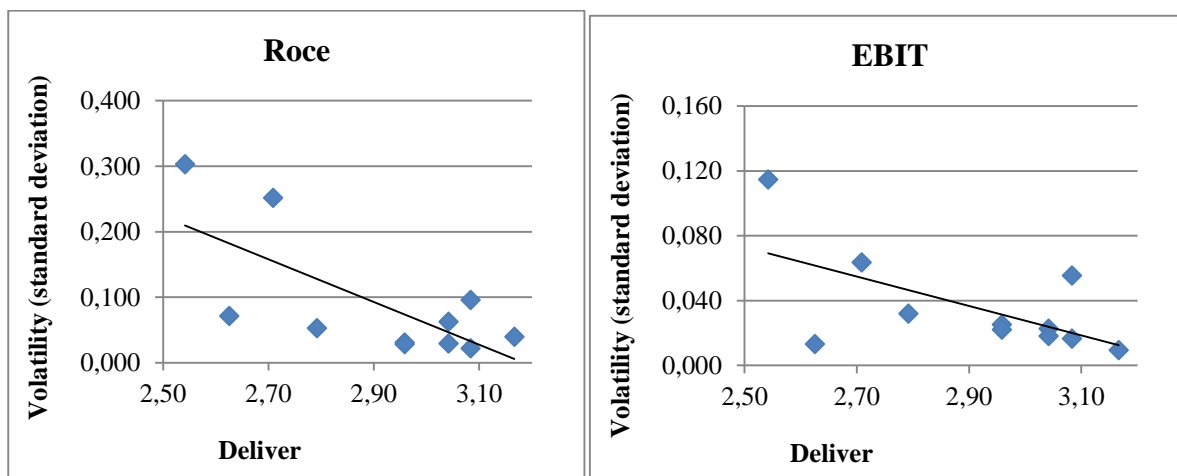


Figure 4.7: ROCE & EBIT and Deliver²⁰⁶

²⁰⁶ Own figure - Financial results volatility correlation analysis.

There is a high negative correlation between ‘SCM maturity/Deliver’ and ‘ROCE and EBIT’. This shows that companies with low maturity in the area of deliver have a higher volatility on results over a three-year period (2007-2010).

Figure 4.8 shows that there is a high negative correlation (-0.6553) between ‘supply chain maturity’ and the volatility of the ‘cash-to-cash cycle’ of a company over the period 2007-2010. This means that more mature companies have less cash-to-cash volatility.

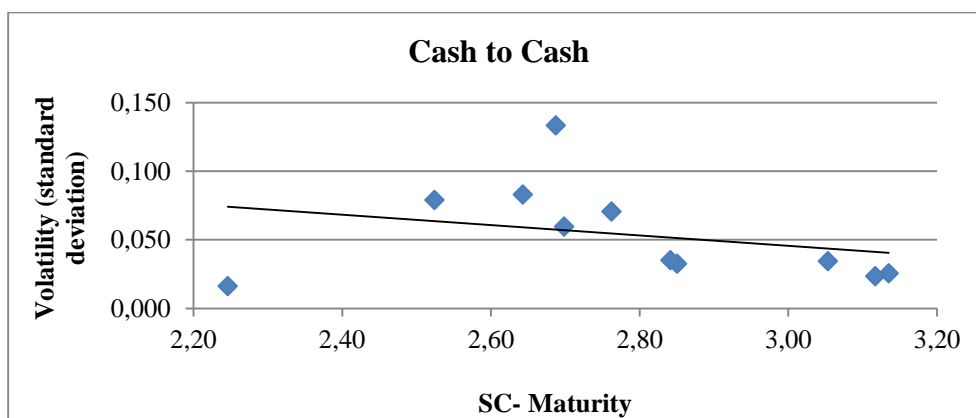


Figure 4.8: Cash-to-Cash Cycle & SC Maturity²⁰⁷

Figure 4.9 points out that there is also a high negative correlation (-0.8367) between ‘competitiveness’ and the volatility of the ‘cash-to-cash’ cycle of a company. This means that companies with higher competitiveness show lower cash-to-cash cycle volatility over the period 2007-2010.

²⁰⁷ Own figure - Financial results volatility correlation analysis.

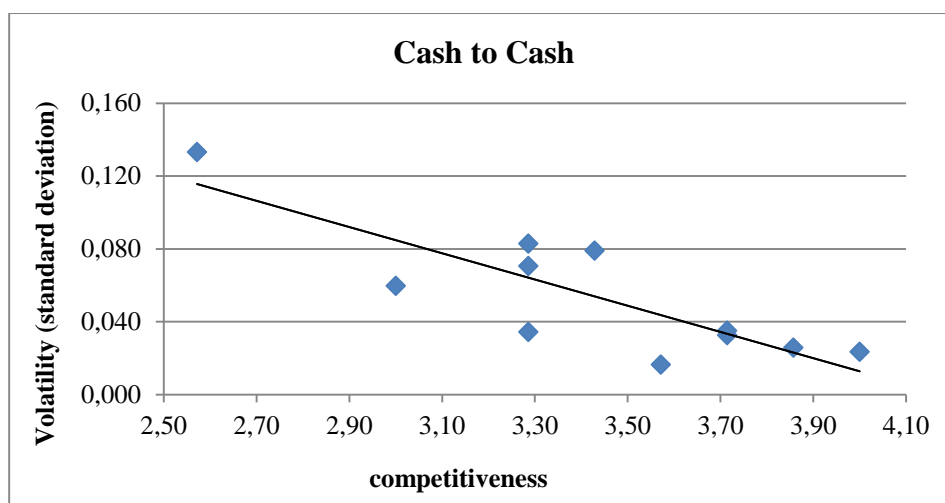


Figure 4.9: Cash-to-Cash Cycle & competitiveness²⁰⁸

Figure 4.10 shows highly negative correlations of ‘leadership & trust’ with the volatility of ‘ROCE’ (-0.8348) and ‘EBIT’ (-0.8367). This means the higher the scores on ‘leadership & trust’, the lower the ‘ROCE and EBIT’ volatility.

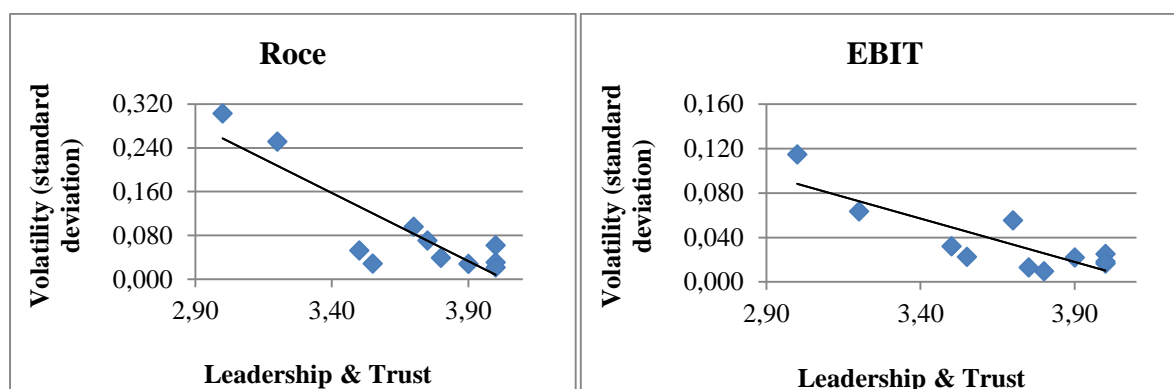


Figure 4.10: ROCE & EBIT and Leadership & Trust²⁰⁹

The discussion of the results with the supply chain managers provided additional insights that companies with higher maturity had more stable results over the three-year period. Customer orientation is higher in companies with higher maturity and these companies also have higher customer satisfaction values (as the figure below shows).

Figure 4.11 shows the profile of a highly mature company in terms of supply chain maturity, customer orientation, and customer satisfaction. This company even showed an improvement

²⁰⁸ Own figure - Financial results volatility correlation analysis.

²⁰⁹ Own figure - Financial results volatility correlation analysis.

of EBIT, ROCE and working capital over the three-year period, although turnover was reduced during the crisis period of 2008 and 2009. The figure at the upper left side shows the maturity profile. Based on the questionnaire developed in chapter 3, the SC maturity was evaluated in four stages, where 4 is the highest stage of maturity and 1 is the lowest (chapter 3.3 SC maturity questionnaire).

The upper left quarter of the upper left side figure shows the attributes of supply chain strategy, manufacturing strategy, sourcing strategy, and planning strategy, where the highly mature company ranked on 4, even above benchmark, which was defined with the top quartile of companies in the sample. This means the company has a clear and explicit SC strategy and SCM is part of strategic management.

Moving clockwise around this figure, organization and infrastructure and SC organization (strategic view of SCM) are the next attributes. Here again the highly mature company is with stage 3 to 4 values on benchmark.

The next attribute moving clockwise is performance management (strategic view of SCM), where the company again ranks on level 4. This means the company has an end-to-end measurement system in place to measure and manage SC performance. The next attributes are practice and process attributes (operative view of SCM), such as demand planning, supply planning, demand and supply balancing, supplier development and management, production scheduling, sourcing processes, material issuing, moving and tracking, manufacturing process control, enabling IT support, order entry and scheduling, warehousing and transport, invoicing and cash collection and supply chain processes.

The highly mature company has the right practices to fit the strategy and is in control of good processes integrated end-to-end (from customer to supplier). The high maturity is reflected in the right upper figure of customer orientation – understanding customer needs and capturing them in written service agreements that are measured regularly – which leads to high customer satisfaction shown in the left lower figure.

These elements together with the right leadership and culture, fostering collaboration and integration (compelling vision, SCM as part of strategic management, cross-functional goal and incentive alignment, full appreciation of SCM and trust in supply chain functions and the supply chain manager), lead to lower financial results volatility, shown in the lower left side figure, even during the period from 2007 to 2010 when demand was very volatile. The highly mature company also saw a decline in turnover, but was able to adjust the end-to-end supply chain in

a way that led to even higher EBIT, ROCE and lower working capital and cash-to-cash cycle results.

