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PERCEPTION OF IT LEADERSHIP
AND IT CAPABILITY FOR
COMPETITIVE ADVANTAGE
IN THE SWISS FINANCIAL SECTOR

Doctoral dissertation submitted by

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Abstract

The financial industry is currently suffering considerably from an economic crisis. This is particularly true for the Swiss financial sector. In this context, Information Technology (IT) organisations of those financial firms are under enormous pressure since IT intensity and investments into IT remain high while the economic values gained from those IT investments are often questionable. IT can no longer just increase productivity, but must focus on truly supporting the dynamic business of this sector in order to create sustained competitive advantage. Furthermore, qualitative and quantitative studies indicate that the Swiss financial sector with its high IT intensity might suffer from insufficient IT (support) services and a lack of qualified IT staff. Based on literature about leadership in IT, the sector would profit from providing more systematic investment aimed at improving leadership in technology delivery.

Research indicates that, in the Swiss financial sector, some firms might have managed to improve their performances by creating and applying strategic IT and IT leadership capabilities. By researching the question to *what extent transformational/transactional leadership and elements of IT capability are related to firm performance in IT organisations of companies of the Swiss financial sector*, this study generates practical knowledge which IT and business managers of the respective firms can use to shape their strategies and operations. Moreover, the study contributes to the literature in several ways, including demonstrating how leadership theory could interact with other strategic IT capabilities in light of the resource-based view (RBV) of the firm.

By using two surveys, this study collected and analysed data from 45 Swiss financial firms, including 182 data sets from IT staff on their perception of the leadership behaviours of their superiors and 217 data sets from business managers on their perception of strategic IT capabilities and resulting firm performance gains. The study found transactional and transformational leadership do not directly impact firm performance measured as a combination of internal operating performance and external market-oriented performance. However, the study results suggest that transformational leadership partially moderates the effect of IT-enabled organisational intangibles on firm performance, while no significant mediating effect of IT capability (between leadership and firm performance) was found. As hypothesised, physical IT infrastructure and IT-enabled organisational intangibles were found to be positively related to firm performance. In contrast to this, the results did not support a significant relationship between human IT capital and firm performance. However, the data analysis indicated that skills other than technical and managerial might have become more important, for example abilities that are related to business and IT alignment.

Implications for managerial practice include that well-chosen combinations of elements of physical IT infrastructure and IT-organisational intangibles might provide Swiss financial firms with more business value whenever firms manage to use them as capabilities that aim at supporting innovation in and flexibility of the business. The results also indicate that the management of Swiss financial firms might want to carefully shape and monitor the degree of IT infrastructure integration, as too much integration could potentially limit flexibility.

In addition, findings suggest that business managers might need to focus more on developing IT-enabled intangibles, together with transformational leadership. Furthermore, results compared with literature imply that organisational learning, entrepreneurial ability and organisational culture might play significant roles in shaping the organisational routines used to create and apply valuable strategic capabilities from IT and leadership. Finally, results propose that Swiss financial firms which now rely more on internal IT might benefit from more outsourcing, subject to this being managed in a professional and careful way.

Certification of dissertation

I declare that the work presented in the thesis is, to the best of my knowledge and belief, original and my own work, except as acknowledged in the text, and that the material has not been submitted, either in whole or in part, for a degree at this or any other university.

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Signature of Stefan Küenzi   Date

ENDORSEMENT

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Signature of Dr Bruce Millett   Date

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Signature of Prof Walter Kuhn   Date

Dedication

To my parents, Katharina and Friedrich, for their love and support and for believing in me

To Jacqueline who would have liked to see the final result of this research

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Chapter 1 - Introduction

1.1   Background to the research and the problem

In a market economy, one of the main purposes of strategy management in firms is to generate competitive advantages for the sake of doing business successfully (Porter 1990). These advantages have become more important than ever as the current downturn in many economies has caused enormous pressure on numerous firms globally and, thus, forced managers to create and sustain companies' capabilities to stay profitable (Hamel 2009). Financial industries worldwide are suffering considerably from the credit crunch and the subprime mortgage crisis, and international experts have called for fundamental changes to the financial systems, policies and behaviour of managers (Soros 2008; Wolf 2008).

It is not enough that Swiss financial firms are currently under pressure by turbulence in their environment: the sector seems to suffer from insufficient business value generated from investments in Information Technology (IT). While IT is very important for the industry, a study amongst Chief Information Officers (CIOs) by KPMG (2005) reported that in the financial sector, 'satisfaction with IT services in general' (p. 18) had gone down between 2003 and 2005, while IT intensity (understood here as the monetary investments into IT per employee) was by far the highest of all industries in Switzerland. Many other industries were analysed, however, the study made this finding only in the financial sector.

Another critical problem IT organisations in the Swiss financial industry face is that the sector is unable to recruit a sufficient number of well-qualified IT professionals to support current and future economic growth and the adoption of new technologies, as well as to cope with fluctuation and retirements in the next 5+ years. Very recent studies conducted by the Swiss ICT Professional Training Association (ICTPTA 2010) revealed that until 2017, as many as 31 900 qualified professionals might be missing in Switzerland. Furthermore, results from interviews held with 75 IT experts in the same studies confirm that professionals in most functional areas of IT are and will most probably be missing; and that in specific areas such as software development or IT-management/-leadership/-organisation, many more highly qualified professionals will be needed. In light of having a high IT intensity, the Swiss financial sector might suffer considerably from these developments in the IT labour market so that the managers of the companies affected will face a major challenge in terms of how they will be able to provide the appropriate level of IT services needed to support their businesses.

Over and above the problems just described, literature indicates that it might be beneficial for firms to foster the development of leadership skills in IT organisations in order to maximise the value of people who deliver IT services. As Glen (2003) points out in his book, *Leading geeks: how to manage and lead people who deliver technology*, which is well regarded by IT professionals, leadership is not something IT organisations normally pay much attention to.

Glen (2003) adds that few firms have realised they would need to focus more on how they steer the human capital in their IT organisations since many companies have become very dependent on IT. It could, therefore, be that the Swiss financial sector with its high IT intensity could profit a lot from more successful IT leadership.

In addition to the issues just discussed, another problem appears to have emerged in the Swiss financial sector in the past years. Based on the US banking industry as an example, Olazabal (2002) demonstrated how productivity in the financial services sector could no longer be raised from investments in IT in the 1990s. The study mentioned that there might have been over-investments into computation capacity that were never used, thus, unnecessary costs occurred that lowered productivity.

At the same time, Olazabal's study proposed that the shift from investments to increase productivity to investments into activities that aim at increasing customer satisfaction and sustained revenues (e.g. through the implementation of Customer Relationship Management CRM systems) might have contributed to an immediate productivity decrease, since the latter investments might only pay out in the future. Based on these statements, one can imagine how difficult it was (and most probably still is) for CIOs in financial firms to justify those large investments as they might often not materialise any obvious return on investment immediately. Furthermore, the crisis in the financial industry might have led to decreasing IT budgets. With less money at hand, CIOs might face more difficult investment decisions.

In light of the issues and challenges presented, it is quite likely that, over the past years, some of the companies in the Swiss financial sector managed to have a strategy in place that provided them with more value from IT. This study, therefore, aims at finding out what aspects of strategic capability and leadership associated with IT organisations contributed to better firm performance in the Swiss financial industry in order to provide an empirical basis that Swiss financial firms can use to plan their future strategic moves.

1.2   Theoretical development of the specific research question

As part of the theory on strategic capabilities, the resource-based view (RBV) of firms takes an inside view of resources and capabilities of a company that can form a competitive advantage over time (Barney 1991; Grant 1991; Wernerfelt 1984). Amongst an organisation's capabilities, Information Technology (IT) was identified by many researchers as a source of improved firm performance (Aral & Weill 2007; Bharadwaj 2000; Ravichandran & Lertwongsatien 2005; Santhanam & Hartono 2003; Xiao 2008). The body of knowledge available in this area includes studies focusing on the banking industry (Lin 2007; Shu & Strassmann 2005). As a specific example, Broadbent et al (1999, p. 169) found that a large Asian bank that needed to become more responsive to customer needs managed to improve the business by leveraging its superior IT infrastructure capability.

Leadership was found to be an important organisational capability as well (Mithas et al 2004; Roepke et al 2000). Agarwal and Farratt (2002) linked leadership with other human IT capital-based capabilities and identified them together as being essential ingredients of best practices that successful IT supervisors should be aware of and utilise. In his effort to illustrate what successful leadership behaviour in IT organisations could encompass, Glen (2003) mentions many behaviours that could improve the value of people's work—from rewarding and motivating people with free food, to considering people as individuals with their strengths and ideas. Glen's (2003) suggestions signify that in order to understand what constitutes successful leadership in IT, a theory that includes a full range of behaviours such as the theory of transactional and transformational leadership (Bass & Avolio 2004) might be most appropriate. Studies that have used this theory suggest that leadership can be positively associated with different kinds of performance measures in many companies, industries and environments (Bass & Riggio 2006; Dumdum et al 2002; Lowe et al 1996). Furthermore, and most recently, Bennett (2009) suggested that IT leaders who exhibit substantial levels of transactional and transformational leadership behaviours induce their subordinates to show higher levels of extra effort and those leaders are perceived as being more effective which, in turn, could lead to enhanced business success.

Thus, based on the above indications, the question arises as to whether leadership and specific IT capabilities could be used by firms in Swiss financial industries to become more profitable in the difficult business environment companies are currently facing and might face going forward.

The answer is that, despite these indications, we do not know, since the creation and use of strategic IT capabilities has not yet been systematically researched in financial firms in Switzerland, nor has a theory that includes a broad range of leadership behaviours been used to analyse how leadership capability formed in IT organisations could create a competitive advantage for these companies. Consequently, more indications about how these elements are related to the performance of firms are needed. These can be used by the respective institutions to shape their strategic and operational activities and, thus, make them more lucrative.

The research question of this study was inferred from the above and the detailed literature review, as well as the theoretical foundation presented in chapter 2:

> *To what extent are transformational/transactional leadership and elements of IT capability related to firm performance in IT organisations of companies of the Swiss financial sector?*

1.3 Justification for the research and contribution

1.3.1 Contribution to practice

The financial industry is the most important economic sector in Switzerland as it contributed approximately 14% or 60 billion US$ to the yearly Gross Domestic Product (GDP) in the first years of the new century (SBA 2006). In light of this fact and the problems presented in the initial sections of this chapter, the research question asked is of high importance and finding answers provides senior and IT management of Swiss financial firms with empirical information about the extent to which contemporary leadership theories and theories about IT capability can create a positive impact on the performance of their businesses.

Therefore, this research study contributes to practice by providing conclusions and managerial implications that can be used to shape IT/business alignment activities, change and process management in IT and individual people development in Swiss financial firms.

1.3.2 Gaps in literature and contribution to knowledge

By answering the research question, the study contributes to knowledge by examining the relationship between transactional and transformational leadership and firm performance in IT organisations. Furthermore, this dissertation makes a first attempt to show how this leadership theory can be seen in light of the resource-based view (RBV) of the firm. With that, the study helps clarify the role of leadership as a potential strategic IT capability. This knowledge, in turn, can be used by researchers as empirical groundwork that complements previous studies in the field such as the one by Glen (2003).

In addition, the study follows a call by Dumdum et al (2002) for more research to examine the impact of transactional and transformational leadership on firm performance outside the United States and in different cultural and organisational settings than those in studies from prior research. Furthermore, by analysing the combined effect of transactional/transformational leadership and IT capability on firm performance and by clarifying possible interaction effects, the study creates new knowledge that can be used in management education.

Finally, this study aims at contributing to the call by Melville et al (2004) for more industry-specific research on the business value generated by IT based on the RBV.

1.4 Research design and methodology

This section outlines the design and methodology used in this project. A more detailed description is available in chapter 3 of this dissertation.

1.4.1 Research design

A survey research study was conducted to find answers to the research problem described earlier in this chapter. The purpose of the research was explanatory as existing theories were used in a new context to find possible solutions to a particular business problem (Neumann 2003). The study aims at confirming and validating the relationships identified in section 2.2, thus, a quantitative research approach was chosen (Leedy & Ormrod 2005). This required a correlational research method since the relationship between the variables were to be examined. The study used cross-sectional research (meaning the data sample was taken at one point in time only) in line with earlier studies conducted in this area.

1.4.2 Population and data used

The target population of the study was approximately 800 banks, security dealers, fund and asset management companies that were either a member of the Swiss Bankers Association (SBA) (www.swissbanking.org) and/or work under the supervision of the Swiss Financial Market Supervisory Authority FINMA (www.finma.ch). These two organisations represent the most important institutions in the Swiss financial industry and their address databases were the most complete and up-to-date ones available. Both organisations agreed that their address databases could be used for the study.

The study used two surveys in order to gather the data needed. Targeted individuals in the abovementioned companies were representatives of IT organisations; they formed one group (hereafter called 'IT staff') where people were asked to rate the leadership style of their immediate superiors. Business managers of these financial firms formed the second target group (hereafter called 'business managers'). Members of this group were asked to rate the IT capability and performance of the firm they work for. Multiple respondents were asked to answer the survey questions per firm. This approach generally aimed at generating a sample as random and as large as possible.

1.4.3   Data collection and survey

The quantitative approach of the study required a large number of data sets. In order to limit the effort for the participants and to support electronic processing of the answers, an online (web-based) survey was conducted in order to collect the data for the study. The questionnaire was peer-reviewed and tested before it was applied.

The process followed generally accepted ethical standards in research in that confidentiality was assured and no commercial re-use of it was guaranteed; participants were informed of the purpose and background of the study, as well as the effort required; they were offered support via email and phone during the survey; and the data was made anonymous for the report (Leedy & Ormrod 2005). In order to give the survey as much credibility as possible, the University of Applied Sciences Zurich supported the data collection. For all constructs used in this study, the measurement instruments were reused from previous empirical research work.

In order to maximise the response rate of the survey, to avoid response bias and to ensure adequate reliability and validity, several activities were carried out. The details of these procedures will be described later in this dissertation.

1.4.4 Data analysis procedures and interpretation

The study used Structured Equation Modelling (SEM) and Partial Least Squares (PLS) technique in order to analyse the data and to test the hypotheses. Multiple Regression Analysis (MRA) is a predominant technique to answer this kind of quantitative research question (Cohen et al 2003; Studenmund 2006) and PLS is an advanced method for causal analysis that uses MRA. PLS was considered as being the most appropriate statistical tool in the context given. A series of data analysis steps were carried out in order to ensure appropriate statistical conclusions validity.

1.5 Delimitations of scope and key assumptions

The research work outlined in this dissertation examines the relationship between transactional / transformational leadership, IT capability and firm performance based on data from Swiss financial companies. No other constructs or relationships were explored.

The study did not analyse the underlying socio-psychological aspects of leadership and human behaviours in business environments. The research did not try to predict the future.

The scope was chosen as previous work of other scholars in the area of IT capability (e.g. Bharadwaj 2000; Ravichandran & Lertwongsatien 2005) and transformational / transactional leadership (e.g. Bass & Riggio 2006; Dumdum et al 2002; Lowe et al 1996) indicated that the relationships hypothesised in this research could form a valuable basis for the contributions described in chapter 1.3. In addition, by using the same constructs and similar boundaries as the above studies, it is possible to compare this work with previous research.

The reasons for selecting the Swiss financial sector were those indicated in section 1.2 so that any information that could be used to strengthen the sector would be helpful for the affected companies and the national economy.

In terms of IT capability and its impact on firm performance, this study assumed that there was no systematic and evident difference between outsourced IT and internal (in-house) IT organisations. This was based on findings of a very recent study by Wang et al (2008). However, this study analysed the response data to that effect as outlined in more detail in chapters 3, 4 and 5.

1.6   Structure of this dissertation

This dissertation is structured and presented in five chapters. This first chapter provides an introduction to the research. It presents the research problem, its issues and provides the reasons why the subject is researched. In addition, the introductory chapter describes the background of the research problem. Furthermore, the scope is defined and the applied methodology is illustrated and justified.

The theoretical foundation is built in chapter 2 and a detailed review of the relevant literature of each area (leadership, IT capability and firm performance) is conducted. A conceptual framework is developed that is used to tackle the research problem. Chapter 3 contains the research design and methodology. A complete and structured view of the design and the methodical aspects of the research work are offered, including the data collection and analysis approaches and methods used. The subsequent chapter 4 (results) presents the data collected in a structured way, as well as the outcomes of the data examination and statistical evaluations. Findings are drawn from these procedures by linking them to the hypotheses and the overall research question. Finally, chapter 5 (conclusions and implications) includes interpretations of the results related to the existing body of knowledge and based on their relevance for and contribution to managerial practice.

1.7 Definitions of key constructs

Several key concepts and approaches are used in this document. The next chapter will provide details on what the constructs 'IT capability', 'leadership' and 'firm performance' mean and how they are used in the context of this study. Definitions of further terms and concepts are given in appendix A.

1.8　　Conclusion

This chapter provided an introduction into the research problem and its setting, as well as the issues and the background of the study. It justified why the study is relevant and generated information that contributes to knowledge and practice. The research methodology and design were described briefly. The scope of the project was described and the key assumptions, as well as the structure of the dissertation, were stated.

Based on this introductory chapter, the next chapter presents the review of the literature relevant for this research project.

Chapter 2 - Literature review

2.1   Introduction

This chapter aims to build the theoretical foundation of the study. A detailed review of the relevant literature in the parent and immediate disciplines involved is presented and hypotheses are formed from these discussions. The analysis is extended by illustrating what other extraneous variables could affect the dependent variables and how these are used in the study as control variables. The conceptual framework that represents the incorporating model of the study is drawn from all previous sections. The chapter is supplemented by an examination of the research around the role of the Chief Information Officer (CIO) and it is completed by concluding remarks. The following figure (Figure 2.1) shows the overall structure of chapter 3.

Figure 2-1 – Structure of the literature review
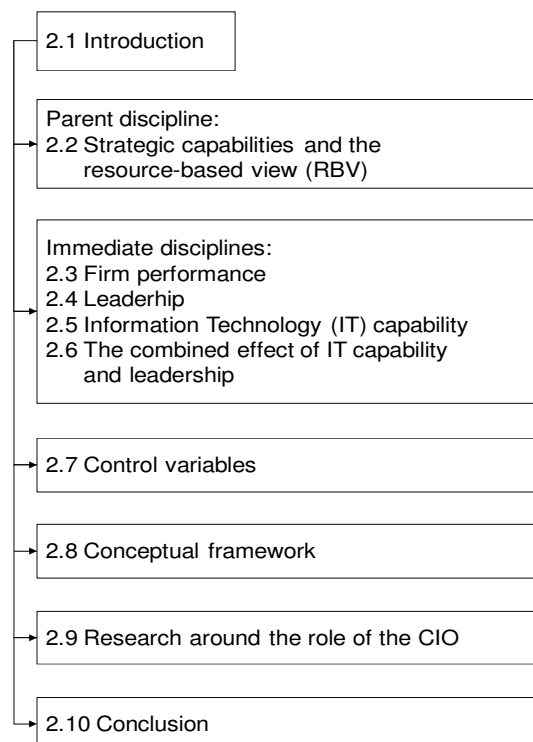
Source: Developed for this research

2.2   Strategic capabilities and the resource-based view (RBV)

The context of the research problem stated uses an inside view of firms. This means that the strategic perspective used focuses on how firms can employ their own resources as a basis for successful economic activities. In the literature on strategy, this concept is called strategic capabilities (Johnson et al 2005) and has its roots in the work of several researchers from the 1960s and 1970s such as Ansoff (1965) and Andrews (1971). The strategic capability of a firm is seen as being favourable if a firm is able to, through its activities and firm processes, use its valuable resources successfully (Prahalad 1983).

The theory about the resource-based view of strategy builds upon the concept of strategic capabilities and advocates that resources and capabilities can form a basis for firms' sustainable competitive advantage—mainly whenever companies manage to form them in a way that they represent an asset and strength that is valuable, cannot be easily copied by competitors, and is imperfectly mobile (Barney 1991; Grant 1991; Wernerfelt 1984). Amit and Schoemaker (1993) added to this the criterion of rarity by suggesting that competitive advantage is generated only if a particular set of resources and capabilities is not available to many firms at the same time. Barney (1991) viewed a resource as a generator of competitive advantage if the respective capability achieved from the resource(s) improves the firm's performance.

Barney categorised resources into three general groups, physical capital resources as described by Williamson (1975) in the sense of all tangible assets that can be used for developing, producing, trading and selling economic goods, human capital resources (Becker, 1964), understood as all the intangible intellectual assets of a company, and intangible capital (Tomer 1987), which can be viewed as the capital gained from a firm's organisation, its structure, processes and relationships between organisational entities inside and outside of the corporation.

Critical to the whole theory of the RBV is the process of creating these valuable strategic capabilities by combining and using resources and capabilities in a unique way. According to Grant (1995), this process (see figure 2-2 below) involves organisational routines which he understood as sets of coordinated actions carried out by individuals in the firm targeted at achieving the company's goals and thus creating valuable capabilities. The actions are seen as being dynamic and evolving since they are adapted over time in order to keep up with changes happening inside and outside the firm.

Figure 2-2 – Turning resources into competitive advantage
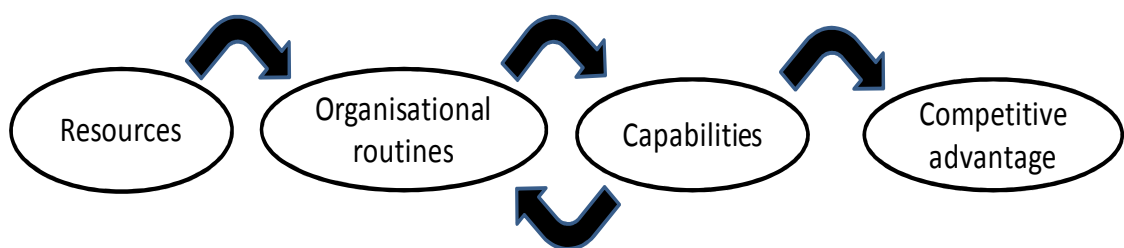
Adapted from Grant (1995)

Barney (1991) described that an important assumption of the RBV is that the links between resources and competitive advantage inherent in the concept of organisational routines is difficult for outsiders (e.g. competitors) to identify, calling this 'causal ambiguity'. Whilst this aspect intuitively seems appealing for the firm possessing the capability, there is an important limitation arising from it in cases where managers and leaders in companies no longer understand where exactly the roots of the valuable capabilities are or how exactly they are generated.

This could occur in situations when the organisational routines are complex and non-obvious, such as when valuable capabilities arise from mixes of organisational settings and culture (Miller & Shamsie 1996). Even more important for this research is the aspect that more and more valuable capabilities are generated from intangible resources such as knowledge (Conner & Prahalad 1996), which is at the very heart of information technology but difficult to capture. The next paragraphs describe why the RBV is relevant to the research problem despite the limitations just stated.

As Collis and Montgomery (1995) describe, based on examples of several firms operating in different industries, that the theory can be used to explain how some firms outperform other companies, as (1) they concentrate better on building the right competencies that provide them with competitive advantage; and (2) they manage to adapt as needed so that the advantage becomes sustainable. The theory therefore seems to provide a broad basis (different industries, countries, organisational settings).

From their meta-analytic review of 125 empirical studies, Armstrong and Shimizu (2007) add to the above that (3) the RBV can be used when trying to capture complex constructs that are built based on several observable variables such as intangibles and psychological phenomena and that (4) the theory provides a basis for examining relationships between various capabilities and performance-related outcomes, both, directly and indirectly via moderating or mediating variables.

Moreover, the resource-based view of the firm has been applied by many IT researchers in order to improve the understanding of how IT capabilities can contribute to business (Bharadwaj 2000; Clemons 1991; Mata et al 1995; Santhanam & Hartono 2003). As Melville et al (2004) conclude in their analysis and review of IT value studies, the RBV as a parent theory provides a robust basis due to its balanced and integrated view of management, technology and economic values.

Based on the statements in the above paragraphs it is, therefore, summarised that the RBV as the parent theory provides a solid and broad basis that fits well with the setting and all elements of this research.

The research question developed is:

> *To what extent are transformational / transactional leadership and elements of IT capability related to firm performance in IT organisations of companies of the Swiss financial sector?*

In order to answer this question, this study focuses on the two specific areas of strategic capabilities identified in section 1.2 as potential influencers of firm performance, leadership and IT capability.

Figure 2-3 – Basic conceptual framework used to answer the research question
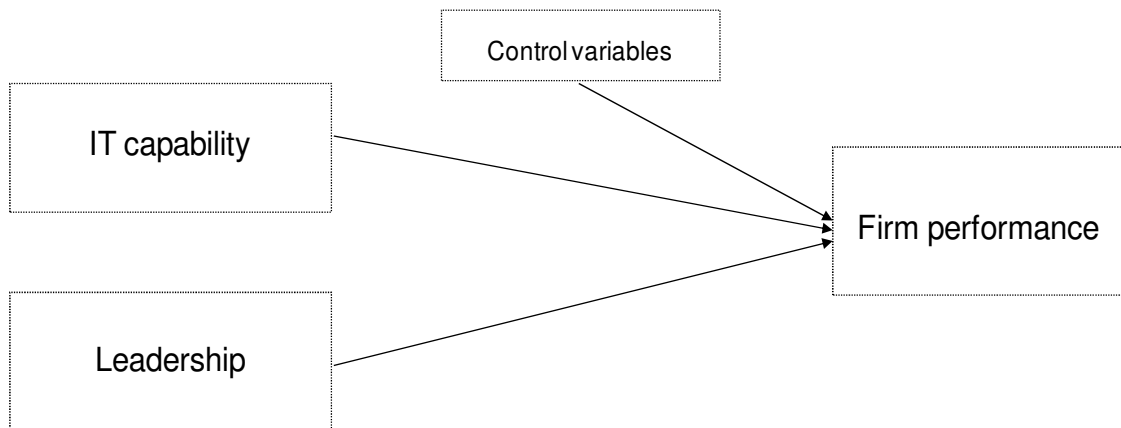
Source: Developed for this research

Before reviewing the literature on the independent variables, the next section of this chapter will provide an introduction to firm performance and will justify the choice of the respective measurement items.

2.3   Firm performance

This section introduces the reader to the concept of firm performance. As many approaches exist in the literature, the first subsection will provide an overview of what measurement items exist in general and why some of them were not found as being suitable for this study.

2.3.1 How firm performance is measured in strategy research

Many academics in their research work on the outcomes of strategic activities of firms traditionally focused on financial measurements as the pursuit of profit, and margin was acknowledged as being the ultimate goal of a firm and was therefore seen as the driving force for the optimal use of resources and the building of superior capabilities. Several studies such as Bull (2007), Rappaport (2006), and Stern et al (1995) illustrated this aspect and stated that the main reasons for using financial parameters were that they are fairly easy to understand, they provide individuals with tangible goals, and provide the company and its stakeholders with hard facts. However, findings of research conducted by Koch and Cebula (1994) indicated that 'fundamental measures of financial performance explain only about thirty per cent of the variance in management evaluations' (p. 694). In addition, studies by other researchers (e.g. Atkinson et al 1997) point out that concepts focusing on operational (internal) performance measures only might tend to result in too much focus on short-term views.

More recently, researchers developed a method called the balanced scorecard (Kaplan & Norton 2001) which represents a set of elements from different perspectives, including financial measures such as cash flow or net margin per product, internal investment measures such as Return-On-Investment (ROI) figures, customer experience-based items such as delivery time or maintenance response time, or market-based figures such as time-to-market (TTM) or speed of imitation (robustness).

As every firm uses a different set of measurement items, it was practically not feasible to use the balanced score card to measure firm performance in this study. However, the idea of having a more balanced view of the outcome of a corporation's activities appeared appealing.

A further research stream in the past focused on a different possible predictor of the long-term success of companies: customer satisfaction. Several pieces of research indicated that the higher customer satisfaction for a good or service leads to higher customer loyalty (Fornell 1992; Oliver 1980). As a consequence, there is research work that reports that higher customer loyalty leads to improved margin by reducing cost or increasing revenues by stimulating consumption of these goods and services (Fornell 1992; Rust et al 1995). Furthermore, Fornell (1992), as well as Anderson (1998), reported that through influencing other potential customers, satisfied customers tend to indirectly increase revenue (of a company) by telling others; while dissatisfied customers might decrease revenue through the same behaviour. While it seems obvious that customer satisfaction as a component of a broader firm performance construct might be relevant, the author found it quite likely that many companies might not have customer satisfaction data at hand so that this practical limitation prevented the study from using this concept.

Only very recently have scholars and practitioners developed whole assessment frameworks such as the Baldrige National Quality Program (see NIST 2002) that uses seven categories of measurement items to assess how well a company does in its efforts towards achieving its goals.

The members of the European Foundation for Quality Management created an excellence model (EFQM 2008) that uses enablers (which are defined similarly to how Wernerfelt 1984 viewed resources) and results, leading to a similar concept as the Baldrige framework. Although these well-standardised measurement and assessment instruments are already well-established and accepted in the global business (Porter & Tanner 2004), an assessment framework was not used in this study as conducting surveys to gather this data would have required immense effort which, practically, would have gone beyond the possible scope of this study and been too expensive.

As illustrated in this subsection, it was generally found that a multi-dimensional approach to measuring firm performance was more adequate than a concept based on a single item measure. The next subsection reviews relevant literature in similar research contexts.

2.3.2   IT organisations, firm performance and the banking industry

Many different previous studies were aimed at establishing what impact IT has on the performance of firms. Shu and Strassmann (2005) listed several examples of research work that reported non-significant or negative IT contributions to business value, but mentioned as well that some research found very positive IT contributions. Dehning and Richardson (2002) summarised that research in the 1970s and 1980s had even found the 'Productivity Paradox' (Brynjolfsson 1993) that was described as an absence of a positive relationship between spending on IT and productivity or profitability.

However, these two authors stated as well that later studies actually found positive relationships between IT and firm performance. Such positive relationships were found by several studies using different dependent and independent constructs (Bharadwaj et al 1999; Brynjolfsson & Hitt 2003; Lee & Bose 2002) so that it can be summarised that, today, many scholars agree that IT can be used to improve the success of companies.

However, in terms of which dependent construct was the 'best' measurement for firm performance, there was no agreement amongst researchers as the next couple of examples illustrate.

Hitt and Brynjolfsson (1994) found in their study that computers had led to higher productivity and created substantial value for consumers, but these benefits had not resulted in measurable improvements in business performance. Contrary to this, Sircar et al (2000) empirically retested the construct created by Hitt and Brynjolfsson (1994) and found strong support for the profitability measures and positive contributions to the performance of the respective firms.

In terms of IT, firm performance and the banking industry, Chen and Zhu (2004) used a set of US banks to validate their two-stage framework that measured firm performance based on the efficiency of resource utilisation. Shu and Strassmann (2005) concluded that there is some support that IT can contribute to productivity in the US banking industry and Lin (2007) found confirmation in his study in the US banking industry that IT capability contributed to the effectiveness of the companies over a 5-year period.

As the descriptions in the previous subsection show, there does not seem to be 'a best choice' of how to measure firm performance in a context such as the one under study. Moreover, the examples provided illustrate that firm performance was measured based on different, rather isolated aspects such as productivity, efficiency or effectiveness. The next subsection therefore aims at justifying why another, broader concept for firm performance was used in this study.

2.3.3 Firm performance measurement in this study

In search for a valid instrument to measure firm performance, the works by Barua et al (1995), Hitt and Brynjolfsson (1994), Tam (1998) and Weill and Broadbent (1998) were referred to as guidelines. These studies all proposed using similar sets of internal operating performance measures (e.g. productivity, profitability, sales growth, inventory turnover, and other financial performance data), complemented by external market measures (e.g. faster time-to-market, market share or sales from new products). Dehning and Richardson (2002) in their meta-analytic review observed as well that performance measurement items of these two categories are often used jointly in IT value studies.

Based on the above research, the author decided to apply the firm performance construct used by Ravichandran and Lertwongsatien (2005) which the two scholars reused from Capon et al (1992), as well as Powell and Dent-Micallef (1997). Ravichandran and Lertwongsatien (2005) retested the construct successfully in their survey-study with 129 US companies.

Furthermore, Ravichandran and Lertwongsatien (2005) highlighted that the scales used 'were validated using standard procedures recommended in the literature' (p. 251) and therefore claimed adequate convergent and discriminant validity, as well as adequate scale reliability, based on a measure by Cronbach (1951). In addition, a recent study by Xiao (2008) used a very similar firm performance construct, as did Ravichandran and Lertwongsatien (2005).

To conclude this subsection, it is summarised that the reason for selecting the above measurement instrument is because (a) it bases on the concept of using a balanced mix of internal operating and (external) market-based performance measures that (b) were suggested by many researchers previously, and because (c) the instrument possesses adequate reliability and validity.

In the next sections, the dependent concepts of leadership and IT capability are reviewed and the respective hypotheses are developed.

2.4   Leadership

2.4.1   What is leadership?

The roots of leadership are seen in sociology and psychology, two sciences that deal with human beings, their behaviour and their coexistence in society. Various controversial definitions of leadership can be found in literature (see Sadler 2003 for a variety of definitions).

However, what almost all definitions of leadership have in common is that they state that the main goal of leadership activities is to make sure employees work towards achieving the main goals of the company and, thus, the main focus is on company success (see several examples of large US companies in Collins & Porras 1994). Then again, leadership theories differ greatly in terms of their statements about how this success is realised. The next two subsections illustrate characteristics leadership can include based on two groups of aspects identified: leaders' roles and leadership processes.

2.4.1.1 Aspects of leaders' roles

Leadership can be described based on a structural element of organisational behaviour: roles. One controversial aspect of a leadership role is power, seen as the formal organisational authority over a person or group of people. Power is a dominant element of many leadership definitions as illustrated by studies such as Raven and French (1958) or Hersey et al (1979). The work of these researchers proposed that formal authority, used to direct and control employees, leads to enhanced business success. However, later work by many other researchers tended to decouple leadership behaviour and its outcomes from formal authority (Bennis & Goldsmith 1994; Heifetz & Linsky 2002; Ulmer 1997), claiming that even in the total absence of formal power, a leader can influence people's behaviour, e.g. by using his or her personal attributes. Glen (2003) even claimed that employees of IT organisations do not respond to formal power at all because their role in the organisation is different from the rest of the firm.

A second aspect of roles is to differentiate between managers and leaders. Kotter (1990) defined leadership as an activity that copes with change, while he understood management to cope with continuity. Zaleznik (1977) observed that managers can be problem solvers who do operational work, while leaders tend to search risk and danger, e.g. by fostering innovation. In his fundamental work on managers, Mintzberg (1973) understood leadership as being just one role within management— that of the motivator and director of employees.

The level of the leader in the hierarchy of an organisation is a third element of roles. Selznick (1984) differentiated between leaders on lower levels who tend to perform routine tasks, while leaders on upper levels take care of the strategy and culture of the company. Senge (1996) suggested in his work that an effective company might need to have three different groups of leaders: a group on the top-level, one group in middle management and one group of professionals acting on the operational level.

2.4.1.2 Aspects of leadership processes

Many definitions of leadership share the aspect of influencing and persuading others (Burns 1978; Yukl 1989). This fact illustrates that leadership can be viewed as a process as well. Intuitively, one can distinguish between approaches where leaders concentrate on activities that are of a rather functional/technical nature or, as a second group, are rather people-centric.

Goal-setting, supervising, controlling and providing others with structure (see e.g. Locke 1968 or Luthans & Kreitner 1975) or an ongoing process of finding the best direction (Collier & Esteban 2000) can be elements of processes of the first group.

Elements such as the social exchange between leaders and followers based on credibility or trust (see e.g. Hollander 1964) or responding to followers needs (see e.g. Ben-Yoav et al 1983) rather belong to the latter group.

The discussion in this section demonstrates the complexity of the topic, in that many different aspects can be included in leadership and that different viewpoints on these aspects can be found in the literature. This study does not use and apply a particular definition but, rather, acknowledges the broad range of behaviours that can go along with leadership and activities involving influencing people towards achieving a company's goals.

The next section discusses the theoretical developments of leadership.

2.4.2 Theoretical developments of leadership

Carlyle (1841) established the foundations of leadership research by presenting his great man theory that understood leaders as being born as heroes. Later scholars extended this theory by adding other qualifications of successful leadership so that the theory on a leader's traits was created.