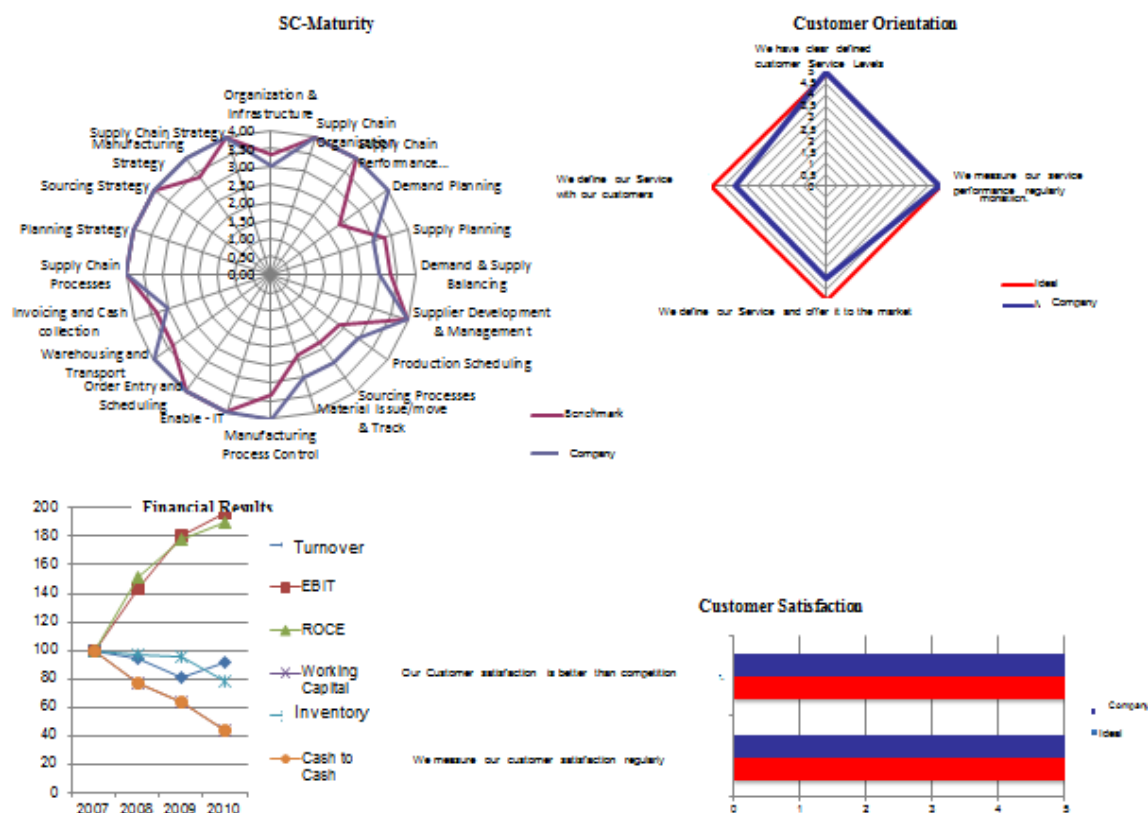


Figure 4.11: Profile of a highly mature company²¹⁰

Figure 4.12 shows a company of very low maturity in terms of supply chain management, low ‘customer orientation’ and lower ‘customer satisfaction’ values, which lead to much higher volatility of results over the three-year period. The upper left quarter of the upper left side figure shows the attributes of supply chain strategy, manufacturing strategy, sourcing strategy, and planning strategy, where the company of low maturity ranked between 1 and 4, in some areas far below benchmark which was defined with the top quartile of companies in the sample. This means the company has no clear or explicit SC strategy and SCM is not part of strategic management.

Moving clockwise around this figure, ‘organization and infrastructure’ and ‘SC organization’ (strategic view of SCM) are the next attributes. Here a company of low maturity is with stage

²¹⁰ Own figure - Company profiles.

1 or 2 values far below benchmark, meaning there is no SC organization to take care of end-to-end process management, collaboration and alignment.

The next attribute moving clockwise is performance management (strategic view of SCM), where the company again ranks only on level 2. This means the company has no end-to-end measurement system in place to measure and manage SC performance. There are some SC performance indicators in place that are measured but not aligned cross-functionally. The next attributes are practice and process attributes (operative view of SCM), such as demand planning, supply planning, demand and supply balancing, supplier development and management, production scheduling, sourcing processes, material issuing, moving & tracking, manufacturing process control, enabling IT support, order entry and scheduling, warehousing and transport, invoicing and cash collection, and supply chain processes.

The company of low maturity has a missing fit of practices: the SC strategy is missing and it is also not in control of end-to-end (from customer to supplier) processes as they are not integrated.

The low maturity is also reflected in the upper right figure of customer orientation. The service levels were defined without customer involvement and they are measured without feedback; this means the effort which is taken may not lead to higher customer satisfaction, as the lower left figure shows, and better returns.

These elements, together with the missing leadership & culture, fostering competition among functions (as a compelling vision is missing and SCM is not part of strategic management, cross-functional goals are indifferent and incentives are not aligned, SCM is seen as a tool for cost reduction and trust in supply chain functions and in the supply chain manager is limited), lead to higher financial results volatility, shown in the lower left figure during the period 2007 to 2010 when demand was very volatile.

The company of low maturity has seen a decline in turnover, but was unable to adjust the end-to-end SC, which led to lower EBIT and ROCE and higher working capital and cash-to-cash cycle results. This case description shows the SCM impact on competitiveness, in which the company of low maturity even faced losses and experienced high volatility in the cash-to-cash cycle.

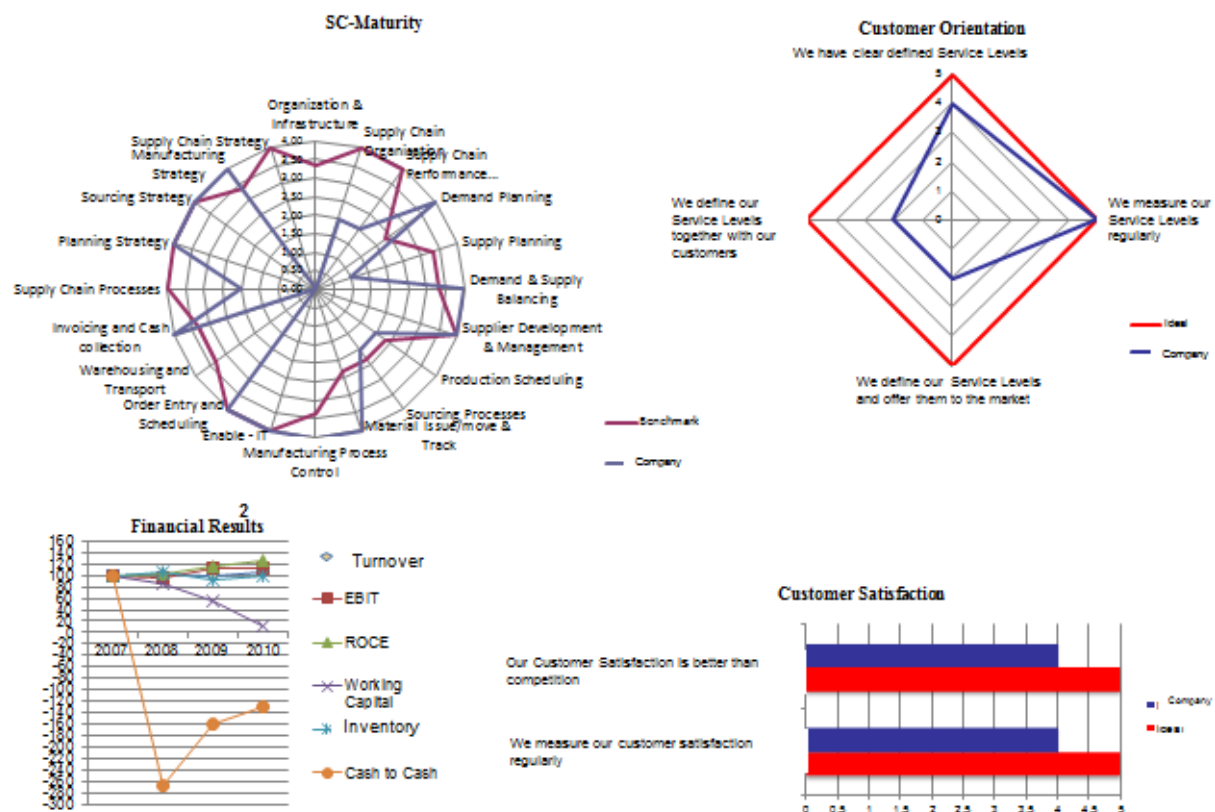


Figure 4.12: Profile of a company of low maturity²¹¹

This shows that the model can be used for SC analysis of supply chain performance and the financial results impact. Based on the analysis, it is also possible to identify the areas for improvement and their possible impact on financial results. In addition, here the author identified during the discussions among the managers that supply chain strategy as part of strategic management is a key element of successful SCM. This strategic importance also triggers a proper SCM organization with strong cross-functional collaboration among sales, production, logistics, finance, procurement, and having a sales and operations planning process in place. Another big part is customer expectation management, which is reflected in ‘customer orientation’, with service levels that are clearly defined and in agreement with customers, measured on regular basis. If these elements were missing, results showed much greater volatility over the four years from 2007 to 2010.

²¹¹ Own figure - Company profiles.

4.4 Testing of sub-hypotheses and interpretation - model validity

For the normally distributed variables, the Bravais-Pearson-correlation coefficient was used. For abnormally distributed or ordinal variables the non-parametric correlation coefficient after Spearman (Spearman's Rho) was used. As normality-distribution-test for continuous variables, the Kolmogorov-Smirnov-test with Lilliefors-correlation was used. Before starting with the interpretation of the sub-hypotheses testing, an example of the interpretation will show how results were interpreted in this section of the study.

Table 4.15: Interpretation of an example²¹²

		Overall Competiveness
Operational Performance	Correlation Coefficient (Spearman's Rho)	0,464
	Sig. (2-tailed)	0,006**
	N	34

There exists a positive correlation between 'operational performance' and 'our competitiveness overall' (large values of operational performance appear with large values of our competitiveness overall and otherwise). The Spearman-correlation coefficient is 0.464 and is statistically significant different from 0 (no correlation) with a p-value of 0.006* (** ... $p < 0.01$, * ... $p < 0.05$). The total number of companies used was 34.

No correction of the type I error was made; therefore the results are only descriptive. Missing values were not replaced. P-values smaller 0.001** are also statistically significant after adjusting for the type I error.

²¹² Own table - Correlation analysis.

The effect size of the correlation coefficient will be interpreted on the basis of the table below, where a value of 0 shows no correlation, a value of 0-0.2 shows a very weak correlation, a value of 0.2-0.4 shows a weak correlation, a value of 0.4-0.6 shows an average correlation, a value of 0.6-0.8 shows a strong correlation and a value of 0.8-1.0 shows a very strong correlation. 1.00 would be perfectly correlated.

The testing of sub-hypotheses was used to examine how well the specified model explains the observed data in terms of goodness of fit indicators, where the Spearman-correlation coefficient indicates the level of internal consistency.

- H1: Customer orientation relates positively to strategic view of SCM.

Table 4.16: Customer orientation relates positively to strategic view of SCM²¹³

		Strategic View (Blocks of SCM)
Customer orientation	Correlation Coefficient (Spearman’s Rho)	0,602
	Sig. (2-tailed)	<0,001**
	N	34

The results confirm a strong correlation between ‘customer orientation’ and ‘strategic view of SCM’, which means companies who define clear service levels and measure them continuously also have a stronger strategic view of SCM such as SCM strategy, SCM performance management and SCM organization.

The p-value of 0.006 confirms a statistically significant correlation of these two elements of the model.

²¹³ Own table - Correlation analysis.

- H2: Leadership & trust is positively related to strategic view of SCM.

Table 4.17: Leadership & Trust and strategic view of SCM²¹⁴

		Strategic View (Blocks of SCM)
Leadership & Trust	Correlation Coefficient (Spearman’s Rho)	0,460
	Sig. (2-tailed)	<0,006**
	N	34

‘Leadership & trust’ shows an average correlation value of 0.46 with ‘strategic view of SCM’ with a p-value of 0.006, meaning the correlation is statistically significant. This indicates that supply chain management is a topic of strategic importance in the company and the supply chain manager has full support and trust in implementing SCM in the organization, which has a significant influence on supply chain strategy, performance management and supply chain organization status.

- H3: Leadership & trust is positively related to high-level supply chain practices.

Table 4.18: Leadership & trust and practice²¹⁵

		Practice
Leadership & Trust	Correlation Coefficient (Spearman’s Rho)	0,022
	Sig. (2-tailed)	0,900
	N	34

The next figure shows low influence of ‘leadership & trust’, with a correlation of 0.022 on high level of ‘supply chain practices’. The correlation is also statistically insignificant at 0.9. The interpretation of this result is that high levels of SCM practices are used in companies independently of top management support by the organization.

²¹⁴ Own table - Correlation analysis.

²¹⁵ Own table - Correlation analysis.

- H4: Strategic view of SCM is positively related to supply chain practices.

Table 4.19: Strategic view & practice²¹⁶

		Practice
Strategic view (Block of SCM)	Correlation Coefficient (Spearman's Rho)	0,630
	Sig. (2-tailed)	<0,001**
	N	34

The 'strategic view of SCM' is strongly positively related to 'SC practices' and the statistical correlation with a p-value of 0.001 are significant. A strategic view of supply chain management, including SCM strategy, SCM performance management and SCM organization, seems to be a strong driver for a high-level use of SC practices such as the sales and operations planning process, supplier and customer collaboration in an organization, and information sharing.

- H5: Leadership & trust is positively related to operational performance.

Table 4.20: Leadership & trust and operative performance²¹⁷

		Operative Performance
Leadership & Trust	Correlation Coefficient (Spearman's Rho)	0,228
	Sig. (2-tailed)	0,194
	N	34

The figure shows that 'leadership & trust' has only a weak correlation with 'operational performance' and the correlation is also statistically insignificant. As the leadership aspects support more the strategic importance and development of SCM, this correlation also shows low direct influence on operational performance, such as delivery reliability, delivery capability and other operational performance indicators.

²¹⁶ Own table - Correlation analysis.

²¹⁷ Own table - Correlation analysis.

- H6: Operational performance is positively related to customer satisfaction.

Table 4.21: Operative performance & customer satisfaction²¹⁸

		Customer Satisfaction
Operative Performance	Correlation Coefficient (Spearman's Rho)	0,462
	Sig. (2-tailed)	0,006**
	N	34

This figure shows an average correlation of 0.462 between 'operational performance' and 'customer satisfaction' with a strong statistical significance of 0.006. This means nevertheless, that better operational performance leads to higher customer satisfaction, meaning higher levels of reliability and capability in the supply chain lead to better customer satisfaction values.

- H7: Operational performance is positively related to financial performance.

Table 4.22: Operative performance & financial performance²¹⁹

		Financial Performance (Mean-Score)
Operative Performance	Correlation Coefficient (Spearman's Rho)	0,344
	Sig. (2-tailed)	0,047*
	N	34

The figure shows that 'operational performance', like delivery reliability, delivery capability and others used in the study, is weakly positively correlated with 'financial performance' factors such as EBIT, ROCE and others used in the study, although the correlation is still statistically significant. This shows that financial results are influenced by many influence factors other than operational performance and therefore correlation is low, but the influence is significant.

²¹⁸ Own table - Correlation analysis.

²¹⁹ Own table - Correlation analysis.

- H8: Customer satisfaction is positively related to financial performance.

Table 4.23: Customer satisfaction & financial performance²²⁰

		Financial Performance (Mean-Score)
Customer Satisfaction	Correlation Coefficient (Spearman's Rho)	0,496
	Sig. (2-tailed)	0,003**
	N	34

This figure shows that 'customer satisfaction' has an average correlation with 'financial performance' but the influence is statistically significant with a p-value of 0.003. The result has to be seen similarly to the previous correlation: financial performance most probably has many other influencing factors, but customer satisfaction is still significant for the financial performance of companies.

- H9: High level of SCM practices is positively related to operational performance.

Table 4.24: Practice & operative performance²²¹

		Operative Performance
Practice	Correlation Coefficient (Spearman's Rho)	0,167
	Sig. (2-tailed)	0,344
	N	34

This figure shows that a 'high level of SC practices' is only weakly correlated, with a value of 0.167, with 'operational performance' and the correlation is also statistically insignificant. The result tells us that a high level of SC practices is not a main driver of operational performance, which can be interpreted as having practices in use that do not necessarily lead to higher performance, as the key driver, also supported by other authors' studies, of how these practices support the strategic approach to SCM and the overall corporate strategy. This also confirms

²²⁰ Own table - Correlation analysis.

²²¹ Own table - Correlation analysis.

that ‘best practices’ can be a risk if merely copied from one company to another, because what fits one company perfectly can harm another business.

- H10: Strategic view of SCM is positively related to competitiveness.

Table 4.25: Strategic-view and competitiveness²²²

		Competitiveness (Mean-Score)
Strategic View (Blocks of SCM)	Correlation Coefficient (Spearman’s Rho)	0,553
	Sig. (2-tailed)	0,001**
	N	34

This figure shows with 0.553 an average correlation between ‘strategic view of SCM’ and ‘competitiveness’, but the statistical influence is significant with 0.001.

This result has to be read similarly to financial performance: there are still other influencing factors on competitiveness and therefore the correlation is only average, but the influence is statistically significant, meaning SCM has a significant influence on the competitiveness of a company.

- H11: High level of SCM practices is positively related to financial performance.

Table 4.26: Practice & financial performance²²³

		Financial Performance (Mean-Score)
Practice	Correlation Coefficient (Spearman’s Rho)	0,102
	Sig. (2-tailed)	0,566
	N	34

This figure shows that a ‘high level of SC practices’ is only weakly positively correlated with 0.102 to ‘financial performance’ and the correlation is also insignificant with 0.566. This seem to confirm the earlier results of this study that the use of SC practices is no indicator of better

²²² Own table - Correlation analysis.

²²³ Own table - Correlation analysis.

performance, be they financial, operational, or in terms of competitiveness, as the next hypothesis will show.

- H12: High level of supply chain practices relate positively to competitiveness.

Table 4.27: Practice & competitiveness²²⁴

		Competiveness (Mean-Score)
Practice	Correlation Coefficient (Spearman's Rho)	0,091
	Sig. (2-tailed)	0,607
	N	34

The figure shows that there is also a weak correlation of 0.091 between 'high level of SC practices' and 'competitiveness'.

As we have already seen in the correlations of operational performance and financial performance, we see a similar picture in terms of competitiveness: a high level of SC practices is not an indicator of better results, be they operational, financial, or overall in terms of competitiveness.

- H13: Customer satisfaction relates positively to competitiveness.

Table 4.28: Customer satisfaction & competitiveness²²⁵

		Competiveness (Mean-Score)
Customer satisfaction	Correlation Coefficient (Spearman's Rho)	0,450
	Sig. (2-tailed)	0,008**
	N	34

This figure shows an average to positive correlation of 0.45 between 'customer satisfaction' and 'competitiveness' and that the correlation is significant with a p-value of 0.008. Customer satisfaction shows an average influence on competitiveness as competitiveness certainly has

²²⁴ Own table - Correlation analysis.

²²⁵ Own table - Correlation analysis.

many more influencing factors than customer satisfaction, but the influence on competitiveness is significant.

- H14: Operational performance relates positively to competitiveness.

Table 4.29: Operational performance & competitiveness²²⁶

		Competiveness (Mean-Score)
Operational Performance	Correlation Coefficient (Spearman's Rho)	0,539
	Sig. (2-tailed)	0,001*
	N	34

This figure shows that 'operational performance' has with 0.539 an average influence on 'competitiveness' and that this influence is significant with a p-value of 0.001. This means better levels of delivery reliability, delivery capability, and through put time than competitors, leading to higher levels of competitiveness.

²²⁶ Own table - Correlation analysis.

Summary of sub-hypotheses, key findings and interpretation

Figure 4.13 shows the overall correlation that the model has a good convergent and discriminant validity. The model validity is high, as most of the p-values show statistical significance.

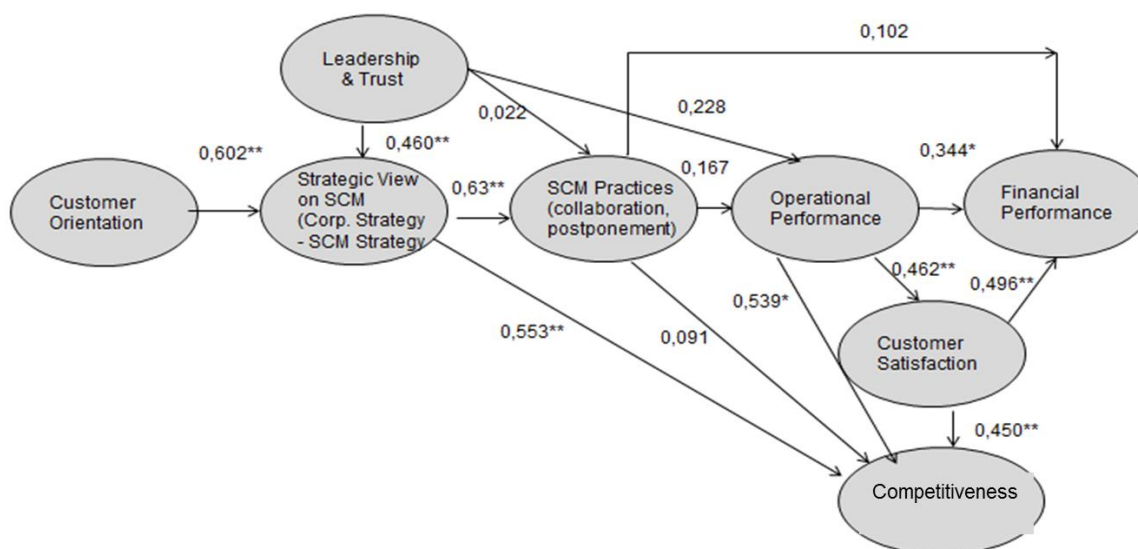


Figure 4.13: Results of SCM impact on firm's competitiveness²²⁷

Notes: * $p < 0.05$; ** $p < 0.01$

The figure shows, first, that there is a correlation between customer orientation and strategic view of SCM and there is a correlation between strategic view of SCM and competitiveness – and both are significant – meaning customer orientation has a significant influence on competitiveness through the influence on the strategic view of SCM. This result suggests that a customer-oriented strategy can help a firm. Therefore it is important to focus its management on satisfying customer needs, which is especially important in highly competitive markets. Second, leadership & trust correlates with the strategic view of SCM and the strategic view of SCM correlates with competitiveness – again, both correlations are significant – meaning that the strategic view of SCM needs leadership support to impact competitiveness. As key decisions are made by top management, only strong management support is able to mobilize and allocate resources to enhance a firm's supply chain capabilities. SCM capabilities focus on cross-functional, cross-company collaboration, goal measurement and alignment across supply

²²⁷ Own figure - Correlation analysis.

chain partners and maximizing benefits for all involved partners with maximum customer satisfaction. These capabilities can only be built if supported by top management. Third, the operative view of SCM has a significant correlation with the strategic view of SCM, reflecting the alignment between strategy and practices. However, practices and processes alone are not sufficient to gain competitiveness. The practices have to fit and enhance the SC strategy. Fourth, the performance measures impacting competitiveness are mainly customer satisfaction, operational performance – having high correlation factors – meaning if customer requirements are met to a high extent, customers are more satisfied and this creates higher loyalty, which in turn creates a higher level of competitiveness. There is as well a positive correlation between customer satisfaction and financial results, as longer-term partnership allows for optimization and transaction cost reductions.