Stogdill (1948) was probably the first to propose that not just traits alone, but the relationship between leaders and followers, was important to understand leadership.

The corresponding shift to behavioural leadership theory (see e.g. Shartle 1950) was dominated by the Ohio State University and propagated consideration (understood as the degree to which a leader respects and shows concern for the follower) and the initiation of structure (the degree to which a leader provides structure to the follower) in order to predict the effectiveness of leadership. This view is very much in line with the process view of leadership described in section 2.4.1.2. Judge et al (2004) stated in their meta-analysis that the theory had shown to hold high validity. However, other researchers found no strong support for it (House & Aditya 1997; Yukl 2002).

When focusing specifically on theories that looked at maximising people's and organisation's performance, Fiedler (1967) suggested using a model of contingency (based on the least preferred co-worker LPC) where the degree to which the leader controls a situation and the context, together with the leader's style, are aspects that drive employees' performance. Other researchers found weaknesses in this concept, mainly validity concerns and unstable relationships between the style and performance outcomes (Evans & Dermer 1974; Hare et al 1998; Schriesheim et al 1979; Schriesheim et al 1994).

The contingency model of leadership created by Vroom and Yetton (1973) put the focus on how much participation the employee needs in the decision-making process. Other researchers found some support for this model (Field 1979; Field 1982; Margerison & Glube 1979; Paul & Ebadi 1989), although some of these studies (e.g. Field 1979) pointed out issues like validity problems because of inappropriate test designs and lack of external validity because of missing real world test findings.

Although a revised model by Vroom and Jago (1995) was found as being more valid, reservations remained since the theory focused very much on 'just' the decision-making process of leadership (Field & Andrews 1998).

The situational leadership theory (SLT) that Hersey and Blanchard (1974) developed is based on the view that subordinates' performance mainly depends on the degree to which they are capable of and prepared to carry out specific tasks. The theory was not found as being valid enough by several researchers such as Blank et al (1990), Goodson et al (1989 and Graeff (1997), although there were studies that found at least partial support for the proposed concept (Hambleton & Gumpert 1982; Vecchio 1987).

Danserau et al (1975) established the Leader-Member Exchange (LMX) theory (also called Vertical Dyad Linkage theory) which argued that high performance is mainly the result of positive and trusted relationships between the leader and the subordinates. Leaders would, therefore, differentiate between people with whom they have and maintain a better rapport (in-group) than with others (out-group). Although several studies found significant support for the theory (Bauer & Green 1996; Deluga 1998; Duchon et al 1986), others found conceptual issues (Burns & Otte 1999; Dienesch & Liden 1986; Van Breukelen et al 2006).

The path-goal theory formed by House (1971) contains a model where leaders concentrate on guiding their subordinates to reach their goals along the most appropriate path by using one of four leadership behaviours considering environmental factors and the individual's abilities and characteristics.

House's theory has found some support in research work conducted by other scholars (e.g. Wofford & Liska 1993). However, these authors' meta-analytic review, as well as findings from older work (Schriesheim & Schriesheim 1980) and later studies (Evans 1996; Jermier 1996), showed significant deficiencies around measurement and consistency of methods used to test the theory.

Inspired by the trait and behavioural theories described above, House (1977) proposed that the charisma of a leader can cause followers to achieve extraordinary performance. According to House, the leader inspires followers whereby a relationship characterised by trust, commitment and loyalty is established. Charismatic leaders do not necessarily use power; and followers neither expect monetary rewards, nor do they act out of fear. House (1977) further suggested that the charismatic leader often expresses a vision or goal that includes a desired future state that followers identify with. Conger and Kanungo (1994; 1998) observed that the charismatic leader expresses confidence that followers can and do achieve the goals and that this increases followers' confidence and self-esteem. In addition, Conger and Kanungo pointed out that the leader often leads by example and even 'engages in self-sacrifice' (1998, p. 94) which, in turn, causes the follower to imitate the values and behaviours of the leader. Several studies found positive relationships between the described characteristics of leadership and the achievements and the performance of followers (e.g. Kirkpatrick and Locke 1996; Waldmann et al 1990). However, other studies found inconsistent results.

Bryman (1992) argued that the theory is too much focused on effects, that the leader characteristics might be too much confounded and that they would need to be separated more clearly in order to measure their individual effects. Shamir et al (1998) suggested that effects of charismatic leadership on individuals and teams might be significantly different.

This section has briefly described the theoretical developments of leadership, including the main propositions and critiques. From this, it becomes clear that many different theories exist, but no theory has been brought forward that is universally applicable or generally superior to others.

2.4.3   Leadership as a strategic capability

The research of several scholars indicates that leadership could be viewed as a strategic capability as well. Bass (1960) and McGregor (1960) identified leadership to influence sciences such as business, management and organisational behaviour; and the work by Lieberson and O'Connor (1972) was probably one of the first empirical studies linking leadership with commercial success.

It was Barney (1991) who connected the works of Becker (1964) around human capital and the study by Tomer (1987) on organisational capital resources, placing them in the context of the RBV by acknowledging the essential impact of human resources on the steering function of the firm. Barney called the resulting strategic capability the 'managerial capability' that influences what people do and how they do it.

Eventually, it was Barney and Zajac (1994) with their work on competitive organisational behaviour who proposed that the 'people' aspect within strategic capability could be far more than technical and business skills and managerial work from the top. Rather, Barney and Zajac (1994) understood that there are organisational behaviours that can improve competitive advantage in that people and teams have great influences on how strategies are conceived and implemented. They argued that those activities of influencing the strategy implementation possess attributes of strategic capabilities (such as being valuable, rare and difficult to imitate) and that some activities have leadership characteristics such as inspiring others, providing a shared vision or fostering the development of other people's strengths.

In his case-study on the turnaround of NCR Corporation, Rosenbloom (2000) illustrated how leadership was used as a strategic capability to initiate a change in a firm that provided technology and related services. Rosenbloom (2000) characterised the capability mainly as a leader's willingness to break commitments and take risks; and by leadership by example. In addition, recent research from Asia by Idris and Ali (2008) indicates that transformational leadership could be seen as a strategic capability that influences the performance of firms when applying it to a situation where the organisation aims at implementing a Total Quality Management (TQM) culture.

2.4.4   Transactional and transformational leadership

The two previous sections illustrated the theoretical development of leadership theory and described indications in the literature that leadership could be viewed as a strategic capability. This section provides a description of transactional and transformational leadership; illustrates why this theory is viewed as the most adequate for this study; and, finally, leads into the hypotheses.

2.4.4.1   What transactional and transformational leadership behaviours are

Burns (1978) established a theory of transactional and transformational leaders inspired by the charismatic leadership theory (House 1977), as well as other leadership theories (as illustrated in the next section). According to Burns's (1978) view, leaders use transactional leadership to reward their employees for performance or punish for non-performance. Furthermore, he found these leaders to focus mainly on processes and tools. On the other hand, he suggested transformational leaders as being different in that they use trust, respect and integrity to motivate and convince people of their ideas and he proposed that these leaders give people visions on the basis of what the company wants to achieve. According to Burns (1978), every leader either belongs to one or the other group exclusively. Later, Bass (1985) developed a perspective where leaders tend to use elements of both of the above approaches of leadership styles in order to be effective. He suggested two main characteristics for transactional leadership (contingent reward, management by exception) and three for transformational leadership (charisma, individualised consideration and intellectual stimulation). In addition, Bass created an instrument he called the 'Multifactor Leadership Questionnaire (MLQ)' to measure behaviours of leaders and leadership outcome.

Numerous studies have been conducted to review Bass's leadership theory and the MLQ. Lowe et al (1996) found more than 70 studies where the MLQ had been used to measure the relationship between the leadership styles and different performance measurements. The authors found broad empirical support for the construct and confirmed its validity as a measurement instrument for effectiveness of leadership and other performance measurements. Dumdum (2002) continued the work of Lowe et al (1996) and validated their findings. Judge and Piccolo (2004) confirmed high validity of the constructs as well. Other researchers such as Yukl (1999) found several weaknesses in the original MLQ. His claims are further outlined in the table below. Based on these inputs and the work by Avolio et al (1999), the MLQ was improved and the MLQ 5X (Bass & Avolio 2004) resulted.

The following table (Table 2-1) provides an overview of the main propositions and critiques of transactional and transformational leadership together.

Table 2-1 – Main propositions and critiques of transactional and transformational leadership

Theory	References	Main propositions and critiques
Transactional leadership & trans-formational leadership (together)	Burns (1978)	• Proposed that a leader either uses transformational or transactional leadership exclusively
	Bass (1985) Bass & Avolio (1997; 2004)	• Proposed using the two styles as complementary as they might be more effective together when trying to achieve business goals
	Lowe et al (1996)	• Claimed that the style of a leader might contain elements of both, transactional and transformational leadership • Reported transformational and transactional leadership as measured by the MLQ in their meta-analytic review as being positively related to various performance measures • Reported transformational/transactional leadership to most likely be the best researched leadership area in the past 10 years
	Dumdum et al (2002)	• Confirmed the findings of Lowe et al (1996)
	Judge & Piccolo (2004)	• Found high validity of both leadership styles
	Yukl (1999)	• Acknowledged that there is considerable support that transformational leadership is effective and agreed that transactional leadership is positively related to performance, although weaker and less consistent than transformational • Claimed that negative effects are not identified sufficiently and that situational factors are under-emphasised

Source: Developed for this research

The table below (Table 2-2) summarises the main propositions of the two areas of the theory separately.

Table 2-2 – Main propositions and critiques of transactional and transformational leadership

Theory	References	Main propositions and critiques
Transactional leadership	Burns (1978)	• Characterises transactional leaders as those who mainly reward for performance and punish for non-performance
	Bass (1985) Bass & Avolio (1997; 2004)	• Understood transactional leaders as those who tend to act and succeed in environments that do not change a lot, where not a lot of risk is needed and where efficiency is important
	Lowe et al (1996)	• Found transactional leadership generally as being positively related to firm performance, although often not as strongly as transformational leadership
	Yukl (1999)	• Stated that transactional behaviour might sometimes include transformational elements as well (e.g. praise / recognition) • Found that the rational for including active management-by-exception as part of the transactional style is not clear
Trans-formational leadership	Bass (1985) Bass & Avolio (1997; 2004)	• Understood transformational leaders as being effective in changing environments, as being less risk averse and as people who try to actively shape their future and that of their followers
	Lowe et al (1996)	• Reported high correlations between transformational leadership and different performance constructs
	Yukl (1999)	• Criticised high focus on individual behaviour and claimed influence on groups is 'not explained very well' (p. 288) • Was concerned about behaviours like 'inspiring, developing and empowering' not being well captured by the theory (p. 290) • Doubted construct validity because of 'overlapping content and high inter-correlation' (p. 287) • Identified a need to clarify differences between transformational and charismatic leadership theories since he understood them as being overlapping but not equivalent

Source: Developed for this research

2.4.4.2 Transactional and transformational leadership as the most relevant theory

The transactional and transformational leadership theory was strongly influenced by several other theories. By that, the theory became an integrated view that incorporates many leadership behaviours and characteristics that were identified in the literature as being important ingredients of successful leadership.

As several of the theories described in section 2.4.2 influenced transactional and transformational leadership considerably, their effects are described below in more detail.

The LPC model by Fiedler (1967) and at least parts of the path-goal theory by House (1971), as well as other leadership theories, are categorised by Burns (1978) as transactional approaches. More specifically, it can be argued that the aspects of controlling the situation and the context of a leader-member relation that the contingency model by Fiedler used (including clear definitions of elements like inputs, expected outputs, guidelines and what timeframes are applicable) can be viewed as the fundamentals of contingent reward (CR), a transactional element within theory by Bass and Avolio (2004). Furthermore, the directive and achievement-oriented elements of the path-goal theory by House (1971) are similar to the concept of CR.

The Vertical Dyad Linkage theory by Danserau et al (1975) on the other hand, with its elements of building a relationship based on trust, most probably laid some of the foundation of the transformational leadership style through delegating authority to subordinates which, in return, fostered stronger commitment to work goals or high levels of effort and performance (Bauer & Green 1996). Other scholars such as Basu and Green (1997) illustrated this further by finding the leader-exchange (LMX) quality as being highly correlated with the 'Individualised Consideration' (IC) elements within the transformational style in their study, indicating the elements might in fact measure similar or even identical things.

In addition, the theory on charismatic leadership by House (1977) on the basis of which later researchers (e.g. Conger & Kanungo 1994; 1998) identified a few typical individual leader characteristics (such as 'has a vision – expressed as an individualised goal') can be seen as an influencing research stream of transformational leadership as defined by Bass and Avolio (1997). Moreover, Bass and Avolio describe that transformational leaders might be perceived by their followers as charismatic leaders.

However, Avolio and Bass (1985) point out that transformational leadership goes beyond what charismatic leadership represents in that the leader does not only project his goals, values and beliefs onto the follower, but that 'the transformational leader will attempt to instil in followers the ability to question not only established views but eventually those established by the leader' (p. 14).

Other leadership behaviours and characteristics that are often mentioned as being very relevant to successful leadership are included in the transactional and transformational leadership theory. Examples include the creation of a trusted relationship between the leader and his or her followers, as Dirks and Ferrin (2000) reported in their meta-analysis. The two researchers concluded that in the absence of trust, the performance of the person or people being led can be seriously lowered.

Moreover, the transactional and transformational leadership theory accounts for the controversy on power as power is not viewed as being a necessary precondition to becoming a successful leader.

Furthermore, transactional leadership includes elements of management as it includes supervising and monitoring of operational activities and comparing actual outcomes of a firm's or organisation's activities against its plans and budgets.

Other scholars in leadership research like Yukl (1989) or Schein (2004) included the aspect of a leader influencing the culture of others by projecting beliefs and values onto followers so that an organisational culture is created in groups. Transformational leadership covers these elements as visible from the MLQ (see appendix B).

In addition, honesty and integrity of the leader were often found as being important components of leadership (Kouzes & Posner 1993; Reave 2005) and are represented in the transactional and transformational theory as well (as described by Bass & Seidlmeier 1999).

These exemplary characteristics illustrate well how transformational and transactional leadership together form a holistic theory (Tichy & Devanna 1986). Moreover, as Rowold and Heinitz (2007) propose, transformational leadership can augment the effect of transactional leadership. Furthermore, based on meta-analytic reviews of Lowe et al (1996) and Dumdum et al (2002), it is very likely that the leadership theory of Bass and Avolio (2004) is the most validated and tested of all contemporary leadership theories. Finally, transactional and transformational leadership have been found as being positively related to firm performance, as discussed in the next section.

Based on the arguments in the above paragraphs, it is claimed that transactional and transformational leadership theory, including the Multifactor Leadership Questionnaire (MLQ) as the corresponding measurement instrument, are relevant and applicable to this project.

2.4.4.3   Transactional and transformational leadership research in similar contexts

A study by Ahn and Kwon (2001) examined the relationship between transformational leadership and leadership performance (as measured by the MLQ) in a sample of 123 IT organisations from diverse industries in Korea and found a significant positive relationship between the two. In addition, Baladima and Gan (2007) examined the effectiveness impacts of transactional and transformational leadership behaviours in an IT organisation; and Bennett (2009) analysed effects of transactional and transformational leadership on IT subordinates' extra effort. Although all three studies indicated that a positive impact of the usage of Bass and Avolio's (2004) leadership theory on IT organisations could potentially be gained, they did not measure any effect on the performance of the firms—so it remains questionable as to what the business value of transformational leadership in an IT setting is.

Based on his own case studies in many firms, Glen (2003) in his book on how to lead IT professionals (he calls them 'geeks') proposes behaviours and actions that contain aspects of both transactional and transformational leadership.

For transactional behaviours, these suggestions include elements such as the leader should ideally organise the work in projects 'with specific, measurable and achievable targets' (p. 111), should avoid 'excessive monitoring' (p. 117) but 'make sure that schedules and interdependencies are being properly planned' (p. 135), and should provide adequate rewards (including generous salaries). For transformational behaviours, aspects mentioned include creating an area of 'safety for ideas' (p. 127) where people are encouraged to be creative, or 'creating community and culture' (p. 125) where common (team) values and spirit are fostered, or supporting critical thinking (including accepting differences of opinions).

In a similar context, Thite (1999) performed a quantitative study among 111 Australian organisations and suggested that a combination of transactional and transformational leadership behaviours might generate better outcomes in technical projects. The author measured the impact of the dimensions of those leadership theories on the outcome of specific technical projects (project success measured by senior managers). Similarly, Sumner et al (2006) proposed that, for successful IT projects, project managers should use transformational and transactional leadership behaviours.

There are several recent studies that provide support for a positive relationship between transactional and/or transformational leadership and performance measured by financial variables (Idris & Ali 2008; Koene et al 2002; Ling et al 2008; Mwendia 2008; Roi 2006; Rowold & Heinitz 2007; Xenikou & Simosi 2006); where all of these studies used either internal operating performance or external market performance measures or a mix of both as suggested in section 2.3.3.

These studies not only provide strong indications for such relationships based on data from different geographical areas, but from different industries and competitive settings as well. Furthermore, transactional and transformational leadership were specifically proposed to have a positive impact on performance of firms in the financial sector (Avolio & Howell 1992; Geyer & Steyrer 1998).

The business situation in the financial industry is not a stable one as illustrated by the current crisis in this market. Furthermore, the IT organisations in financial companies constantly change in order to respond to those outside challenges. Together, transactional leadership complemented by transformational leadership was found as being specifically effective in changing environments in general (Bass & Avolio 2004) and De Hoogh et al (2004) summarised in their study that variations in firm performance can be explained by charismatic elements of transformational leadership, explicitly 'under conditions of environmental uncertainty' (p. 462).

In summary, the previous paragraphs indicate that transactional and transformational theories represent an appropriate approach for this research, together with the MLQ as a suitable measurement instrument.

2.4.4.4   Leadership hypotheses

Although transformational and transactional leadership as defined by Bass and Avolio (2004) seem to represent valuable instruments in the given context of IT organisations in the financial sector, and even though strong indications exist in the literature that leadership could be viewed as an important strategic capability that can improve firm performance, the author of this study is not aware of any research work that has examined the relationship of transactional and transformational leadership and firm performance in IT organisations in the financial industry.

From this identified gap and in line with the arguments in the previous sections, the following hypotheses are developed:

Hypothesis 1:   Transformational leadership is positively related to firm performance in IT organisations in the Swiss financial sector.

Hypothesis 2:   Transactional leadership is positively related to firm performance in IT organisations in the Swiss financial sector.

2.5   Information Technology (IT) capability

As indicated earlier in this chapter, scientists in the past realised that investments in IT can have a positive impact on a firm's business, e.g. on cost (Mitra & Chaya 1996) or on productivity (Brynjolfsson & Hitt 2003), but can impact on a company's commercial activities negatively as well (e.g. Beccalli 2007; Thatcher & Oliver 2001).

Kauffmann and Weill (1989) suggested a research model where a company's IT activities are seen as efforts towards building up an IT competence (in the sense of a broad set of skills) and they argued that this is a better predictor for firms' business performance than just investments. Researchers, therefore, started to look for a more adequate definition of what an IT organisation should possess in order to generate value for their businesses.

2.5.1 Towards a broader concept of the IT function based on the RBV

Using the resource-based view (Barney 1991; Grant 1991; Wernerfelt 1984), Mata et al (1995) analysed what elements of IT had previously been suggested to generate sustained competitive advantage. They found that IT can indeed create expedient strategic capabilities if firms manage to create and maintain capabilities that are valuable, heterogeneously distributed across firms and imperfectly mobile. Mata et al (1995) concluded in their study that having access to capital needed to make (risky) IT investments, establishing some sort of proprietary technology or acquiring or developing the technical IT skills needed might all (on their own) be valuable, though often subject to being copied or bought by competitors at rather low costs.

Several RBV-based studies stressed the importance of particular elements of IT. Broadbent and Weill (1997), Byrd and Turner (2001), Davenport and Lindner (1994), as well as Qi et al (2008) proposed in their studies that IT infrastructure elements are essential in order to generate value for the business.

Mata et al (1995) suggested in their study that managerial IT skills 'are likely to be a source of competitive advantage' (p. 500) because of the socially complex process that is involved if managers succeed in steering and guiding IT professionals towards understanding and working closely with business representatives. Sambamurthy (2000), as well as Dehning and Stratopoulos (2003), made similar recommendations.

It was Grant (1995) who established the broad concept he called 'MIS capability', viewing it as a functional capability that forms the basis for cross-functional abilities of a firm (such as product development, sales or customer support) that are superior to those of competitors.

Ross et al (1996) suggested a more precise definition, categorizing the underlying elements of IT capability into 'technology assets', 'human assets' and 'relationship assets'. Almost at the same time, Powell and Dent-Micallef (1997) suggested dividing the antecedents of IT capability into 'human resources', 'business resources' and 'technology resources'. By doing so, the two studies laid the foundation for most of the later studies in this scientific area. Davern and Kauffman (2000) concluded in their research that besides investments in pure technology and infrastructure, complementary assets such as human intellectual capital and optimal business processes are crucial in order to realise an optimal level of value gained from IT. In addition, Santhanam and Hartono (2003) and Melville et al (2004) recommended multidimensional measures for IT capability in order to capture the broad scope of abilities needed to generate such a valuable and sustainable competitive advantage based on the IT function of a firm.

As more contemporary research (Aral & Weill 2007; Wade & Hulland 2004) favoured a broader view of IT capability where several sets of elements complement each other in order to generate an IT capability, this study aimed at using such a broad perspective. Consequently, the next three sections review three research streams relevant to this study.

2.5.2   The Feeny/Willcocks framework around IS capabilities

With the goal of planning an optimal IS/IT function, Feeny and Willcocks (1998) proposed such a broad IS capability framework founded on the resource-based view of the firm. Their proposal contained nine core IS capabilities grouped in three areas:

Figure 2-4 – The framework around IS capabilities
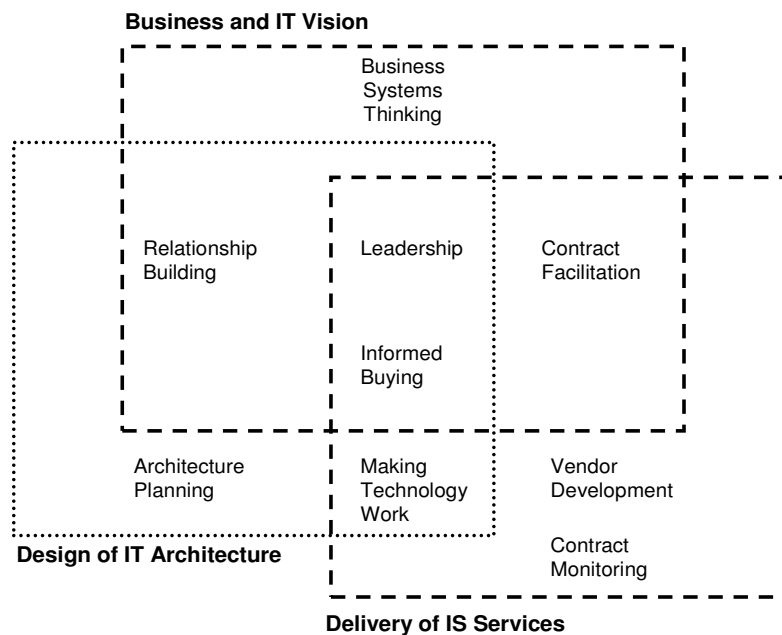
Source: Feeny & Willcocks (1998)

The model by Feeny and Willcocks (1998) was shaped mainly by three streams of research: (a) studies that looked at the value of IT outsourcing and how firms successfully outsource IT functions such as Lacity et al (1996); (b) investigations by Feeny et al (1997) in and around skills and competencies IS/IT teams would ideally need to be successful; and (c) studies focusing mainly on the role of the Chief Information Officer (CIO, meaning the head of the IS/IT function—see section 2.9 for details).

Together with the model, Feeny and Willcocks (1998) introduced a concept where they argued that in each of the nine core capabilities, a mix of three different levels of business, technical and interpersonal skills were ideally needed and that the skills used to form the capabilities are rooted in a mix of motivating values (structure/strategy/individuals and technology).

Feeny and Willcocks concluded that firms with outsourced IT functions could maximize the value of IS/IT by implementing such an IS capability model based on the individual nature of the firm's business. After having analysed the findings of three long-term case studies, Willcocks et al (2006) revisited the framework and generally confirmed the effectiveness of it. They proposed the framework to 'better be applied as an evolutionary process rather than an instant fix' (p. 36).

Although the work of Feeny, and Willcocks et al built on rather broad empirical support (three research streams and many long-term case studies), there seems to be a lack of larger quantitative studies available that tested the reliability of their framework.

A very recent multiple case study by Chun and Mooney (2009) found strong support for just three of the nine capabilities. For two, they found some support and only weak support for the remaining four capabilities. Very outsourcing-specific capabilities like 'vendor management' and 'contract monitoring' got weak support only. The same was found for the capability 'making technology work'. The latter, according to Feeny and Willcocks (1998), consists of the ability to deliver fast fixes to arising problems in the technical supply chain and the ability to find and apply solutions for business needs that cannot be properly supplied by standard technical approaches.

In view of these statements and based on the fact that the Feeny and Willcocks (1998) model focused very strongly on firms that outsourced most of their IT function, it seemed that this framework was not suitable enough for this study. However, a range of managerial/leadership skills that steer the IT function as well as elements of human IT, technical and organisational skills (such as relationship building) was used in the Feeny & Willcocks (1998) framework. This confirms the need for a broader view of the needed capabilities, as discussed in the previous sections.

As demonstrated in the next sections, later research was influenced significantly by several aspects of the model by Feeny & Willcocks (1998).

2.5.3   Armstrong and Sambamurthy's (1999) IT assimilation model

By adding the resource-based view of the firm to the research around the CIO role (see section 2.9), Armstrong and Sambamurthy (1999) conducted a large-scale quantitative study. They assessed the impact of IT knowledge of the CIO and the top management team (TMT) of a firm, together with superior IT infrastructure, on IT assimilation. The latter was defined as firm performance in terms of the outcomes of different value-chain activities and results of strategic business activities, relative to competitors.

Armstrong and Sambamurthy (1999) found that the CIO's IT and business knowledge contributed positively to the overall performance of the respective firms. In addition, a positive relationship of superior IT infrastructure and firm performance resulted, based on the ratings from the TMT. Furthermore, they emphasised the positive effect of the CIO's superior IT and business knowledge, together with frequent informal interactions with members of top management on the IT assimilation.

Although these findings provide valuable insights into how the RBV could be used in strategic IT settings, the model is not fully adequate to be used in this study. The independent constructs very much focus on just (IT and business) knowledge and IT infrastructure; whereas other potential resources for valuable capabilities that a firm could use to build a competitive advantage are neglected. Thus, the constructs seem to be rather too narrow. In addition, further empirical studies that reassessed the model are missing. Hence, reliability could be limited.

However, the study and the model produced valuable insights into how value could be generated by the IT function so that later research could reuse some of the findings.

2.5.4 Bharadwaj's (2000) IT capability construct

Bharadwaj (2000) introduced an even broader concept of IT capability based on the resource-based view of the firm. She defined IT capability as 'the ability to mobilize and deploy IT-based resources in combination or co-present with other resources and capabilities' (p. 171). The definition of Bharadwaj's suggestion found broad acceptance and was reused in several other studies in the field (see Zhang 2005, pp. 12-4). Her model included physical infrastructure elements, human IT capital (including managerial IT skills), and IT-enabled organisational intangibles such as excellence in customer relationship management. In her empirical study, Bharadwaj (2000) found a positive relationship between the three elements of IT capability and firm performance.

Figure 2-5 – IT capability construct
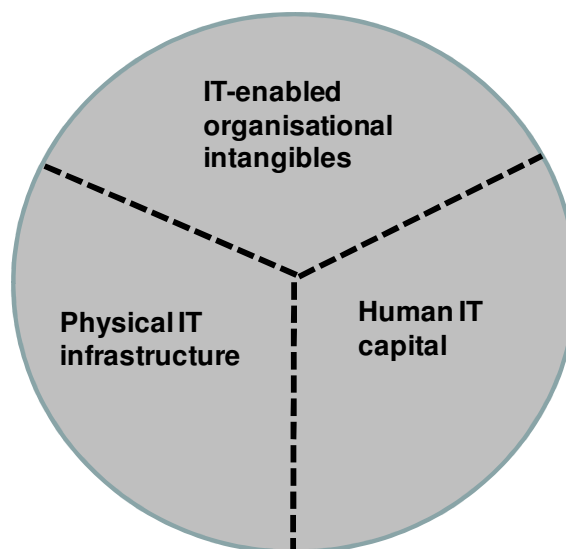
Adapted from Bharadwaj (2000)

Santhanam and Hartono (2003) tested the robustness of IT capability and its impact on firm performance and found that firms with superior IT capability generate higher profits and lower costs than other firms in their industry. These findings confirmed the conclusions of Bharadwaj's (2000) study.

Lin (2007) conducted a study with 155 banking firms in the US and found that firms with superior IT capability generated higher firm performance, which is again in line with the results of Bharadwaj (2000) and Santhanam and Hartono (2003). In addition, Aral and Weill (2007) identified IT capability as being a product of the use of superior IT resources, confirming empirical support for a positive relationship with firm performance.

Finally, a very recent empirical study in this field by Xiao (2008) found an IT capability construct extended by 'IT reconfigurability' (understood as a specific set of variables measuring flexibility/agility of IT) as being significantly and positively related with firm performance.

This study uses the IT capability construct by Bharadwaj (2000) because of the robustness mentioned and the broad empirical support. However, as Bharadwaj (2000), Santhanam and Hartono (2003) and Lin (2007) all point out, more research is needed to confirm that superior IT capability should be built and applied by firms in order to achieve competitive advantage, the latter (Lin 2007) explicitly in the financial sector.

The following sections provide more details about the three elements of IT capability and they lead to the specific hypotheses to be tested in order to answer the research question.

2.5.4.1 Physical IT infrastructure components

The physical IT infrastructure of a firm was identified as an important part of IT capability as it represents the basis for applications that allow automation of cross-functional business processes (Broadbent & Weill 1997).

Based on resources, companies can achieve competitive advantage by building an IT infrastructure that is capable of serving as a shared information delivery and service base (Qi et al 2008) and a flexible, modular platform for launching business applications (Byrd & Turner 2001). Both aspects have their roots in the work of (a) McKey and Brockway (1989), who stated that IT infrastructure needs to provide the basis for business applications through offering base services; as well as (b) Keen (1991) who suggested that IT infrastructure must serve as a business-enabling resource and thus must be able to cope with changes.

Moreover, an adequate degree of IT integration can improve the value of physical infrastructure components (Bharadwaj 2000). Finally, an important attribute of superior physical infrastructure components is that it can serve as an enabler for innovation and continuous improvement (Duncan 1995).

This idea was triggered by the work of Rogers (1983) who understood technology to foster innovation as it offers information-seeking and information processing functionality which, in turn, reduces uncertainty about the effects of ideas and the time needed to implement them.

In line with previous studies and based on the above, the following hypothesis is formed:

Hypothesis 3:   Physical IT infrastructure as part of the IT capability is positively related to firm performance in IT organisations in the Swiss financial sector.

2.5.4.2   Human IT capital

Barney (1991) originally viewed organisational human resources mainly as experience, training, insights and relationships of a firm's staff. Wright et al (1994) analysed the human resource aspect within the RBV theory in great detail and found it important in developing a 'high quality human resource capital pool' (p. 316) out of existing or new resources. Through becoming 'valuable, rare, inimitable and non-substitutable' (p. 301), the authors state that this pool would then form a competitive advantage that fosters the success of the firm. The authors further explain that this human capital pool would 'be developed and behaviour brought in line with firm goals through human resource practices' (p. 319).

Research on human IT capital has originally focused much on managerial capability. Ferratt et al (1993), as well as Major et al (2007), reported that superb IT management skills and practices often improve the value IT organisations are able to provide to their business. Mata et al (1995), as well as Dehning and Stratopoulos (2002), concluded that exceptional managerial IT skills can improve the sustainability of a competitive advantage IT provides to a company.

Lee et al (1995) and Rockart et al (1996) were among the first to systematically research the skills and knowledge needed by IT/IS professionals and identified a broad set of knowledge and experience including technical skills, understanding of business problems and challenges, as well as interpersonal skills.

Based on this stream of research that proposed a broader view of skills IS professionals need, Bharadwaj (2000) extended the human IT capital part of IT capability by adding the ability to better integrate business and IT planning processes than competitors. She expanded the construct by adding the skill to communicate and work with business units more efficiently; and the ability to deliver reliable and cost effective business applications faster than other firms. Finally, she added an ability to anticipate future business needs of the firm and innovate valuable new product features ahead of competitors.

Contemporary research studies (e.g. Gallagher et al 2010; Joseph et al 2010) confirm the broad view of skills needed and proposed by the research work mentioned above and reinforce Bharadwaj's (2000) suggestion that superior human IT capital could lead to competitive advantage.

Based on these statements, the following hypothesis is formed:

Hypothesis 4:   Human IT capital as part of IT capability is positively related to firm performance in IT organisations in the Swiss financial sector.

2.5.4.3   IT-enabled organisational intangibles

The foundations of the resource-based view of the firm recognize the contribution that intangible organisational resources can make in the process of developing unique capabilities that are of value to a firm (Barney 1991).

Some of the IT-related elements of intangible organisational resources and their potential business value have been discussed extensively in the literature, elements such as excellent customer relationship management abilities (Brynjolfsson & Hitt 1997; Chan 2005; Harding et al 2004), superior skills in integrating, transferring and applying knowledge (Bogdanowicz & Bailey 2002; Botha 2000; Chen & Edgington 2005), and the ability to respond to environmental changes adequately (Ekman & Angwin 2007; Oosterhout et al 2006).

The latter element refers to the idea of flexible and agile information systems which originates in work of (a) Weill (1993) who stated the need to handle an increasing variety of customer needs at costs as low as possible; and (b) D'Aveni (1994) who introduced the need for a firm's ability to identify opportunities and to apply resources and capabilities fast and unexpectedly—a capability the researcher found to often create business value.

In addition, the positive effects of effective and efficient IT-enabled sharing of resources and capabilities among different organisational units in a firm are well-documented in literature, mainly based on cases of larger service firms (Bruno 2002; Govindarajan & Fisher 1990; Holden 2003). The roots of this variable can be found in Porter (1985) who indicated that a high level of resource sharing amongst business units might yield synergistic advantages.

Two more elements were added by Bharadwaj (2000). The first is the ability to remove physical, spatial and temporal limitations to communication, a core discipline of every IT service, which is well demonstrated by the huge success of electronic mail and other similar electronic tools. The second and last aspect added is the ability to realise cost and demand synergies by marketing new products and services at little added cost. This part of the capability is often referred to as 'IT-enabled new product development' which can provide significant value to a business, e.g. through supporting the idea generation process or through more efficient product testing (Barczak et al 2007).

Markides and Williamson (1995) later referred to this concept as 'related diversification' that allows for capitalising on similarities among internal business units in order to gain competitive advantage.

Based on what has been discussed in this subsection, the following hypothesis is presented:

Hypothesis 5:   IT-enabled organisational intangibles as part of IT capability are positively related to firm performance in IT organisations in the Swiss financial sector.

2.6   The combined effect of IT capability and leadership

Although no research exists about the combined effect of IT capability and leadership on firm performance, there are a considerable number of studies that contain indications about a possible combined effect of the two.

Luftman and Brier (1999) found leadership to be an important influencing factor on IT strategies as well as IT and business alignment, both as possible sources of business success. Roepke et al (2000) illustrated a case of successful introduction of leadership into the organisation of the company 3M and suggest that improving leadership behaviours of IT managers could lead to improved business, IT alignment and better firm performance.

Agarwal and Farratt (2002) linked leadership with other human IT-based capabilities and identified them together as being essential skills needed for best practice and ones which successful IT supervisors should know and use. Glen (2003) mentioned charismatic and other elements of transformational leadership as being effective capabilities needed in IT organisations so that IT staff can perform best and can contribute to firm performance. His work, however, did not include empirical support for the suggestions made. Mithas et al (2004) considered leadership as being a relevant influencing factor on organisational IT capabilities and found elements of the latter as being positively related to firm performance.

From these studies, it can be inferred that leadership could possibly enhance the positive effect of IT capability as a strategic tool that can lead to improved firm performance. This would point to a moderating effect of leadership between IT capability and firm performance. The following is therefore suggested:

Hypothesis 6a: In IT organisations in the Swiss financial sector, transactional and transformational leadership moderate the relationship between IT capability and firm performance in such a way that leadership acts as an enhancer.

In social research studies, effects involving multiple complex constructs that are not directly observable (latent constructs) should be analysed from different angles. As Brown and Kenny (1986) proposed, it is appropriate and recommended that an alternate model to a moderated one is tested. This procedure can be viewed as a best practice in social research studies (see e.g. Sosik & Dinger 2007).

For the context of this study, this would mean viewing IT capability as the mediating construct which would account for at least part of the relationship between transactional and transformational leadership (the predictor or independent construct) and firm performance (the criterion or dependent construct). When revisiting the statements on the role of leadership made above (Agarwal & Ferratt 2002; Luftman & Brier 1999; Roepke et al 2000), it could indeed be inferred to view leadership as an antecedent variable to IT capability, implying that its effect on firm performance would partially or completely be transferred through IT capability, similar to Major et al's (2007) description of IT supervising skills to unfold their value indirectly by influencing best practice. Consequently, the following is presented as an alternative hypothesis to 6a:

Hypothesis 6b: In IT organisations in the Swiss financial sector, IT capability mediates the relationship between transactional and transformational leadership and firm performance.

2.7   Control variables

In research, it is always likely that other extraneous variables might have an impact on the dependent construct or constructs (Kumar 1996), which could lead to a misinterpretation of variances in the latter. Moreover, a meta-analytic review of IT value literature by Kohli and Devaraj (2003) found that studies that use IT payoff-/ IT-outcome-related dependent variables without closely examining the process of how the value was achieved might suffer from extraneous influences. In order to account for relevant influencing aspects, several control variables were used in this study and they were included in the conceptual framework as independent variables (such as in Ravichandran & Lertwongsatien 2005). The next paragraphs provide details on what variables were used and why.

2.7.1   Organisational size and age

Aldrich and Auster (2000) mentioned that firms that are longer in service might be more successful due to aspects such as well-established business partnerships, matured processes and more experienced staff. Contrary to this, younger firms might need to fight against entry-barriers such as lower creditworthiness. The age of the firms differs significantly in an industry such as the Swiss financial sector where there are institutions that have been operational for more than hundred years (e.g. traditional private banks), but where there are relatively new businesses such as securities dealers as well. Stonecash et al (2002) highlight that the success of a firm often depends on its ability to profit from economies of scale, both for tangible goods as well as for services, and that larger firms might have an advantage of realising a disproportionately high performance compared to smaller firms.

In addition, the size of firms was used as a control variable in studies conducted in similar settings, e.g. in the work by Liu et al (2008). In line with these views, the number of full-time employees (organisation size) and the number of years since the formation of the firm (organisation age) were used as control variables.

2.7.2   Degree of IT outsourcing

A considerable percentage of firms outsource parts of their IT function. Although it was suggested by prior research that many firms do benefit from such outsourcing activities (Lacity et al 2009), there are studies where it is reported that value realisation often depends on factors such as the degree to which superior IT capability was formed (Wang et al 2008), or from the outsourcing strategy that was chosen (Lee et al 2004), or from both of the above (Lacity et al 1996; Willcocks et al 2006). In addition, researchers pointed out that for many IT outsourcing initiatives, the resulting benefits were over-estimated because the company did not account for the total cost of the outsourcing (Barthélemy 2001).

In order to account for this controversial and complex aspect, the percentage of IT services outsourced to an external provider (degree of IT outsourcing) was used as an additional control variable.

2.7.3   Environmental dynamism

Although this study focused one just the one industrial sector, it seemed appropriate to the author to acknowledge the dramatic changes that happened and are still happening in the financial industry as an influencing factor that could potentially affect the performance of firms differently.

The measurement instrument for environmental dynamism proposed by De Hoogh et al (2004) was therefore used as a further control variable.

2.7.4 Leader gender and culture as potential influencing factors

In terms of other influencing factors in settings attempting to capture leadership, this study incorporated the gender of the leader (leader gender) into the study as there are indications in several studies that leadership behaviour of men could be different from women (Bass et al 1996; Carless 1998b).

It was proposed by earlier research that specific cultural settings could influence the leadership style used (e.g. Jung et al 1995). Thus, it might have been adequate in this study to control for cultural factors or conditions the leaders act in. However, Den Hartog et al (1999) examined leadership behaviours within 62 cultures and found a generally positive relationship between elements of charismatic and transformational leadership and desired outcomes. Moreover, Ardichvili and Kuchinke (2002) found no substantial correlation between cultural settings in different geographical areas and leadership styles used. Based on the latter two studies, this research work did not specifically control for any cultural aspect.

2.7.5 Information intensity

The percentage of the firm's total annual cost spent on IT (information intensity) is not used as a control variable since this study used a single industry sample where it could be assumed that similar degrees of IT intensity were present (Ravichandran & Lertwongsatien 2005).

2.7.6   Person's position in the organisation

Drawn from the discussion on organisational group structure and organisational roles by Robbins (2005), it was inferred that the organisational level of the person participating in the data collection process could potentially influence people's perception of the firm's performance, thus, the person's position in the hierarchy was used as a control variable.

As a concluding remark in terms of control variables, it shall be added that variables including organisational characteristics, the degree of environmental dynamism, the gender of the leader and the leader's position in the organisation were all mentioned by Antonakis et al (2003, pp. 270-1) as being important influencing elements that should be analysed when leadership behaviours are the subject of studies as these contextual factors might affect the results of leadership activities.

2.8   Conceptual framework

Considering the relevant literature discussed in the above sections, the following conceptual framework is used.

Figure 2-6 – Conceptual framework
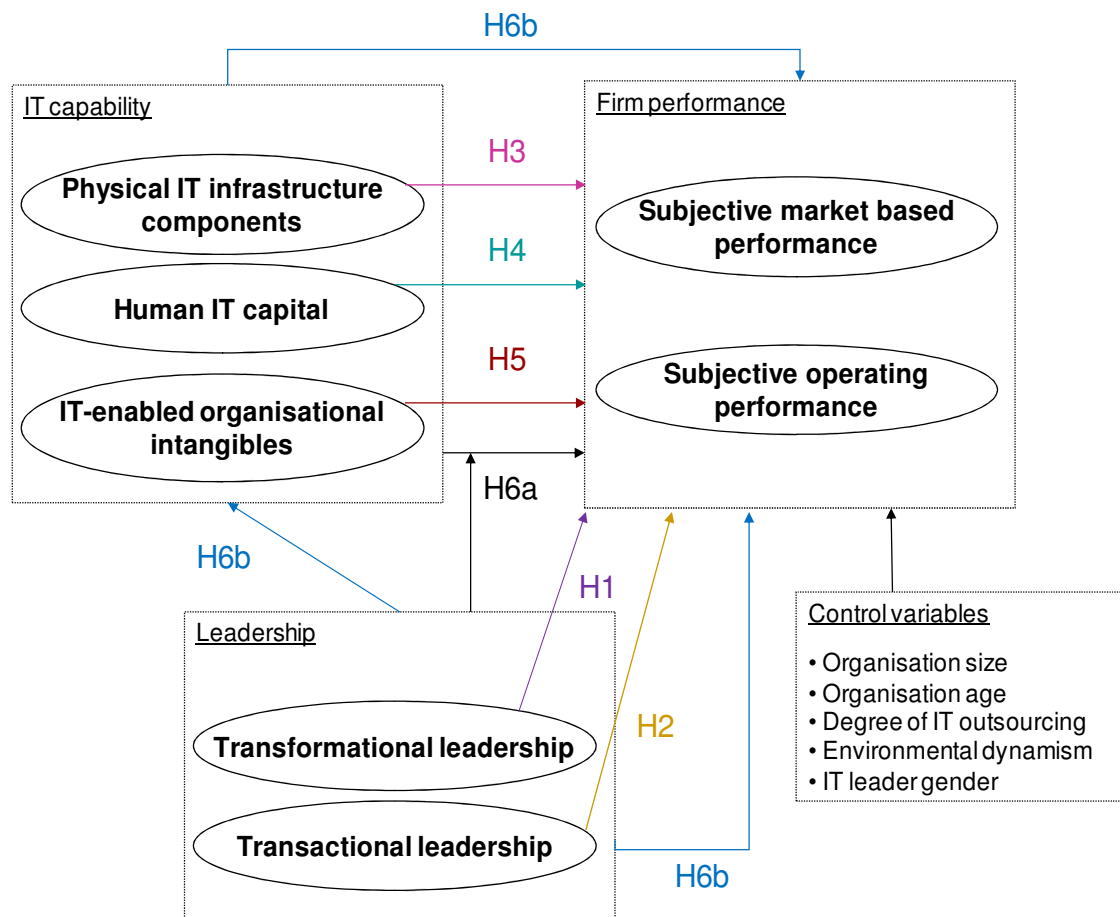
Source: Developed for this research

The framework combines the constructs reviewed in this chapter including the control variables in one model. In addition, it contains the hypotheses made plus the relationships that are to be tested. Details about the measurement items are not visible, but are provided in chapter 4.

2.9 Research around the role of the Chief Information Officer (CIO)

There exists a body of knowledge on IT management and leadership that specifically focuses on the role of the head of an IT organisation (often referred to as the CIO). This focus is different from section 2.5 in that the latter captures the IT organisation and its dynamics as a whole. However, in order to show that the essential ideas and contributions of this research stream reinforce the conceptual framework presented above, a discussion of relevant studies is provided in this section.

2.9.1 The role of the CIO: who they are and what they do

Based on the traditional roles of managers espoused by Mintzberg (1973), several researchers in the 1980s and 1990s conducted studies in which they tried to find out who the people are who direct IT organisations and what they did.

The work by Ives and Olson (1981) based on six case studies of heads of IT organisations concluded that the CIO role changed from a rather minor and technical function to that of a more business orientated role that was targeted at contributing to a firm's profits. In addition, Ives and Olson (1981) noticed that the function moved towards participating in strategic business planning and business strategy implementation. However, they did not examine the effects the behaviours of the managers had on the business and success of the firms. Stephens et al (1992) confirmed the findings of Ives and Olson (1981); and Applegate and Elam (1992) further highlighted the importance of strategic business knowledge of leaders of IT organisations in order to optimise IT and business alignment.

Although Applegate and Elam mentioned the importance of leadership in their study context, they did not specifically analyse the behaviours of the heads of IT organisations in that respect.

Grover et al (1993) were the first to look at IT middle managers and found that their role and what they do does not differ from that of the head of an IT organisation. In their interviews with CEOs/CIOs in fourteen companies, Earl and Feeny (1995) concentrated on finding out how the role of the CIO influences the value IT provides to a firm. They concluded that the personal abilities of a CIO accounted for much of what was perceived as being either an IT asset or an IT liability. Their findings included that a CIO would ideally have a profile consisting of elements such as openness, loyalty to the business, motivation towards business goals, good communication and consulting skills, as well as technical IT knowledge and experience.

Finally, Chun and Mooney (2009) further analysed the role of a CIO and found that he/she had to optimise the IT function in order to fully align it with the business and its strategy, to minimise costs, and to establish IT as an enabler of effective and efficient product and services development and marketing.

Unfortunately, most of the mentioned research on what CIOs did in the past concentrated on just the head of the IT function and there is minimal empirical support for a positive impact of these activities on firm performance. Furthermore, the research largely neglected the influence of leadership (as defined in this study) on CIO's followers.

However, in these studies there are (consistent) indications that managerial knowledge in IT organisations would need to be amended by business knowledge. This aspect arising from research around what CIOs do reinforces the broad definition of the human IT capital element within the IT capability construct by Bharadwaj (2000), as presented in the conceptual model.

2.9.2   CIO capability and CIO role effectiveness

Drawing from the research around the role of the CIO discussed above and influenced by the study by Armstrong and Sambamurthy (1999) discussed in section 2.5.3 of this chapter, Smaltz et al (2006) analysed the effectiveness of CIOs based on capabilities they proposed the CIO should have and the CIO's engagement with the top management team (TMT) of firms. The quantitative study was conducted in the North American healthcare industry with 136 participants.

Again, based on Mintzberg's managerial roles, 25 different expectations the CIO should meet were inferred from a variety of literature to form the 'CIO role effectiveness' construct, which was then used by members of the TMT to assess the impact the CIO's work had on the business. The CIO's capabilities in turn were thought to serve as the basis for reaching high effectiveness and they were drawn from several studies as well. They included 'political savvy', 'communicative ability', 'strategic business knowledge' and 'strategic IT knowledge'. The independent construct 'CIO/TMT engagements' included the 'hierarchical level of CIO', 'TMT membership', 'extent of networking activities' and 'extent of trusting relationships', again inferred from previous literature.

Smaltz et al (2006) found a significant positive relationship of all elements of the CIO capability construct with CIO role effectiveness. In addition, CIO capability was found as being a positive mediator construct between CIO/TMT engagements and CIO role effectiveness.

The study supported elements of the conceptual framework used in this study such as the 'ability to communicate and work with business units more effectively', as well as the 'ability to integrate IT and business processes more effectively', both of which are parts of the human IT capital construct. The 'ability to integrate/transfer/apply knowledge' within the IT-enabled organisational intangibles construct was reinforced as well.

However, the study was specifically designed for and conducted in the healthcare industry and Smaltz et al (2006) further advocated that their constructs could differ from industry to industry. Furthermore, analysis again concentrated on just the role of the CIO and neglected influences of managers and leaders on lower levels. Moreover, the model used in the study, including CIO capability and CIO role effectiveness, had not been re-evaluated by further studies—leaving the question of adequate reliability open. In addition, this study did not include any aspects about other manifestations of leadership behaviour in the IT organisations and possible effects on followers.

2.9.3 The integrated IS leadership role model by McLean and Smits (2003)

A completely separate research stream on the work of IT managers and leaders was that of McLean, Smits and others. Mainly based on a longitudinal study of careers of IT graduates (see McLean et al 1991; Smits et al 1993), these researchers proposed an integrated IS leadership model that incorporates three dimensions: the focus of the role, the business climate of the firm and the types of leadership applied by IT managers and leaders (McLean & Smits 2003).

Figure 2-7 – Integrated IS leadership model
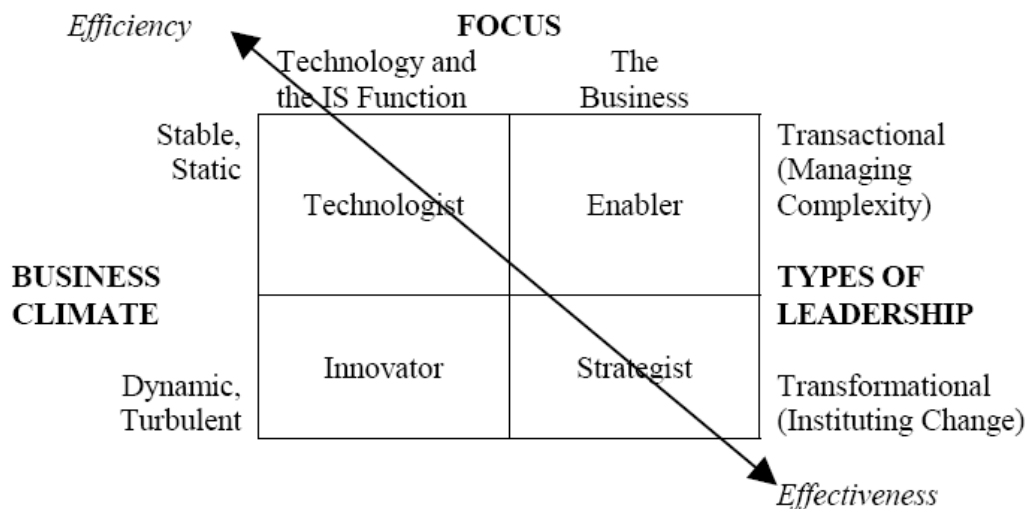
Source: McLean & Smits (2003)

The model was originally based on McClelland's (1961) theory of needs where intrinsic motivation was regarded as being based on satisfaction from the fulfilment of needs. Referring to the McClelland theory, Atkinson and Raynor (1974) argued that motivation stimulates the development of superior individual skills which, in turn, was proposed by Smits et al (1993) to foster the career progression of IS graduates.

The model, and particularly the four dimensions of leadership roles formed ('technologists', 'enablers', innovators' and 'strategists'), was influenced as well by earlier IT and leadership research such as Hinterhuber and Popp (1992), Rogers (1983) and Stokes (1991).

Although the model was developed through synthesis and analysis of a broad range of research, the author of this research project was unable to find empirical studies that tested it, so its reliability remains uncertain. Maybe this is why measurement instruments for the models are missing. In addition, as McLean et al (1991) and Smits et al (1993) concentrated mainly on IS graduates and academic grades were used as indicators for student's achievement, a positive impact of the roles and behaviours on the real performance of firms can hardly be inferred. Consequently, this model seemed unsuitable for this study. Furthermore, it remained somehow open as to why exactly these four roles should be the most important ones for successful IS leadership as McLean and Smits (2003) did not provide more insights into the analysis of prior leadership research in their study (the two researchers also remarked that their paper was conceptual in nature).

However, the fact that McLean and Smits (2003) regarded leadership as being an essential ability of an IT organisation overall reinforces the conceptual model presented in this paper. Further capabilities of successful IT organisations highlighted as being crucial by McLean and Smits (2003) support the conceptual model as well.

Aspects such as the ability 'to master new technological developments', the ability 'of building a strong partnership with the business users', the necessity 'to make sure that the IS organisation is ready to play a key role in its parent organisation's future' and that the 'organisation is ready to play a key role in its marketplace' substantiate elements of the three areas of IT capability (IT infrastructure, human IT capital and IT-enabled organisational intangibles) as defined by Bharadwaj (2000) and as used in this study.

2.9.4   Summary of the research around the role of the CIO

As discussed in the previous subsections, many elements of the research stream on the role of the Chief Information Officer (CIO) are included in the IT capability construct by Bharadwaj (2000); and the research streams described acknowledge as well that IT leadership is an important aspect for IT organisations for becoming more successful going forward. It is therefore summarised that the essential ideas and suggestions of the literature on the role of the CIO reinforce the conceptual model presented in this chapter. Furthermore and apparently, none of the concepts presented in the research stream on the work of CIOs would be better suited than the theories and concepts used in this study.

2.10   Conclusion

In this chapter, the theoretical basis for the project was developed. The concept on strategic capabilities and the resource-based view (RBV) were identified, the latter as the parent discipline of this study. In these strategy theories, resources and capabilities of a firm can be used to gain a competitive advantage, mainly whenever a company manages to build and apply unique capabilities that cannot easily be imitated by others (Barney 1991; Grant 1991; Wernerfelt 1994).

In a next step, the immediate disciplines were analysed. Firstly, firm performance was reviewed. Past research mainly focused on profitability/financial measurements since these parameters are easy to understand and tangible (Bull 2007; Rappaport 2006; Stern et al 1995). As other studies indicated that financial measures represent a view that is too narrow and short-sighted (Atkinson et al 1997; Koch & Cebula 1994), other research streams proposed broader concepts such as the balanced scorecard (Kaplan & Norton 2001), more customer-focused views such as customer satisfaction and loyalty (Fornell 1992) or whole assessment frameworks (NIST 2002; EFQM 2008).

As there was no agreement amongst researchers as to what the 'best' measurement for firm performance in IT contexts is, the review of literature concluded that a firm performance construct based on internal operating performance and external market measures which was empirically tested in very similar settings (Ravichandran & Lertwongsatien 2005; Xiao 2008) represented the most adequate choice for this study.

In a next step, leadership theory was reviewed. Based on the theoretical development of leadership and indications in the literature that leadership could be understood as a strategic capability, the transformational and transactional theory by Bass and Avolio (2004) was identified to represent the most adequate leadership theory for the study. This understanding is based on the aspects that the theory includes a full range of styles of behaviours, that it was used previously in very similar settings, and established as being valid and reliable.

Despite the fact that the financial industry is a very dynamic economic sector and IT organisations in financial firms change regularly so that transformational and transactional leadership could be used as valuable instruments that could contribute positively to the business, no studies are available that previously analysed the extent to which the constructs are related to firm performance in such a context. Consequently, this study hypothesised that transformational and transactional leadership is positively related to performances in firms of the Swiss financial sector.

Literature on capabilities of IT organisations was reviewed. Researchers found that IT investments are not an ideal predictor of firm performance, but that a broader IT competence based on the concept of the resourced-based view of the firm should be built in an organisation (Kauffmann & Weill 1989; Santhanam & Hartono 2003).

The framework around IS capabilities suggested by Feeny and Willcocks (1998) was analysed but rated as being too outsourcing-specific to be used in this study. Furthermore, not enough quantitative studies in which the model was validated were found. The IT assimilation model by Armstrong and Sambamurthy (1999) was reviewed as well, but considered as being too much focused on knowledge and IT infrastructure and not validated sufficiently by other research.

A construct called IT capability suggested by Bharadwaj (2000) includes IT infrastructure (see e.g. Broadbent & Weill 1997), IT human resource aspects (see e.g. Davern & Kauffmann 2000) and IT-enabled organisational intangibles (see e.g. Barczak et al 2007). The construct can form a good basis for obtaining competitive advantage (Xiao 2008) as it has been validated and found as being robust and often positively related with firm performance (Aral & Weill 2007; Santhanam & Hartono 2003). Despite these findings, several researchers ask for more empirical testing of the IT capability construct in order to confirm earlier studies (Bharadwaj 2000; Lin 2007; Santhanam & Hartono 2003). It was therefore hypothesised that elements of IT capability are positively related to firm performance in the context of this study.

Based on the original paper on competitive organisational behaviour by Barney and Zajac (1994), a number of studies indicated that leadership and IT capability could have a combined effect on firm performance (Luftman & Brier 1999; Mithas et al 2004; Roepke et al 2000). Aspects include that leadership could complete the managerial knowledge and experience in the IT human capital element (Agarwal & Ferratt 2002; Glen 2003) and could improve innovation as part of the IT-enabled organisational intangibles (Gumusluolu & Arzu 2009). However, no empirical studies have examined this combined effect of leadership and IT capability so far, which represents a major gap in the literature. It shall therefore be analysed whether transactional and transformational leadership moderate the relationship between IT capability and firm performance and, as an alternative model, whether IT capability mediates the relationship between transactional/transformational leadership and firm performance.

Research work in a very similar setting suggested using control variables in order to check whether aspects other than leadership and IT capability could impact firm performance (Ravichandran & Lertwongsatien 2005). Based on this, a number of extraneous variables were identified and included in the research.

The resulting conceptual framework was developed and described in this chapter, incorporating all elements discussed in the previous sections.

The final part of the chapter evaluated and analysed the research streams around the role of the Chief Information Officer (CIO). Some studies focused on the role of the CIO (see e.g. Applegate & Elam 1992; Grover et al 1993; Ives & Olson 1981); another one on the capabilities of the CIO and the resulting level of effectiveness (Smaltz et al 2006); and a third group of studies on creating an integrated role model of successful IS leadership (McLean & Smits 2003). Although all the models and concepts were found unsuitable for this study, several aspects and findings of the studies discussed re-enforced the conceptual framework presented in this chapter.

Chapter 3 - Dissertation methodology

3.1   Introduction

In the previous chapter, literature relevant to answering the research problem was reviewed. Hypotheses were provided including the overall conceptual framework of this study. This chapter presents the research methodology used in this study. The following figure (Figure 3-1) illustrates the structure of this chapter.

Figure 3-1 – Structure of dissertation methodology

3.1 Introduction

3.2 Research paradigm and
methodology

3.3 Population and data used

3.4 Data collection and survey

3.5 Measurement instruments

3.6 Data analysis procedures and
interpretation

3.7 Limitations of the methodology

3.8 Ethical considerations

3.9 Conclusion
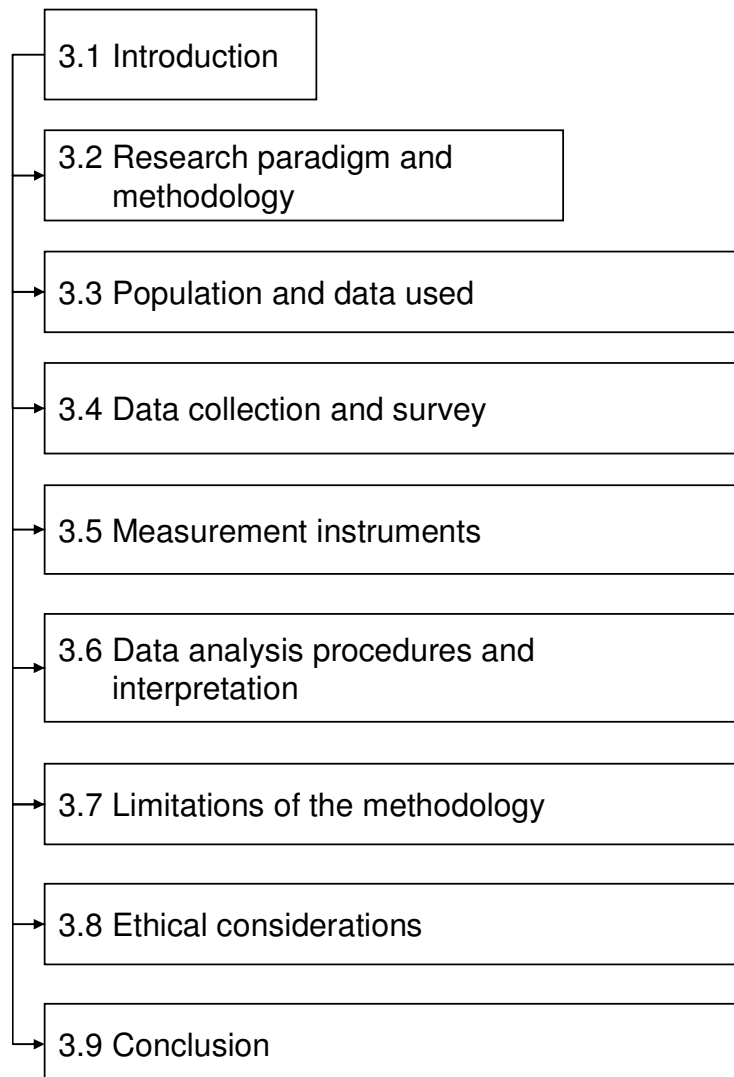
Source: Developed for this research

3.2   Research paradigm and methodology

A research paradigm is a particular lens or view on the social world (Burrell & Morgan 1979). How we understand the world around us in research is therefore a question of what view we use in the study (Trochim 2006). Adopting a particular paradigm in a research study might influence the outcome of the work (Punch 2006) so that the researcher should carefully envision and question the view used and applied.

Guba and Lincoln (1994) described four different paradigms. Positivism is understood as being an objective lens onto the world, where truth exists and can be captured precisely. Post-positivism, also called critical realism (Cook & Campbell 1979), is characterised by an existing reality that humans can never understand perfectly because of their limited skills to do so or because the phenomenon under investigation can never be fully captured. Critical theory, as a third paradigm, is described by Guba and Lincoln (1994) as a lens that acknowledges reality once existed, but has been altered by historical and social processes over time; so that today's individual perceptions of the natural reality are influenced by people's values, believes and experiences and reality thus tends to be rather subjective. Constructivism, as the last paradigm, is characterised as a view where perceptions of realities are completely individual and subjective, where a 'true', absolute reality no longer exists.

Guba and Lincoln (1994) proposed that, in the particular context of a research study, questions on the ontology and epistemology should be asked and that the answers a researcher finds would then guide an appropriate selection of the methodology. The following table (Table 3-1) therefore asks these two questions and includes the views of the author of this study.

Table 3-1 – Ontology and epistemology questions

Dimension	Question asked	Answer/view in this research study
Ontology	What is the form and nature of reality?	Based on the empirical studies reviewed in the previous chapter and building on the conceptual framework presented there, the author of this research believes that leadership and IT capabilities are formed and used in businesses and that data collected about its formation and usage represent manifestations of the reality, although the manifestations are seen as imperfect representations of reality (Guba & Lincoln 1994; Leedy & Ormrod 2005).
Epistemology	What is the nature of the relationship between the would-be knower and what can be known?	In line with the answer to the ontology question, this work assumes that the data collected about the usage of leadership and IT capability, together with a critical analysis of the results in light of other empirical work, provides a limited objective view on reality (Sayer 2000).

Adapted from Guba & Lincoln (1994)

The answers to the two questions provided in the table indicate that the view of this study tends to be that of a post-positivism/critical realism paradigm (Bhaskar 1978). In order to verify whether this view is adequate for this research, the answers given in Table 3-1 were compared with views stated in other relevant studies. The next two paragraphs illustrate these views.

In terms of the parent discipline of this research, strategic capabilities and the source-based view, Montgomery et al (1989) state that 'the research process is a continuous expansion of knowledge involving the generation, refutation and application of theories' (p. 189). The scholars critically challenge their findings and express that their results might be true only to certain extents (Guba & Lincoln 1994), which indicates a certain level of departure from pure realism. On the other hand, Montgomery et al (1989) express their belief in theories as such, and thus suggest a certain level of objectivity. The post-positivism paradigm therefore seems to fit best with their lens on the world. Godfrey and Hill (1995) propose a similar view in their work on strategy research.

In previous IT research studies where social aspects like leadership or intangible elements of capabilities were analysed in order to try to understand the underlying structures and mechanisms of the situations, it was previously proposed to apply the view of the critical realist (Dobson 2001; Mingers 2004) as well.

In light of these statements, post-positivism was found as being an adequate paradigm. It was subsequently taken as the view this study takes when trying to answer the research question.

In a next step and guided by the answers on ontology and epistemology, the author tried to find an adequate answer to the methodology question by Guba and Lincoln (1994).

The following table (Table 3-2) provides an overview of the answer that could be given.

Table 3-2 – Methodology question

Dimension	Question asked	Answer/view in this research study
Methodology	How can the would-be knower go about finding out whatever he or she believes can be known?	Based on the answers to the ontology and epistemology questions, this study uses the following methods: • Explanatory research is applied as existing theories were used to explain a particular situation (Newmann 2000) • A quantitative design approach is used in order to try to generalise findings as well as possible (Gay & Airasian 2003) • A survey research method is used in order to ensure high validity and reliability by reusing existing measurement instruments (Trochim 2006) • Cross-sectional research is applied in line with empirical research in similar contexts

Adapted from Guba & Lincoln (1994)

These general views were used to direct the detailed research design and processes which are described in the remainder of this chapter.

3.3   Population and data used

3.3.1   Population description

The target population of the study were the banks, security dealers, fund management and asset management companies that were either a member of the Swiss Bankers Association SBA (www.swissbanking.org) and/or work under the supervision of the Swiss Financial Market Supervisory Authority FINMA (www.finma.ch). Both associations agreed that their address databases could be used.

The SBA is almost one hundred years old and generally aims at supporting and strengthening the Swiss financial industry nationally and internationally. Since this association represents the most important of its kind in the country, it could be assumed that its publicly available and always up-to-date member database represented the most complete source of addresses and contacts for this industry.

The recently-founded FINMA (which used to be the Swiss Banking Agency) represents the regulatory authority that supervises all licensed financial institutions in Switzerland according to the Swiss Federal Constitution. Its address database was assumed as being complete and always up-to-date because of the governmental function of the FINMA. The database was publicly available as well. The population size was estimated to be about 800 firms.

The data collection process targeted two groups of employees of Swiss financial firms (statistical units). The first group consisted of representatives of IT organisations (IT staff) who were asked to rate the leadership styles of their superiors. This was done in order to avoid possible bias caused by self-rating. In this group, the potential number of participants was estimated to be about 17 000 based on numbers in SFSO (2009). This approximate figure was confirmed by recent studies of the Swiss ICT Professional Training Association (ICTPTA 2010).

According to own estimates and the annual reports of the respective companies, the two largest Swiss banks each employed about 4 000 IT specialists in Switzerland and about another 2 000 IT staff worked for the third, fourth and fifth largest Swiss financial institutions. Further, roughly 3 000 IT specialists were employed by an additional 20 financial firms with a labour size of 500 or more each. So, this target group of IT staff included about 13 000 people working in the 25 largest firms in the sector, while the remaining estimated 4 000 people were assumed to be engaged at the remaining (approximate) 775 smaller firms. Consequently, it was expected that a large percentage of the IT staff survey answers would come from those large firms, while it was expected to be quite difficult to reach the IT specialists of the many smaller firms.

Figure 3-2 below summarises the estimated composition of the population for the 'IT staff group'.

Figure 3-2 – Details on population composition of survey group 'IT staff'

- two largest banks
- third, fourth and fifth largest Swiss financial firms
- sixth to 25th largest Swiss financial firms
- remaining 775 'smaller' Swiss financial firms
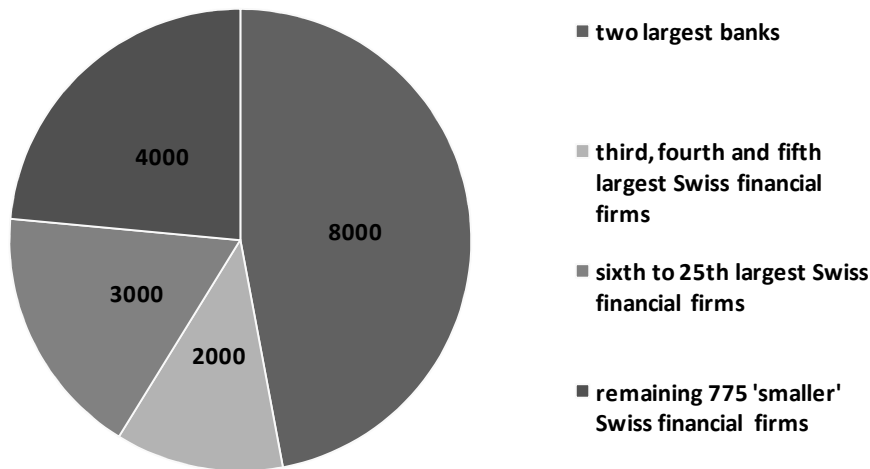
Source: Developed for this research

The second group included business managers (business unit managers, heads of business departments, middle managers, team leaders etc.) who were asked to rate the IT capabilities and firm performance elements of the questionnaire. In the author's view, these people represented the customers of the IT organisations well. Furthermore, as Tiernan and Peppard (2004) point out, IT value is only generated through using IT in the organisation so that it could be argued that the perceptions of customers of IT are good descriptors of the value generated by IT.

Furthermore, possible bias caused by self-rating was to be avoided. This second group was estimated to include about 70 000 people based on numbers in SFSO (2009). Based on own estimates and annual reports of the respective companies, the two largest Swiss banks employed around 19 500 business managers in Switzerland and another approximately 6 500 people in this group served in the businesses of the third to fifth largest financial firms.

It was further estimated that the next 20 financial firms with labour sizes of 500 and more employed an additional 10 000 business managers. In summary, about 50% of the people in this group could be assigned to the largest 25 businesses, while the remaining 50% were expected to work for the smaller (approximate) 775 entities. Compared to the IT staff, it was therefore expected that a smaller percentage of the responses would come from the large firms, while it was expected to be easier to obtain answers from people who worked for the smaller firms of this group.

Figure 3-3 below summarises the estimated composition of the population for the 'business manager' group.

Figure 3-3 – Details on population composition of survey group 'business managers'
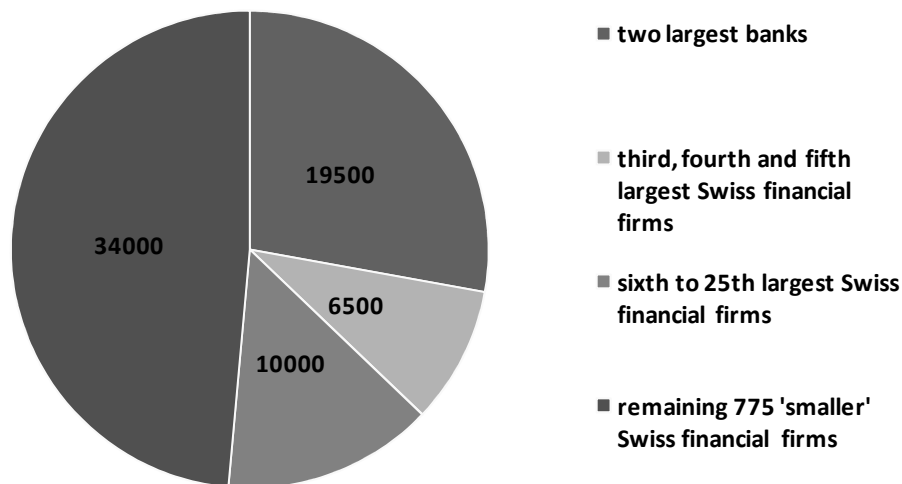
Source: Developed for this research

The following table (Table 3-3) describes the population characteristics in more detail.