Overall, the interpretation and suggestion to management is that supply chain management significantly impacts the firm's competitiveness by the alignment between corporate strategy, channel strategy, service strategy and supply chain strategy (strategic management). Top management support is a key to SCM strategy execution/implementation cross-functionally and in the extended network of relations, by goal and incentive alignment (leadership & trust). As the independent variables are reflected by supply chain capabilities and organizational behaviours, the model reflects to what extent an organization is using the impact of supply chain management on competitiveness. This means that the model can be used for supply chain analysis of firms, to understand the extent to which supply chain management impacts competitiveness in that specific organization and how better supply chain management would impact competitiveness.

4.5 Results of the regression analysis - path analysis

A regression analysis was used to see how and to what extent the components of the conceptual model explain the supply chain impact the competitiveness of an organization as a total model and not just as a set of sub-hypotheses:

The model components are the building blocks of the model:

- Customer Orientation,
- Overall Supply Chain Performance,
- Leadership & Trust,
- Operative Performance,
- Financial Performance and
- Customer Satisfaction.

Figure 4.14 shows the impact of SCM on a firm’s competitiveness. Competitiveness is explained by the model parameters to a degree of 72.4%. ‘Customer orientation’ with a mean score of 3.32 on the left side and correlation coefficient of 0.12; ‘our supply chain performance overall’ with a mean score of 3.53 (supply chain maturity covering strategic view of SCM and operative view of SCM) and a correlation coefficient of 0.33; ‘leadership & trust’ with a mean score of 3.61 and a correlation coefficient of 0.43; ‘Customer satisfaction’ with a mean score of 3.49 and a correlation coefficient of -0.06; ‘financial performance’ with mean score of 3.39 and a correlation coefficient of -0.03; and ‘operative performance’ with a mean score of 3.49 and a correlation coefficient of 0.15.

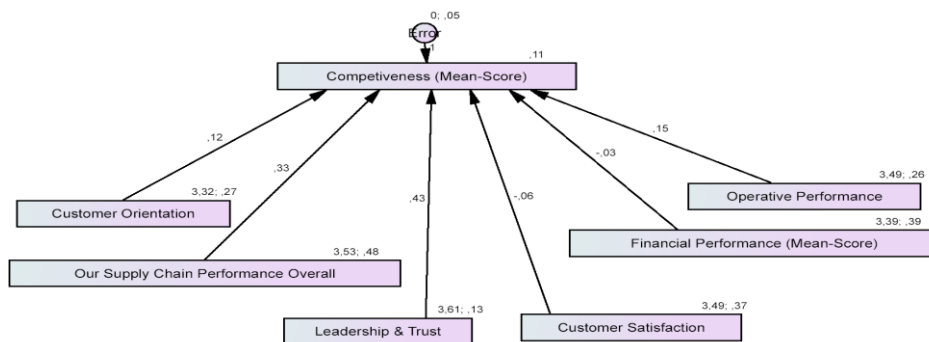


Figure 4.14: Regression analysis²²⁸

²²⁸ Own figure - Structural equation.

Table 4.30: Linear regression and dependent variables of competitiveness²²⁹

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	0,110	0,465		0,236	0,815	-0,845	1,065
Customer Orientation	0,124	0,097	0,140	1,279	0,212	-0,075	0,322
<i>Our Supply Chain Performance Overall</i>	0,333	0,098	0,505	3,385	0,002**	0,131	0,534
Leadership & Trust	0,431	0,166	0,340	2,602	0,015*	0,091	0,771
Operative Performance	0,151	0,111	0,168	1,358	0,186	-0,077	0,378
Financial Performance (Mean-Score)	-0,025	0,082	-0,034	-0,310	0,759	-0,193	0,142
Customer Satisfaction	-0,060	0,103	-0,080	-0,579	0,567	-0,272	0,152

Adjusted R² = 0.724

The model components ‘our supply chain performance overall’ and “leadership & trust” have a statistically high relevance for competitiveness.

In summary, the components used in the model explain competitiveness to a degree of 72.4%, as shown by the adjusted R². This means there are other components missing in the model to explain the full impact on competitiveness. Customer orientation is important to understanding customer requirements and market needs. Supply chain performance overall, covering operational view of SCM and operative view of SCM and leadership & trust, have – as already seen in the correlations of the sub-hypotheses – a significant impact on competitiveness (explanation already provided under 4.4 of this study). The impact of the performance indicators (financial, operational, and customer satisfaction) on competitiveness gives weak results, which can be explained by the variety of industries covered by the interview study. As

²²⁹ Own table - Structural equation.

mentioned in the model development section of this study, supply chain management is a tradeoff between non-financial responsiveness indicators such as delivery accuracy, delivery capability, and short lead times; efficiency indicators such as productivity and costs; profit & loss statement impact indicators; asset utilization indicators such as asset utilization, inventory turns, cash-to-cash cycle; and balance sheet indicators. It is obvious that with the small sample, we might have different prioritizations and therefore the correlation of performance indicators on competitiveness seems to be low.

In fact, the sample size is still too small for such statistical methods, and it would be necessary to conduct a hundred or more interviews to deliver stable results. This is also reflected by the tested goodness of fit indices - Tucker-Lewis-Index (TLI) = 0.157 (should above 0.9 for good fit) RMSEA (root mean square error of approximation) = 0.363 (should be about 0.05 or less for good fit). As the database will be used further, this could be validated in a couple of years.

4.6 Correlation analysis between the constructs of the conceptual model

In addition to the sub-hypotheses and the path analysis of the constructs of the conceptual model, the author checked how well the model explains the observed data on several additional valuable correlations. This was done to further strengthen validity and reliability of the model and to understand other correlations within the model that were not specified up front as sub-hypotheses.

The following additional correlations were examined:

Our supply chain performance is better than our peers

The correlation between ‘operative performance’ and ‘supply chain performance’ is high and significant. The attributes ‘delivery reliability’ and ‘delivery capability’ correlate with 0.659** and with 0.362* significance with operational performance. The overall operative performance has an impact on supply chain performance with 0.437*. This means that the key drivers of supply chain performance are delivery reliability, delivery capability and lead times, which are the key service determinants in terms of product availability and service reliability, getting products delivered on time, in full.

Overall-construct correlations of the model

The correlation between ‘competitiveness’ and ‘supply chain performance overall’ (0.742**), ‘customer satisfaction’ (0.45**), ‘SC maturity overall’ (0.582**) and ‘leadership & trust’ (0.587**) is between medium and high and statistically significant, which reflects that the model has a strong construct validity and SCM has a significant influence on competitiveness.

The ‘supply chain performance overall’ correlates as well on an average level with ‘financial performance’ (0.459*), ‘customer satisfaction’ (0.635**), ‘SC maturity overall’ (0.428*) and ‘leadership & trust’ (0.486**) and the correlations are statistically significant. This means that SC performance has a significant influence on competitiveness and leadership & trust has a significant influence on supply chain performance. Supply Chain performance can also be seen as significant for customer satisfaction, which is a key driver of business success. These correlations show, as already mentioned in earlier parts of this work, that supply chain management impacts competitiveness through SC maturity (strategic and operative view of SCM) measured as a capability indicator of how well the organization is doing in terms of SCM and supported by top management. The effect of SCM can be seen in terms of financial performance, supply chain performance, customer satisfaction, and these effects again have an impact on the competitiveness of organizations.

Correlations between company priorities and customer satisfaction

The correlation of ‘customer orientation’ attributes shows that productivity (-0.556**) correlates significantly negatively with turnover.

There is also a statistically significant negative correlation between costs (-0.57**) and customer satisfaction, which means for supply chain management that the prioritization of costs and responsiveness has a significant influence on customer satisfaction (as explained in chapter 3 - model development frame). This further means that missing priorities and alignment between internal functions will have a significant negative impact on customer satisfaction, as functional silos will optimize their functional area, and in direct response this will impact negatively the competitiveness of the firm.

This means that company priorities should fit customer expectations, and this is only possible if customer expectations are known – meaning covered in a structured way by service levels and other methods of documentation and analysis.

Table 4.31: Correlation between leadership & trust and its building blocks²³⁰

Correlation Coefficient (Spearman's Rho)		Idealized Influence	Individual Consideration	Inspirational Motivation	Intellectual Stimulation
Idealized Influence	Correlation Coefficient		,538**	,612**	,294
	Sig. (2-tailed)		,001	<0,001	,092
	N		34	34	34
Individual Consideration	Correlation Coefficient	,538**		,625**	,423*
	Sig. (2-tailed)	,001		<0,001	,013
	N	34		34	34
Inspirational Motivation	Correlation Coefficient	,612**	,625**		,281
	Sig. (2-tailed)	<0,001	<0,001		,107
	N	34	34		34
Intellectual Stimulation	Correlation Coefficient	,294	,423*	,281	
	Sig. (2-tailed)	,092	,013	,107	
	N	34	34	34	

The correlation of the building blocks on 'leadership & trust' shows that there is an average correlation between 'idealized influence', 'individual consideration' (0.538**), and a strong correlation of 'inspirational motivation' (0.612**), which is also statistically significant. For the SCM impact on competitiveness, this means a strong leader with a clear and compelling vision of SCM, who acts in a coherent way according his vision and supports followers on the path of implementation, will succeed and create a strong impact of SCM on competitiveness.

²³⁰ Own table - Multi regression analysis.

There is a strong correlation between ‘individual consideration’ and ‘inspirational motivation’ (0.625**), which means that trust and relationships are key elements for people to believe in the vision of the leader and trust his input. If people feel trusted, they will also believe the vision of the leaders, which is a highly sensitive topic in SCM. The correlation of ‘intellectual stimulation’ and ‘idealized influence’ (0.294) is low, as these two aspects have different directions. Intellectual stimulation is about questioning the status quo in constructive way, and idealized influence is about acting like praying; this may explain the weak correlation. Questioning things can sometimes counteract the “walk-the-talk” story.