Table 3-3 – Population description

Group	Characteristic	Description
IT staff	Implementers of IT strategy	Targeted individuals were IT staff members who implement the IT strategy in the firms of the financial sector.
	Followers	It was expected that targeted people are influenced by the individual management & leadership styles of their superiors and that the superiors shape the IT strategy and the way it is implemented in the firm.
Business managers	Business deciders	The people in this group were thought to be individuals who are deciders on at least a part of the company's core business so that a high overall company performance is amongst their top goals.
	Customers of IT and influencers of IT strategy	The people in this group, in their role as customers of the IT organisations, were thought to be deciders on what IT resources the firms use and what IT capabilities are formed to reach the overall business goals.

Source: Developed for this research

All 800 firms were included in order to increase generalisability of the results (Gay & Airasian 2003). The study used a survey research approach to gather the data.

3.3.2 Multiple statistical units per element in the target population

Survey studies that rely on the judgement of a single individual are often based on the so-called key informant concept. This means that for the measurement of an organisational aspect, a knowledgeable key person such as a team/department manager or another representative of the organisation who can report competently on a matter is asked for his or her observation on a particular question or problem (Phillips 1982; Seidler 1974).

However, as Kumar et al (1993) described, information from a key informant is not always representative for an entire unit as an individual's view is influenced by their role, their personal views and perceptions, or their current personal situation. This might introduce different kinds of bias (Huges & Preski 1997). Thus, the study aimed at gaining responses from multiple statistical units (people) from the same element in the target population (financial firms) in order to improve the quality of the survey data (Van Bruggen et al 2002).

Using multiple views onto the same reality is in line with the post-positivism/critical realism paradigm chosen for this study (see section3.2) as several perceptions of the reality can then be triangulated in order to get a more precise picture of the reality (Perry et al 1999). Consequently, invitations for both surveys were sent to as many people per firm as possible and all firm representatives invited were asked to forward the invitation to other people in their respective company that matched with the target group definitions above.

3.3.3   Sampling procedure

The quantitative approach of the study required a large number of data sets in order to ensure statistical conclusions validity. In the face of the trade-off between the large target groups that theoretically required the use of a representative sample (McFarlan 1987) and the potential problem of only getting a small number of responses, the author of this study decided to send invitations to as many people as possible, while maintaining the principle of each potential survey respondent having an equal chance of being included in the study (Pinsonneault & Kraemer 1993).

Asking professional and alumni organisations of four different categories (see table 3-4) was considered as being the best practical way of reaching as many employees from the 800 financial firms as possible, since these institutions possessed the largest and most up-to-date sets of contact information available.

Moreover, by doing this, no issues of personal data protection were expected to arise. As many organisations as possible were asked for their participation prior to conducting the study.

Table 3-4 provides an overview of what specific activities were carried out in order to ensure adequate sampling. Information is given per category/group of organisations.

Table 3-4 – Activities for sampling procedure

#	Description of activity for the category / group of organisations	Mixture	Approx. number of people	Remarks
1	The two largest professional organisations of members of the Management of Swiss financial institutions were asked to send survey invitations to their members.	~80% Business / ~20% IT staff	1 300	Memberships in these organisations were voluntary and open to all people who work in the specific professional area.
2	The three largest organisations of Swiss ICT professionals and the largest professional organisation of commercial employees/clerks were asked to send survey invitations to those of their members that work for one of the ~800 firms.	~45% Business / ~55% IT staff	1 400	
3	Major alumni associations of Swiss universities and institutions of higher education (business and technical) were asked to send survey invitations to those of their members that work for one of the ~800 firms.	~80% Business / ~20% IT staff	2 000	Only some of the institutions asked agreed to invite their members.
4	Personal data of CEOs and CIOs was bought from the market leader in the direct-marketing industry in Switzerland	~40% Business / ~60% IT staff	750	Data was only available for some of the firms. However, this database is the most completed one of its kind.
Total number of invited people			5 450	

Source: Developed for this research / shares based on the respective institution's estimates

An offer was extended to all the organisations to have their administrative cost refunded for sending out invitations to their members. Those organisations that did not offer support for this study all indicated that they generally do not participate in survey research (of any kind). The figures in the table are all based on estimates received from the respective organisations.

As shown in Table 3-4, it was planned to invite approximately 5 450 people to participate in the study, from which around 3 570 (~65%) were expected to be business managers and approximately 1 880 (~35%) IT staff. The significantly lower number of IT staff to be invited probably resulted from the fact that IT staff within the Swiss financial industry were less well-organised than business managers (or hardly at all).

The organisations described in Table 3-4 were not selected randomly per category but, rather, selected on purpose as they were the biggest and most important ones per category/group. However, it can be argued that the mix of people invited per survey altogether reflected an adequate degree of randomness since the researcher did not have control over who was a member of which group (or was a member of a group at all) and who participated and who did not. In addition, for people who were not a member of one or several of the groups, there was an adequate chance of being invited since people in all groups were asked to forward the invitations to people in the same firm who matched with the target group of either survey.

At the point of designing the sample, the researcher was aware of the aspect that people could potentially be members of several of the organisations and that the total number of people invited could thus be lower in reality. This aspect is discussed in more detail in chapter 4 (results).

3.4   Data collection and survey

In order to limit the effort for the participants and the work of managing the responses and to support electronic processing of the answers, online (web-based) surveys were conducted for the study. Web-based surveys represent an adequate tool to be used for participants working in a white collar worker context. In addition, the use of web-based surveys should limit response bias since the influence of the researcher on the collection process is rather low (Van Selm & Jankowski 2006).

The questions in the surveys were asked in German and English to try to avoid bias due to language problems. Participants received an email address and a phone number they could use to ask questions about the survey as needed. Participants were offered access to the data and outcome of the study. This was done in order to increase the response rate.

Emails with direct links to the web page were sent out to the potential participants. Where this was not possible, printed letters were sent to potential participants. In order to achieve as high a response rate as possible, follow-up emails/letters were distributed after an initial period. This research project and the data collection process were supported by two institutions of Zurich University of Applied Sciences. These institutions also hosted and represented the survey to give it as much credibility as possible.

A response rate of ≥ 50% is always desirable, but researchers often experience lower rates (Rogelberg & Luong 1998). Especially in the given context where the turbulences in the financial markets worldwide put a lot of pressure on many firms and their employees, it was expected that a lower response rate would result. The online survey was designed for ease of use and to be as unambiguous as possible; not too long and with an appealing and professional layout since these aspects were considered essential in order to increase the response rate (Van Selm & Jankowski 2006). Both questionnaires were peer-reviewed first and then tested in a pilot study with a small group of eight people from the two target groups of the survey. Through testing the survey, it ensured that people understood the survey and did not have problems answering it.

As a consequence of the sampling and data collection procedures described in this chapter, only the survey answers from representatives of firms where there were answers on both the survey for IT staff and business managers could be used in the study.

3.5   Measurement instruments

The measurement instruments for the constructs used in this study were reused from previous research work. All constructs were multi-dimensional. This means that several variables formed the construct. Each variable of the construct was represented by one measurement instrument (which, in turn, formed a question in the survey).

Table 3-5 provides an overview of the measurement instruments for leadership, including the survey in which the instrument was used and the source from which measurement items were adapted (details can be found in appendix C).

Table 3-5 – Measurement items/variables for leadership styles

Construct	Survey	Measurement instruments	Hypotheses
Trans-formational leadership (Bass & Avolio 2004)	IT staff	Variables of idealised influence (II) as measured by the MLQ (attributed and based on behaviour)	H1, H6a & H6b
		Variables of inspirational motivation (IM) as measured by the MLQ	
		Variables of intellectual stimulation (IS) as measured by the MLQ	
		Variables of individualised consideration (IC) as measured by the MLQ	
Trans-actional leadership (Bass & Avolio 2004)	IT staff	Variables of contingent reward (CR) as measured by the MLQ	H2, H6a & H6b
		Variables of management-by-exception active (MBEA) as measured by the MLQ	

Source: Developed for this research

Table 3-6 below shows the measurement instruments for IT capability, including the source where measurement items were adapted from.

Table 3-6 – Measurement items/variables for IT capability

Construct	Survey	Measurement instruments	Hypotheses
Physical IT infra-structure (Bharadwaj 2000)	Business managers	Corporate platform for launching business applications	H3 H6a H6b
		Provides IT infrastructure that allows for innovation and continuous improvements of products	
		Appropriate computer & communication technologies	
		Appropriate corporate databases	
		Appropriate degree of integration of IT infrastructure	
Human IT capital (Bharadwaj 2000)	Business managers	Technical skills and experience in the IT organisation	H4 H6a H6b
		Managerial skills and experience in the IT organisation	
		Ability to integrate IT and business planning processes more effectively than competitors	
		Ability to develop reliable and cost effective applications that support the business needs of the firm faster than competition	
		Ability to communicate and work with business units more efficiently than competitors	
		Superior IT project management practice	
		Ability to anticipate future business needs of the firm and innovate valuable new product features before competitors	
IT-enabled organi-sational intangibles (Bharadwaj 2000)	Business managers	IT-enabled ability to integrate/transfer/apply knowledge	H5 H6a H6b
		IT-enabled ability to respond to environmental changes quickly and adequately	
		IT-enabled excellence in customer relationship management	
		IT-enabled ability to track and predict changing customer preferences rapidly	
		IT-enabled excellence in sharing of resources and capabilities across organisational divisions	
		IT-enabled ability to remove physical, spatial and temporal limitations to communication	
		IT-enabled ability to realize cost and demand synergies by marketing new products and services at little added cost	

Source: Developed for this research

For details on the variables used, please refer to appendix C. The third table (Table 3-7) provides an overview of the firm performance measurement items as they were used, as well as information about where they were taken from.

Table 3-7 – Measurement instruments for firm performance

Construct	Survey	Measurement instruments	Hypotheses
Subjective market based performance (Capon et al 1992)	Business managers	Percentage of total corporate in this fiscal year's sales from products and services brought to market in the past 2 years	all hypotheses
		Percentage of this fiscal year's sales to be generated by products dependent on technology which did not exist or was not commercially viable five years ago	
		Percentage of cases being first to market when launching new products or services	
		Percentage of new products or services using cutting edge technology at time of launch	
Subjective operating performance (Powell & Dent-Micallef 1997)	Business managers	New ITs have increased the firm's productivity	all hypotheses
		New ITs have improved the firm's competitive position	
		New ITs have increased the firm's sales	
		New ITs have increased the firm's profitability	
		New ITs have improved the firm's overall performance	
		Over the past 3 years, the firm's financial performance has been outstanding/exceeded the one of its competitors'	
		Over the past 3 years, the firm's sales growth has been outstanding/exceeded the one of its competitors'	
		Over the past 3 years, the firm has been more profitable than its competitors	

Source: Developed for this research

For details on the variables used, please refer to appendix C.

Finally, Table 3-8 presents the control variables used in this study.

Table 3-8 – Measurement instruments for control variables

Construct	Survey	Measurement instruments
Control variables	Business managers	Organisation size/number of fulltime employees (own question)
		Organisation age/number of years the firm is in business (own question)
		Environmental dynamism as measured by two questions taken from De Hoogh et al (2004)
		Early and late respondents (no question but noted down technically for every answer)
		Position of person in business organisation (own question)
	IT staff	IT leader gender (own question)
		Position of person in IT organisation (own question)
		Degree of outsourcing (own question)

Source: Developed for this research

For details on the variables used, please refer to appendix C.

The measurement items for the leadership, IT capability and performance constructs were all developed and tested by other researchers as outlined above. This study aimed at applying the measurement items to a similar setting/context in terms of the research problem in order to achieve an acceptable level of reliability. All measurement items used 6-item rating scales in order to measure the variable as well as possible, based on best practices in social research settings (Green & Rao 1970).

One requirement of the statistical procedures used in this study was to have interval data where equidistance is needed between the different scale items. Based on the work of Rohrmann (1978), this study tried to cover both extreme ends of the scales, clear descriptions for all scale items were given and the wording for the descriptions was chosen with care, as well as being pre-tested. Potential limitations of this aspect are stated in section 3.7. More detailed information on the survey items can be found in appendix B.

3.6   Data analysis procedures and interpretation

3.6.1   General information on the data analysis procedures

In line with best practice for any statistical analysis, the data was stored correctly in the database in order to avoid technical or human coding error. Data sets that were stored automatically from the survey were double-checked manually. Appropriate computer tools such as SPSS, SmartPLS (Ringle et al 2005), AmeliaII (Honaker et al 2010) and PRODCLIN2 (MacKinnon et al 2007b) were used to perform the different statistical modelling and analysis procedures. As mentioned previously, an explanatory (also called confirmatory) research approach was applied since theory suggested a clear direction of the relationships between the constructs. These suggestions are reflected in the hypotheses presented in the previous chapter.

3.6.2   Measures to capture potential response bias and control variables

The sample gained was analysed for possible bias caused by design and methodological elements of the study, as suggested by Leedy and Ormrod (2005, p. 210). In a first step, descriptive statistics and frequency distributions of each variable were checked in order to see whether individual questions generated high levels of a particular answer (e.g. 'don't know') or were skipped without being answered. In addition, a few non-respondents were asked for the reasons why they did not participate. This was done in order to check for possible self-selection bias.

In a second step, responses that contained > 50% of unit non-response were compared with the rest of the sample. Survey answers that could not be used because of missing data in either of the two surveys for the particular firm (see section 3.4) were compared with the records that could in fact be used. The data sets were checked visually and based on descriptive statistics and frequency distributions as well.

Last but not least, all control variables described in section 3.5 were included in the measurement models as independent variables in order to check whether there were significant relationships between these control variables and the dependent construct (checks for partial correlations that could potentially distort the results of the hypotheses tests). For early and late respondents, the first 50% of the answers were coded as 1; the later 50% were coded as 2.

3.6.3   Dealing with missing survey data

In many survey research projects using multivariate data, the sample data collected is not complete. Values for variables of some cases (a phenomenon that is called item non-response) might be missing. There can be several reasons for this: respondents forgot to answer an item, they did not have enough time, did not know the answer, or they refused to answer an item.

Missing data in the context of this study was regarded as being the data that was missing from the surveys conducted. As Allison (2002) points out, the problem with missing data is that almost all statistical procedures used in quantitative studies can only handle complete data sets. The statistical approaches presented and discussed in section 3.6.6 suffer from this limitation as well.

In survey research, it is often practically impossible to sample the entire population due to time, money or other restrictions. Consequently, the data of the resulting sample and its estimators of the population characteristics normally used to draw inferences and conclusions about the phenomenon under investigation must be assumed as being biased just because of the incompleteness of any sample (Madow et al 1983). Hence, there is a need to select an appropriate technique to handle the missing data with the aim of minimising bias, and maximising statistical power and reliability (Little & Rubin 1987).

In the past, the most widely used method of dealing with missing data was to delete the incomplete data sets, a technique known as Case-Wise or List-Wise Deletion. As Schafer and Olsen (1998) reported, these methods can lead to bias since the remaining complete data sets may not be representative for the entire sample anymore. In addition, the remaining data set may be too small to be used for any common statistical procedure such as regression analysis. Another popular approach is to use single imputation where, in most cases, the missing values for a variable are replaced by the mean of the remaining values of this variable. This technique is not recommended when missing data is present since it can seriously distort data distribution (Jones 1996).

Furthermore, both methods mentioned in this paragraph assume that the data is missing completely at random (MCAR), a category of missing data where the distribution of the missing data in a study is independent from the observed data as well as the missing data (Rubin 1976). While it would be possible to test independence of missing values of one variable from values of other variables in the data through a z-test for mean difference (Allison 2002, p. 3), it is practically impossible to prove that the distribution of the missing data of a variable is independent from the observed data for that variable so that MCAR cannot be ensured in this study.

In the past decades, two methods were developed that are today considered state-of-the-art and do not need missing data to be MCAR: Maximum Likelihood (ML) estimation and Multiple Imputation (MI).

The first of the two methods is based on the EM (Estimation Maximisation) algorithm proposed first by Dempster et al (1977) and can be used to fill in missing values estimated based on all complete and incomplete data sets that are available. The EM algorithm works in a way where it tries to 'choose as estimates those values that, if true, would maximise the probability of observing what has, in fact, been observed' based on 'the probability of the data as a function of both, the data and the unknown parameters' (Allison 2002, p. 13). In other words, missing values are replaced by values that, based on the normal distribution of the respective variable, are the values that have the highest probability of being observed.

A disadvantage of the ML approach is that it tends to underestimate standard errors (Allison 2002; Garson 1998; Schafer & Graham 2002). In addition, ML is generally used to only generate one (the most likely) value per missing value.

The latter of the two disadvantages above can be diminished if the second of the mentioned contemporary methods for handling missing values is used: Multiple Imputation (MI). MI represents an approach to replace missing values with a list of n > 1 simulated values per missing value (Schafer & Graham 2002). This means that several matrices are produced consisting of the observed values and an estimator per missing value per matrix. Consequently, this method of handling missing data requires much more effort since statistical analyses of the data such as regression analyses need to be done for each matrix individually.

There is a need for a distribution assumption (normality) about the data when using MI and the MI approach often uses the EM algorithm to estimate values per missing value. Although it is generally desirable to avoid techniques that assume normality of the data in contexts, such an assumption made to handle the missing data seems acceptable since Schafer (1997) states that the (multivariate, linear) normal model used together with MI should produce good quality estimates for the missing values even if the distribution of the available data is not normal. As Allison (2002, p. 32) points out, using MI with an EM algorithm and a normal model might be robust as long as it is used just to impute the data but not to estimate other parameters (such as e.g. regression coefficients).

In order to account for the disadvantage of underestimated standard errors mentioned together with ML, it is advisable to use, together with MI and the EM algorithm, a technique that makes sure that for each estimated value 'a random noise is added to preserve a correct amount of variability in the imputed data' (Schaffer & Graham 2002, p. 167). Schaffer and Graham recommend replacing pure EM estimates by a distribution 'based on the observed-data likelihood and a prior' in order to 'reflect uncertainty about the parameters from one imputation to the other' (p. 167).

Allison (2002, pp. 33-4) mentions that either a type of Monte Carlo algorithm called Data Augmentation DA (Schaffer 1997) could be used to generate this uncertainty or, alternatively, a sampling importance/resampling method (SIR) described by Rubin (1987). King et al (2001) developed an extended EM algorithm called EMis which includes the above SIR function.

In their study, King and colleagues provide data from Monte Carlo simulations indicating that this algorithm works well with larger and smaller samples with higher or lower rates of missing data, with many variables of exogenous and endogenous nature and much faster than other EM algorithms with DA implemented. Moreover, the corresponding application called 'Amelia II' (Honaker et al 2010) is easy to use. A disadvantage of EMis is, as it is partly based on simulation, that it generates different values each time it is used. This aspect would need to be considered in case the study results needed to be reproduced.

However, in light of what was discussed in this section, the author decided to use an MI approach in this study based on the EMis algorithm by King et al (2001). As recommended by Honaker et al (2010), m = 3 data matrices were generated and analysed subsequently and their results were compared for hypothesis testing. As recommended by Allison (2002), distributions of variables were checked before imputation and 'highly skewed' (p. 39) variables were transformed according to advice given in Honaker et al (2010b).

This above proposition holds, although Bass & Avolio (2004) recommend using mean imputation for missing values resulting from the use of the MLQ. This was done despite Bass and Avolio not giving reasons for their statement.

Figure 3-4 illustrates the usage of the Multiple Imputation (MI) technique in this study:

Figure 3-4 – Multiple Imputation (MI) process illustrated
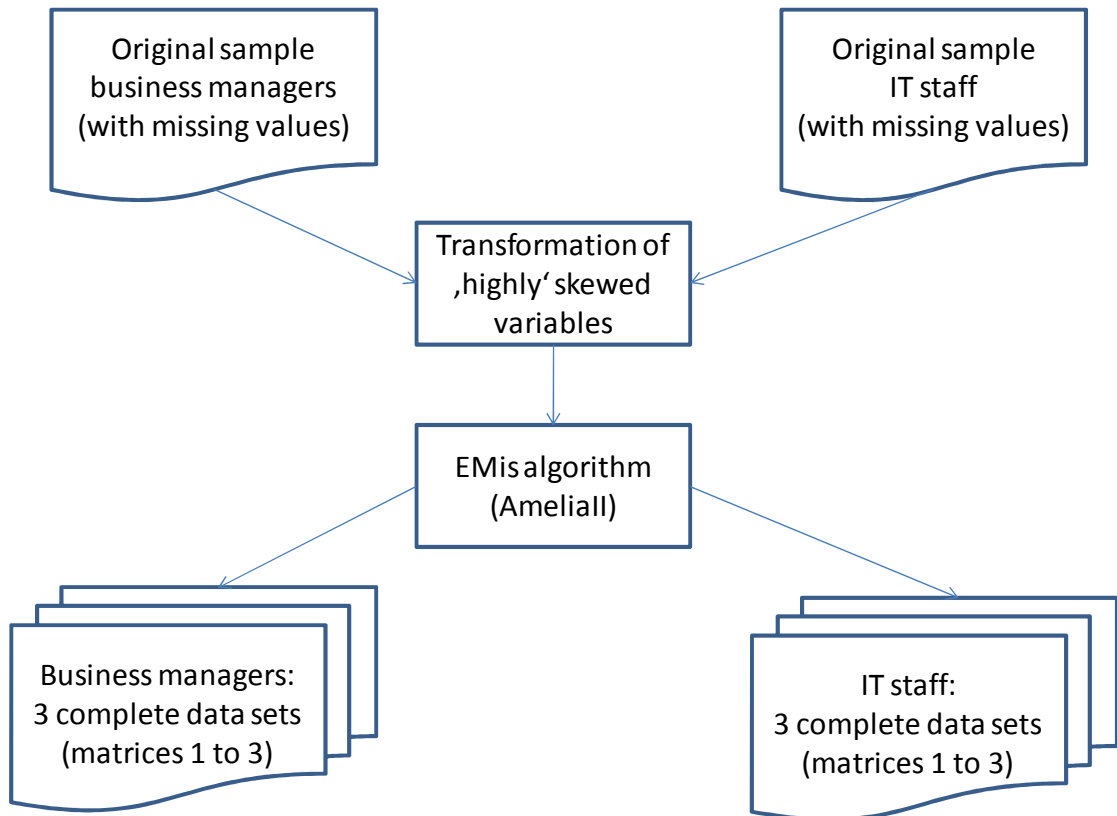
Source: Developed for this research

3.6.4 Formative or reflective indicators

The conceptual framework shown in the previous chapter indicated that the constructs used (transformational and transactional leadership, IT capability and firm performance) are of a latent nature. Latent constructs are elements that are not directly measurable and are therefore indirectly defined and measured through several (measurable and observable) indicators that then, together, describe the real world phenomenon (Bagozzi 1980). When using latent constructs, the researcher must decide whether the constructs used are of a formative or reflective nature. Distinguishing between the two forms is highly important since the decision has a direct impact on how the measurement model is specified and what will result from the measurement and testing procedures. Improper models might lead to inappropriate results, as demonstrated by Jarvis et al (2003).

Measurement models are reflective if the observable (manifest) variables of a latent construct all have characters of occurrences of the construct (Diamantopoulos 1999). With such constructs, manifest variables should be replaceable without changing the content of the construct and variables are often correlated within the latent construct. This phenomenon is also known as collinearity. In contrast to reflective models, constructs that are built as the sum of a set of variables are used in a formative measurement model (Bollen 1989). In such cases, manifest variables should not be replaceable and do not necessarily describe the same aspect of a construct.

Jarvis et al (2003) provide a procedure with questions that can be used to better distinguish between formative and reflective indicators. Whether formative or reflective models are used must always be inferred from theory according to Jarvis et al.

In terms of transformational and transactional leadership, the two constructs (as developed in the MLQ) consist of several sub-constructs (so-called first-order constructs) such as 'Idealised Influence' (II) or 'Individualised Consideration' (IC).

Based on the work of Podsakoff et al (2003), several studies in the past built those first-order constructs in a reflexive way by using the MLQ questionnaire items as manifest indicators (e.g. Avolio & Howell 1992; Turner et al 2002). In those studies, the first-order constructs were used to form the transformational and transactional leadership constructs in a formative way and as second-order constructs. MacKenzie et al (2005, p. 716) explicitly confirm this view as they believe that the MLQ questionnaire items per leadership behaviour (e.g. for 'Individualised Consideration') encompass the same thing and are hence to be seen as reflexive indicators. In addition, MacKenzie et al (2005) indicate that the leadership behaviours as such represent different styles so that transformational and transactional leadership are to be formed in a formative way if used as one (leadership) phenomenon.

The IT capability construct consists of several first-order constructs (e.g. physical IT infrastructure) as well. As the underlying manifest variables represent disparate aspects and the first-order constructs catch different resources and competences, earlier studies on IT value and IT/IS capabilities suggested viewing IT capability as a formative construct and proposed building the first-order constructs in a formative way (Eikebrokk & Olson 2007; Han et al 2008; Ravichandran & Lertwongsatien 2005).

The author of this study agreed with the authors of earlier studies on leadership and IT capability cited above so that their recommendations on how the constructs are to be built were followed.

When looking at the firm performance construct and its measurement items as presented in section 3.5 of this chapter, there are two first-order constructs, namely, subjective operating performance and subjective marked-based performance. The operating performance aspects and the market-based performance aspects seem to capture two different phenomena which is the reason why Ravichandran and Lertwongsatien (2005) viewed them as formative elements to build the firm performance construct in their study.

The way the market-based performance construct was built and used by Capon et al (1992) suggested that the manifest variables capture the same aspects and should be exchangeable as the researchers clearly mentioned their expectation of highly correlated items (Capon et al 1992, p. 162). The subjective operating performance construct applied by Powell and Dent-Micallef (1997) has similar characteristics. The two researchers stated that they viewed the construct 'as linear combinations' of the manifest variables and presented high correlations of the respective items (Powell & Dent-Micallef 1997, p. 390).

Based on the above, the firm performance construct was used as a function of formative first-order constructs (market-based performance and subjective operating performance). Market-based and subjective operating performance first-order constructs were built using reflexive indicators.

3.6.5 Aggregating data from multiple statistical units per element of the population

In order to preserve as much meaning of the data as possible, the collected data was only consolidated on a firm level (element of the population) where necessary. However, since performance data was only collected from the business managers group (see section 3.3.1 for details); there was a need to consolidate either the leadership data or the subjective performance data in order to arrive at the combined measurement model described further below.

The author of this study decided to consolidate the leadership data. The main reason for this was that the leadership behaviours measured represent individual styles used per leader so that there was a need to aggregate these differences onto a firm level in order to represent the firm.

An additional reason was that the primary purpose of regression analysis (as it is used in this study) is prediction of values of dependent variables based on values from independent variables (Levine et al 2005, p. 512) so that this analysis method includes the assumption that more uncertainty exists about the values of the dependent variables. Consequently, aggregating the independent leadership variables was more reasonable.

In terms of the aggregation procedure to be used, there were several possible methods available. As all leadership variables were measured based on questionnaire items with fixed scales, no outliers were possible. Thus, the use of a median per variable was not particularly useful.

Using the mode per variable would have been problematic because the way the leadership data was collected did not imply a certain level of agreement amongst the survey participants. Similarly, the usage of a data-based weighted mean as proposed by Van Bruggen et al (2002) was not considered as being a good option since this procedure is based on the level of agreement amongst people's responses as well.

As a consequence of the above, the arithmetic mean was used to aggregate the leadership values per variable onto a firm level since it was regarded as the best alternative available. The resulting averages per leadership variable were then used for every response gathered for the same firm from the questionnaire used by the business managers.

In terms of the control variables that were collected in the survey for the IT staff, the situation was partly different. The degree of outsourcing (variable 'C_OUTS') was aggregated based on the mode where possible, since a certain level of agreement amongst the respondents had to be assumed. Only where there was no mode available, the mean was used instead. For the organisational level of the IT staff (variable 'C_POS2') and the IT leader gender (variable 'C_SUP_G'), the means were used for the same reasons as for the leadership variables.

3.6.6 Choosing the most appropriate technique to test the hypotheses

Several different techniques were used to answer research questions in earlier studies in the domains of Information Systems (IS), Information Technology (IT) and leadership. However, multiple regression analysis (MRA) techniques represented by far the most popular group of analysis tools in this field because these methods are very flexible (Cohen et al 2003, p. 3), since causation of real world phenomena can potentially be inferred from logical interpretation of measurements of correlations (Schendera 2008, pp. 3-6) and because many regression–based statistical tests include great preciseness and power (Garson 1998). Predominant regression techniques in the past were classical Multiple Regression Analysis (MRA, often called first generation regression analysis) as well as Structural Equation Modelling (SEM, often called second generation regression analysis). Both, MRA and SEM use some sort of variance or co-variance analysis in order to illustrate and explain the spreading of the data points of the sample. In general, the choice about the approach to be used should be made based on the data gathered, its distribution and the sample size (Cohen et al 2003).

In contrast to classical MRA, SEM is able to estimate an entire model consisting of multiple hypothesised relationships simultaneously (Jöreskog & Wold 1982). Furthermore, by using SEM one can design two-step regression models where latent constructs are formed based on a set of manifest variables (this is called the measurement or inner model) and where relationships amongst the latent constructs can then be estimated (Diamantopoulos & Siguaw 2000). The latter is often called the structural model or outer model.

Furthermore, as this study used many independent variables, there could have been an issue with the degrees of freedom when applying classical MRA, whereas the two-step process used by SEM would eliminate this problem. In addition, as Hunt (1991), as well as Perry et al (1999) state, SEM is an adequate method in research that is guided by the critical realism/post-positivism paradigm as its features allow for modelling reality in a much more complex way. These features make SEM more suitable for this study than MRA.

Within SEM, there are two different approaches that can be used: co-variance analysis and variance analysis. Co-variance analysis applies a spreading/variance/co-variance matrix as its basis to examine the structure of observed variables (Jöreskog & Wold 1982). For this study, a possible technique using co-variance analysis would have been Unweighted Least Squares (ULS) as it does not require normally distributed data (Bollen 1989). Other co-variance analysis techniques did not seem suitable for this study. The Maximum Likelihood (ML) method needs normally-distributed data (Jöreskog & Wold 1982) and the Asymptomatically Distribution Free Method (ADF) requires very large sample sizes (>2000) as illustrated by Nevitt and Hancock (2001).

Although in co-variance-based SEM there is a statistical technique available called Principal Component Analysis (PCA) that is used to form latent constructs from manifest variables, this technique can only be used for reflective measurement models (Weiber & Mühlhaus 2010).

The most popular variance-based approach within SEM is Partial Least Squares (PLS). PLS uses multiple regression analysis to estimate the measurement and structural model. It is largely independent from a particular distribution (Jöreskog & Wold 1982) which makes the technique especially appealing since research often does not produce normally-distributed data as Chin (1998b, p. 278) describes. Due to the independence from normally-distributed data, PLS is not susceptible to classical linear regression problems like heteroscedasticity, abnormal distribution of errors or autocorrelation (Lohmöller 1989).

PLS was found as being particularly adequate with smaller sample sizes (Chin 1998). However, as illustrated by other research in the information systems domain by Goodhue et al (2006) and in leadership (Sosik 2009), the statistical power of PLS might not necessarily be superior to other statistical methods under such circumstances.

An additional important advantage of PLS over co-variance analysis is that although PLS tends to overestimate relationships in the measurement model; it underestimates the relationships in the structural model that is used to judge the hypothesized relationships. This aspect, in contrast to co-variance analysis, minimises the danger of over-estimating relationships between constructs as a consequence of an imperfect or even poor measurement model, as illustrated well by Lohmöller (1989).

The PLS method has its disadvantages as well. First of all, with PLS, estimates for path coefficients and weights/loadings of the indicators on their constructs become better the more indicators per construct are available.

This 'consistency-at-large' effect (Jöreskog & Wold 1982) could lead to higher standard errors the fewer indicators are present (Lyttkens 1973) so that estimates might become less precise in such cases. Furthermore, a disadvantage of PLS is that it provides weaker quality criteria than approaches that require a particular data distribution since parametric significance tests (such as t-tests) are not possible in the absence of an assumption about the distribution of the population. The latter makes it more difficult to judge the quality of the measurement/test results (Weiber & Mühlhaus 2010). It is, however, possible to replace the missing distribution of the population with that of the sample by using a technique called bootstrapping (Chin 1998b). In this procedure, several sub-samples are taken from the sample itself (with replacement). This then permits the calculation of t-statistics and t-test values whereas significance thresholds remain the same as for traditional t-tests (Levine et al 2005). However, bootstrapping is recommended to be used only when the sample is representative for the whole population and when the sample size is ≥ 100 (Weiber & Mühlhaus 2010, p. 259).

In light of the statements made, SEM and PLS seemed to be the best available choice so that these techniques were used to test the hypotheses stated in the previous chapter.

3.6.7 Creating the PLS models and identifying potential collinearity problems

When using SEM, the first step is to build the structural model. This is the transformation of the conceptual framework into a path model that shows the hypothesized relationships between the independent and the dependent constructs (Schumacker & Lomax 2004). The second step is then to add the indicators per construct to the model. The resulting is called the measurement model (Hoyle 1995).

With formative measurement variables, the relationship with the construct is represented by an arrow that points at the construct, indicating that the construct is formed by a sum of a set of variables. As explained earlier in this dissertation, the IT capability variables in the model were considered as being formative as they all have the character of defining the construct rather than being occurrences of the construct (Jarvis et al 2003).

For reflexive measurement items, the relationship with the constructs is shown by an arrow that points at the measurement variable, indicating that the variables are replaceable manifestations of that construct (Weiber & Mühlhaus 2010, p. 37). As mentioned previously, the variables for the first-order constructs of transformational leadership (e.g. 'Idealised Influence' or 'Individualised Consideration') and transactional leadership (e.g. 'Contingent Reward') were all considered as being reflexive items. As illustrated earlier, the first-order constructs of firm performance, market-based and subjective operating performance were built based on their reflexive variables as well.

Figure 3-5 represents the model as it was used to test hypotheses 1 to 5. The model includes the control variables that could potentially influence the dependent construct as exogenous manifests.

Figure 3-5 – SEM structural and measurement model 1 for hypotheses 1 to 5
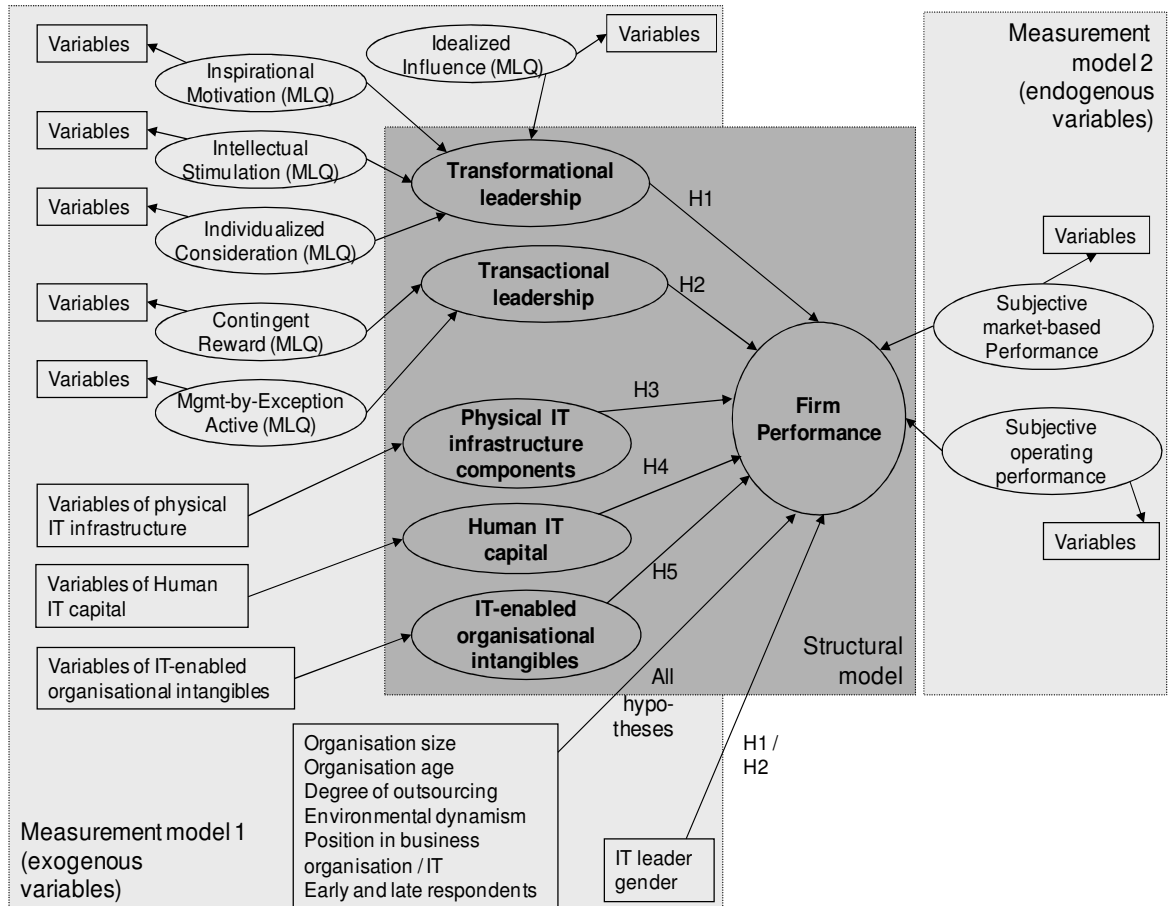
Source: Developed for this research

As part of step two, the manifest reflexive indicators for the leadership and for subjective market-based and subjective operating performance had to be translated into the latent constructs by using Principal Components Analysis (PCA) as illustrated by Weiber and Mühlhaus (2010, p. 59). This was done in SPSS based on a procedure suggested by Brosius (2008, pp. 780-1).