‘Inspirational motivation’ is strongly correlated with ‘idealized influence’ (0.612**) and ‘individual consideration’ (0.625**) and the correlation is statistically significant, which means that a visionary leader is more trusted by the people, but he has to be open to his reports and support them in their work. In SCM especially, this is a key success factor. Does the leader or leaders have a compelling vision of SCM? Does he or she “walk the talk” – i.e. live the vision – and take care of followers and their concerns and support needs? If so, then SCM creates a strong, positive impact on competitiveness. In terms of SCM, “walk the talk” means if we have cross-functional collaboration and optimization, all functional heads must be aligned in terms of performance measures and incentives, with supply chain targets. No one maximizes his functional target at the cost of all or some other targets. The discussion about alignment is based on strategic priorities and tradeoffs among the indicators and not on hierarchical power.

This is the key element of this work: examining leadership behavior and how that behavior supports SCM strategies and implementation. Having conducted an intense review of the literature, it is fair to say that no one has ever looked before into this kind of correlation between SCM and leadership & trust, yet it is essential to SCM impact and success.

Correlation between financial performance and its building blocks

The statistical analysis proves that there is a strong correlation between ‘our financial performance within our industry’ and our ROCE, EBIT, WC, C2C and ‘our financial performance compared to peers’ (0.395* - 0.633**), which is also statistically significant with p-values < 0.01. This means companies belonging to the top performers of the industrial sector also show better financial results in terms of ROCE, EBIT, WC, C2C and overall financial performance. Inventories do have a significant impact on ROCE, EBIT, WC (0.389*-0.681**), which means there is an indirect effect of inventories on financials, through working capital and financing costs of inventories on EBIT and ROCE. This means the financial figures used

for financial performance evaluation have the biggest influence on the financial performance of companies compared to peers and compared to an entire industry.

Correlation of competitiveness constructs

The study confirms a strong correlation between ‘overall competitiveness compared to peers’ and ‘costs’ (0.698**), and an average correlation to ‘service’ (0.369*) and ‘supply chain performance’ (0.453**). On the other hand, products, prices, and assortment show weak correlation with competitiveness. This can be explained in a highly competitive market environment, where products are no longer a real differentiator – as quality is more a hygiene factor than a differentiator. Prices are given by supply and demand on the market. The assortment is not a key differentiator as long as it is in line with market. This leaves costs, service and supply chain performance (product availability and delivery reliability) as major impact factors on competitiveness – getting the right product for the right price, at the right cost, at the right time, into the right place, in the right quantity and quality. Differentiation through a set of activities, as explored by a study of the literature, creates a sustainable competitiveness. This is the reason why SCM, once implemented successfully, definitely creates sustainable competitiveness, as shown by many industry leaders.

Correlations between supply chain maturity overall and model construct

The examination shows an average correlation of ‘supply chain maturity overall’ on ‘customer orientation’ (0.523**), and a weak correlation of ‘financial performance’ (0.347*), and a weak correlation of ‘competitiveness’ (0.344*), but the influence is statistically significant. This means that SCM capabilities impact how customer requirements and market needs are identified and incorporated in the supply chain design and execution. The capabilities also have a strong influence on financials, but of course there are other factors in the business impacting financial success and the same applies for competitiveness. On the other hand, this impact becomes visible in terms of performance factors impacting financials and competitiveness where no one draws a correlation with SC capabilities, as their impact is very often indirect – e.g. better service delivers higher customer satisfaction; higher customer satisfaction provides better returns and higher loyalty at lower costs.

The ‘operative performance’ has an average correlation with ‘competitiveness’ (0.539**) and a weak correlation with ‘customer satisfaction’ (0.462*) and ‘financial performance’ (0.344*) but is again statistically significant with p-values below 0.01. The operative performance has a

strong impact on competitiveness, as here the effects of maturity are measured in terms of performance indicators.

‘Leadership & trust’ correlates on an average level with ‘customer orientation’ (0.509**), ‘competitiveness’ (0.587**), ‘customer satisfaction’ (0.406*) and on a weak level with ‘financial performance’ (0.367) in a statistically significant way. This confirms that SCM requires top management support, because customer orientation is already supply chain behavior. The leadership impact on competitiveness is driven by a clear and compelling vision, and strategy and cross-company alignment are behaviors necessary for SCM success. In other words, the supply chain behavior is indirectly visible in the importance of leadership on competitiveness.

‘Customer satisfaction’ correlates to an average degree with ‘leadership & trust’ (0.406*), ‘operative performance’ (0.462**), ‘financial performance’ (0.496**) and ‘competitiveness’ (0.45**), and is again statistically significant. The result of good SCM is good service and this in turn leads to higher customer satisfaction and this in turn leads to better financials and competitiveness. The leadership aspect is similar to what was mentioned earlier, as supply chain behavior is reflected in leadership. This is one of the most important correlations as it shows the cross effects between the constructs of the model and strengthens further the validity and reliability of the SCM impact on competitiveness of firms.

Customer satisfaction in correlation with customer orientation

Customer satisfaction

- Product quality, price, service, delivery accuracy, delivery capability, innovation, assortment

Customer orientation

- Productivity, costs, turnover, customer satisfaction

The author developed three propositions that were checked by statistical analysis.

- Proposition 1: If price is important for the customer, then costs and productivity should be a priority for the company.

Table 4.32: Linear regression - dependent variable: price²³¹

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	5,733	1,130		5,074	<0,001**	3,415	8,051
Costs	-0,035	0,270	-0,025	-0,128	0,899	-0,588	0,519
Productivity	-0,097	0,335	-0,056	-0,289	0,775	-0,784	0,590

Adjusted R² = 0

Cost and productivity are negatively correlated with price. If a company wants to differentiate through service performance, then costs and productivity cannot be highest ranked among priorities. As we have a full range of industries, these correlations do not make sense, although for a single company for analysis purposes, this would be useful to see if the company's priorities are in line with the market or customer priorities.

- Proposition 2: If customer satisfaction is important, then quality should be a priority

Table 4.33: Linear regression - dependent variable: product quality²³²

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	4,976	0,880		5,655	<0,001**	3,176	6,775
Customer satisfaction	-0,102	0,281	-0,067	-0,361	0,721	-0,677	0,474

Adjusted R² = 0

Customer satisfaction is negatively correlated with product quality. Showing that product quality is only a qualifier – a hygiene factor – and not a key criterion of customer satisfaction. Companies with poor-quality products run the risk of being out of market rather than it having

²³¹ Own table - Multi regression analysis.²³² Own table - Multi regression analysis.

an impact on customer satisfaction – as such companies are not around anymore. This confirms the earlier statement that the product alone is no longer a differentiator and, if it is, it will not be sustainable as it is easier to copy a product, compared to a set of activities that is even driven by complex leadership and organizational capabilities, to be accomplished successfully.

- Proposition 3: If customer satisfaction is important, then service and delivery reliability and capability should be priorities.

Table 4.34: Linear regression - dependent variable: customer satisfaction²³³

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	3,122	1,044		2,990	0,006**	0,980	5,265
service	0,005	0,126	0,009	0,040	0,968	-0,254	0,264
Delivery reliability	-0,050	0,126	-0,083	-0,396	0,696	-0,308	0,209
Delivery capability	0,004	0,127	0,007	0,032	0,974	-0,256	0,264

Adjusted R² = 0

Service and delivery capability are positively correlated with customer satisfaction. Delivery reliability is negatively correlated with customer satisfaction. This reflects a similar picture to that of product quality. Delivery reliability is a hygiene factor – receiving a delivery as ordered is seen as normal. The service and the delivery capability are qualifiers and differentiators in terms of customer satisfaction, and therefore impact competitiveness positively.

Influence of strategic and operative supply chain management on key model elements

The SCM maturity components were grouped into strategic blocks and operative blocks. The strategic block reflects SCM strategy, SCM organization and SCM performance management, and the operative block reflects SCM processes and practices, and maturity overall. The SC-maturity questions were grouped into these categories, and categories were assigned to the

²³³ Own table - multi regression analysis.

blocks as mentioned above.

Table 4.35: Influence of strategic SCM and operative SCM on key elements of the model²³⁴

		Operativ View (Blocks of SCM)	Strategic View (Blocks of SCM)
Customer Orientation	Correlation Coefficient	,445**	,602**
	Sig. (2-tailed)	,008	,000
	N	34	34
Operativ View (Blocks of SCM)	Correlation Coefficient		,759**
	Sig. (2-tailed)		,000
	N		34
Strategic View (Blocks of SCM)	Correlation Coefficient	,759**	
	Sig. (2-tailed)	,000	
	N	34	
Our financial performance in comparison to our competitors is	Correlation Coefficient	,084	,255
	Sig. (2-tailed)	,642	,152
	N	33	33
Our financial performance in our industry is..... (answers	Correlation Coefficient	,121	,266
	Sig. (2-tailed)	,503	,135
	N	33	33
Our supply chain performance is... than	Correlation Coefficient	,091	,461**
	Sig. (2-tailed)	,607	,006
	N	34	34
We are overall ...in terms of competitiveness than your	Correlation Coefficient	,171	,400*
	Sig. (2-tailed)	,333	,019
	N	34	34

The 'strategic view of supply chain management' shows a strong positive correlation with 'customer orientation' (0.602**) and with the 'operative view of SCM' (0.759**) and an average correlation with 'supply chain performance compared to peers' (0.461**) and with 'competitiveness' (0.400*) compared to peers. This picture reflects the strong impact of customer orientation on SCM, as only once an organization has identified customer requirements is it capable of designing and developing a strategy to support the fulfillment of those needs. The right supply chain strategy triggers then the right operative steps for

²³⁴ Own table - Multi regression analysis.

implementation, which can be seen by the strong correlation with the operative view of SCM. This shows that processes and practices have less influence on competitiveness than strategic aspects of SCM, such as strategy, organization and performance management. The strategic capabilities, combined with the leadership aspects of inspirational motivation (0.493**) – visible by clear and compelling vision of the leader – individual consideration (0.388*) – visible by personal appreciation and support of followers – impact financial performance and competitiveness, as mentioned above. Overall, SCM must be a strategic matter and supported by top management to impact positively on competitiveness.

The correlation between ‘customer orientation’ and ‘operative view of SCM’ (0.445**) is also statistically significant. This means once it is decided on the strategic level to be implemented, it also needs the right understanding on the operative level to use the right practices for successful implementation of the strategy. Leadership is not significantly correlated to the operative view of SCM, as the aspects covered by leadership have to be lived on strategic level to enable operative work, so the influence may be reflected indirectly by the strong correlation between operative view and strategic view of SCM.

4.7 Additional interview information

During the interviews, the following additional topics could be identified:

- Most of the companies have not formalized their service levels.
 - There is no written document that captures service levels in a standardized way.
 - Service levels are not captured by information systems to be checked electronically at order entry.
- Service levels are defined from the company point of view without customer involvement.
 - Services are mostly defined by the company without any involvement of customers, because the customer could want things that are not easily possible for the company.
- The supply chain strategy is not formalized.
 - There is no document existing in most of the companies where the supply chain strategy is written in an explicit form; yet it is known implicitly.

- Financial figures are mostly unknown to the SCM managers.
 - The ROCE, EBIT, working capital, and cash-to-cash cycle are unknown to SCM managers; not meaning they don't know the numbers at all, but it is not a key figure for their work and therefore they generally don't know the figures and have to ask finance departments for information.
 - Inventories and transport costs are known by most of the supply chain-managers.
- The qualitative SCM performance is not measured regularly by about 30% of the companies and 20% do measure it, but wrongly.
 - Delivery reliability is only correctly measured by half of the companies in the study.
 - Delivery capability is measured by even less than 50% of the companies, and
 - Order fulfillment lead times are only measured by one third of the companies in this study.
- There is no supply chain segmentation based on different service requirements.
 - Most of the companies have one supply chain set-up for the entire business although they have different service requirements.
- The complexity is not measured to a high degree.
 - Complexity is not quantified and therefore not measured. This could be driven by input factors (raw materials), assortment, markets, customers, networks, and others.

SUMMARY, CONCLUSIONS AND IMPLICATIONS

Summary of research

The summary of the empirical research discusses the methods of research, considers the contribution of the research findings to the literature and theory, reviews the implications of the findings, discusses the limitations of the research, and concludes with suggested recommendations for managerial practice.

Methods of research and research findings

This study employed a study of the literature based on theory, theoretical models and case studies to understand constructs of supply chain management and how SCM impacts the competitiveness of organizations. The study of the literature confirmed that SCM has an impact on a firm's competitiveness in six ways. First, an organization needs customer orientation; this means it has to identify and understand the customer requirements/expectations and market needs. Second, a supply chain strategy that is in line with corporate strategy and channel and service strategy, has to be developed to respond to the market needs in an effective and differentiating way and answer priorities of the triangle of – responsiveness, efficiency and asset utilization – by using financial and non-financial performance figures for evaluation. Third, principles and practices best fitting the strategy have to be developed to execute the strategy. Fourth, leadership and top management support are necessary to effectively implement SCM in terms of vision, mission, strategy, and in terms of leadership behavior (transformational leadership) supporting supply chain orientation. Fifth, performance management indicators and incentive schemes have to be developed and implemented to drive SC orientation and align business functions and cross- company relations. Sixth, SC-performance has to meet customer expectations driving customer satisfaction, which has a positive influence on competitiveness. These six elements are also part of the definition used for this study.

Based on these elements, through a study of the literature on SCM models and case studies, the conceptual model was generated. The model covers the following elements: 'customer orientation', 'strategic view of supply chain management', 'operative view of SCM (supply chain practices and processes)', 'leadership & trust', 'operational performance', 'financial performance', 'customer satisfaction', and 'competitiveness'. Less than 30% of all models studied covered 'leadership' as an element, and those 30% did not touch it as behavior, following the elements of leadership (inspirational motivation, individualized consideration,

intellectual stimulation, and idealized influence). Less than 50% of the models studied evaluated the impact on competitiveness.

The model was evaluated in two different ways:

1. With a questionnaire-based study for 34 companies which were selected randomly fitting the sample criteria: A standard questionnaire was evaluated by academic and professional experts. The survey was conducted by semi-structured interviews with senior supply chain managers within the respective companies. As the questionnaire had an explorative character, the author decided to carry out the questionnaire in an interview form. The questionnaire based interviews ensured validity in three ways:
 - It was possible to uncover important information beyond the semi-structured questionnaire with narrative parts (see chapter 4.7), as there was also the possibility of explaining terms of questions if the interviewee asked for clarification.
 - Different industry specifics could be understood and discussed to ensure that the result reflected the right context.
 - Interviews were conducted by different people to ensure the results were not influenced by the author's own bias.
2. Benchmarking exercise with 12 Austrian-based companies, included in the 34, where the maturity results of the questionnaire were put in relation to the volatility of their respective financial results for the years 2007 to 2010.
 - These results showed a high correlation between their SCM maturity and the volatility of financial results during this volatile period of time (financial crisis in Europe).
 - The results were discussed with the supply chain managers of the respective companies to really understand the main differences of their maturity levels.

This triangulation approach was done to validate the model with real cases and not just with questionnaires where the financial figures were only answered relative to competition, but not in terms of figures. The discussion with the supply chain professionals was very valuable in validating the model with daily practice in reality. The questionnaire-based study with the 34 interviews, in which the 12 companies are included, was evaluated in the following way:

Through the use of a factor analysis, the research variables were reduced to a few principle components. The factor loadings showed average to high loadings of the questions to the

components with average to high statistical significance, which confirmed not only reliability and construct validity but also discriminant and convergent validity.

The fourteen sub-hypotheses developed and examined by observed data in this study were perfectly confirmed. Nevertheless, there is a weak correlation between ‘operative view of SCM = practices and processes’ and the other parts of the model, and an average correlation between ‘strategic view of SCM’ and the other parts of the model with a high statistical significance, but this is driven by the sample size and the number of different industries in the sample.

The results confirm a strong correlation between ‘customer orientation’ and ‘strategic view of SCM’, which means companies who define clear service levels and measure them continuously also have a stronger strategic view of SCM, such as SCM strategy, SCM performance management and SCM organization. The p-value of 0.006 confirms a statistically significant correlation of these two elements of the model.

‘Leadership & trust’ shows an average correlation value of 0.46 with ‘strategic view of SCM’ with a p-value of 0.006, which means the correlation is statistically significant. This means supply chain management is a topic of strategic importance in the company, supply chain strategy is developed with the management, and the supply chain manager has full support and trust in implementing SCM in the organization. This has a significant influence on supply chain strategy, performance management, and customer satisfaction which has in turn a high impact on the competitiveness of the organization.

There is a low correlation of ‘leadership & trust’, with 0.022 on a high level of ‘supply chain practices’. The correlation is as well statistically insignificant with 0.9. The interpretation of this result is that high levels of ‘SCM practices’ are used in companies independently of top management support by the organization.

The ‘strategic view of SCM’ is strongly positively related to ‘SC practices’ and the statistical correlation with a p-value of 0.001 are significant. A strategic view of supply chain management, such as SCM strategy, SCM performance management, and SCM organization, seems to be a strong driver of a high-level use of ‘SC practices’, such as sales and operations planning process, and supplier and customer collaboration in an organization.

‘Leadership & trust’ has only a weak correlation with ‘operational performance’ and the correlation is also statistically insignificant. As the leadership aspects support to a greater degree the strategic importance and development of SCM, this correlation also shows low direct

influence on operational performance, such as delivery reliability, delivery capability and other operational performance indicators.

There is an average correlation of 0.462 between 'operational performance' and 'customer satisfaction' with a strong statistical significance of 0.006. Nevertheless, this means better operational performance leads to higher customer satisfaction, meaning higher levels of reliability and capability in the supply chain lead to better customer satisfaction values.

'Operational performance', like delivery reliability, delivery capability and others used in the study, is weakly positively correlated with 'financial performance' measures like EBIT, ROCE and others used in the study, although the correlation is still statistically significant. This shows that financial results are influenced by many other influence factors than operational performance and therefore correlation is low, but the influence is significant.

'Customer satisfaction' has an average correlation with 'financial performance', but the influence is statistically significant with a p-value of 0.003. The result has to be seen similarly to the previous correlation: financial performance most probably has many other influencing factors, but customer satisfaction is still significant for the financial performance of companies.

A 'high level of SC practices' is only weakly correlated, with a value of 0.167, with 'operational performance' and the correlation is also statistically insignificant. The result tells us that a high level of SC practices is not a main driver of operational performance. This can be interpreted to mean that having practices in use does not necessarily lead to higher performance, as based on literature the key driver is how these practices support the strategic approach to SCM and the overall corporate strategy. This confirms as well that 'best practices' can be a risk if merely copied from one company to another, because what fits perfectly in one company can harm another business.

With 0.553 there is an average correlation between 'strategic view of SCM' and 'competitiveness', but the statistical influence is significant with 0.001. This result has to be read similarly to that of financial performance: there are still other factors influencing competitiveness and therefore the correlation may be only average but the influence is statistically significant, meaning SCM has a significant influence on the competitiveness of a company.

A 'high level of SC practices' is only weakly positively correlated to 'financial performance' with 0.102, and the correlation may be also insignificant with 0.566. This seems to confirm the

earlier results of this study that the use of SC practices is not an indicator of better performance, be they financial, operational, or in terms of competitiveness, as the next hypothesis will show.

There is a weak correlation of 0.091 between 'high level of SC-practices' and 'competitiveness'. As we have already seen in the correlations of operational performance and financial performance, we also see a similar picture in terms of competitiveness – a high level of SC practices is not an indicator of better results, be they operational, financial, or overall in terms of competitiveness.

This figure shows that 'customer satisfaction' correlates positively to an average degree to 'competitiveness' with 0.45, and that the correlation is significant with a p-value of 0.008. Customer satisfaction shows an average influence on competitiveness as competitiveness certainly has many more influencing factors than customer satisfaction, but the influence is significant on competitiveness.

'Operational performance' has with 0.539 an average influence on 'competitiveness' and this influence are significant with a p-value of 0.001. This means that better levels of delivery reliability, delivery capability, and through put time than competitors lead to higher levels of competitiveness in companies.

The causal relations of the model explain the SCM impact on competitiveness to a degree of 72.4%. The highest correlation with 'competitiveness' is shown by 'leadership & trust' with 0.431 which is statistically highly significant with a p-value < 0.015 and by 'supply chain performance overall compared to peers' with 0.333 and a p-value of < 0.02 . Nevertheless, goodness of fit measures showed weak results, as they do not work with such small sample sizes. A sample of 34 is definitely too low; we would need a sample of a hundred or more interviews.

The analysis and synthesis of the conceptual model provides a set of supply chain management factors that are causal for competitiveness in a specific environment for the industrial sectors covered by the study.

Limitations

The validity is limited to the industries captured by the study and the validity and reliability of the conceptual model is limited in terms of parameters taken into consideration.

The study only covers companies in developed countries and would therefore need further research for a different economic environment. From a cultural background, the study is valid only for the cultures in which the companies analyzed are operating. The interviewees were

only Supply Chain managers and logistics or operations managers, due to the fact that the matter especially in terms of Supply Chain maturity requires deep knowledge of sales and operations planning processes.

The model was validated based on 34 interviews, which, of course was rather low in terms of statistical validity, but it was not feasible to conduct a higher number of interviews for this study with reasonable effort and time. Validity was increased by a triangulation with a group of supply chain managers of top-performing companies, in which questionnaire results were discussed in detail concerning their operative and financial figures and the impact on competitiveness.

Further limitations discovered by the author:

The model is only valid for companies operating in a polypolistic market environment.

The statistical validity of the path analysis is limited by the fact that the sample size is still too small for such statistical methods. It would be necessary to conduct a hundred or more interviews to deliver stable results. This is also reflected by the tested goodness of fit indices - Tucker-Lewis-Index (TLI) = 0.157 (should above 0.9 for good fit) RMSEA (root mean square error of approximation) = 0.363 (should be about 0.05 or less for good fit). As the database will be used further, this could be validated in a couple of years.