The procedure included step-wise extraction of linear factors (called components) that together explain as much of the variance of all manifest variables as possible. Where possible, and enough variables per construct were available, an oblique rotation (Direct Oblimin) was used instead of an orthogonal rotation as the aim of the factor extraction was not to reduce the number of variables but to keep as much of the variance as possible. Oblique rotation was considered as being more adequate based on Brosius (2008, p. 792) and Coakes and Steed (2007, p. 131) since all constructs with reflexive manifest variables used were explicitly built to be latent constructs so that multicollinearity was not unwanted. The number of factors per construct to be used was determined by the help of a screeplot similar to the one below (Figure 3-6) where the turning point in the function (from left to right) establishes the border between factors that should be used (left) and components that do not explain enough variance (right). In any case, the eigenvalue (as a measure for how much of the variance of all variables is explained by one resulting element) of components to be used always had to be > 1 (Brosius 2008, p. 782).

Figure 3-6 – Screeplot example where two components should be used
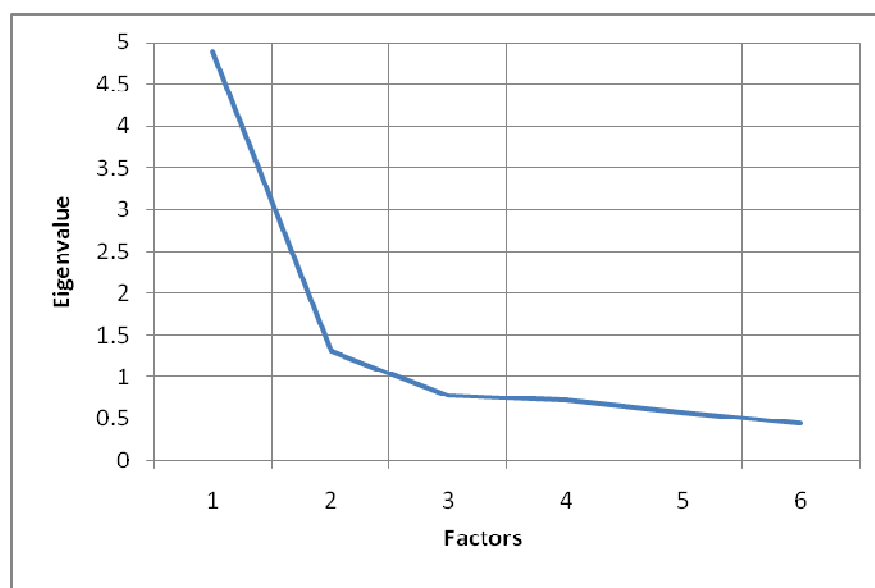
Source: Developed for this research

Although principal components regression includes the disadvantage of possibly reducing the statistical power of the regression analysis since the smaller (discarded) components could account for significant variance in the endogenous variable(s), as explained by Cohen et al (2003) as well as Hadi and Ling (1998), its usage can be justified by a study by Albers and Götz (2006) who explicitly recommend using PCA to translate reflexive indicators into first-order constructs that are then used to build second-order constructs in a formative way (p. 674).

In step three, a system of linear (regression) equations that mathematically describes the measurement model was built (linear equations). Statistical software packages such as SmartPLS (Ringle et al 2005) automatically generate the linear equations based on the structural and measurement models created by the researcher.

For formative constructs, the relationships between the variables and the exogenous constructs can be described as the system of linear equations that follows

Formula 3-1 – Effect of manifest formative variables on exogenous constructs

$$\xi = \prod_{\xi} x + \delta_{\xi}$$

Source: Huber et al (2007, p. 5)

For the endogenous constructs, the system of linear equations can be described as

Formula 3-2 – Effect of manifest formative variables on endogenous constructs

$$\eta = \prod_{\eta} y + \delta_{\eta}$$

Source: Huber et al (2007, p. 5)

In the above formulas, $\prod_\xi$ and $\prod_\eta$ represent the (multiple) regression coefficients whereas δ_ξ and δ_η describe the error terms.

In the last (fourth) step of the procedure, the variance analysis-based PLS approach estimates (a) so called construct values for the measurement model; then (b) the path coefficients between the constructs for the structural model; and, finally, (c) the mean values and the intercepts.

The PLS algorithm aims at minimising the variance of the error variables in the structural model as well as in the measurement model (Backhaus et al 2008). This is done in order to represent the original data collected as well as possible and to produce path coefficients as precisely as possible at the same time.

The construct values represent the observable underlying variables (Bollen 2002). For formative models, this is done through using multiple regression analysis on the variables per latent construct. PLS uses an iterative approach to estimate these construct values by comparing the estimated values of the structural model and the value of the measurements model per iteration (Jöreskog & Wold 1982).

Once these construct values are known, the next step is then to estimate the path coefficients that represent the significance and strengths of a particular path between two constructs in the model (Diamantopoulos & Siguaw 2000). In contrast to classical regressions analysis (including MRA), PLS is capable of estimating several relationships by looking at several regression equations at a time, an aspect that is called complex relationships between variables (Backhaus et al 2008).

According to Huber et al (2007, p. 4), the linear equation system for the structural model can be described as

Formula 3-3 – System of equations for the structural model

$$\eta = B\eta + \Gamma\xi + \zeta$$

Source: Huber et al (2007, p. 4)

In the above, η describes the vector of endogenous and ξ the vector of exogenous variables. Γ and B represent the effects of exogenous on endogenous and endogenous on endogenous variables respectively. The element ζ accounts for the error terms in the structural model.

In order to be able to perform proper statistical analysis, all data was standardized (mean = 0 and standard deviation = 1) by using a z-transformation technique (Levine et al 2005, p. 227).

In terms of interpreting the quality of the measurement model with SEM and PLS, there are a couple of aspects that are worth mentioning. First, according to Jarvis et al (2003), there is no possibility of distinguishing between the variance of the error variables and the variance of the construct (see earlier discussion in this chapter). As Diamantopoulos (2006) pointed out, this aspect alone limits the analysis and interpretation of the model since no real measurement error can be identified. Any error in the model must be attributed to an incomplete or wrong model specification (Jarvis et al 2003).

Secondly, unwanted collinearity of independent indicators (linear dependency of variables) is problematic, similar to classical MRA, so in this study collinearity tests were made by calculating Variance Inflation Factors (VIF). According to Diamantopoulos and Riefler (2008), VIF values of ≥ 5 should be examined. Moreover, Henseler et al (2009, p. 302) emphasised that 'any VIF substantially greater than 1 might indicate multicollinearity'. In order to analyse potential collinearity problems, a procedure by Huber et al (2007, pp. 98-100) based on manual VIF checks with the help of SPSS was used in this study.

In case of serious violation of the recommendations above, dropping of an indicator would have needed to be considered since variables with high VIF values often contain redundant information (Diamantopoulos & Winklhofer 2001) and may lead to inaccurate model estimates according to Weiber and Mühlhaus (2010, p. 208).

The coefficient of determination (R^2) that shows what percentage of variance in the construct is explained by the variance of the manifest indicators should not reduce significantly after dropping the indicator. In the presence of unwanted collinearity, aggregation of the respective manifest variables in a separate component via PCA could be considered (Weiber & Mühlhaus 2010, p. 208).

The detailed procedures used to analyse the models and the hypotheses are described in the next sections. The steps are generally based on recommendations made by Brosius (2008), Chin (1998; 1998b), Huber et al (2007), Weiber and Mühlhaus (2010) and Wold (1989).

3.6.8 Validity and reliability of the constructs and their indicators

Although the MLQ was found to not always be fully stable in certain business contexts (Carless 1998; Yukl, 1999, 2002), the MLQ 5X based on factors proposed by Bass and Avolio (2004) were the most valid and recognized instruments available in this field. Judge and Piccolo (2004) reported high overall validity (including external validity) of the MLQ in their large meta-analytic review of studies on the transactional and transformational leadership theory. Furthermore, based on the results of their study, Muenjohn and Armstrong (2008) reported high construct and internal validity of the MLQ 5X as it is used in this study.

The elements of IT capability from Bharadwaj (2000) were tested by several other researchers such as Lin (2007), Liu et al (2008) and Santhanam Hartono (2003) so that an adequate level of validity and reliability could be assumed for these items as well. For the measurement instruments for firm performance, Ravichandran and Lertwongsatien (2005) pointed out that the scales used 'were validated using standard procedures recommended in the literature' (p. 251) and they presented cross-loadings that show adequate convergent validity, as well as significantly high values for Cronbach's alpha (Cronbach 1951) that illustrate satisfactory discriminant validity.

In spite of the tests conducted by other researchers mentioned above, all measurement items and constructs were re-tested in order to increase confidence that the statistical hypotheses testing procedures used later produced reasonable results. In terms of testing for appropriate construct validity and reliability, two important aspects arose from the usage of formative constructs.

Firstly, reliability based on Confirmatory Factor Analysis (CFA) and cross-loadings could not be used with formative constructs (Weiber & Mühlhaus 2010, p. 209). This is due to not being able to capture measurement errors. Secondly, internal consistency reliability based on Cronbach's alpha could only be used for formative measurement models since this technique builds on the assumption that consistent and reliable indicators are those that correlate high with other indicators in the same construct (Albrecht 2005). Furthermore, practically, it was not possible to measure test/retest reliability since this would have required conducting the surveys again with the same participants. Consequently, it was not possible to test reliability for formative measurement items (Weiber & Mühlhaus 2010, p. 209).

However, several actions were taken to analyse whether the measurement instruments used actually measured what they should (which is equal to an adequate level of validity). In order to examine the validity of formative indicators (per construct), a procedure proposed by Diamantopoulos et al (2008, p. 1189) was used. According to their descriptions, only indicators with weights of formative indicators that are significantly different from zero should be used, based on bootstrapping and t-test statistics.

For reflexive measurement items that formed the first-order constructs, the Kaiser-Meyer-Olkin criteria (KMO) and the Bartlett test procedures in SPSS were used. As illustrated by Weiber and Mühlhaus (2010, p. 107), the KMO criteria aggregate Measures of Sampling Adequacy (MSA) indicate KMO criteria should ideally be ≥ 0.6 and MSA values should be ≥ 0.5 in order to have a construct (built based on reflexive measurement items) that has adequate validity.

The Bartlett test uses a chi-square test that verifies the null hypothesis of having variables from an uncorrelated population which means that the null hypothesis should be rejected in cases where an adequate relationship between the variables in the construct can be assumed (Brosius 2008, p. 777).

In order to test the construct validity with PLS, Diemantopoulos and Winklhofer (2001, p. 273) suggest verifying the path coefficients for the hypothesised relationships between the independent and the dependent constructs. They should be different from zero, as well as plausible and justifiable in terms of their direction of action (algebraic sign) based on theory and previous research. Chin (1998, p. 11) recommended viewing standardized path coefficients of $\geq |\,0.2\,|$ as valid.

In addition, the coefficient of determination (R^2) should be ≥ 0.3 according to Chin (1998b, p. 325) in order to ensure adequate construct validity. More precisely, Chin characterises a 'weak' model to have values around 0.19, a 'moderate' one around 0.33 and a 'substantial' model ≥ 0.66.

As Chin and Newsted (1999, pp. 312-3) pointed out, there is a certain tendency with smaller samples to overrate indicator weights and to underrate path coefficients when using PLS. This aspects needs to be considered when interpreting results that are close to critical t-values (see next section).

3.6.9   Testing the hypotheses

The significance of the paths of the structural model was examined by using t-tests based on bootstrapping (Nevitt & Hancock 2001). As Huber et al (2007, p. 45) as well as Weiber and Mühlhaus (2010, p. 256) described, two-sided t-tests for a correlation coefficient should be made per hypothesis where the null hypothesis is that the estimated path coefficients are not significantly different from zero (H_0: $\gamma_p = 0$).

The t-value was calculated by using

Formula 3-4 – Parametric (two-sided) t-test to check significance of path coefficients

$$t_{ij} = \frac{\gamma_p}{s_{\gamma_{ijb}}}$$

Source: Chin (1998b)

In the above formula, γ_p represents the path coefficient and $s_{\gamma_{ijb}}$ describes the standard deviation of the path coefficient taken from the bootstrap procedure. The bootstrapped samples follow a t-distribution with m+n-2 degrees of freedom where 'm' is equal to the number of PLS estimates and 'n' equals the number of bootstrap estimates (Henseler et al 2009, p. 305). Hence, when using a level of significance (2α) of 5%, H_0 should be rejected in case the calculated t-value is either > $t_{0.025,\ m+n-2}$ or < -$t_{0.025,\ m+n-2}$. As bootstrap samples are usually selected to be > 121, the critical t-values for m+n-2 degrees of freedom were 1.98 and -1.98 respectively (Huber et al 2007, p. 45) or as small as 1.96 and -1.96 as 'n' becomes very large (Levine et al 2005, p. 845).

3.6.10 Analysing the moderating and mediating effects

In order to test the combined effects (also called interaction effects) of leadership and IT capability on firm performance as hypothesised, a procedure for the mediators and one for moderators was needed that could be used together with SEM/PLS and formative constructs.

The study thus employed a procedure proposed by Huber et al (2007, pp.48-51) in order to test the moderating effect of leadership between IT capability and firm performance as stated in hypothesis 6a. Multiple group analysis was used as all the IT capability variables had an interval scale.

Based on a recommendation by Huber et al (2007, p. 119), the answers from the business representative survey were divided into two groups of approximately the same size. One group included all the answers of firms where, in the IT staff survey, people rated the leadership behaviour of their superiors as being below average based on the total MLQ scores of all questions (the 'lower leadership' group) compared to the other group (the 'higher leadership' group).

As a basis for the group analysis, the original SEM model presented in section 3.6.7 served as the basis. However, the leadership constructs had to be removed so that a new model resulted (see Figure 3-7). Consequently, all validity tests had to be redone for the model.

Figure 3-7 – SEM structural and measurement model 2 – moderating effect (hypothesis 6a)
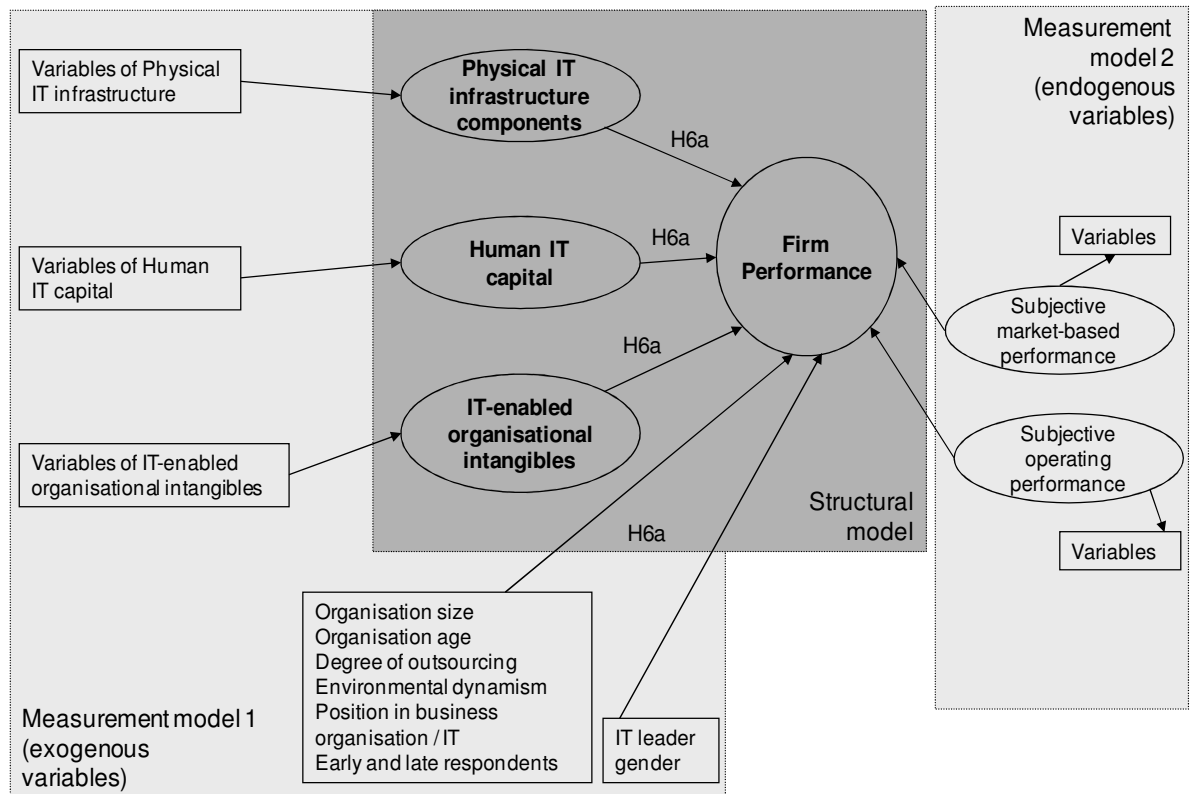
Source: Developed for this research

Before any group analysis could be done, it was necessary to ensure that the measurement model parameters for the two groups were not significantly different from each other. In order to do this, Huber (2007, p. 50) proposes using a procedure designed by Chin (2004) which is based on a t-test for the indicator weights based on bootstrapping samples.

The mentioned test approach used is a pooled-variance t-test (Levine et al, p. 375) for a t-distribution with m+n-2 degrees of freedom.

Formula 3-5 – Parametric t-test for measurement model invariance

$$t = \frac{\gamma_i^1 - \gamma_i^2}{S * \sqrt{\dfrac{1}{m} + \dfrac{1}{n}}}$$

Source: Chin (2004)

In the formula above, 'm' and 'n' describe the size of the two groups, whereas γ_i^1 and γ_i^2 represent the weights of the indicators on their construct per group. Moreover, the parameter 'S' in the formula above represents the pooled estimator for the variance that is calculated as follows

Formula 3-6 – Pooled estimator for the parametric t-test for measurement model invariance

$$S = \sqrt{\frac{(m-1)^2}{(m+n-2)} * \left(\sigma\left(\gamma_{ib}^1\right)\right)^2 + \frac{(n-1)^2}{(m+n-2)} * \left(\sigma\left(\gamma_{ib}^2\right)\right)^2}$$

Source: Chin (2004)

In the formula for the pooled estimator for the variance, $\sigma\left(\gamma_{ib}^1\right)$ and $\sigma\left(\gamma_{ib}^1\right)$ describe the standard errors gained from the bootstrapping samples (Huber et al 2007, p. 51). Chin (2004) states that the weights should be approximately equivalent, which would be equal to accepting H_0: $\gamma_i^1 = \gamma_i^2$. However, Huber et al (2007) contend that the statistical criteria of measurement model invariance 'is questionable' (p. 51) as a slight difference of the indicator weights of the two groups would, strictly speaking, inhibit the group analysis itself and, by that, potential insights gained from it.

After the measurement model invariance is calculated, Huber et al (2007, p. 51) propose using the same t-test procedure to perform the group analysis, but to use the path coefficients (γ_p) for the hypothesised relationships in the structural model instead of the indicator weights. With that, the moderating effect of leadership between the first-order constructs of IT capability and firm performance hypothesised in 6a should be viewed as significant if the calculated t value is either $> t_{m+n-2}$ or $< -t_{m+n-2}$ (Levine et al 2005, p. 376) when using a level of significance of 5% in a two-sided test (equivalent to accepting H$_1$: $\gamma_p^1 \neq \gamma_p^2$). The t-tests mentioned were carried out for each of the three path coefficients.

In terms of the test method to be used to evaluate the mediating effect of IT capability between leadership and firm performance hypothesised in 6b, a procedure proposed by Huber et al (2007, pp. 69-71) was used. A separate SEM model was needed that used a measurement model where IT capability is defined as the latent exogenous construct formed by all manifest variables defined by Bharadwaj (2000) and transactional and transformational leadership is a function of all its first-order constructs. The resulting model is shown below in Figure 3-8.

Figure 3-8 – SEM structural and measurement model 3 – mediating effect (hypothesis 6b)
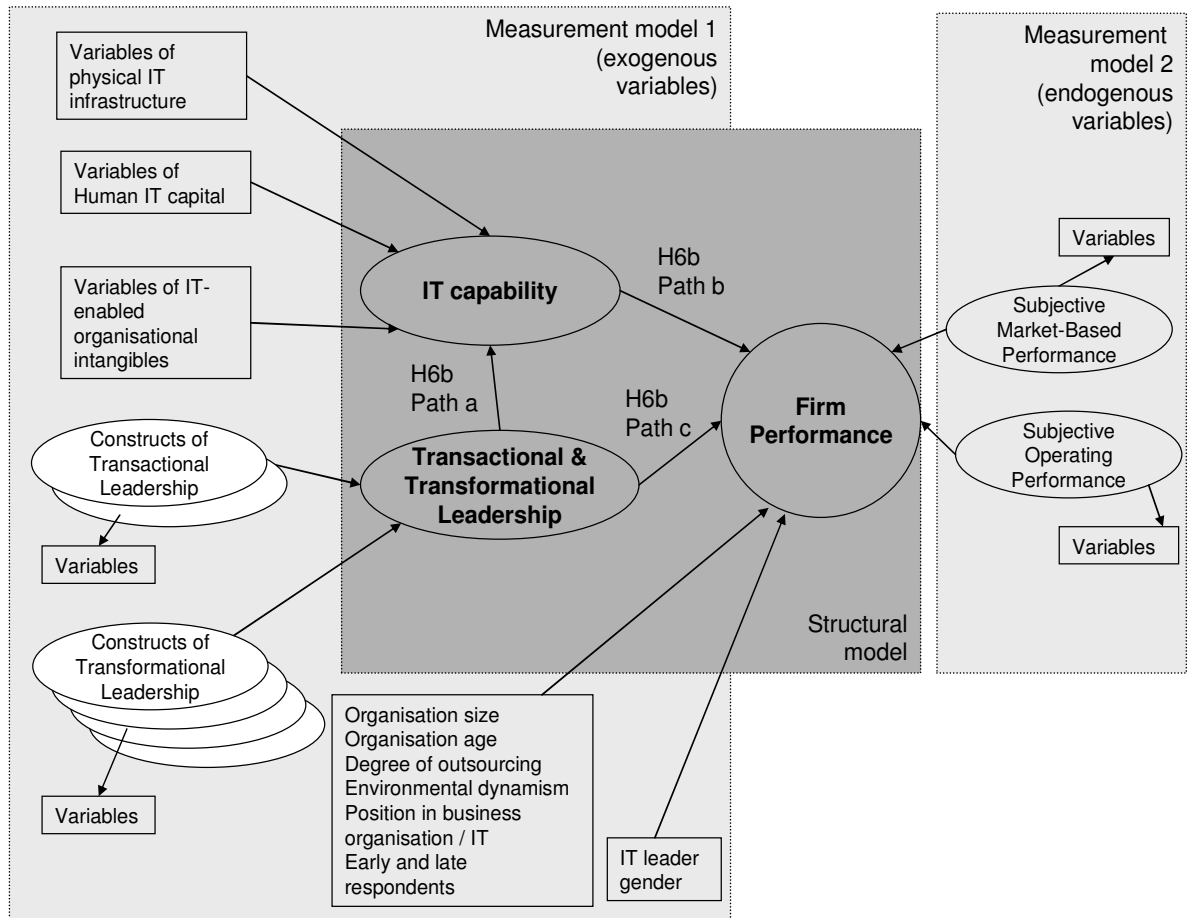
Source: Developed for this research

All tests for collinearity and all validity tests had to be repeated for this model since it included a completely new measurement and structural model with different paths.

The procedure by Huber et al (2007, p. 70) is based on a definition by Preacher and Hayes (2004) where a mediating effect is present if the path coefficient (γ_{p_a}) between the exogenous construct (leadership) and the mediating construct (IT capability), marked as path 'a' in figure 3-8, is $\neq 0$ (zero) and if the path coefficient (γ_{p_b}) between the mediating construct and the endogenous construct (marked as path 'b' in the figure above) is $\neq 0$ (zero). In addition, the path coefficient (γ_{p_c}) between the exogenous construct and the endogenous construct (path 'c' in figure 3-8) needed to be ≥ 0 (zero) and smaller than the path coefficient value (between the same constructs) in a model without the mediating variable, meaning that the effect of the exogenous construct on the endogenous construct should be smaller in the mediated model. According to Huber et al (2007, p. 70), a perfect mediation is present if path 'c' = 0 (zero). Any value $\neq 0$ for path 'c' leads to a partly mediated model. In case of an existing mediating effect, Huber et al (2007, pp. 71-2) propose using a z-test designed by Sobel (1982) to verify whether the mediating effect is significant.

Formula 3-7 – z-test for mediating effects based on path coefficient products

$$z = \frac{\gamma_{p_a} * \gamma_{p_b}}{\sqrt{\gamma_{p_b}{}^2 * \sigma(\gamma_{p_a})^2 + \gamma_{p_a}{}^2 * \sigma(\gamma_{p_b})^2}}$$

Source: Sobel (1982)

In the above formula, $\sigma(\gamma_{p_a})$ and $\sigma(\gamma_{p_b})$ describe the standard errors of the path coefficients 'a' and 'b' respectively. According to Huber et al (2007, pp. 71-2), the null hypothesis of having no mediating effect of IT capability would need to be rejected if the calculated z-value is > +1.96 or < -1.96 and the sample size should be > 200 in order to get unbiased results.

However, the z-test presented above assumes that both path coefficients are normally distributed, which is hardly ever the case—as illustrated by Fritz and MacKinnon (2007, pp. 235-6). Consequently, MacKinnon et al (2007) propose computing asymmetric confidence intervals that are based on the distribution of the product of the two path coefficients. In the procedure Fritz and MacKinnon suggest, the critical value is first calculated based on the path coefficients and the level of significance with the help of their software PRODCLIN2 (MacKinnon et al 2007b). The limits are then determined by calculating

Formula 3-8 – Asymmetric confidence interval based on distribution of coefficient products

$$Limits = \gamma_{p_a} * \gamma_{p_a} \pm \left[\frac{critical\ value - \dfrac{\gamma_{p_a} * \gamma_{p_b}}{\sigma(\gamma_{p_a}) * \sigma(\gamma_{p_b})}}{\sqrt{\dfrac{\gamma_{p_a}^{\ 2}}{\sigma(\gamma_{p_a})^2} + \dfrac{\gamma_{p_b}^{\ 2}}{\sigma(\gamma_{p_a})^2} + 1}} \right] * \sqrt{\gamma_{p_b}^{\ 2} * \sigma(\gamma_{p_a})^2 + \gamma_{p_a}^{\ 2} * \sigma(\gamma_{p_b})^2}$$

Source: Fritz & MacKinnon (2007)

Fritz and MacKinnon (2007, p. 236) propose the mediating effect as being significant if the calculated confidence interval does not contain 0 (zero). In terms of the sample size needed to achieve high statistical power, Fritz and MacKinnon (2007, p. 237) concluded from their simulations that the procedure described above is amongst those showing the best results across all possible combinations of sizes of γ_{p_a} and γ_{p_b}.

3.7　　Limitations of the methodology

Although the study design, data collection and analysis methods and procedures described aimed at limiting potential bias in the research work, it is acknowledged that the resulting data of the study could be distorted. One of the underlying aspects is the fact that the research model used consisted of latent variables which are not directly observable in reality, but which were formed by using predictors. In addition, responses from participants of the survey reflected their own views and opinions so that the data did not necessarily represent reality. Furthermore, respondents of the surveys could have influenced the data by their values, attitudes and perception of the situation and the questions asked in the surveys. The layout of the questionnaire, the form of the questions, scales and even the institution represented by the sender could have had an impact on how and what the participants of the survey answered.

Moreover, the fact that measurement items were reused from previous studies but applied to a non-identical research setting could have had an impact on the outcome of this study. The use of rating scales that do not necessarily produce interval scales with equal distances between scale items of measurement variables could have negatively impacted the results of this study as well. Furthermore, the topic of the study and questionnaire as such and its roots in business and behavioural sciences could have had an unplanned effect on responses. In addition, it is possible that the use of a web-based survey and the corresponding technological tool formed a problem for some of the participants which could have resulted in distortion of the data.

The research work was limited to the firm representatives who could be reached and to cross-sectional data from financial institutions from Switzerland. Both aspects reduced generalisability of the results and their interpretation. This means that it is acknowledged that data of a stratified sample from a larger number of potential participants invited and longitudinal data from a broader range of institutions, cultures and contexts would have shown a more solid picture of the relationships hypothesised. However, comparability with earlier studies in similar contexts is possible using cross-sectional data.

The global crisis in the financial industry could have had an impact on how people handled the questionnaire, and if and how they responded. It could be assumed that people were under a lot of pressure and that possible respondents were very busy, so that there might have been a lack of time for them to participate in the study (see next chapter). Further unknown aspects might have influenced the quality of the data.

3.8   Ethical considerations

Respecting ethical best practices is an important aspect of every research study. Several ethical responsibilities and principles are mentioned in literature. Overall, it is the personal responsibility of the researcher to treat the involved stakeholders of the study with respect, honesty and integrity (Leedy & Ormrod 2005; Zikmund 2000). From that, it was inferred that all research activities had to be carried out bearing in mind the different cultural backgrounds and personalities of the involved people, including their rights and their position in the society.

It is acknowledged that due to the usage of survey technique and the involvement of human aspects such as behaviour, leadership and traits, data collection and processing had to be done very carefully.

Table 3-9 lists the ethical dimensions that the author viewed as being the most important in the context of this work, including questions that had to be answered for this research study.

Table 3-9 – Ethical considerations in this study – Part 1

Dimension	Questions asked	Answer for this study
Informed consent	Did people get full information about the research and why and how they had been chosen to participate?	• Participation in the survey was voluntary and participants were informed of the purpose of the study and the effort required. • People were informed in the invitation that the Swiss Financial Market Authority (FINMA) and the Swiss Bankers Association (SBA) agreed that their address databases could be used for this study.
Confidentiality and anonymity	How was information safeguarded and the identity and personality of people protected?	• Participants were granted the right to withdraw from the survey at any time and to withdraw any previously provided information. • People were assured that participant's data was kept confidential and that the online survey approach allowed the researcher to make respondents' answers anonymous (unless people were explicitly willing to give their email address in order to participate in the competition to win a prize and to gain access to the study results). • Adequate technical procedures were applied including protecting the survey and the database with password, the use of encrypted connections to the survey platform and to the database.

Adapted from Punch (2006)

Table 3-10 – Ethical considerations in this study – Part 2

Dimension	Questions asked	Answer for this study
Intervention and advocacy	What could people do if they saw harmful, illegal, wrongful behaviour related to the research?	• Participants were informed that they might always contact the researcher as well as one of the supervisors and that they had the right to file a request or complaint with the Secretary of the Human Research Ethics Committee of USQ at any time.
Use and misuse of results	How did the researcher make sure results were used appropriately?	• In the introduction of the survey, potential participants were assured that the results of this study were solely to be used for academic research purposes, that results would neither be used for any kind of commercial activity nor would they be shared with any third party without having been made completely anonymous. • Company data and individual responses were to be deleted irrevocably from the database and files once the study is completed.
Protection from harm and risk	How did the researcher make sure people were not hurt and not exposed to undue risk?	• People were not asked to carry out any other task than participating in the survey. • They were neither subjected to any additional stress nor were they exposed to any situation that could have possibly compromised their health.

Adapted from Punch (2006)

3.9 Conclusion

This chapter developed and presented the methodology of this dissertation. In a first step, questions by Guba and Lincoln (1994) regarding the ontology, epistemology and methodology were asked. The answers given specifically for this study included the researcher's fundamental assumptions about reality and its impact on the possibilities and the process of acquiring knowledge.

The results show that the overall view of this research work can be described as the post-positivism/critical realism paradigm (Bhasar 1978; Cook & Campbell 1979), a view that, after comparing the answers with other research work in similar contexts, was argued as representing an acceptable lens for this study.

In a next step, the population and data used in this study were described, including the two publicly available address databases from the Swiss Bankers Association (SBA) and the Swiss Financial Market Authority (FINMA). The two groups of people that were the addressees of the surveys were described with their characteristics and it was justified why these two groups represented adequate choices.

The exact process of how the data was collected with the help of the surveys was then illustrated. Achieving a sufficient response rate was a key to this study and the respective measurements that were used to help achieve this were explained in detail. Subsequently, the measurement instruments were presented. As these indicators were re-used from previous research in similar settings, their validity and reliability was discussed based on associated studies and their results.

In the next section, it was explained which statistical analysis procedures are used and why. In this regard, it was stated that the combination of Structured Equation Modelling (SEM) plus Partial Least Squares (PLS) were viewed as being the best choice for this study, based on theory, the conceptual framework and the nature of the data gathered from the surveys.

Detailed procedures to deal with potential response bias, missing data, aggregation of data and hypotheses testing were presented.

The chapter then proceeded by describing the limitations of the study and what extraneous aspects could possibly influence the study results. Items mentioned included the current crisis in the financial market and the limitations due to the study design and methodology. Finally, the importance of ethical considerations and its dimensions in research in general and how the study addressed related questions in these domains were described.

In the next chapter, the study results are presented and discussed.

Chapter 4 - Dissertation results

4.1   Introduction

The previous chapter presented the research methodology used in this study. In this chapter, the data collected from the two surveys was analysed and the hypotheses stated in chapter 2 were tested. The results generated were to lay the foundation for chapter 5 where the results are interpreted and implications are inferred. The activities carried out can be split into three phases: preparation of the data, verification and testing, and the final closing phase. Figure 4-1 presents the structure of the chapter.

Figure 4-1 – Structure of the results chapter

PREPARATION OF DATA	
	4.1 Introduction
	4.2 General information on the data collected
	4.3 Separating the data for hypotheses testing from the rest of the samples
	4.4 Tests on potential response bias problems
	4.5 Handling of missing data
	4.6 Aggregating the data
	4.7 Building the first-order constructs for reflexive indicators
	4.8 Integrating the IT people data into the business survey data
VERIFICATION AND TESTING	
	4.9 Multicollinearity tests
	4.10 Model verification and tests for hypotheses 1 to 5
	4.11 Model verification and tests for hypothesis 6a
	4.12 Model verification and tests for hypothesis 6b
CLOSING	
	4.13 Limitations of the data collection and analysis
	4.14 Conclusion

Source: Developed for this research

As presented in the introductory chapter, this study aimed at answering the following research question:

To what extent are transformational / transactional leadership and elements of IT capability related to firm performance in IT organisations of companies of the Swiss financial sector?

Appendix D contains an overview of what detailed information on the data, and the data analysis procedures are available from the author on request.

4.2 General information on the data collected

4.2.1 Remarks on the collection process results

The data collection process followed the procedure described in the previous chapter. Before collecting the data, the two surveys were peer-reviewed by two marketing lecturers at the University of Applied Sciences Zurich, a business information technology expert and a person with human resources management background. Improvements were made based on the feedback of these people. Four randomly selected people from one financial firm then tested the survey for employees of IT organisations and four (randomly selected) business managers from another financial company answered the second survey. Minor changes were made to the wording of the questions based on the comments of these eight volunteers.

Table 4-1 presents the final number of invitations that were sent out to members of the four groups identified in the previous chapter.

Table 4-1 – Final number of invitations sent out for both surveys

Group	Description of group	People invited
1	Members of the two largest professional organisations of the management representatives of Swiss financial institutions	1 355
2	Members of the three largest organisations of Swiss ICT professionals and commercial employees/clerks	1 444
3	Two major alumni associations of Swiss universities and one major alumni organisation of higher education (business and technical)	1 963
4	CEOs and CIOs of financial firms based on data bought from a major direct-marketing firm in Switzerland	766
Final total number of people invited		5 528

Source: Developed for this research

From the eight partner organisations of the first three groups mentioned above, five institutions agreed to send out reminders to their 1 984 members who represent a share of almost 42% of the three first groups. The other three organisations either reasoned that they wanted to protect their members from receiving too many emails from them or did not give reason for declining the request to send out reminders. All 766 CEOs and CIOs received reminders.

No person invited to participate in one of the two surveys lodged a concern or complaint with either the author of this study, the Secretary of the Human Research Ethics Committee of the University of Southern Queensland (USQ) or the supervisor of the Swiss USQ partner university. A total of four participants called the researcher or sent emails to him as they had questions related to either the handling of the survey or they wanted to clarify the meaning of one or several questions. No technical problems concerning the online survey platform were reported or encountered.

The data collection process lasted from the 1 December 2009 until the end of May 2010. It was tried to disperse invitations and reminders for the four groups evenly across the six months. For data security reasons, answers received during the data collection period were retrieved from the survey platform database at least three times a week and deleted from the platform thereafter. When retrieving the data from the platform, manual checks were made in order to ensure consistency of the data. All retrieved records were then inserted into electronic worksheets stored on a secured server.

4.2.2 Overview of answers and response rates

Table 4-2 presents comparisons of the response rates per group and per survey. For groups one to three, the figures on how many people were invited per group are based on the final counts given by the partner organisations that sent out the invitations to their members.

Table 4-2 – Summary of response rates for both surveys per group

Group	Survey for IT staff			Survey for business managers		
	Invitations sent out	Answers received	Response rate	Invitations sent out	Answers received	Response rate
1	230	22	9.57%	1 125	118	10.49%
2	1 002	117	11.68%	442	43	9.73%
3	551	49	8.89%	1 412	125	8.85%
4	434	28	6.45%	332	18	5.42%
Total	2 217	216	9.74%	3 311	304	9.18%

Source: Developed for this research

The achieved response rate of slightly less than 10% on average was quite low compared to studies in comparable settings such as Ravichandran and Lertwongsatien (2005) who achieved about 18%.

However, it can be assumed that a number of people received more than one invitation to the same survey as they were members of several partner institutions that supported this study. The resulting uncertainty about these response rates could not be quantified since, in order to protect the privacy of potential participants and legal requirements, the author of this study did not know who was invited by the partners. Consequently, although the real response rates per group were most probably higher than what is stated above, it was not possible to state how high exactly they were.

This aspect is discussed further in sections 4.4.1 and 4.13 of this chapter.

4.3 Separating the data for hypothesis testing from the rest of the samples

4.3.1 High item non-response and records with no information on firm

In terms of determining what data could be used to test the hypotheses and which part of it could not, the information collected from the surveys was first analysed with regard to the degree of completeness of the data sets. Table 4-3 provides an overview of the results of this step.

Table 4-3 – Summary of answers with high item non-response and no information on firm

Group	Survey for IT staff		Survey for business managers	
	Answers with ≥ 50% item non-response	Answers with no information on firm	Answers with ≥ 50% item non-response	Answers with no information on firm
1	2 (9.09%)	0 (0.00%)	17 (14.41%)	2 (1.69%)
2	10 (8.55%)	0 (0.00%)	6 (13.95%)	0 (0.00%)
3	5 (10.20%)	1 (2.04%)	20 (16.00%)	1 (0.80%)
4	4 (14.29%)	1 (3.57%)	4 (22.22%)	0 (0.00%)
Total	21 (09.72%)	2 (0.93%)	47 (15.46%)	3 (0.99%)

Source: Developed for this research

Although relatively high rates of item non-response were found (almost 10% for the IT staff survey and more than 15% for the survey for business managers), it was decided not to use data sets that had less than 50% of items filled since the missing data handling method chosen (see section 4.5) could not have imputed values for absent items of such cases. In addition, a total of five records were found that did not include information about the respective firm. These items were not used for hypothesis testing either as the very small proportions of the samples were not expected to introduce significant bias. Consequently, the aspects presented in this paragraph reduced the sample sizes to n = 193 (IT staff) and n = 254 (business managers), respectively. However, the mentioned 23 records from the survey for IT staff and the 50 records from the business manager survey were used to test for potential response bias problems as shown in sections 4.4.3 and 4.4.4.

4.3.2   Determining matches regarding firms

In the next step, the two samples were analysed with respect to matches of firms. Figure 4-2 presents what followed from this procedure.

Figure 4-2 – Matches regarding firms

Sample from
IT people (n= 193)
including answers
from 54 different firms

Matching sample
including answers
from 45 different
firms ; containing
182 answers from IT
people and 217
answers from
business managers

Sample from
Business managers
(n= 254) including
answers from 80
different firms
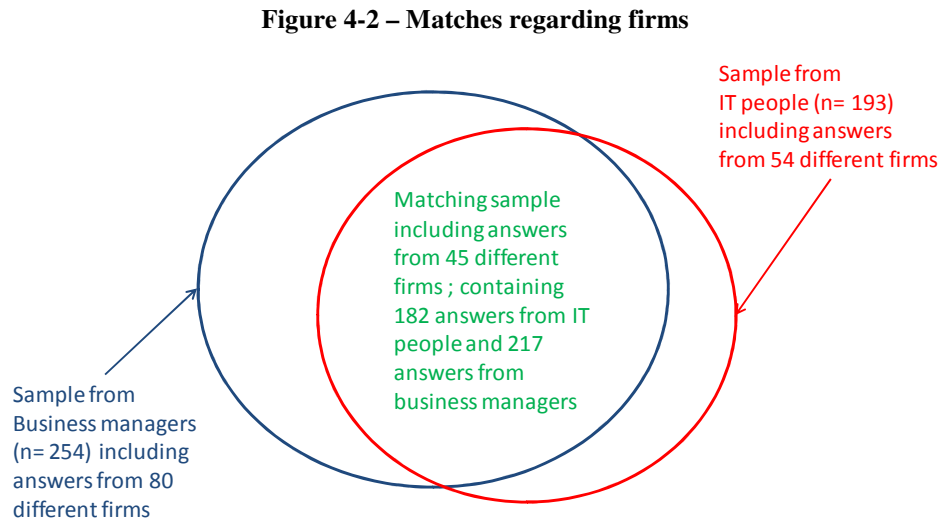
Source: Developed for this research

Although 37 answers from 35 firms of the survey of business managers and 11 answers from 9 firms of the survey of IT staff were lost by this matching procedure, it can be argued that the sample quality was improved by this step as a significant portion of the firms that were only represented by one answer were removed. The outcome of the analysis for potential bias introduced by this matching procedure is described in section 4.4.4.

Table 4-4 shows how firms were represented in the matched samples.

Table 4-4 – Overview of answers by which firms were represented in the final sample of 45 firms

Sample	Number of firms represented by			
	1 answer	2-5 answers	6-10 answers	>10 answers
IT staff	19	18	4	4
Business managers	17	22	2	4

Source: Developed for this research

Figure 4-3 provides information on how many employees worked for the 45 firms represented in the sample. The websites of the firms served as a source to determine the staff size.

Figure 4-3 – Overview of staff size distribution in the sample of 45 firms
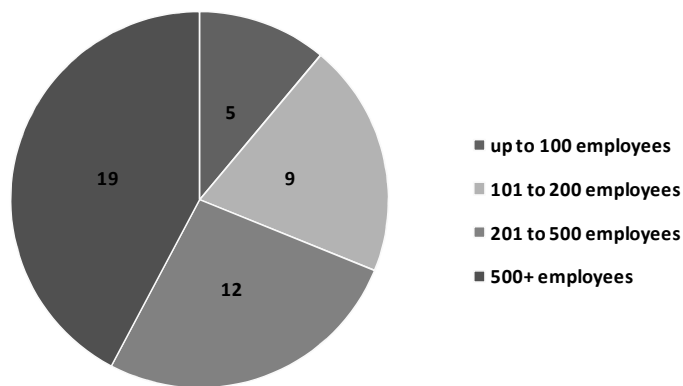
Source: Developed for this research

Figure 4-3 shows that there were more larger firms than smaller ones in the sample. Moreover, table 4-5 illustrates that the number of answers of larger firms was disproportionally high for both of the two surveys.

Table 4-5 – Number of answers per category of staff size in the sample per survey

Sample	Number of answers in the staff size category			
	Up to 100 employees	101 to 200 employees	201 to 500 employees	500 plus employees
IT staff	6	14	31	131
Business managers	5	15	22	175

Source: Developed for this research

In addition to the observation of an asymmetric distribution in terms of organisation size, the matched sample for business managers revealed that, with an average of about 4.6, the number of years that a firm was in business (variable 'C_YOB') was disproportionally high, indicating that mainly 'older' firms remained in the matched sample. Limitations inferred from these observations are stated in section 4.13. The influence of the number of employees is analysed in section 4.10.4.2.

Furthermore, the averaged mean of the two variables for environmental dynamism (variables 'C_ENV1' and 'C_ENV2') was found as being 2.832, so well above the theoretical mean of 2.5. This indirectly confirmed the assumption made in section 2.7.3 in which the Swiss financial sector was assumed as being an industry that employees of firms perceive as being rather dynamic. Finally, the relatively high standard deviation of >1.1 for the outsourcing variable ('C_OUTS') indicated that a broad range of sourcing concepts were represented in the sample.

4.4 Tests on potential response bias problems

4.4.1 Unit non-response

In order to find out more about the relatively high unit non-response, phone calls were made to 15 randomly selected people per survey from group four (since this was the only group where contact information was available and since this group had the lowest response rates). Table 4-6 provides an overview of the reasons given by the total of 28 people who actually confirmed not to have participated.

Table 4-6 – Unit non-response – reasons given by people contacted after survey

Survey	Reasons stated for non-participation (several reasons per person possible)	Number of answers
IT staff (15 people)	Not enough time/too much to do/turbulent times	7
	Not interested in study and/or study topic in general	5
	Felt uncomfortable about providing information on leadership behaviour of superior	2
	Never participates in survey research studies	2
	Receives too many requests to participate in surveys	2
	Was unsure whether collected data would be handled confidentially	1
Business managers (13 people)	Not enough time/too much to do/turbulent times	8
	Receives too many requests to participate in surveys	6
	Not interested in study and/or study topic in general	2
	Uncertain whether study would generate useful results for the Swiss financial sector	2
	Did not receive invitation and reminder to participate in the study	1
	Absence during data collection period	1

Source: Developed for this research

The reasons given by the non-respondents did not disclose any systematic response bias that could have been clearly attributed to the research design, questionnaire or the data collection methods.

4.4.2 Descriptive statistics and frequency distributions

Means, standard deviations, skewness figures and frequency distributions were generated for all variables of both final samples.

In terms of descriptive statistics for the variables of the survey of business managers, a couple of aspects are worth highlighting. Firstly, means for all IT capability variables were either around the theoretical arithmetic mean of three for a normally distributed sample, with some of them being substantially higher. No mean was significantly below three. From this observation, it could be inferred that participants rated the strategic capabilities of their IT organisations as being quite high on average. Secondly, means for the subjective market-based performance variables were all significantly below three, indicating the opposite of what is said for the IT capability variables above. No conspicuousness could be found in the subjective operating performance figures as means for most variables resided around three, with one exception significantly below (variable 'P_SOP3') and two exceptions substantially above this number (variables 'P_SOP1' and 'P_SOP2'). Thirdly, it resulted that more than half of the respondents resided more than three organisational levels below the CEO (variable 'C_POS1'). This could have resulted from the relatively high number of participants from larger organisations where many managerial levels are present. No other noticeable aspects were found in the remaining skewness and frequency figures.

A few additional remarks need to be made in terms of the analysis tests for the variables from the survey from IT staff. The means for the leadership questions were again either around three or significantly higher with no mean substantially below three, indicating that leadership capabilities of the superiors were rated as being quite high on average. Almost half of the respondents rated the outsourcing degree (variable 'C_OUTS') as being below 20% and almost 4/5 below 40%. This might have been a result of the relatively high number of participants from larger firms where there is less of a tendency to outsource larger parts of the IT function.

Similar to the survey for business managers, many respondents from the survey from IT staff (almost 65%) indicated they work in a position that is three or more organisational levels below the CIO (variable 'C_POS2'), potentially for the same reasons as given in terms of the business managers. Finally, more than 90% of the IT staff stated that their superior was a man (variable 'C_SUP_G'). Unfortunately, this low proportion of female leaders meant that IT leader gender could not be used as a control variable as it would not have been possible to measure different leader behaviours with such a small group. Consequently, this control variable had to be dropped.

Again, no other noticeable elements were found in the other skewness and frequency distribution figures. No systematic bias or distortion arose from the analysis done in this section. Potential limitations are mentioned in section 4.13. Details on the handling of missing data can found in section 4.5.

4.4.3   Analysing answers with high item non-response

In section 4.3.1, items with high item non-response rates were separated from the rest of the two samples. In this section, the 21 records from the survey for IT staff and the 47 records from the survey for business managers were analysed in more detail. Visual inspection was done to find potential reasons for the high item non-response rates. Descriptive statistics and frequency distributions of the records were compared with the statistical figures of the samples used for hypothesis testing.

Checking the survey data from business managers (n = 47) showed that the sets could roughly be divided into three groups. In the first group, 22 (about 47%) of the respondents stopped answering the questionnaire at some point, without their last answer(s) being 'don't know(s)'. However, the points at which people stopped answering tended to be distributed randomly with no clear pattern.

It could, therefore, only be guessed that this group of participants stopped because they did not have sufficient time to finish the questionnaire, they were interrupted or no longer interested, which would be partly in line with some of the reasons given by people who did not answer the questionnaire at all (see section 4.4.1).

The second group (11 of the respondents or about 23%) did finish the questionnaire, but with more than 50% items left blank or including 'don't know'. Again, no clear pattern was visible. It could be speculated that this group represented the people who just did not know enough about the subjects or did not feel confident enough to state their perception. The third group (the remaining 14 answers or about 30%) did not finish the questionnaire and had one or several 'don't knows' as their last answer(s).

Again, no pattern was visible that could have explained the behaviour of these respondents, so it could only be guessed that the possible reasons given for the first two groups could be applied to this one as well.

For the survey for business managers, only descriptive statistics and frequency distributions for the control variables were compared with the same figures from the sample used for hypothesis testing. No substantial differences were found between the two groups.

In the data sets with high non-response rates from business managers, no systematic pattern was identified that could be linked to the points in time when the people answered and no pattern was found that could be related to a specific firm or a group of firms (answers were from 23 different firms where there were disproportionately more answers from larger firms again).

The same three groups of answering behaviours as for the business managers could be identified from visually analysing the data sets with high item non-response rates from the survey for IT staff (n = 21). Compared to the survey for business managers, the first group in which people stopped answering at some point without having one or several 'don't know(s)' at the end made up a greater proportion (14 answers or about 67%). The second group only accounted for about 9% (two answers), whereas the third group consisted of the remaining five answers (about 24%). No patterns could be detected that would have explained different answering behaviour from the one in the sample used for hypothesis testing.

Consequently, the above guessed reasons on the data sets from the survey for business managers could be applied analogously to the three groups of answers mentioned in this paragraph.

For the survey from IT staff, descriptive statistics and frequency distributions of the control variables from the data sets with high non-response rates were not substantially different from the records used for hypothesis testing and, again, no pattern could be detected that could have been attributed to the point in time at which people answered or to which firm they belonged (the 21 data sets were from 16 different firms).

To sum up, no systematic response bias could be found from analysing the data sets with high rates of item non-response in this section.

4.4.4   Inspecting complete data sets that were not used for hypothesis testing

In section 4.3.1, records that included no firm information (two answers for the survey for IT staff and three for the survey for business managers) were separated from the samples used for hypothesis testing. Moreover, in the firm matching procedure described in section 4.3.2, records which did not answer both surveys for the same firms were dropped (11 from the survey for IT staff and 37 from the survey for business managers).

In this section, the data was analysed in search for potential response bias similar to what was done for the data sets used for hypothesis testing. Comparisons were made with the data used for hypothesis testing.

Comparing the two samples from the survey for business managers showed that for the data sets not used, firms were substantially smaller (variable 'C_EMP') and younger (variable 'C_YOB'). This effect could have resulted from the fact that, on the one hand, many younger companies in the financial sector are smaller and, on the other hand, the probability of getting answers to the survey for IT staff was lower for smaller firms. The mean for the position within the business organisation (variable 'C_POS1') was again substantially smaller for the data sets not used which could have resulted from the fact that firms were smaller on average and thus might have fewer organisational levels. Means for almost all variables of IT capability were found as being lower, indicating that smaller and younger financial firms might not be able to invest into their resources and capabilities the same way larger firms do. Firm performance indicators were found as being on a very similar level compared to the data sets used for hypothesis testing. In terms of item non-response levels, the two data sets showed similar values.

Comparing the two data sets from the survey for IT staff was more difficult as only 13 data sets were not used for hypothesis testing. The mean of the position of the person within the IT organisation (variable 'C_POS2') was substantially smaller because some answers from CIOs were part of the data. Checking the sizes of the nine firms that were known confirmed that five firms had fewer than 50 employees, three had between 50 and 100 and only one had more than 100 (but fewer than 200) employees. Consequently, the IT staff data sets not used for hypothesis testing included a higher number of smaller firms as well which, again, could have occurred as it was more difficult to get answers to the business survey from these firms.

In terms of the answers to the leadership questions, 16 means of the variables were lower, eight were higher and three were about the same, where five out of eight constructs had more variables with lower means than higher means. From these observations, it could be inferred that, similar to the IT capability resources, leadership was rated as being lower by smaller firms. In terms of item non-response levels, the data sets not used for hypothesis testing did not show any irregularities.

Taken together, no illogic or inexplicable differences were found in the data sets used for hypothesis testing and those not used so that no systematic response bias seemed present.

4.5 Handling of missing data

4.5.1 Item non-response rates

For the variables from the survey for business managers, only 36 items (0.437%) were left empty, whereas for 408 items (4.95%) people did not know a suitable answer. While the questions left empty were practically unproblematic, three of the firm performance variables ('P_SMA2' / 'P_SMA4' and 'P_SOP3') had rates of slightly below or above 10% in terms of 'don't knows'. This aspect suggested the use of the Multiple Imputation (MI) process (as described in chapter 3) with three complete data sets/data matrices to be generated and analysed subsequently. The data for the variables from the survey for IT staff showed only 27 items (0.451%) left empty and only 80 items (1.34%) produced no answer because people did not know. In this survey, no item had more than 5% item non-response which, again, confirmed this aspect as not being a problem. The data matrices created per survey are subsequently named matrix 1, 2 and 3.

4.5.2 Results from the Multiple Imputation (MI) process

For the multiple imputation process, all data fields that held a six ('don't know') were deleted before starting the imputation procedure. Company numbers (variable 'C_COMP') were removed beforehand in order not to jeopardise the imputation algorithm. Based on recommendations given in Honaker et al (2010b, pp. 18-9), all variables with skewness figures > | 0.75 | were used with natural logarithm transformation before imputation in order to improve results based on the normal multivariate model used by AmeliaII (Honaker et al 2010).

For the business survey sample, the variables to be transformed were 'C_YOB', 'C_EMP', 'C_POS1', 'C_ENV2', 'I_INFRA1', 'I_INFRA5', 'I_STAFF1', 'P_SMA1', 'P_SMA2', 'P_SMA3', 'P_SMA4' and 'P_SOP1'. For this sample, AmeliaII ran the algorithm with 21 / 24 / 22 iterations and with normal EM (Expectation Maximisation) convergence for each of the output matrices to be generated (three output files).

For the survey for IT staff, the skewed variables that were log transformed were 'C_OUTS', 'C_POS2', 'L_TC_CR1', 'L_TF_IM9', 'L_TF_IM13', 'L_TF_IC19', 'L_TF_IIA21', 'L_TF_IC29', 'L_TC_CR35' and 'L_TF_IM36'. Due to the lower item non-response rates in this sample, AmeliaII ran with 20 / 20 / 18 iterations only and again with normal EM convergence for each matrix (three files).

A total of six matrices were produced (three per sample/survey). In order to preserve the original scales of the variables and to avoid artificial outliers, values imputed < 1 were manually replaced by 1.00001 and those >5 were substituted by 4.99999.

This way, the imputed values could still be identified in the sample without distorting the meaning of the data. The effect of the random component used by the EMis algorithm (King et al 2001) in AmeliaII became visible in that values for several variables in the frequency distribution table were slightly different amongst the three matrices created per sample. When comparing the original samples without imputed values to the three matrices created per sample, it became clear that standard deviations, as well as means and skewness figures, were not substantially altered by the imputation process—not even for variables with higher item non-response rates such as 'P_SMA4' and 'P_SOP3'. This aspect was vital in order to preserve as much meaning of the data as possible, especially with a view to the variance analysis described later in this chapter.

4.6   Aggregating the data

As a next step after the multiple imputation process, the data from the survey for IT staff were aggregated on a firm level in order to lay the foundation for linking the three matrices with the three matrices from the survey for business managers (see section 4.8). As stated in chapter 3, means were calculated for all leadership variables and the organisational level of the IT staff (control variable 'C_POS2'). Where possible, the mode was calculated for the degree of outsourcing per firm (control variable 'C_OUTS'). Means were used where this was not possible. In order to keep validity and reliability of the variables as high as possible, only those imputed values were finally used where there was no value for the same variable from one or several other data sets of the same firm. As a result of this, only 14 of the original 107 imputed values (see section 4.5.1) had to be used in the aggregated three matrices.

4.7 Building the first-order constructs for reflexive indicators

In the next step of the preparation phase, Principal Components Analysis (PCA) was applied to the leadership and performance variables as explained in chapter 3. Results from the components extraction processes done in SPSS are described below.

4.7.1 Extracting the components for the two leadership constructs

Table 4-7 summarises the results generated in this step for each first-order construct and for each of the three data matrices generated in the multiple imputation procedure.

Table 4-7 – Results from PCA process for the leadership first-order constructs (n = 45)

First-order construct	Matrix	KMO value	Bartlett's test		Components extracted	Eigen-values	Variance explained
			χ2	Sig.			
Contingent reward (CR)	1	0.694	33.5	.000	L_TC_CR_PCA	2.119	52.978
	2	0.699	27.7	.000		2.035	50.870
	3	0.705	30.8	.000		2.096	52.403
Mgmt-by exception active (MBEA)	1	0.430	7.6	.273	(L_TC_MBEA_PCA_1)	1.358	33.940
					(L_TC_MBEA_PCA_2)	1.089	27.234
	2	0.367	10.6	.103	(L_TC_MBEA_PCA_1)	1.359	33.981
					(L_TC_MBEA_PCA_2)	1.143	28.567
	3	0.393	9.4	.153	(L_TC_MBEA_PCA_1)	1.374	34.361
					(L_TC_MBEA_PCA_2)	1.095	24.990
Intellectual stimulation (IS)	1	0.730	42.5	.000	L_TF_IS_PCA	2.322	58.044
	2	0.730	42.5	.000		2.322	58.044
	3	0.730	42.5	.000		2.322	58.044
Idealised Influence (II)	1	0.798	255.4	.000	L_TF_II_PCA	5.006	62.576
	2	0.805	255.7	.000		4.983	62.286
	3	0.815	254.2	.000		4.994	62.423
Inspirational motivation (IM)	1	0.830	112.7	.000	L_TF_IM_PCA	3.105	77.616
	2	0.839	121.0	.000		3.167	79.185
	3	0.816	104.3	.000		3.022	75.562
Individual-lised considera-tion(IC)	1	0.686	81.2	.000	L_TF_IC_PCA	2.661	66.526
	2	0.696	79.3	.000		2.662	66.558
	3	0.692	80.1	.000		2.662	66.561

Source: Developed for this research

The results for the 'Intellectual Stimulation' (IS) construct were all the same since no imputed values remained in the aggregated matrices. The significance levels of the Bartlett's test of sphericity, as well as the values from the Kaiser-Meyer-Olkin (KMO) measure were all acceptable except for the 'Management-by-exception' (MBEA) construct where the corresponding values were clearly insufficient. This insufficient fit for MBEA was contradictory to what had been observed by MacKenzie et al (2005). However, as those variables were clearly not replaceable and thus not of a reflexive nature based on the data collected, they were subsequently handled as four separate formative indicators for transactional leadership. Too much of the variance would have been lost if the extracted components had been used.

4.7.2 Extracting the components for the two performance constructs

Table 4-8 provides an overview of the results for the two performance first-order constructs, again per matrix created in the multiple imputation process.

Table 4-8 – Results from PCA process for the performance first-order constructs (n = 217)

First-order construct	Matrix	KMO value	Bartlett's test		Components extracted	Eigen-values	Variance explained (%)
			$\chi 2$	Sig.			
Subjective market-based performance (SMA)	1	0.684	210.5	.000	P_SMA_PCA	2.257	56.413
	2	0.688	199.6	.000		2.237	55.923
	3	0.695	189.6	.000		2.219	55.464
Subjective operating performance (SOP)	1	0.827	1626.5	.000	P_SOP_PCA_1	4.367	43.669
					P_SOP_PCA_2	3.108	31.078
	2	0.823	1614.8	.000	P_SOP_PCA_1	4.354	43.539
					P_SOP_PCA_2	3.090	30.901
	3	0.830	1593.8	.000	P_SOP_PCA_1	4.316	43.159
					P_SOP_PCA_2	3.125	31.248

Source: Developed for this research

Bartlett's tests were all significant for these two first-order constructs and KMO values were all at least on an acceptable level.

4.8 Integrating the IT staff data into the business survey data

In the last step of the preparation phase, the three data set matrices from the survey for IT staff were merged with the three business survey matrices; first, second and third sets each together. As explained in chapter 3, for firms that were represented by several data sets in the business manager data matrices, the same data set from the respective IT staff data matrix was imputed as many times as needed.

4.9 Multicollinearity tests

In this first step of the verification and testing phase, Variance Inflation Factors (VIF) were calculated by carrying out separate linear regression analyses in SPSS based on the procedure recommended by Huber et al (2007, pp. 98-100). According to Weiber and Mühlhaus (2010, p. 208), high multicollinearity could lead to inaccurate estimates for regression model parameters in general, and to an underestimation of indicator weights.

4.9.1 Test results for models 1 and 2 (hypotheses 1 to 6a)

As the constructs used for testing of hypotheses 1 to 6a all shared the same constructs in the models, a first multicollinearity test was conducted for these models. Results per variable used and per each of the three matrices are presented in Table 4-9.

Based on recommendations by Diamantopoulos et al (2008, p. 1193), only the VIF value for the principal component 'Idealised Influence' (II) was found as being higher than the critical value of five, but for all three matrices. Dropping this indicator was considered an inadequate measure since the whole first-order construct and all of its meaning would have been lost in that case.

Table 4-9 – Results from multicollinearity tests for models 1 and 2

Dependent variable	Matrix 1		Matrix 2		Matrix 3	
	Coefficient of determination (R^2)	VIF value	Coefficient of determination (R^2)	VIF value	Coefficient of determination (R^2)	VIF value
L_TC_CR_PCA	0.204	1.25628	0.203	1.25471	0.225	1.29032
L_TC_MBEA4	0.179	1.21803	0.207	1.26103	0.192	1.23762
L_TC_MBEA22	0.026	1.02669	0.039	1.04058	0.04	1.04167
L_TC_MBEA24	0.066	1.07066	0.074	1.07991	0.104	1.11607
L_TC_MBEA27	0.05	1.05263	0.054	1.05708	0.063	1.06724
L_TF_IS_PCA	0.349	1.53610	0.353	1.54560	0.354	1.54799
L_TF_II_PCA	0.867	7.51880	0.875	8.00000	0.863	7.29927
L_TF_IM_PCA	0.772	4.38596	0.788	4.71698	0.759	4.14938
L_TF_IC_PCA	0.754	4.06504	0.762	4.20168	0.758	4.13223
I_INFRA1	0.596	2.47525	0.602	2.51256	0.605	2.53165
I_INFRA2	0.632	2.71739	0.634	2.73224	0.633	2.72480
I_INFRA3	0.463	1.86220	0.469	1.88324	0.473	1.89753
I_INFRA4	0.633	2.72480	0.63	2.70270	0.639	2.77008
I_INFRA5	0.604	2.52525	0.606	2.53807	0.621	2.63852
I_STAFF1	0.512	2.04918	0.52	2.08333	0.541	2.17865
I_STAFF2	0.546	2.20264	0.558	2.26244	0.555	2.24719
I_STAFF3	0.683	3.15457	0.685	3.17460	0.698	3.31126
I_STAFF4	0.606	2.53807	0.626	2.67380	0.626	2.67380
I_STAFF5	0.607	2.54453	0.623	2.65252	0.609	2.55754
I_STAFF6	0.548	2.21239	0.576	2.35849	0.569	2.32019
I_STAFF7	0.607	2.54453	0.611	2.57069	0.589	2.43309
I_INTAN1	0.602	2.51256	0.601	2.50627	0.584	2.40385
I_INTAN2	0.622	2.64550	0.612	2.57732	0.6	2.50000
I_INTAN3	0.597	2.48139	0.607	2.54453	0.593	2.45700
I_INTAN4	0.653	2.88184	0.638	2.76243	0.647	2.83286
I_INTAN5	0.601	2.50627	0.581	2.38663	0.599	2.49377
I_INTAN6	0.453	1.82815	0.456	1.83824	0.48	1.92308
I_INTAN7	0.512	2.04918	0.471	1.89036	0.507	2.02840
P_SMA_PCA	0.102	1.11359	0.124	1.14155	0.112	1.12613
P_SOP_PCA_1	0.013	1.01317	0.013	1.01317	0.012	1.01215
P_SOP_PCA_2	0.121	1.13766	0.142	1.16550	0.129	1.14811

Source: Developed for this research

Consequently, based on the advice of Weiber and Mühlhaus (2010, p. 208) and as two other first-order constructs of transformational leadership showed VIF values >4 for all three matrices, an alternative principal component analysis (PCA) was run for all four components of transformational leadership.

A Varimax (orthogonal) rotation was configured in SPSS since the four first-order constructs and their underlying variables were not designed to inter-correlate (Brosius 2008, p. 789).

Table 4-10 provides an overview of the results of the additional PCA mentioned above.

Table 4-10 – Results from additional PCA process for transformational leadership (n = 217)

Matrix	KMO value	Bartlett's test		Component extracted	Eigen-values	Variance explained (%)
		χ2	Sig.			
1	0.777	709.6	.000	L_TF_PCA	3.121	78.021
2	0.782	734.7	.000		3.143	78.579
3	0.775	700.5	.000		3.117	77.926

Source: Developed for this research

No rotated solution was possible since only one component with an eigenvalue > 1 could be extracted (confirmed by the scree plots; see section 3.6.7 for an explanation of how scree plots are used). The results of this PCA run were evaluated subsequently as an alternative solution (hereafter called model 1b) to keeping all first-order constructs for transformational leadership (hereafter called model 1).

4.9.2   Test results for model 3 (hypothesis 6b)

In a second step, the same test procedure was used for model 3 where IT capability was formed based on its formative indicators and leadership was represented by all of its first-order constructs. Again, VIF values were calculated based on separate linear regressions for every manifest indicator per construct seen as the dependent variable. Table 4-11 summarises the results of the VIF tests for this model.

Table 4-11 – Results from multicollinearity tests for model 3

Dependent variable	Matrix 3 Coefficient of determination (R²)	VIF value	Matrix 2 Coefficient of determination (R²)	VIF value	Matrix 3 Coefficient of determination (R²)	VIF value
L_TC_CR_PCA	0.86	7.14286	0.849	6.62252	0.855	6.89655
L_TC_MBEA4	0.221	1.28370	0.246	1.32626	0.23	1.29870
L_TC_MBEA22	0.372	1.59236	0.371	1.58983	0.454	1.83150
L_TC_MBEA24	0.351	1.54083	0.348	1.53374	0.481	1.92678
L_TC_MBEA27	0.239	1.31406	0.262	1.35501	0.255	1.34228
L_TF_IS_PCA	0.568	2.31481	0.53	2.12766	0.61	2.56410
L_TF_II_PCA	0.916	11.90476	0.919	12.34568	0.925	13.33333
L_TF_IM_PCA	0.832	5.95238	0.831	5.91716	0.828	5.81395
L_TF_IC_PCA	0.849	6.62252	0.845	6.45161	0.848	6.57895
I_INFRA1	0.615	2.59740	0.627	2.68097	0.637	2.75482
I_INFRA2	0.672	3.04878	0.694	3.26797	0.699	3.32226
I_INFRA3	0.503	2.01207	0.509	2.03666	0.519	2.07900
I_INFRA4	0.655	2.89855	0.652	2.87356	0.66	2.94118
I_INFRA5	0.629	2.69542	0.635	2.73973	0.647	2.83286
I_STAFF1	0.516	2.06612	0.526	2.10970	0.555	2.24719
I_STAFF2	0.596	2.47525	0.6	2.50000	0.606	2.53807
I_STAFF3	0.714	3.49650	0.72	3.57143	0.725	3.63636
I_STAFF4	0.639	2.77008	0.656	2.90698	0.644	2.80899
I_STAFF5	0.638	2.76243	0.634	2.73224	0.634	2.73224
I_STAFF6	0.556	2.25225	0.582	2.39234	0.586	2.41546
I_STAFF7	0.67	3.03030	0.677	3.09598	0.653	2.88184
I_INTAN1	0.625	2.66667	0.625	2.66667	0.61	2.56410
I_INTAN2	0.685	3.17460	0.684	3.16456	0.682	3.14465
I_INTAN3	0.656	2.90698	0.646	2.82486	0.646	2.82486
I_INTAN4	0.656	2.90698	0.641	2.78552	0.641	2.78552
I_INTAN5	0.599	2.49377	0.585	2.40964	0.594	2.46305
I_INTAN6	0.486	1.94553	0.491	1.96464	0.513	2.05339
I_INTAN7	0.551	2.22717	0.513	2.05339	0.539	2.16920
P_SMA_PCA	0.102	1.11359	0.124	1.14155	0.112	1.12613
P_SOP_PCA_1	0.013	1.01317	0.013	1.01317	0.012	1.01215
P_SOP_PCA_2	0.121	1.13766	0.124	1.14155	0.129	1.14811

Source: Developed for this research

As apparent from the data in Table 4-11, all VIF values for the IT capability and firm performance construct were found as being well below the critical value of five across all three matrices.

In contrast to this, four out of nine indicators of the leadership construct showed VIF values greater than the critical value of five across all three matrices. The component for 'Idealised Influence' (II) even had values >10 for every matrix which represented a serious violation of what Diamantopoulos et al (2008, p. 1193) recommend as acceptable. Consequently, and in line with what was done in the previous section, an additional PCA was run for the indicators of the leadership construct in order to overcome the problem. Again, a Varimax (orthogonal) rotation was configured for the PCA for the same reasons as stated in the previous section.

The results from the additional PCA are summarised in Table 4-12 below.

Table 4-12 – Results from additional PCA process for leadership (n = 217)

Matrix	KMO value	Bartlett's test		Component extracted	Eigen-values	Variance explained (%)	Total variance explained (%)
		χ2	Sig.				
1	0.708	1395.0	.000	L_PCA1	4.337	45.111	74.025
				L_PCA2	1.244	15.823	
				L_PCA3	1.081	13.090	
2	0.724	1391.5	.000	L_PCA1	4.333	46.067	74.540
				L_PCA2	1.265	15.573	
				L_PCA3	1.111	12.900	
3	0.671	1426.2	.000	L_PCA1	4.345	44.935	74.748
				L_PCA2	1.238	15.666	
				L_PCA3	1.144	14.147	

Source: Developed for this research

The Bartlett's tests for all three matrices were significant with acceptable KMO values and high chi-square values. Three components were extracted per matrix with the total variance explained being >74% for all three matrices. The results of this PCA run were evaluated subsequently as an alternative solution (model 3b) to keeping all first-order constructs for leadership (model 3).