Conclusions and recommendations for managerial practice

Conclusions

1. The critical success factors of SCM that were determined have an impact on competitiveness and shall be applied by companies as they can provide higher level of competitiveness. The most important critical success factors are ‘customer orientation’, ‘strategic view of SCM’, ‘leadership & trust’, and ‘customer satisfaction’.
2. Top management support in companies is necessary to effectively implement SCM in terms of vision, mission, strategy, and leadership behavior.
3. The model developed by the author shall be applied by companies for Supply Chain analysis and design as it shows a high convergent and discriminant validity and the significance of the correlations among the components of the model is high.

4. The components of the model explain to a degree of 72.4% the SCM impact on the competitiveness of organizations. Thus the model is highly valuable and shall be used by companies for supply chain analysis and supply chain design
5. Existing literature overrates the operative view (processes and practices) of SCM and underrates the strategic view of SCM, companies should therefore focus on strategic SCM instead on SCM practices.
6. Companies have to identify market, channel and customer requirements as they are highly important for SCM impact on competitiveness.
7. Supply Chain managers need solid financial knowledge as it is crucial to SCM impact on competitiveness.
8. SCM strategy formulation is important for companies as missing SC strategy formulation leads to lower impact of SCM on competitiveness.
9. Companies need a high level of SC maturity to keep financial volatility low as the volatility of financial results over the period 2007-2010 shows a high correlation with supply chain maturity.
10. Companies shall implement SCM as competitiveness can be increased through SCM, as a set of activities that sustainably differentiates a company from its peers.

In general it can be said that organizations with higher levels of SCM maturity and higher leadership & trust from management, design and implement supply chain management in a way that supports the competitiveness of organizations.

The results confirm the hypothesis that SCM and its implementation has a positive impact on competitiveness of business organizations.

Recommendations for managerial practice

1. Organizations have to understand supply chain management as a management philosophy that, along with its implementation, can contribute substantially to competitiveness. This topic includes two main inputs – management philosophy and implementation – because the management philosophy impacts competitiveness only once implemented properly.
2. Organizations need to build SCM as part of the strategic management of the organization. SCM has to be part of strategic management to have a positive effect on competitiveness. SCM strategy has to be in line with corporate strategy and channel

strategy. All functional areas of the organization have to be committed to the SCM strategy and its implementation.

3. Organizations have to capture customer and market requirements properly, document them, measure them, take action on deviations and communicate them back to customers explicitly. Only if customer requirements are properly understood can the supply chain be designed (fit) effectively for competitiveness.
4. Organizations have to develop a strategy that is based on market/customer requirements and in line with their own asset networks, and set strategic priorities for the triangle of – responsiveness, efficiency and asset utilization – to deliver maximum benefits for the company and value to the customer. Prioritization is a major driver of success, as it brings clarity and focus into the organization across business functions.
5. Organizations should develop a limited set of performance indicators (only about 10 to 12 figures maximum), fitting into a performance pyramid/system, to steer and monitor SCM strategy implementation and align incentives of involved stakeholders.
6. Organizations have to develop and use/implement the right SC practices to deliver the strategy successfully. The practices have to be used in a way that they deliver maximum value, meaning not every practice makes sense for every supply chain; there has to be a fit with the operating model.
7. Organizations should use the model developed by the author on a managerial basis for supply chain analysis/diagnostics and implementation of projects or for adoption of existing supply chain models. The 360-degree view of the model reflects the supply chain impact, for the respective company, on competitiveness.
8. Organizations should install a fully trusted supply chain manager with solid financial knowledge and good access to financial data, as financial data are important for the impact of SCM on competitiveness. It is important that the supply chain manager has the full support of the organization, because his work of coordination and collaboration affects all business functions. The financial knowledge/data access is highly important as SCM has a huge impact on financial figures such as ROCE, cash-to-cash cycle, EBIT, asset returns and supply chain costs. Financial success indirectly raises competitiveness.
9. Organizations need to develop a leadership culture with a clear vision, trust, and empowerment, alignment of targets and incentives, and collaboration across functions and across the company. Leaders have to communicate a compelling vision of SCM and they have to foster trust among employees as collaboration works only among

people who feel trust. Only with the right leadership culture can the SCM impact on competitiveness be maximized.

10. Organizations have to understand and use SCM as a competitive instrument/weapon in a highly competitive and volatile market environment, and develop it as a set of activities that differentiates a company sustainably from its peers, because it is very difficult to copy or imitate.

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WORDS OF GRATITUDE

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APPENDIX

Supply Chain study questionnaire

1. Which industrial sector is your company in?

Industrial sector	
Assembly industry	<input type="checkbox"/>
Chemical & pharmaceutical industry	<input type="checkbox"/>
Process industry	<input type="checkbox"/>
Automotive industry	<input type="checkbox"/>
Merchandise	<input type="checkbox"/>
Other	<input type="checkbox"/>

2. What is the number of employees in your company?

Number of employees	
< 200	<input type="checkbox"/>
201 - 500	<input type="checkbox"/>
501 - 1.000	<input type="checkbox"/>
> 1.000	<input type="checkbox"/>

3. What was the turnover in 2010 in Million Euro?

Turnover	
< 50 Mio. €	<input type="checkbox"/>
51 - 200 Mio. €	<input type="checkbox"/>
201 - 1.000 Mio. €	<input type="checkbox"/>
> 1.000 Mio. €	<input type="checkbox"/>

4. What is your role in the company?

Name of function	
Supply Chain Management	<input type="checkbox"/>
Logistics	<input type="checkbox"/>
Production planning	<input type="checkbox"/>
Other	<input type="checkbox"/>

5. Do you have a cross-functional responsibility in the company?

- Yes
 No

6. Do you have a group-responsibility in the company?

- Yes
 No

7. How old are you?

Age	
< 25	<input type="checkbox"/>
25 - 40	<input type="checkbox"/>
41 - 50	<input type="checkbox"/>
> 50	<input type="checkbox"/>

8. Gender

- Male
- Female

SCM Questions

Customer Orientation

Scale from 5-1 (5 fully agree, 1 fully disagree)

Customer Orientation	5 fully agree	4 agree	3 don't know	2 dis- agree	1 fully dis- agree
We have clearly defined customer service levels. (How does this work?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We measure the service level achievement monthly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We define our service levels and offer them to the market.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We define service levels together with our customers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What is your top priority? Please rank the following topics from 1-4, where 4 is the most important (Productivity/Costs/Turnover/Customer satisfaction/other)

....Productivity,Costs,Turnover,Customer satisfaction,Other

Strategic view on SCM (Maturity Questionnaire - Strategy, Organization, Performance)

Scale from 5-1 (5 fully agree, 1 fully disagree)

	Strategy	5 fully agree	4 agree	3 don't know	2 dis- agree	1 fully dis- agree
1	Department supply Chains are updated and aggregated as a part of annual budgeting or planning process.					
2	A Formal Sales and Operations Planning process involves operations, marketing, sales and finance on at least a monthly basis in determination strategic supply chain changes.					
3	Strategic customers and suppliers formally provide critical planning input (e.g., supply or demand changes) on at least a monthly basis.					
4	Quantity end-to-end supply chain asset, flexibility, service level and cost targets are integrated into plans and budgets.					
1	Sourcing strategies are primarily determined and executed at the local plant or division level.					
2	Sourcing strategies are designed to achieve lowest delivered cost per unit.					
3	Sourcing decisions involve cross-functional teams (e.g., procurement, development, production, and strategic suppliers) with specific commodity expertise.					
4	Supply base performance is continuously and automatically monitored and compared to established targets; performance below required standards is immediately highlighted and addressed.					
1	The predominant manufacturing strategy is defined to optimize manufacturing performance and may not optimally meet market requirements.					
2	Manufacturing is demand-driven in a well-conceived and structured manner; make-to-order is the predominant manufacturing strategy (if appropriate). Which percentage?					

3	Subassemblies or intermediate products are built to forecast at highest generic level in Bill of Material to maintain flexibility while minimizing cycle time and inventory position.(as soon as possible in the value chain)					
4	Demand-pull mechanism and mass customization techniques allow almost all products to be configured or produced-to-order with competitive customer lead times. How does this work?					
1	Governance and financial controls for Supply Chain processes & information systems are based on individual functional strategies and budgets.					
2	Governance for supply chain processes and information systems is driven across functions by the supply chain strategy.					
3	Governance for supply chain processes and information systems is driven by the supply chain strategy, which includes requirements from key suppliers and customers.					
4	A business process and information systems roadmap which includes integration with strategic customers and suppliers is in place and enables the supply chain strategy.					

	Organization	5 fully agree	4 agree	3 don't know	2 dis- agree	1 fully dis- agree
1	Specific responsibility for key sourcing activities, such as cost reduction, on -going performance management, and day to day communication is not clearly defined or simply not adhered to.					
2	Cross-functionally staffed commodity management teams are in place and meet regularly.					
3	Relationship Managers for key supplier partnerships are in place and they direct a cross-functional team that also includes formal supplier involvement.					
4	Cross-enterprise integration and electronic exchange environments enable real-time access to necessary planning, procurement and performance data for most suppliers.					
1	There is no clearly career path for supply chain professionals.					
2	Specific competencies and roles needed to enable effective supply chain management are documented as part of formal job descriptions.					
2	Each major supply chain process has an accountable functional or individual "process owner" responsible for ensuring a common, best practice, process architecture is adopted across the organization.					
3	Specific skills required to support collaboration with suppliers are identified and integrated into competency models are reflected in supply chain role descriptions.					

4	Recruiting, staffing, and educational/training plans explicitly integrate the competencies needed to enable the overall supply chain strategy.					
---	--	--	--	--	--	--

	Performance	5 fully agree	4 agree	3 don't know	2 dis- agree	1 fully dis- agree
1	Supply Chain metrics are visible only within the supply chain functions themselves.					
1	There is no formal assessment of organizational effectiveness for the supply chain.					
2	A limited subset of supply chain metrics are automatically generated.					
2	Supply chain metrics are published to a broad, cross-functional audience, but not consistently reviewed.					
2	Most supply chain metrics have specific targets, but targets are not linked to specific process improvement initiatives.					
3	Quantitative performance targets exist for end-to-end supply chain processes, such as cash-to-cash cycle time and total supply chain management cost.					
3	Information systems highlight when key supplier and customer performance metrics are out of control and an escalation process exists for when boundary conditions are violated.					
4	Supply chain performance management is automated as part of an overall Corporate Performance Management reporting capability.					