4.10 Model verification and tests for hypotheses 1 to 5

4.10.1 Characteristics of PLS model 1

Based on the data generated in the previous sections, the measurement and structural models for model 1 (which included all constructs) were built in SmartPLS 2 M3 (Ringle et al 2005). The PLS algorithm was used with the path weighting scheme and standard values in terms of iterations and abort criteria. A z-transformation was applied in order to get standardized model parameters. Table 4-13 summarises the results for model 1 to be used to test hypotheses 1 to 5 for all three data matrices (γ_i = weights, γ_p = patch coefficients).

Table 4-13 – Overview of PLS procedure output of model 1 for hypotheses 1 to 5

Indicators	Matrix 1		Matrix 2		Matrix 3	
	γ_i	γ_p	γ_i	γ_p	γ_i	γ_p
L_TC_CR_PCA	-0.316	-0.093	-0.393	-0.128	-0.321	-0.085
L_TC_MBEA4	+0.881		+0.977		+0.903	
L_TC_MBEA22	-0.463		-0.453		-0.457	
L_TC_MBEA24	+0.604		+0.570		+0.630	
L_TC_MBEA27	-0.343		-0.286		-0.402	
L_TF_IS_PCA	-0.730	+0.049	-0.600	+0.020	+0.736	-0.046
L_TF_II_PCA	+0.198		+0.479		-0.295	
L_TF_IM_PCA	+1.197		+1.127		-1.061	
L_TF_IC_PCA	-1.085		-1.360		+1.138	
I_INFRA1	+0.314	+0.210	+0.309	+0.248	+0.248	+0.265
I_INFRA2	+0.446		+0.496		+0.528	
I_INFRA3	+0.292		+0.282		+0.312	
I_INFRA4	+0.267		+0.231		+0.264	
I_INFRA5	-0.180		-0.201		-0.243	
I_STAFF1	-0.115	+0.173	-0.114	+0.130	-0.077	+0.107
I_STAFF2	+0.139		+0.109		+0.095	
I_STAFF3	+0.315		+0.347		+0.316	
I_STAFF4	-0.092		-0.077		-0.061	
I_STAFF5	+0.122		+0.133		+0.141	
I_STAFF6	+0.349		+0.331		+0.318	
I_STAFF7	+0.407		+0.387		+0.403	
I_INTAN1	-0.071	+0.361	-0.002	+0.360	-0.078	+0.371
I_INTAN2	+0.372		+0.328		+0.311	
I_INTAN3	+0.231		+0.311		+0.233	
I_INTAN4	+0.259		+0.157		0.276	
I_INTAN5	-0.136		-0.171		-0.130	
I_INTAN6	+0.222		+0.286		+0.211	
I_INTAN7	+0.329		+0.323		+0.382	
P_SMA_PCA	+0.227	-	+0.194	-	+0.184	-
P_SOP_PCA_1	+0.159		+0.234		+0.173	
P_SOP_PCA_2	+0.866		+0.854		+0.885	
R^2 in firm performance		53.6%		53.8%		53.7%

Source: Developed for this research

All variables showed stable weights and coefficients across the three matrices, except for the variables for transformational leadership where weights varied substantially and were partly >1 which represented an indication for collinearity problems (see previous section).

Table 4-14, therefore, shows the results for the alternative model (1b) where the single component created in the additional PCA was used for transformational leadership.

Table 4-14 – Overview of PLS procedure output of model 1b for hypotheses 1 to 5

Indicators	Matrix 1		Matrix 2		Matrix 3	
	γ_i	γ_p	γ_i	γ_p	γ_i	γ_p
L_TC_CR_PCA	-0.348	-0.113	-0.393	-0.131	-0.351	-0.104
L_TC_MBEA4	+0.898		+0.977		+0.919	
L_TC_MBEA22	-0.461		-0.452		-0.456	
L_TC_MBEA24	+0.592		+0.570		+0.623	
L_TC_MBEA27	-0.319		-0.287		-0.379	
L_TF_PCA	1	-0.005	1	-0.013	1	-0.012
I_INFRA1	+0.314	+0.210	+0.310	+0.248	+0.248	+0.263
I_INFRA2	+0.449		+0.495		+0.531	
I_INFRA3	+0.294		+0.282		+0.313	
I_INFRA4	+0.266		+0.232		+0.262	
I_INFRA5	-0.196		-0.201		-0.247	
I_STAFF1	-0.122	+0.190	-0.115	+0.145	-0.082	+0.129
I_STAFF2	+0.151		+0.110		+0.104	
I_STAFF3	+0.314		+0.347		+0.314	
I_STAFF4	-0.091		-0.077		-0.058	
I_STAFF5	+0.129		+0.133		+0.153	
I_STAFF6	+0.340		+0.332		+0.309	
I_STAFF7	+0.405		+0.387		+0.399	
I_INTAN1	-0.069	+0.343	-0.002	+0.356	-0.077	+0.346
I_INTAN2	+0.375		+0.327		+0.317	
I_INTAN3	+0.228		+0.312		+0.231	
I_INTAN4	+0.259		+0.158		0.271	
I_INTAN5	-0.130		-0.171		-0.126	
I_INTAN6	+0.222		+0.286		+0.211	
I_INTAN7	+0.323		+0.322		+0.378	
P_SMA_PCA	+0.216	-	+0.191	-	+0.177	-
P_SOP_PCA_1	+0.190		+0.234		+0.203	
P_SOP_PCA_2	+0.862		+0.855		+0.879	
R^2 in firm performance		53.6%		53.9%		53.8%

Source: Developed for this research

The above alternative model (1b) appeared more stable as path coefficients for transformational leadership remained relatively similar across the three matrices, while the weights and path coefficients for all other indicators were not substantially different from the ones in model 1.

4.10.2 Indicator validity tests for model 1

In terms of validity of reflexive indicators that were used to build the first-order constructs, KMO and Bartlett's test values were already analysed in section 4.7. The significance of indicators was tested for all formative constructs as suggested by Diamantopoulos et al (2008, p. 1189) and as already described in chapter 3. For this, bootstrapping was used where 1 000 samples (b) of 217 cases (n) were taken (Weiber & Mühlhaus 2010, p. 256) from the respective sample matrices with replacement in order to generate error statistics for the t-tests. Two-sided t-tests were applied to the weights of the indicators (Huber et al 2007, p. 45) for every matrix of both, the original models with all components of transformational leadership first (model 1) and then for all matrices of the alternative model where transformational leadership was represented by the single component extracted from all first-order constructs (model 1b). All bootstrapped samples followed a t-distribution with m+n-2 degrees of freedom (Henseler et al 2009, p. 305) so equal to 216 for the t-tests done. The significance was tested with H_0: $\gamma_i = 0$ and with critical t-values of $\pm$ 1.98 at $\alpha = 2.5\%$. T-statistics for every indicator weight were generated by calculating

Formula 4-1 – Parametric (two-sided) t-test to check significance of indicator weight

$$t_i = \frac{\gamma_i}{\sigma(\gamma_{ib})}$$

Source: Chin (1998b)

In the formula above, γ_i represents the weight and $\sigma(\gamma_{ib})$ describes the standard deviation of the indicator weights taken from the bootstrap procedure. All values were taken from the SmartPLS output.

4.10.2.1 Indicator validity of original matrices

Table 4-15 provides the results for the three original matrices of model 1.

Table 4-15 – Indicator validity test results for original 3 sample matrices (model 1)

Indicators	Matrix 1			Matrix 2			Matrix 3		
	γ_i	$\sigma(\gamma_{ib})$	t_i	γ_i	$\sigma(\gamma_{ib})$	t_i	γ_i	$\sigma(\gamma_{ib})$	t_i
L_TC_CR_PCA	-0.316	0.4344	-0.7278	-0.393	0.4429	-0.8865	-0.321	0.4099	-0.7837
L_TC_MBEA4	+0.881	0.4191	**+2.1022**	+0.977	0.5215	+1.8729	+0.903	0.3906	**+2.3123**
L_TC_MBEA22	-0.463	0.2714	-1.7067	-0.453	0.3169	-1.4293	-0.457	0.2583	-1.7709
L_TC_MBEA24	+0.604	0.2765	**+2.183**	+0.570	0.3152	+1.8075	+0.630	0.2565	**+2.4559**
L_TC_MBEA27	-0.343	0.3645	-0.9422	-0.286	0.3781	-0.7563	-0.402	0.3353	-1.1982
L_TF_IS_PCA	-0.730	0.7579	-0.9637	-0.600	0.7407	-0.8099	+0.736	0.742	-0.9926
L_TF_II_PCA	+0.198	0.8611	+0.2300	+0.479	0.9836	+0.4871	-0.295	0.9226	+0.3195
L_TF_IM_PCA	+1.197	1.0574	+1.132	+1.127	0.9969	+1.1303	-1.061	0.9672	+1.0969
L_TF_IC_PCA	-1.085	1.0641	-1.0198	-1.360	1.1673	-1.1651	+1.138	1.1291	-1.0077
I_INFRA1	+0.314	0.164	+1.912	+0.309	0.1627	+1.9013	+0.248	0.1568	+1.5786
I_INFRA2	+0.446	0.1983	**+2.2476**	+0.496	0.185	**+2.68**	+0.528	0.1824	**+2.8951**
I_INFRA3	+0.292	0.1702	+1.7134	+0.282	0.1649	+1.7101	+0.312	0.1617	+1.9262
I_INFRA4	+0.267	0.223	+1.1951	+0.231	0.2058	+1.1208	+0.264	0.2275	+1.1586
I_INFRA5	-0.180	0.2063	-0.9184	-0.201	0.195	-1.0286	-0.243	0.2011	-1.2058
I_STAFF1	-0.115	0.1919	-0.5996	-0.114	0.1712	-0.6685	-0.077	0.185	-0.415
I_STAFF2	+0.139	0.2098	+0.662	+0.109	0.201	+0.5417	+0.095	0.197	+0.4841
I_STAFF3	+0.315	0.1768	+1.7793	+0.347	0.1796	+1.9318	+0.316	0.1769	+1.7886
I_STAFF4	-0.092	0.1571	-0.5859	-0.077	0.1556	-0.4919	-0.061	0.1654	-0.3669
I_STAFF5	+0.122	0.1759	+0.6941	+0.133	0.2085	+0.6398	+0.141	0.1954	+0.7211
I_STAFF6	+0.349	0.2257	+1.5466	+0.331	0.234	+1.4129	+0.318	0.2045	+1.5569
I_STAFF7	+0.407	0.1689	**+2.4096**	+0.387	0.182	**+2.1287**	+0.403	0.1924	**+2.0947**
I_INTAN1	-0.071	0.1602	-0.4458	-0.002	0.1558	-0.0133	-0.078	0.1509	-0.5137
I_INTAN2	+0.372	0.1654	**+2.2478**	+0.328	0.1778	+1.8425	+0.311	0.1715	+1.8125
I_INTAN3	+0.231	0.1822	+1.2695	+0.311	0.1779	+1.7499	+0.233	0.1731	+1.3458
I_INTAN4	+0.259	0.179	+1.4457	+0.157	0.2035	+0.7722	+0.276	0.2096	+1.3613
I_INTAN5	-0.136	0.1715	-0.7925	-0.171	0.1529	-1.1209	-0.130	0.1647	-0.7922
I_INTAN6	+0.222	0.1423	+1.5624	+0.286	0.1399	**+2.0425**	+0.211	0.1349	+1.5654
I_INTAN7	+0.329	0.1801	+1.8278	+0.323	0.1559	**+2.0703**	+0.382	0.1734	**+2.201**
P_SMA_PCA	+0.227	0.1596	+1.4241	+0.194	0.1452	+1.3347	+0.184	0.144	+1.2787
P_SOP_PCA_1	+0.159	0.3461	+0.4594	+0.234	0.3301	+0.7096	+0.173	0.3201	+0.539
P_SOP_PCA_2	+0.866	0.1848	**+4.6852**	+0.854	0.1835	**+4.6522**	+0.885	0.1566	**+5.6497**

Source: Developed for this research

Significant t-values are written in boldface. Indicators that showed average t-values larger than the critical t-value of | 1.98 | are written in boldface.

4.10.2.2 Indicator validity of alternative matrices

Table 4-16 presents the same statistics for the alternative three matrices generated that include one component for transformational leadership only (model 1b).

Table 4-16 – Indicator validity test results for original 3 sample matrices (model 1b)

Indicators	Matrix 1			Matrix 2			Matrix 3		
	γ_i	$\sigma(\gamma_{ib})$	t_i	γ_i	$\sigma(\gamma_{ib})$	t_i	γ_i	$\sigma(\gamma_{ib})$	t_i
L_TC_CR_PCA	-0.348	0.4046	-0.8593	-0.393	0.4123	-0.9523	-0.351	0.3823	-0.9184
L_TC_MBEA4	+0.898	0.3968	**+2.2638**	+0.977	0.4835	**+2.0201**	+0.919	0.3816	**+2.407**
L_TC_MBEA22	-0.461	0.2693	+1.7115	-0.452	0.2984	+1.5164	-0.456	0.255	-1.7893
L_TC_MBEA24	+0.592	0.2676	**+2.2142**	+0.570	0.2809	**+2.0307**	+0.623	0.2588	**+2.4052**
L_TC_MBEA27	-0.319	0.3455	-0.9231	-0.287	0.3482	-0.8233	-0.379	0.335	-1.1299
L_TF_PCA	1	-	-	1	-	-	1	-	
I_INFRA1	+0.314	0.1441	**+2.1774**	+0.310	0.1462	**+2.1179**	+0.248	0.1481	+1.6717
I_INFRA2	+0.449	0.1792	**+2.5063**	+0.495	0.1604	**+3.0842**	+0.531	0.164	**+3.2381**
I_INFRA3	+0.294	0.1523	+1.9285	+0.282	0.1501	+1.8793	+0.313	0.159	+1.9671
I_INFRA4	+0.266	0.1945	+1.3665	+0.232	0.181	+1.2815	+0.262	0.1922	+1.3642
I_INFRA5	-0.196	0.1908	-1.0293	-0.201	0.1836	-1.097	-0.247	0.1801	-1.3689
I_STAFF1	-0.122	0.1802	-0.6795	-0.115	0.1645	-0.6988	-0.082	0.1762	-0.4676
I_STAFF2	+0.151	0.1975	+0.7651	+0.110	0.1775	+0.6175	+0.104	0.1613	+0.6465
I_STAFF3	+0.314	0.1666	+1.8873	+0.347	0.1623	**+2.1407**	+0.314	0.1778	+1.7637
I_STAFF4	-0.091	0.1424	-0.6418	-0.077	0.1396	-0.5524	-0.058	0.1534	-0.3757
I_STAFF5	+0.129	0.1539	+0.837	+0.133	0.1856	+0.7155	+0.153	0.1756	+0.871
I_STAFF6	+0.340	0.1888	+1.7986	+0.332	0.1787	+1.8565	+0.309	0.1825	+1.6907
I_STAFF7	+0.405	0.1476	**+2.7423**	+0.387	0.1622	**+2.3848**	+0.399	0.1876	**+2.124**
I_INTAN1	-0.069	0.1624	-0.4271	-0.002	0.1496	-0.011	-0.077	0.1444	-0.5317
I_INTAN2	+0.375	0.1484	**+2.5238**	+0.327	0.1478	**+2.2124**	+0.317	0.1586	**+1.9962**
I_INTAN3	+0.228	0.1627	+1.3981	+0.312	0.1474	**+2.1135**	+0.231	0.1616	+1.4318
I_INTAN4	+0.259	0.1642	+1.5775	+0.158	0.1637	+0.9626	0.271	0.1752	+1.5498
I_INTAN5	-0.130	0.1623	-0.8024	-0.171	0.1396	-1.226	-0.126	0.1552	-0.8112
I_INTAN6	+0.222	0.1258	+1.7621	+0.286	0.1333	**+2.316**	+0.211	0.1327	+1.5934
I_INTAN7	+0.323	0.1573	**+2.0547**	+0.322	0.1366	**+2.3577**	+0.378	0.1591	**+2.3733**
P_SMA_PCA	+0.216	0.1451	+1.4896	+0.191	0.1322	+1.4433	+0.177	0.1359	+1.3049
P_SOP_PCA_1	+0.190	0.3058	+0.6221	+0.234	0.2947	+0.7929	+0.203	0.2802	+0.7236
P_SOP_PCA_2	+0.862	0.1286	**+6.701**	+0.855	0.1118	**+7.6492**	+0.879	0.145	**+6.0609**

Source: Developed for this research

Significant t-values (p ≤ 0.05) are again written in boldface as well as those indicators that show average t-values larger than the critical t-value of | 1.98 |.

4.10.2.3 Comparison and consequences of indicator validity tests of model 1

When evaluating the results of the original three matrices (model 1) and those of the alternative three matrices (model 1b), it resulted that the latter with the minor collinearity problem produced more stable results with more t-values being significant. This confirmed the findings of section 4.9. Consequently, only the alternative measurement model (model 1b) was used subsequently.

Overall, indicator validity was considered relatively poor as only eight out of 28 indicators were found as being significant (about 28.5%), compared to similar studies such as Ravichandran and Lertwongsatien (2005) where almost all indicators had been found as being significant. However, as Bollen and Lennox (1991, p. 308) pointed out, dropping insignificant indicators during validity testing is not regarded adequate with formative measurement models as the meaning of latent constructs would be altered improperly. Consequently, no further changes were made to the model. Limitations arising from this analysis are described in section 4.13.

4.10.3 Evaluating construct validity and the structural model

4.10.3.1 Path coefficients

In this section, path coefficients of the alternative model (1b) created in section 4.10.1 were compared with standards proposed by Diemantopoulos and Winklhofer (2001, p. 273) and Chin (1998, p. 11). Table 4-17 summarises the results.

Table 4-17 – Overview of path coefficient analysis for model 1b

Exogenous construct	γ_p			Standard		
	Matrices			Chin	Diemantopoulos & Winkelhofer	
	1	**2**	**3**	$\geq \lvert 0.2 \rvert$	**Direction of action**	$\neq 0$
Transformational leadership	-0.005	-0.013	-0.012	NOK	NOK	OK
Transactional leadership	-0.113	-0.131	-0.104	NOK	NOK	OK
Physical IT infrastructure	0.210	0.248	0.263	**OK**	**OK**	**OK**
Human IT capital	0.190	0.145	0.129	NOK	OK	OK
IT-enabled organisational intangibles	0.343	0.356	0.346	**OK**	**OK**	**OK**

Source: Developed for this research

The evaluation showed that only the constructs for physical IT infrastructure and IT-enabled organisational intangibles met the standards.

4.10.3.2 Coefficients of determination (R^2)

The coefficients of determination (R^2) of the alternative models from section 4.10.1 were compared with the quality levels suggested by Chin (1998b, p. 325). All three values were between 0.53 and 0.54 which corresponds to a level between 'moderate' (0.33) and 'substantial' (0.66) according to Chin's proposal.

4.10.4 Tests for hypotheses 1 to 5

4.10.4.1 Significance tests for path coefficients of latent constructs

In order to test the hypotheses 1 to 5 stated in chapter 3, the same t-test procedure was used as for the indicator validity analysis described in section 4.10.2. The bases for the tests were the same bootstrapping samples taken with identical degrees of freedom. Only the alternative three matrices created in section 4.9 (model 1b) were used as they were considered as being more stable. The results are shown in Table 4-18.

Table 4-18 – Path coefficient significance tests for hypotheses 1 to 5

Exogenous construct	Hyp	Matrix 1			Matrix 2			Matrix 3		
		γ_p	$\sigma(\gamma_{pb})$	t_p	γ_p	$\sigma(\gamma_{pb})$	t_p	γ_p	$\sigma(\gamma_{pb})$	t_p
Trans-formational leadership	1	-0.005	0.054	-0.087	-0.013	0.063	-0.199	-0.012	0.052	-0.230
Transactional leadership	2	-0.113	0.109	+1.039	-0.131	0.131	-0.997	-0.104	0.105	-0.99
Physical IT infra-structure	**3**	0.210	0.084	**+2.502****	0.248	0.082	**+3.018*****	0.263	0.088	**+2.982*****
Human IT capital	4	0.190	0.100	+1.901*	0.145	0.108	+1.341	0.129	0.098	+1.322
IT-enabled organisa-tional intangibles	**5**	0.343	0.109	**+3.154*****	0.356	0.104	**+3.330*****	0.346	0.108	**+3.196*****

Source: Developed for this research / Caption: *p ≤ 0.10; **p ≤ 0.025; *** p ≤ 0.01

Hypothesis 1 proposed that transformational leadership is positively related to firm performance and hypothesis 2 suggested that transactional leadership is positively related to firm performance in IT organisations in the Swiss financial sector. As evident from Table 4-18, the data did not support hypotheses 1 and 2 so that no significant relationship was found between either transformational leadership and firm performance, or transactional leadership and firm performance (p ≤ 0.10).

Hypothesis 3 proposed that physical IT infrastructure as part of IT capability is positively related to firm performance in IT organisations in the Swiss financial sector. All relationships between physical IT infrastructure and firm performance were found as being significant at $p \leq 0.025$ and the two paths for matrix 2 and 3 were even significant at $p \leq 0.01$ so that the data supported hypothesis 3.

Hypothesis 4 suggested that human IT capital as part of IT capability is positively related to firm performance in IT organisations in the Swiss financial sector. All three paths between human IT capital and firm performance were too weak to be significant at $p \leq 0.05$ and the paths for matrix 2 and 3 were even insignificant at $p \leq 0.10$ (critical value is | 1.66 | according to Levine et al 2005, p. 845). Consequently, hypothesis 4 was not supported by the data.

In hypothesis 5, it was proposed that IT-enabled organisational intangibles as part of IT capability are positively related to firm performance in IT organisations in the Swiss financial sector. Similar to the results for hypothesis 3, in all matrices, relationships between IT-enabled organisational intangibles and firm performance were found to be significant at $p \leq 0.01$.

The results were all in line with path coefficient verifications made in section 4.10.3.1 and were supported by the findings from the validity tests shown in section 4.10.2.2 as well.

4.10.4.2 Significance tests for control variables

The t-tests were repeated for all control variables in order to verify whether they had a significant influence on the results generated in the previous section. The three alternative data matrices for model 1b were again used as the basis. Results are again shown in the same table format in Table 4-19.

Table 4-19 – Path coefficient significance tests for control variables

Exogenous construct	Matrix 1			Matrix 2			Matrix 3		
	γ_p	$\sigma(\gamma_{pb})$	t_p	γ_p	$\sigma(\gamma_{pb})$	t_p	γ_p	$\sigma(\gamma_{pb})$	t_p
Organisation size	-0.0106	0.0792	-0.1342	+0.0029	0.0798	+0.036	+0.0256	0.0776	+0.3297
Organisation age	-0.0399	0.0651	-0.6136	-0.0586	0.0627	-0.9337	-0.0454	0.0647	-0.7007
Degree of outsourcing	+0.0124	0.0581	+0.2131	+0.0256	0.0639	+0.4006	-0.0112	0.0592	-0.1883
Environmental dynamism 1	-0.0986	0.1699	-0.5803	-0.1089	0.1604	-0.6791	-0.099	0.1563	-0.6333
Environmental dynamism 2	+0.0313	0.0599	+0.523	+0.0444	0.064	+0.6948	+0.0431	0.0582	+0.7405
Position in business organisation	+0.0204	0.0716	+0.2851	-0.0052	0.0668	-0.0786	-0.0191	0.0694	-0.2755
Position in IT organisation	+0.0128	0.0751	+0.1698	+0.0019	0.0777	+0.0247	+0.02	0.074	+0.27
Early and late respondents	-0.0302	0.0576	-0.5238	-0.0381	0.0554	-0.6877	-0.051	0.0547	-0.9329

Source: Developed for this research / Caption: * p ≤ 0.10; **p ≤ 0.05; *** p ≤ 0.01

None of the control variable was found to have a significant influence (p ≤ 0.10) on the results of the models for any of the three data matrices.

4.11   Model verification and tests for hypothesis 6a

4.11.1 Characteristics of PLS model 2

Identically to what was described in section 4.10.1, the PLS model was created first, but without using the leadership constructs as independent constructs. A summary of the main characteristics of model 2 is shown in Table 4-20 (γ_i = weights, γ_p = patch coefficients).

Table 4-20 – Overview of PLS procedure output of model 2 for hypothesis 6a

Indicators	Matrix 1		Matrix 2		Matrix 3	
	γ_i	γ_p	γ_i	γ_p	γ_i	γ_p
I_INFRA1	+0.315	+0.240	+0.310	+0.279	+0.250	+0.291
I_INFRA2	+0.486		+0.485		+0.520	
I_INFRA3	+0.291		+0.277		+0.311	
I_INFRA4	+0.277		+0.241		+0.273	
I_INFRA5	-0.189		-0.192		-0.244	
I_STAFF1	-0.112	+0.185	-0.105	+0.152	-0.074	+0.123
I_STAFF2	+0.133		+0.086		+0.092	
I_STAFF3	+0.317		+0.356		+0.320	
I_STAFF4	-0.097		-0.083		-0.068	
I_STAFF5	+0.110		+0.097		+0.128	
I_STAFF6	+0.367		+0.369		+0.337	
I_STAFF7	+0.405		+0.391		+0.400	
I_INTAN1	-0.072	+0.360	-0.003	+0.358	-0.078	+0.371
I_INTAN2	+0.366		+0.305		+0.305	
I_INTAN3	+0.235		+0.314		+0.235	
I_INTAN4	+0.264		+0.173		+0.285	
I_INTAN5	-0.142		-0.167		-0.135	
I_INTAN6	+0.220		+0.284		+0.210	
I_INTAN7	+0.332		+0.326		+0.383	
P_SMA_PCA	+0.215	-	+0.189	-	+0.171	-
P_SOP_PCA_1	+0.124		+0.146		+0.138	
P_SOP_PCA_2	+0.882		+0.885		+0.901	
Variance explained (R^2) in firm performance		53.1%		52.7%		52.8%

Source: Developed for this research

Results of indicator weights and path coefficients were again similar across all three matrices. In addition, the model produced similar characteristics as models 1 and 1b described in section 4.10.1.

4.11.2 Indicator validity tests for model 2

Significance tests were done for all indicators of model 2 based on the procedure described and used for hypotheses 1 to 5. The bootstrapping algorithm was again run with identical configurations (as described in section 4.10.2). Table 4-21 provides an overview of the results where γ_i represents the weight, $\sigma(\gamma_{ib})$ describes the standard deviation per weight and t_i stands for the t-statistic per weight.

Table 4-21 – Indicator validity test results for model 2

Indicators	Matrix 1			Matrix 2			Matrix 3		
	γ_i	$\sigma(\gamma_{ib})$	t_i	γ_i	$\sigma(\gamma_{ib})$	t_i	γ_i	$\sigma(\gamma_{ib})$	t_i
I_INFRA1	+0.315	0.1356	**+2.3233**	+0.310	0.138	**+2.2427**	+0.250	0.1373	+1.8181
I_INFRA2	+0.486	0.1567	**+2.7825**	+0.485	0.159	**+3.0503**	+0.520	0.1501	**+3.4632**
I_INFRA3	+0.291	0.1528	+1.9018	+0.277	0.1482	+1.8705	+0.311	0.1459	**+2.131**
I_INFRA4	+0.277	0.1861	+1.4861	+0.241	0.1895	+1.2693	+0.273	0.1879	+1.4543
I_INFRA5	-0.189	0.1737	-1.0907	-0.192	0.1745	-1.0973	-0.244	0.1754	-1.3933
I_STAFF1	-0.112	0.1528	-0.7349	-0.105	0.1437	-0.7307	-0.074	0.1615	-0.4601
I_STAFF2	+0.133	0.1595	+0.8363	+0.086	0.1549	+0.5525	+0.092	0.1564	+0.5867
I_STAFF3	+0.317	0.15	**+2.5122**	+0.356	0.1632	**+2.181**	+0.320	0.165	+1.9406
I_STAFF4	-0.097	0.1344	-0.7226	-0.083	0.1378	-0.5988	-0.068	0.1454	-0.4646
I_STAFF5	+0.110	0.1356	+0.8091	+0.097	0.1541	+0.6271	+0.128	0.1552	+0.8233
I_STAFF6	+0.367	0.1411	**+2.5975**	+0.369	0.1489	**+2.4817**	+0.337	0.1552	**+2.1717**
I_STAFF7	+0.405	0.1357	**+2.9853**	+0.391	0.1472	**+2.6538**	+0.400	0.1593	**+2.5129**
I_INTAN1	-0.072	0.1362	-0.5257	-0.003	0.1337	-0.0226	-0.078	0.1459	-0.5358
I_INTAN2	+0.366	0.1316	**+2.7826**	+0.305	0.1382	**+2.2089**	+0.305	0.1406	**+2.1688**
I_INTAN3	+0.235	0.1477	+1.5942	+0.314	0.1509	**+2.0784**	+0.235	0.1501	+1.5636
I_INTAN4	+0.264	0.1557	+1.6979	+0.173	0.1595	+1.0861	+0.285	0.1574	+1.8093
I_INTAN5	-0.142	0.1439	-0.9842	-0.167	0.1273	-1.3154	-0.135	0.1354	-0.9994
I_INTAN6	+0.220	0.12	+1.8349	+0.284	0.122	**+2.3232**	+0.210	0.1214	+1.7264
I_INTAN7	+0.332	0.1322	**+2.5122**	+0.326	0.131	**+2.4861**	+0.383	0.1372	**+2.7885**
P_SMA_PCA	+0.215	0.1373	+1.5666	+0.189	0.1384	+1.367	+0.171	0.1405	+1.2176
P_SOP_PCA_1	+0.124	0.2233	+0.5571	+0.146	0.2253	+0.65	+0.138	0.2179	+0.6312
P_SOP_PCA_2	+0.882	0.0788	**+11.1937**	+0.885	0.0876	**+10.106**	+0.901	0.09	**+10.0114**

Source: Developed for this research

T-values significant at p ≤ 0.05 are written in boldface. Indicators with average t-values larger than the critical t-value of | 1.98 | are written in boldface as well.

Although overall indicator validity was considered as being relatively poor, the t-statistics of model 2 were better compared to models 1 and 1b (see 4.10.2) as eight out of 22 indicators were significant (about 36.4%).

4.11.3 Evaluating construct validity and the structural model

In line with the analysis performed for model 1b, path coefficients were compared again with relevant validity standards given in the literature. In addition, significance tests were done with the same configuration as used for the hypothesis tests in section 4.10.4.1 in order to allow for comparisons of the models.

Table 4-22 – Overview of path coefficient analysis for model 2

Exogenous construct	γ_p			Standard		
	Matrices			Chin	Diemantopoulos & Winkelhofer	
	1	2	3	≥ | 0.2 |	Direction of action	≠ 0
Physical IT infrastructure	+0.240	+0.279	+0.291	**OK**	**OK**	**OK**
Human IT capital	+0.185	+0.152	+0.123	NOK	OK	OK
IT-enabled organisational intangibles	+0.360	+0.358	+0.371	**OK**	**OK**	**OK**

Source: Developed for this research

Table 4-23 – Path coefficient significance tests for model 2

Exogenous construct	Matrix 1			Matrix 2			Matrix 3		
	γ_p	$\sigma(\gamma_{pb})$	t_p	γ_p	$\sigma(\gamma_{pb})$	t_p	γ_p	$\sigma(\gamma_{pb})$	t_p
Physical IT infra-structure	0.240	0.0867	**+2.765*****	0.279	0.0842	**+3.319*****	0.291	0.0876	**+3.321*****
Human IT capital	0.185	0.0993	+1.865*	0.152	0.1078	+1.407	0.123	0.1003	+1.225
IT-enabled organi-sational intangibles	0.360	0.097	**+3.712*****	0.358	0.099	**+3.613*****	0.371	0.1004	**+3.693*****

Source: Developed for this research / Caption: * $p \leq 0.10$; **$p \leq 0.05$; *** $p \leq 0.01$

The results for model 2 were very much in line with what was found for model 1b. Only physical IT infrastructure and IT-enabled organisational intangibles met the standard construct validity criteria. Indirectly, the t-test results thus confirmed the test results for hypotheses 1 to 5 (section 4.10.4). The coefficients of determination (R^2) for model 2 (see section 4.11.1) were all between 0.52 and 0.54 so that the same quality grades (Chin 1998b, p. 325) as found for model 1b resulted, meaning that a level between 'moderate' (0.33) and 'substantial' (0.66) was reached for all of them.

4.11.4 Building the groups for higher and lower leadership

The total score of the Multifactor Leadership Questionnaire (MLQ) per firm for the three data matrices from the data aggregation process was used as the basis for determining whether the data sets of a particular firm belonged to either the 'lower leadership' group (group 1) or the 'higher leadership' group (group 2). As the differences between the three data matrices were very small, the same firm was allocated to the same group in all of the three matrices.

The sums of the MLQ scores were all between 60 to 130 for all matrices and 95.5 points served as the lowest score for the 'higher leadership' group (group 2). Unfortunately, it was not possible to form groups of equal sizes as this would have meant splitting up the data sets of one of the larger companies into two portions. Consequently, the 'lower leadership' group (group 1) included 120 data sets where the 'higher leadership' group (group 2) included 97.

4.11.5 Invariance tests for the measurement model

As described in chapter 3, the procedure by Huber et al (2007, pp. 118-21) was used to analyse whether the measurement models for the two groups per matrix were different from each other. To this end, bootstrapping was used where 1 000 samples of 120 cases (group 1 = m) or 97 cases (group 2 = n) were taken from the respective group per matrix with replacement in order to generate error statistics for the t-tests (Weiber & Mühlhaus 2010, p. 256). All bootstrapped samples followed a t-distribution with m+n-2 degrees of freedom, so equal to 215 for the t-tests done. Based on Chin (2004), it was tested whether the indicator weights of the groups were approximately equivalent (H_0: $\gamma_i^1 = \gamma_i^2$) with critical t-values of ± 1.98 at p = 0.05 (α).

Table 4-24 summarises the results of these pooled variance t-tests for the measurement model.