Supply Chain Processes and Practices (Maturity Questionnaire - Practices and Processes)

Scale from 5-1 (5 fully agree, 1 fully disagree)

	Processes	5 fully agree	4 agree	3 don't know	2 dis- agree	1 fully dis- agree
1	The majority of a buyer's (purchasing responsible) time is spent on purchase order placement and following up on existing orders.					
2	Sourcing processes are cross-functionally integrated, but include little or no formal supplier involvement.					
3	All major suppliers are connected via electronic links that automate business processes (e.g., electronic POs, confirmations, pull signals, ASNs, invoices).					
4	Real-time collaborative sourcing processes and supplier product quality feedback are electronically enabled and used to ensure optimal supply base performance.					
1	Raw materials are transacted to work-in-process inventory upon release or start of production order (if relevant to your industry and if back flushing not used).					
2	Demand-pull mechanisms are used to pull material through the production process to avoid WIP inventory build-up (not relevant for continuous processes).					
3	Real-time inventory level visibility is in place where back flushing is not employed (RM & WIP).					
4	Perpetual polling of in-process production drives electronic pull signals across extended/external enterprises to the originating point of supply.					
1	Product quality data is manually captured by production order on hardcopy forms as orders move through the process.					
2	Posted performance results are maintained and used to manage on-going operations on the manufacturing floor.					
3	Cellular manufacturing and U-shaped lines (discrete/low volume) or real-time process control systems process/ repetitive high volume) are used to insure rapid feedback of process information (if appropriate). Don't know means fully disagree!					
4	Serialized or lot-based product quality data is captured electronically in real-time with on-line statistical process controls allowing dynamic evaluation of product quality and process performance and maintenance of historical information.					
1	There are no clear rules governing the prioritization of customer orders.					
1	Changes to the design of the physical supply chain are primarily reactive rather than proactive.					
2	The processes are associated responsibilities for maintaining existing customer orders (prior to shipment) including configuration management and pricing are clearly documented.					
2	Delivery performance standards focus on both timeliness and error management.					
3	Well-integrated data maintenance procedures and electronically - enabled reporting ensure that product configuration and/or pricing data is accurate and made available to all supply chain partners in real time.					
4	Product and order data, such as configuration, pricing, inventory position, backlog, order status, and customer credit history, is visible to, and can be queried by the appropriate supply chain partners.					

4	Elements of the distribution network (activities) that are strategically outsourced act and look like they are part of the company owned network (from customer perspective).					
1	Some data needed to enter and schedule customer orders is not readily available, necessitating off-line inquiry and call back after verification.					
1	Key elements of the order entry process, such as order confirmation, or credit and price checking, are done manually (if they are done at all).					
2	The rules and processes for the order entry and scheduling.					
2	Customer allocations, when required due to constrained supply, are managed manually.					
3	Order rules are consistent with differentiated service levels for customer and product classes based on well-defined customer segmentation policies.					
4	A majority of customer orders can be received electronically and processed automatically without the need for administrative holds.					
1	Most products are shipped when available, even if earlier than customer requested delivery date.					
1	Product is assumed to have arrived at the customer site, but no verification is made.					
2	Warehousing, transportation, and deliver rules are developed internally with little customer input.					
2	Verification the product was received by customer is accomplished by manually checking Proof Of Deliveries against orders.					
3	Automatic product identification and tracking (i.e., using barcodes., etc.) is linked to systems the manage dynamic location assignment and shipping.					
3	Carriers are selected and rates determined based on the consolidated transportation needs of multiple plants, distribution centers, and business units.					
4	Where feasible based upon cost and services objectives, orders are automatically consolidated with those from other products/divisions/companies.					
1	The predominant invoicing process is paper invoices generated and mailed upon shipment.					
2	Invoicing and cash collection procedures are developed internally with little or no unique customer perspective.					
3	Invoicing and cash collection rules are developed with customer input and are very clearly communicated to and understood by customers.					
4	Customer receipt automatically triggers payment cycle based upon pre-agreed payment terms.					
1	A supply chain "process architecture" (clearly documenting activities (processes), data, metrics, applications, etc.) does not exist or exists in an unconsolidated and manually maintained format such that it is unleveragable.					
2	The process and information systems architecture is not explicitly linked to the basis of competition as described in the supply chain strategy.					
3	"Process architectures" has been defined, but their content differs by country or region based on history or organizational control, not actual business needs.					
3	Supply Chain process and information systems architecture is optimized around the primary basis of competition.					
4	"Process architectures" content is standardized globally to support geographically dispersed teams, enabling the unified sharing and transfer of work across locations.					

4	Planning data, business rules, and transaction data synchronization is regular and done electronically across supply chain partners.					
	Practices	5 fully agree	4 agree	3 don't know	2 dis- agree	1 fully dis- agree
1	Demand forecasts are generated unilaterally by a single business function using an informal process.					
2	Demand planning processes are cross-functionally integrated, but include little or no customer involvement.					
3	Customer-generated forecasts are directly incorporated into the demand planning process.					
4	Collaboratively developed demand forecast information flows freely and regularly between customer and supplier via an automated process.					
1	Supply planning considers some, but not all potential supply constraints (e.g., raw material, labor, equipment availability).					
2	Supply planning considers all potential supply constraints (e.g., raw material, labor, equipment availability).					
3	Strategic suppliers provide access to information about supply availability and constraints, which is considered in development of supply plans.					
4	Automated supply planning processes enable the Company and its main-suppliers to collaboratively develop consensus supply plans.					
1	Demand/supply balancing tools are limited, typically spread sheet based.					
2	The demand/supply balancing process (timing, events, formats, etc.) is well communicated internally, but customer and supplier awareness is limited.					
3	Supply plans that violate business rules are addressed cross-functionally and consider multiple business impacts (e.g., revenue, cost, quality, customer service), with supplier involvement as appropriate.					
4	Supply chain planning systems are integrated with demand/supply data sources through public and private supply chain networks/exchanges when available.					
1	Suppliers are not segmented according to strategic importance - the same supplier management process is applied across the entire supply base.					
2	Structured supplier development and relationship management processes are in place and followed consistently, but are unilaterally developed from an internal perspective.					
3	Standardized supplier scorecards have been co-developed with collaboration from all significant suppliers.					
4	Strategic supply chain partners participate in a highly collaborative supplier selection, development, management, and commodity rationalization process.					
1	Data inaccuracies or untimeliness make automated Material Requirements Planning/ Master Production Scheduling (MRP/MPS) planning tools difficult to use.					
2	Production planning processes are cross-functionally integrated, but include little or no supplier or customer involvement.					
3	Advances constraint-based scheduling systems resolve and present demand/supply conflicts automatically by considering pre-defined business rules and automated status information.					
4	Advance scheduling systems are linked to strategic customer and strategic supplier systems to enable instantaneous transfer of changes in production requirements, schedule, status, and constraints.					

Leadership

Categories:

I-Infl. = idealized influence,

IM = inspirational motivation,

Int. Stim. = intellectual stimulation,

Ind. Cons. = individual consideration

Scale from 5-1 (5 fully agree, 1 fully disagree)

	Questions		5 fully agree	4 agree	3 don't know	2 dis- agree	1 fully dis- agree
1	SCM is part of strategic management.	I-Infl.					
2	We have a clear SC-Vision. IM Which parts does the SC-Vision cover? How is the SC-Vision?	IM					
3	We have a clear SC-Strategy.	IM					
4	We have a cross functional SC-responsibility in our company.	I-Infl.					
5	Our top management values and supports SCM.	Ind. Cons.					
6	Our top Management believes SCM is attributable to performance.	I-Infl.					
7	SCM performance is part of top and middle management bonus-schemes.	I-Infl.					
8	SCM performance figures (delivery reliability, del capability, inventories, forecast accuracy,..) are part of monthly management reporting.	I-Infl.					
9	The sales and operations planning team is preparing decisions.	Int. Stim.					
10	The sales and operations planning team is making decisions.	Int. Stim.					
11	The plans which are agreed in the sales and operations planning meeting get executed as agreed.	Ind. Cons.					
12	In the sales and operations planning meeting agreed plans get overruled by management. How often?	Ind. Cons.					
13	SC-performance is measured across all functions.	Int. Stim.					
14	Sales, production, logistics and finance work together in a collaborative way.	IM					
15	We work very functional as marketing, sales, logistics, production, finance,...	I-Infl.					
16	We have no cross functional performance figures on SCM.	I-Infl.					
17	The status quo of SCM gets questioned constructively by top management.	I-Infl.					
18	I'm involved directly in the question how to achieve our SC-strategy.	Ind. Cons.					

19	The top management fully supports my role as SCM-manager. How is this manifested?	Ind. Cons.					
20	I feel as SCM manager trusted by top management.	Ind. Cons.					

Firm Performance

Delivery reliability on time delivery performance to committed date

What is your delivery reliability in percent?

..... %

Delivery capability scheduled to customer request date

What is your delivery capability in percent?

..... %

Order fulfilment lead time in days

What is your order fulfilment lead time in days?

..... Days

Operational Performance

Scale from 5-1 (5 fully agree, 1 fully disagree)

Operational Performance	5 much better	4 better	3 equal	2 worse	1 much worse
Our operational performance in terms of delivery reliability is ...than our competitors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our operational performance in terms of delivery capability is ...than our competitors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our operational performance in terms of order fulfilment lead times is ...than our competitors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Financial Performance

What is your revenue development from 2007 till 2010?

2007 Index 100 2008 Index..... 2009 Index..... 2010 Index....

What is your profitability development - EBIT from 2007 till 2010?

2007 Index 100 2008 Index..... 2009 Index..... 2010 Index....

What is your return on capital development - ROCE from 2007 till 2010?

2007 Index 100 2008 Index..... 2009 Index..... 2010 Index....

What is your working capital development from 2007 till 2010?

2007 Index 100 2008 Index..... 2009 Index..... 2010 Index....

What is your Cash to cash cycle development from 2007 till 2010?

2007 Index 100 2008 Index..... 2009 Index..... 2010 Index....

Financial Performance

Scale from 5-1 (5 fully agree, 1 fully disagree)

Financial Performance	5 much better	4 better	3 equal	2 worse	1 much worse
Our ROCE compared to peers is.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our EBIT compared to peers is.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our Working capital compared to peers is.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our C2C compared to peers is.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our Inventories compared to peers are	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our financial performance in comparison to our competitors is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our financial performance in our industry is..... (answers on a 5 point Likert-Scale where 5 is top quartile and 1 is last quartile) top quartile..... between average and top.....average.... below average..... last quartile.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Customer satisfaction

Scale from 5-1 (5 fully agree, 1 fully disagree)

Customer satisfaction	5 much better	4 better	3 equal	2 worse	1 much worse
We measure customer satisfaction periodically.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our customer satisfaction compared to our peers is..... (answers on a 5 point Likert-Scale where 5 is much better and 1 is much worse).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What are the top 7 important topics for customers? (rate them from 1-7, where 7 is the most important)
....Product-quality,price,service,delivery reliability,delivery capability,innovation,assortment

Control Variables

Top 3 competitors

Name your top 3 competitors?

- 1.....
- 2.....
- 3.....

Why did you name this three?

Do they have a SCM-differentiation?

Competitiveness

Scale from 5-1 (5 fully agree, 1 fully disagree)

Competitiveness	5 much better	4 better	3 equal	2 worse	1 much worse
Our service is than peers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our products are.. than peers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our prices are... than peers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our costs are... than peers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our assortment is.... than peers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our supply chain performance is... than peers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We are overallin terms of competitiveness than your peers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>