Table 4-24 – Invariance tests for the measurement model based on pooled variance t-tests

Indicators	Matrix 1					Matrix 2					Matrix 3				
	γ_i^1	$\sigma(\gamma_{ib}^1)$	γ_i^2	$\sigma(\gamma_{ib}^2)$	t_i	γ_i^1	$\sigma(\gamma_{ib}^1)$	γ_i^2	$\sigma(\gamma_{ib}^2)$	t_i	γ_i^1	$\sigma(\gamma_{ib}^1)$	γ_i^2	$\sigma(\gamma_{ib}^2)$	t_i
I_INFRA1	+0.5727	0.2706	+0.0684	0.2147	+0.147	+0.5966	0.2463	+0.0626	0.2079	+1.617	+0.5453	0.2828	+0.0269	0.2184	+1.404
I_INFRA2	+0.4311	0.2744	+0.6806	0.2343	-0.676	+0.3643	0.2477	+0.7017	0.2294	-0.985	+0.4774	0.2655	+0.7024	0.2455	-0.613
I_INFRA3	+0.3789	0.215	+0.2453	0.252	+0.407	+0.3444	0.2004	+0.2369	0.2368	+0.350	+0.378	0.2503	+0.2307	0.241	+0.419
I_INFRA4	+0.3141	0.2835	+0.152	0.2863	+0.400	+0.3618	0.2574	+0.1372	0.2829	+0.589	+0.311	0.3085	+0.2332	0.2809	+0.183
I_INFRA5	-0.7487	0.2791	-0.0187	0.2419	-1.934	-0.6807	0.3189	-0.0193	0.2414	-1.597	-0.7778	0.3241	-0.0762	0.2543	-1.651
I_STAFF1	-0.6807	0.2973	+0.0386	0.2236	-1.867	-0.5845	0.2687	+0.0684	0.2122	-1.849	-0.5972	0.304	+0.124	0.2483	-1.788
I_STAFF2	+0.7021	0.2621	+0.1891	0.2331	+1.435	+0.5118	0.2856	+0.1159	0.2304	+1.048	+0.5898	0.2997	+0.1546	0.2362	+1.106
I_STAFF3	+0.3277	0.2783	+0.2758	0.2821	+0.130	+0.4478	0.2514	+0.341	0.2964	+0.278	+0.3224	0.2995	+0.2307	0.2979	+0.216
I_STAFF4	-0.1673	0.2559	-0.0623	0.2429	-0.294	-0.1114	0.2191	-0.1223	0.238	+0.034	-0.047	0.2405	-0.0582	0.2502	+0.032
I_STAFF5	+0.2681	0.2901	+0.0923	0.255	+0.446	+0.2722	0.2447	+0.1211	0.2665	+0.419	+0.3841	0.2722	+0.2247	0.2744	+0.410
I_STAFF6	+0.3797	0.2447	+0.1732	0.2834	+0.556	+0.4081	0.2314	+0.1692	0.3119	+0.631	+0.3762	0.2684	+0.062	0.296	+0.789
I_STAFF7	+0.0914	0.2565	+0.5078	0.2437	-1.163	+0.0351	0.2589	+0.5148	0.2419	-1.335	-0.0666	0.2694	+0.504	0.2339	-1.566
I_INTAN1	+0.2769	0.2769	-0.1548	0.1924	+1.227	+0.2166	0.2917	-0.1237	0.1818	+0.941	+0.1724	0.279	-0.1121	0.1811	+0.815
I_INTAN2	+0.3114	0.2846	+0.6167	0.1906	-0.852	+0.3591	0.2901	+0.6843	0.1845	-0.900	+0.3724	0.2602	+0.5432	0.1956	-0.507
I_INTAN3	+0.2303	0.345	+0.0798	0.1657	+0.367	+0.6986	0.3104	+0.1048	0.1708	+1.578	+0.4489	0.331	+0.0126	0.1629	+1.106
I_INTAN4	-0.2752	0.3782	+0.5371	0.2071	-1.773	-0.4708	0.343	+0.5227	0.1931	**-2.380**	-0.5914	0.3474	+0.6354	0.1815	**-2.937**
I_INTAN5	+0.3193	0.3044	-0.138	0.1771	+1.227	-0.21	0.2437	-0.1658	0.1851	-0.140	+0.211	0.3004	-0.1239	0.1782	+0.908
I_INTAN6	+0.3129	0.2401	+0.1433	0.1567	+0.564	+0.2903	0.2144	+0.2276	0.1535	+0.229	+0.3552	0.24	+0.121	0.1536	+0.782
I_INTAN7	+0.0237	0.3025	+0.0462	0.1716	-0.061	+0.3118	0.2568	-0.0502	0.1729	+1.118	+0.2013	0.2898	+0.0272	0.1715	+0.489
P_SMA_PCA	-0.1175	0.1026	+0.0907	0.1531	-1.170	-0.097	0.1516	+0.0989	0.1962	-0.807	-0.1543	0.1169	+0.0236	0.1545	-0.940
P_SOP_PCA_1	+0.8131	0.1325	+0.2288	0.1942	**+2.570**	+0.7108	0.2289	+0.2267	0.174	+1.627	+0.8186	0.1807	+0.2442	0.1656	**+2.307**
P_SOP_PCA_2	+0.4251	0.1447	+0.9126	0.1082	**-2.603**	+0.5514	0.1935	+0.903	0.1171	-1.474	+0.4158	0.169	+0.9319	0.1033	**-2.472**

Adapted from Chin (2004)

The results revealed that the invariance criteria for all exogenous measurement variables were fulfilled with only the average t-value for one variable out of 19 being significantly different at $p \leq 0.025$. However, average t-values for two out of three endogenous variables were significantly different at $p < 0.05$ so that the invariance criterion for the endogenous measurement model was not met. Limitations that arose from this are stated in section 4.13.

4.11.6 Tests for hypothesis 6a

Based on the same procedure used in the previous section, the path coefficients were analysed in terms of significant differences between them (H$_0$: $\gamma_p^1 = \gamma_p^2$). Standard errors for the path coefficients were taken from the bootstrapping procedures for the invariance tests presented in section 4.11.5. The results are shown in Table 4-25.

Table 4-25 – Pooled variance t-tests for path coefficients - hypothesis 6a

Exogenous construct	Matrices	γ_p^1	$\sigma(\gamma_{pb}^1)$	γ_p^2	$\sigma(\gamma_{pb}^2)$	t_p
Physical IT infrastructure	1	0.3268	0.0798	0.216	0.1131	+0.825
	2	0.3147	0.0871	0.2316	0.1119	+0.598
	3	0.3428	0.0843	0.2679	0.1157	+0.537
Human IT capital	1	0.1507	0.092	-0.0128	0.1256	+1.078
	2	0.1421	0.1154	-0.0611	0.1231	+1.204
	3	0.1167	0.098	-0.076	0.1185	+1.270
IT-enabled organisational intangibles	1	-0.019	0.0978	0.5788	0.1202	**-3.917****
	2	0.1217	0.133	0.5999	0.1234	**-2.598***
	3	-0.0192	0.1008	0.5937	0.1165	**-4.013****

Source: Developed for this research / Caption: * $p \leq 0.025$; ** $p \leq 0.01$

Hypothesis 6a proposed that in IT organisations in the Swiss financial sector, transactional and transformational leadership moderate the relationship between IT capability and firm performance in a way that leadership acts as an enhancer.

As evident from Table 4-25, path coefficients for IT-enabled organisational intangibles were substantially higher for the 'higher leadership' group (2) compared to the 'lower leadership' group (1). The corresponding t-statistic for matrix 2 was significant at $p \leq 0.025$ and the statistics for matrix 1 and 3 were even significant at $p \leq 0.01$.

The two path coefficients for physical IT infrastructure and human IT capital remained insignificant even at $p \leq 0.10$. Consequently, hypothesis 6a was partly supported by the data as only the relationship between IT-enabled organisational intangibles and firm performance was significantly moderated by transformational and transactional leadership.

4.11.7 Finding the causes of the moderating effect

In order to find out how the transactional and transformational indicators of leadership contributed to the moderating effect, the total MLQ scores determined in section 4.11.4 were further divided into transactional and transformational scores. Per participating firm, the ratio between transformational leadership (TF) and transactional leadership (TC) was calculated (TF divided by TC) and ratios were averaged separately for the 'lower leadership' group and the 'higher leadership' group.

From this procedure, it resulted that for all three matrices, the average ratios calculated were between 0.25 and 0.27 (or about 10%) higher for the 'high leadership' group, indicating that the transformational part in the construct mainly accounted for the difference between the two groups. Therefore, this finding showed that transformational leadership explained a larger part of the moderating effect than transactional leadership.

4.12 Model verification and tests for hypothesis 6b

4.12.1 Characteristics of PLS model 3

In order to test the mediating effect of IT capability between leadership and firm performance, a third model (model 3) was needed. The model was built in SmartPLS according to the descriptions given in chapter 3. The data from model 1 was used in the first instance. Table 4-26 summarises the model characteristics for all 3 matrices.

Table 4-26 – Overview of PLS procedure output of model 3 for hypothesis 6b

Indicators	Matrix 1		Matrix 2		Matrix 3	
	γ_i	γ_p	γ_i	γ_p	γ_i	γ_p
L_TC_CR_PCA	+0.218	Path a (to IT capability): -0.462	+0.072	Path a (to IT capability): -0.485	-0.012	Path a (to IT capability): -0.466
L_TC_MBEA4	+0.768		+0.786		+0.782	
L_TC_MBEA22	-0.539		-0.465		-0.596	
L_TC_MBEA24	+0.650		+0.639		+0.730	
L_TC_MBEA27	-0.406		-0.463		-0.495	
L_TF_IS_PCA	+0.046	Path c (to firm per-formance): -0.002	+0.223	Path c (to firm per-formance): +0.019	+0.042	Path c (to firm per-formance): -0.021
L_TF_II_PCA	+0.357		+0.212		+0.618	
L_TF_IM_PCA	-0.559		-0.365		-0.511	
L_TF_IC_PCA	-0.419		-0.388		-0.443	
I_INFRA1	+0.297	Path b (to firm per-formance): +0.693	+0.311	Path b (to firm per-formance): +0.725	+0.206	Path b (to firm per-formance): +0.698
I_INFRA2	+0.309		+0.318		+0.410	
I_INFRA3	+0.240		+0.186		+0.195	
I_INFRA4	-0.044		-0.071		-0.042	
I_INFRA5	-0.527		-0.444		-0.473	
I_STAFF1	-0.165		-0.127		-0.142	
I_STAFF2	+0.110		+0.037		+0.099	
I_STAFF3	+0.194		+0.207		+0.154	
I_STAFF4	-0.056		-0.078		+0.003	
I_STAFF5	+0.074		+0.079		+0.087	
I_STAFF6	+0.065		+0.161		+0.075	
I_STAFF7	+0.160		+0.195		+0.243	
I_INTAN1	-0.090		-0.112		-0.108	
I_INTAN2	-0.036		-0.028		-0.133	
I_INTAN3	+0.060		+0.028		+0.005	
I_INTAN4	+0.261		+0.273		+0.294	
I_INTAN5	-0.039		-0.139		-0.039	
I_INTAN6	+0.268		+0.321		+0.280	
I_INTAN7	+0.035		+0.063		+0.080	
P_SMA_PCA	+0.125	-	+0.176	-	+0.164	-
P_SOP_PCA_1	+0.343		+0.246		+0.273	
P_SOP_PCA_2	+0.843		+0.859		+0.859	
R^2 in firm performance: IT capability		54.5% 21.3%		54.3% 23.5%		54.6% 21.7%

Source: Developed for this research

Similar to section 4.10.1 and because of collinearity problems, an alternative model (3b) with three leadership components gained from the additional PCA (section 4.9.2) was created in SmartPLS. The results for all three data matrices are presented below in Table 4-27.

Table 4-27 – Overview of PLS procedure output of model 3b for hypothesis 6b

Indicators	Matrix 1		Matrix 2		Matrix 3	
	γ_i	γ_p	γ_i	γ_p	γ_i	γ_p
L_PCA1	+0.165	Path a (to IT capability): -0.196	+0.220	Path a (to IT capability): -0.167	+0.435	Path a (to IT capability): -0.156
L_PCA2	+0.632	Path c (to firm per-formance): +0.067	+0.763	Path c (to firm per-formance): +0.048	+0.705	Path c (to firm per-formance): +0.047
L_PCA3	+0.757		+0.608		+0.560	
I_INFRA1	+0.172	Path b (to firm per-formance): +0.745	+0.188	Path b (to firm per-formance): +0.744	+0.115	Path b (to firm per-formance): +0.736
I_INFRA2	+0.194		+0.231		+0.308	
I_INFRA3	+0.143		+0.140		+0.187	
I_INFRA4	+0.105		+0.106		+0.139	
I_INFRA5	-0.408		-0.401		-0.453	
I_STAFF1	-0.202		-0.204		-0.189	
I_STAFF2	+0.093		+0.054		+0.092	
I_STAFF3	+0.096		+0.083		+0.035	
I_STAFF4	-0.053		-0.033		-0.010	
I_STAFF5	-0.080		-0.028		-0.025	
I_STAFF6	+0.261		+0.220		+0.199	
I_STAFF7	+0.145		+0.144		+0.134	
I_INTAN1	-0.101		-0.046		-0.080	
I_INTAN2	+0.101		+0.065		-0.015	
I_INTAN3	+0.170		+0.227		+0.170	
I_INTAN4	+0.289		+0.179		+0.315	
I_INTAN5	-0.148		-0.177		-0.144	
I_INTAN6	+0.196		+0.254		+0.164	
I_INTAN7	+0.180		+0.157		+0.213	
P_SMA_PCA	+0.101	-	+0.116	-	+0.088	-
P_SOP_PCA_1	+0.182		+0.193		+0.190	
P_SOP_PCA_2	+0.919		+0.907		+0.924	
R^2 in in firm performance: in IT capability		56.9% 3.8%		56.6% 2.8%		57.1% 2.4%

Source: Developed for this research

Comparing the two models, 3 and 3b, it became evident that the variance explained in IT capability had shrunk substantially as a result of the PCA done based on the leadership indicators. However, from the indicators weights and path coefficients, it could not be determined whether either of the models was of a better overall quality.

4.12.2 Indicator validity tests for model 3

For model 3, significance tests were made for the indicator weights based on the bootstrapping procedure already described in section 4.10.2.

4.12.2.1 Indicator validity of original matrices

Table 4-28 summarises the results for all three original matrices (model 3) where γ_i represents the weight, $\sigma(\gamma_{ib})$ describes the standard deviation and t_i the t-statistic.

Table 4-28 – Indicator validity test results for original 3 sample matrices (model 3)

Indicators	Matrix 1			Matrix 2			Matrix 3		
	γ_i	$\sigma(\gamma_{ib})$	t_i	γ_i	$\sigma(\gamma_{ib})$	t_i	γ_i	$\sigma(\gamma_{ib})$	t_i
L_TC_CR_PCA	+0.218	0.2333	+0.459	+0.072	0.4155	+0.1732	-0.012	0.4759	-0.0251
L_TC_MBEA4	+0.768	0.5495	+1.3982	+0.786	0.6284	+1.2502	+0.782	0.5005	+1.5624
L_TC_MBEA22	-0.539	0.4084	-1.3206	-0.465	0.4174	-1.1153	-0.596	0.4363	-1.3654
L_TC_MBEA24	+0.650	0.4333	+1.4989	+0.639	0.476	+1.3425	+0.730	0.4529	+1.6109
L_TC_MBEA27	-0.406	0.4394	-0.9243	-0.463	0.4789	-0.9669	-0.495	0.4591	-1.079
L_TF_IS_PCA	+0.046	0.5555	+0.0825	+0.223	0.5628	+0.3971	+0.042	0.5583	+0.0755
L_TF_II_PCA	+0.357	0.6607	+0.5409	+0.212	0.7017	+0.3027	+0.618	0.7263	+0.8513
L_TF_IM_PCA	-0.559	0.5307	-1.0526	-0.365	0.5082	-0.7184	-0.511	0.5031	-1.0163
L_TF_IC_PCA	-0.419	0.6173	-0.6785	-0.388	0.6155	-0.631	-0.443	0.6177	-0.7173
I_INFRA1	+0.297	0.1953	+1.521	+0.311	0.2023	+1.538	+0.206	0.1797	+1.1439
I_INFRA2	+0.309	0.2114	+1.4594	+0.318	0.2435	+1.3049	+0.410	0.2291	+1.7879
I_INFRA3	+0.240	0.1702	+1.4081	+0.186	0.1678	+1.107	+0.195	0.1679	+1.1597
I_INFRA4	-0.044	0.1837	-0.2374	-0.071	0.1894	-0.3761	-0.042	0.1897	-0.2239
I_INFRA5	-0.527	0.223	**-2.3617**	-0.444	0.234	-1.8987	-0.473	0.2288	**-2.068**
I_STAFF1	-0.165	0.2675	-0.6171	-0.127	0.2502	-0.5081	-0.142	0.2799	-0.508
I_STAFF2	+0.110	0.2476	+0.4429	+0.037	0.2612	+0.1408	+0.099	0.2389	+0.4133
I_STAFF3	+0.194	0.2201	+0.8836	+0.207	0.2409	+0.8574	+0.154	0.2145	+0.7162
I_STAFF4	-0.056	0.19	-0.2956	-0.078	0.1815	-0.4287	+0.003	0.1728	+0.0201
I_STAFF5	+0.074	0.2628	+0.2831	+0.079	0.3113	+0.2538	+0.087	0.3095	+0.1197
I_STAFF6	+0.065	0.3415	+0.2485	+0.161	0.3173	+0.5086	+0.075	0.2785	+0.2702
I_STAFF7	+0.160	0.2333	+0.6869	+0.195	0.2544	+0.768	+0.243	0.2802	+0.8663
I_INTAN1	-0.090	0.2007	-0.449	-0.112	0.1915	-0.5857	-0.108	0.1961	-0.5519
I_INTAN2	-0.036	0.2354	-0.152	-0.028	0.2544	-0.1106	-0.133	0.2592	-0.5132
I_INTAN3	+0.060	0.2234	+0.2686	+0.028	0.2934	-0.0941	+0.005	0.2584	-0.0197
I_INTAN4	+0.261	0.3053	+0.8544	+0.273	0.3463	+0.7887	+0.294	0.3741	+0.7861
I_INTAN5	-0.039	0.1923	-0.2043	-0.139	0.1652	-0.8408	-0.039	0.1633	-0.2399
I_INTAN6	+0.268	0.2039	+1.3143	+0.321	0.1974	+1.6249	+0.280	0.1868	+1.4969
I_INTAN7	+0.035	0.2171	+0.1592	+0.063	0.1526	+0.4126	+0.080	0.1705	+0.4668
P_SMA_PCA	+0.125	0.2116	+0.5889	+0.176	0.2015	+0.8728	+0.164	0.2037	+0.8066
P_SOP_PCA_1	+0.343	0.4156	+0.8256	+0.246	0.4553	+0.5399	+0.273	0.4308	+0.6328
P_SOP_PCA_2	+0.843	0.3682	**+2.2885**	+0.859	0.3643	**+2.3566**	+0.859	0.3599	**+2.3867**

Source: Developed for this research

Significant t-values at p ≤ 0.05 are in boldface.

4.12.2.2 Indicator validity of alternative matrices

Table 4-29 summarises the same indicator validity tests made for model 3b.

Table 4-29 – Indicator validity test results for original 3 sample matrices (model 3b)

Indicators	Matrix 1			Matrix 2			Matrix 3		
	γ_i	$\sigma(\gamma_{ib})$	t_i	γ_i	$\sigma(\gamma_{ib})$	t_i	γ_i	$\sigma(\gamma_{ib})$	t_i
L_PCA1	+0.165	0.3822	+0.4325	+0.220	0.4484	+0.4906	+0.435	0.4534	+0.9593
L_PCA2	+0.632	0.4137	+1.5288	+0.763	0.5028	+1.5167	+0.705	0.4453	+1.5843
L_PCA3	+0.757	0.4066	+1.8613	+0.608	0.4464	+1.3628	+0.560	0.4788	+1.1687
I_INFRA1	+0.172	0.1426	+1.2071	+0.188	0.1454	+1.2903	+0.115	0.1825	+0.6319
I_INFRA2	+0.194	0.14	+1.3835	+0.231	0.1567	+1.4711	+0.308	0.1641	+1.8758
I_INFRA3	+0.143	0.1294	+1.1018	+0.140	0.1387	+1.0112	+0.187	0.1474	+1.2692
I_INFRA4	+0.105	0.1617	+0.648	+0.106	0.1682	+0.6316	+0.139	0.1788	+0.7784
I_INFRA5	-0.408	0.1792	**-2.2801**	-0.401	0.1722	**-2.3265**	-0.453	0.2067	**-2.1929**
I_STAFF1	-0.202	0.1682	-1.2031	-0.204	0.1695	-1.2039	-0.189	0.1711	-1.1058
I_STAFF2	+0.093	0.1665	+0.5582	+0.054	0.1568	+0.343	+0.092	0.1506	+0.6097
I_STAFF3	+0.096	0.1663	+0.5801	+0.083	0.1774	+0.4687	+0.035	0.1663	+0.2116
I_STAFF4	-0.053	0.1604	-0.3333	-0.033	0.1623	-0.2021	-0.010	0.1754	-0.0572
I_STAFF5	-0.080	0.2044	-0.3892	-0.028	0.2215	-0.1248	-0.025	0.274	-0.0919
I_STAFF6	+0.261	0.2191	+1.1888	+0.220	0.1956	+1.1258	+0.199	0.1802	+1.1035
I_STAFF7	+0.145	0.1624	+0.8917	+0.144	0.1785	+0.8057	+0.134	0.2278	+0.5869
I_INTAN1	-0.101	0.1628	-0.6191	-0.046	0.1632	-0.2817	-0.080	0.1563	-0.5141
I_INTAN2	+0.101	0.1487	+0.68	+0.065	0.1711	+0.3779	-0.015	0.1833	-0.0813
I_INTAN3	+0.170	0.1736	+0.977	+0.227	0.1661	+1.3653	+0.170	0.1781	+0.9517
I_INTAN4	+0.289	0.1811	+1.5963	+0.179	0.1657	+1.078	+0.315	0.185	+1.7004
I_INTAN5	-0.148	0.1539	-0.9628	-0.177	0.1465	-1.2096	-0.144	0.1475	-0.9754
I_INTAN6	+0.196	0.1604	+1.2202	+0.254	0.136	+1.8664	+0.164	0.1559	+1.0543
I_INTAN7	+0.180	0.1456	+1.2348	+0.157	0.1386	+1.1301	+0.213	0.1767	+1.2071
P_SMA_PCA	+0.101	0.1744	+0.578	+0.116	0.1792	+0.6495	+0.088	0.1941	+0.4518
P_SOP_PCA_1	+0.182	0.2851	+0.6387	+0.193	0.2813	+0.6849	+0.190	0.3097	+0.6128
P_SOP_PCA_2	+0.919	0.2128	**+4.3191**	+0.907	0.1968	**+4.607**	+0.924	0.2318	**+3.9839**

Source: Developed for this research

Significant t-values at $p \leq 0.05$ are in boldface.

4.12.2.3 Comparison and consequences of indicator validity tests for model 3

Unlike the results in section 4.10.2 (where models 1 and 1b were compared), model 3b with no collinearity problems did not produce results of substantially better quality than model 3. Hence, model 3b was only chosen to be used subsequently in order to avoid any influences of the collinearity issues on the path coefficients used for the hypothesis testing. Model 3 was not used for further analysis.

Indicator validity was again considered relatively poor for both models, even poorer than what was found for models 1 and 1b as only two out of 25 indicators were found as being significant (< 10%). Nevertheless, dropping any insignificant indicator was not considered adequate based on recommendations by Bollen and Lennox (1991, p. 308) as the meaning of latent constructs modelled on formative indicators would have been changed otherwise. Potential limitations resulting from this analysis are described in section 4.13.

4.12.3 Evaluating construct validity and the structural model

4.12.3.1 Path coefficients

Again, the path coefficients of the alternative model (3b) were compared with standards proposed by Diemantopoulos and Winklhofer (2001, p. 273) as well as Chin (1998, p. 11), similar to sections 4.10.3 and 4.11.3. Table 4-30 presents the results.

Table 4-30 – Overview of path coefficient analysis for model 3b

Path description	γ_p			Standard		
	Matrices			**Chin**	**Diemantopoulos & Winkelhofer**	
	1	**2**	**3**	**≥ | 0.2 |**	**Direction of action**	**≠ 0**
Leadership ➜ IT capability (path a)	-0.196	-0.167	-0.156	NOK	NOK	OK
IT capability ➜ firm performance (path b)	+0.745	+0.744	+0.736	**OK**	**OK**	**OK**
Leadership ➜ firm performance (path c)	+0.067	+0.048	+0.047	NOK	NOK	OK

Source: Developed for this research

The evaluation showed that only the IT capability construct fulfilled all standards.

4.12.3.2 Coefficients of determination (R^2)

The coefficients of determination (R^2) of the alternative model (3b) shown in section 4.12.1 were compared with the quality levels suggested by Chin (1998b, p. 325). All three values for firm performance were between 0.56 and 0.571 which corresponded to a level between 'moderate' (0.33) and 'substantial' (0.66) according to Chin. The values for the variance explained in IT capability were all below 0.04, which is equivalent to a 'weak' level.

4.12.4 Testing for presence of a mediated effect

Based on the procedure described in chapter 3, it was tested whether IT capability significantly mediated the relationship between leadership and firm performance. This was done in two steps. Firstly, it was verified whether the path coefficients met the three standards proposed by Huber et al (2007, p. 70).

In order to do this, the IT capability construct was removed from model 3b in order to determine the path coefficient values for $\gamma_{p_{c-n}}$ for all three matrices. Table 4-31 presents the results for all three alternative data matrices (model 3b).

Table 4-31 – Overview of requirements tests for mediation

Path description	γ_p			Standard		
	Matrices			$\gamma_{p_a} \neq 0$	$\gamma_{p_b} \neq 0$	$\gamma_{p_{c-n}} > \gamma_{p_c}$ > 0
	1	**2**	**3**			
Leadership ➔ IT capability (γ_{p_a})	-0.196	-0.167	-0.156	Yes		
IT capability ➔ firm performance (γ_{p_b})	+0.745	+0.744	+0.736		Yes	
Leadership ➔ firm performance <u>with</u> IT capability (γ_{p_c})	+0.067	+0.048	+0.047			No
Leadership ➔ firm performance <u>with no</u> IT capability ($\gamma_{p_{c-n}}$)	-0.121	-0.123	-0.112			

Adapted from Huber et al (2007, p. 70)

Secondly, and as described in more detail in chapter 3, the asymmetric confidence intervals that are based on the distribution of the product of the two coefficients for paths 'a' and 'b' (γ_{p_a} and γ_{p_b}) were calculated for all three matrices as recommended by Fritz and MacKinnon (2007, pp. 235-6). Bootstrapping procedures were applied to create standard errors for the path coefficients. Table 4-32 presents the results of the calculations using a significance level of $p = 0.05$ (α).

Table 4-32 – Asymmetric confidence interval calculations for model 3b

Matrices	γ_{p_a}	$\sigma(\gamma_{p_a})$	γ_{p_b}	$\sigma(\gamma_{p_b})$	Lower limit	Upper limit
1	-0.196	0.1428	+0.745	0.1582	-0.38137	0.05722
2	-0.167	0.172	+0.744	0.14	-0.39364	0.12251
3	-0.156	0.157	+0.736	0.1709	-0.36598	0.10629

Adapted from Fritz & MacKinnon (2007, pp. 235-6)

In hypothesis 6b, it was suggested that, in IT organisations of the Swiss financial sector, IT capability mediates the relationship between transactional and transformational leadership and firm performance. As evident from Table 4-32, intervals for all three matrices of model 3b contained zero so that no significant mediating effect was found according to Fritz and MacKinnon (2007, p. 236). As a result of the test, hypothesis 6b was not supported.

4.13   Limitations of the data collection and analysis

The methodological concepts presented in chapter 3 proved to be the correct instruments to analyse the data in this research. However, a few additional limiting aspects were found during data collection and analysis.

Firstly, the limited possibility of sending reminders as described in section 4.2.1 led to a smaller sample. According to Leedy and Ormrod (2005, p. 207), a sample size of 400 per survey would have been ideal given the size of the population used in the study.

However, as already outlined in chapter 3, the statistical methods and procedures used in this study all required minimum sample sizes of about 200. Consequently, the restricting effects of this aspect is acknowledged, but considered as being minimal.

In addition, the study suffered from a lower response rate than other comparable studies as stated in section 4.2.2.

While Pinsonneault and Kraemer (1993) recommend a rate of $\geq 51\%$ in studies in Management Information Systems (MIS) research, they note in their review of 122 survey research studies that $> 40\%$ of the projects analysed did not reach this level. Moreover, based on Johnson (2005) who cites Keeter et al (2000), lower response rates do not necessarily lead to less generalizability of findings and more biased data. It is therefore acknowledged that the lower response rate could have influenced the results found, although the impact level remained uncertain.

Furthermore, smaller firms were not sufficiently represented in the samples used for hypothesis testing. It is thus acknowledged that generalisability of the results might be limited and that results might be more relevant for larger firms.

The measured validity of the indicators for models 1, 1b and 2 was found as being relatively poor (see section 4.10.2) and the validity of the indicators for model 3 proved to be very poor (see section 4.12.2). As none of the indicators were dropped because the meaning of the latent constructs should remain unchanged, the resulting increase in the error term (ζ) led to a decrease of the quality of the measurement models. It is therefore acknowledged that the latent constructs and their underlying phenomena were captured less precisely than intended (see Diamantopoulos & Riefler 2008, p. 1189) and that the results of the hypothesis tests should be interpreted carefully.

Finally, the invariance criteria for the endogenous measurement model used for hypothesis 6a were not fulfilled (see section 4.11.5). Although the measurement models used for the group analysis both included the same indicators, equality of the two groups was not fully given so that the power of the respective pooled variance t-tests was potentially decreased and the results might have been slightly distorted.

In conclusion, although it is admitted that the constraints stated influenced the results, the tests and analysis revealed significant findings based on an adequate methodological design and appropriate statistical procedures.

4.14   Conclusion

In this chapter, the results of the data collection and analysis were presented. It began by providing an overview of what data was collected in the four different survey groups defined initially and by giving specific information on the quantity of answers received per group. An average response rate of almost 10% resulted, whereas the percentage was a little lower for the survey for IT staff.

Answers with $\geq 50\%$ item non-response and answers with no information on the firm could not be used since these data sets did not include enough information to be included in the analysis procedures. Therefore, about 10% of the survey for IT staff and slightly more than 15% of the answers from the survey for business managers had to be discarded.

It was then described how answers from the two surveys were matched with respect to participating firms. The outcome of this was a sample of 217 answers from business managers and 189 answers from IT staff, both covering the same 45 firms. This step revealed as well that 306 answers came from 31 firms that all have 201 or more employees, indicating that the answers to both surveys predominantly covered larger financial firms.

Analysis of unit non-response, descriptive statistics and frequency distributions, as well as visual inspections of answers with high item non-response, did not disclose systematic response bias: neither did checks on complete data sets not used for hypothesis testing.

While questions left unanswered by respondents were not numerous (0.437% and 0.451% respectively) and thus unproblematic, the presence of about 10% of missing data due to people's lack of knowledge on three of the dependent performance variables necessitated the generation of three data matrices per survey by using the Multiple Imputation (MI) technique. The three data matrices were all analysed subsequently.

Per matrix, the data from the survey for IT staff was aggregated on a firm level. The first-order constructs for transformational and transactional leadership, as well as for firm performance, were created in SPSS based on Principal Components Analysis (PCA) and adequate quality checks. The resulting three data matrices from the IT survey were integrated into the data from business managers.

Tests of potential multicollinearity problems were made separately for the PLS models used for hypotheses 1 to 6a (models 1 and 2) and for hypothesis 6b (model 3) as the constructs used were different. High VIF values demanded the creation of separate principal components for transformational leadership (hypotheses 1 to 6a) and for leadership (hypothesis 6b).

As a next step, models were created in SmartPLS separately and weights and path coefficients were shown per matrix and model. Validity tests were made for all indicators and the structural models were analysed based on path coefficients and coefficients of determination. Both transformational leadership (hypothesis 1) and transactional leadership (hypothesis 2) did not show significant relationships with firm performance at $p \leq 0.05$.

Physical IT infrastructure (hypothesis 3) was found as being significantly and positively related to firm performance (average $t_p = 2.834$; $p \leq 0.01$) and IT-enabled organisational intangibles (hypothesis 5) were found as being significantly and positively related to firm performance (average $t_p = 3.2268$; $p \leq 0.01$) as well. On average, the t-values for the path coefficients between the human IT capital construct and firm performance were not significant at (average $t_p = 1.521$; $p \leq 0.10$). No control variable was found as being significant at $p \leq 0.10$.

After carrying out the necessary tests for invariance of the measurement models used, multi group tests for hypothesis 6a exposed that only the relationship between IT-enabled organisational intangibles and firm performance was moderated by the leadership construct (average $t_p = 3.509$; $p \leq 0.01$) for all three matrices.

The hypothesis was therefore partially supported. Further analysis revealed that transformational leadership accounted for a larger portion of the moderating effect than transactional leadership did.

A test for the presence of a mediating effect of IT capability between leadership and firm performance based on asymmetric confidence intervals (Fritz & MacKinnon 2007, pp. 235-6) with $p = 0.05$ showed that hypothesis 6b was not supported by the data as all three calculated intervals contained 0 (zero).

The most important limitations identified during data collection and analysis included that mainly larger firms were represented by the data and that the quality of the measurement models decreased due to poor indicator validity, so that the abovementioned results should be interpreted carefully. Nevertheless, significant findings were made based on suitable methodology, statistical methods and tools.

Figure 4-4 illustrates the results of the hypothesis tests based on the conceptual framework used (see chapter 3).

Figure 4-4 – Illustration of results based on conceptual framework
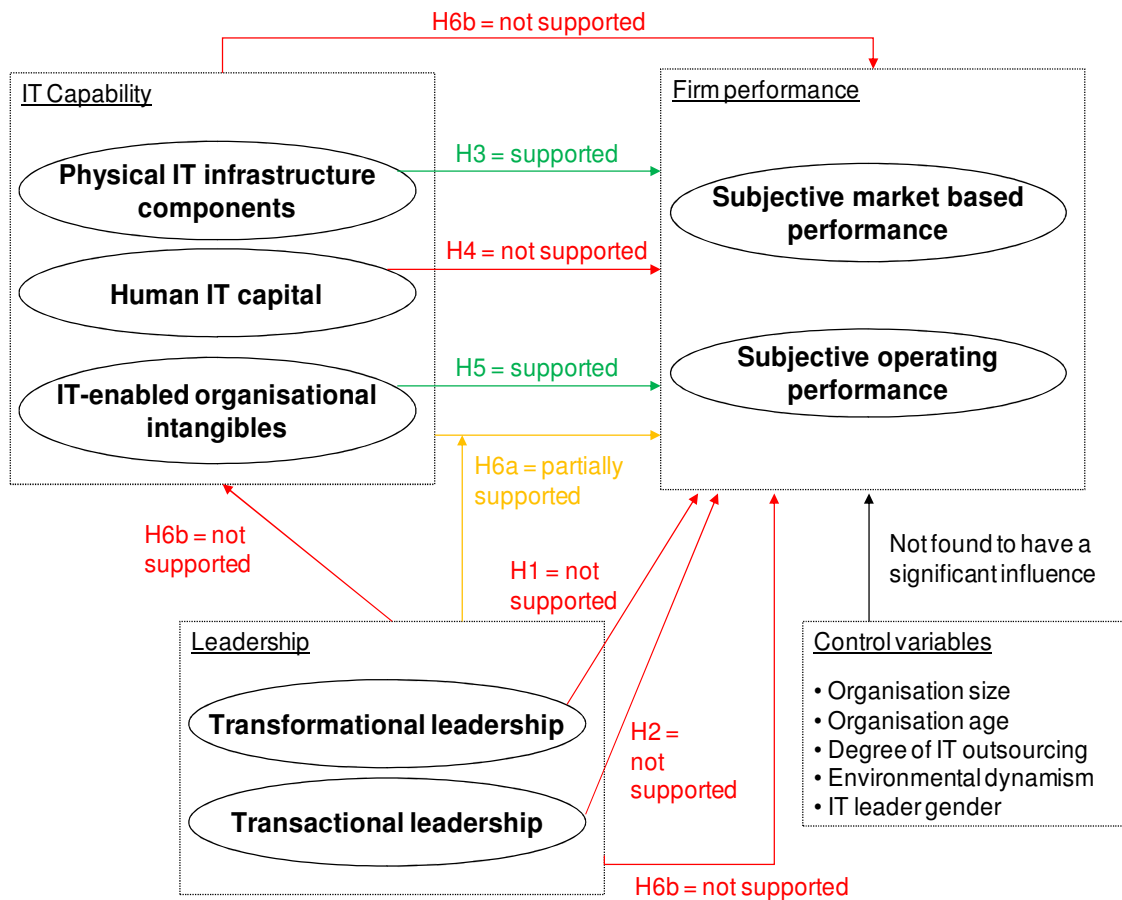

Source: Developed for this research

In the next and final chapter of this dissertation, conclusions and implications are made and drawn from the results presented in this chapter.

Chapter 5 - Conclusions and implications

5.1   Introduction

In the previous chapter, the results of the data collection process and statistical procedures were presented and the hypotheses tested. This final chapter presents conclusions and implications inferred from these results. Figure 5-1 provides an overview of the structure of this chapter.

**Figure 5-1 – Structure of conclusions and implications chapter**

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┌─────────────────────────────────────────────────────┐
│  5.1 Introduction                                    │
└─────────────────────────────────────────────────────┘

┌─────────────────────────────────────────────────────┐
│  5.2 Conclusions per hypothesis                      │
└─────────────────────────────────────────────────────┘

┌─────────────────────────────────────────────────────┐
│  5.3 Supplementary conclusions                       │
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│  5.4 Implications for managerial practice            │
└─────────────────────────────────────────────────────┘

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│  5.5 Implications for theory                         │
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┌─────────────────────────────────────────────────────┐
│  5.6 Limitations and suggestions for future research │
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│  5.7 Conclusion                                      │
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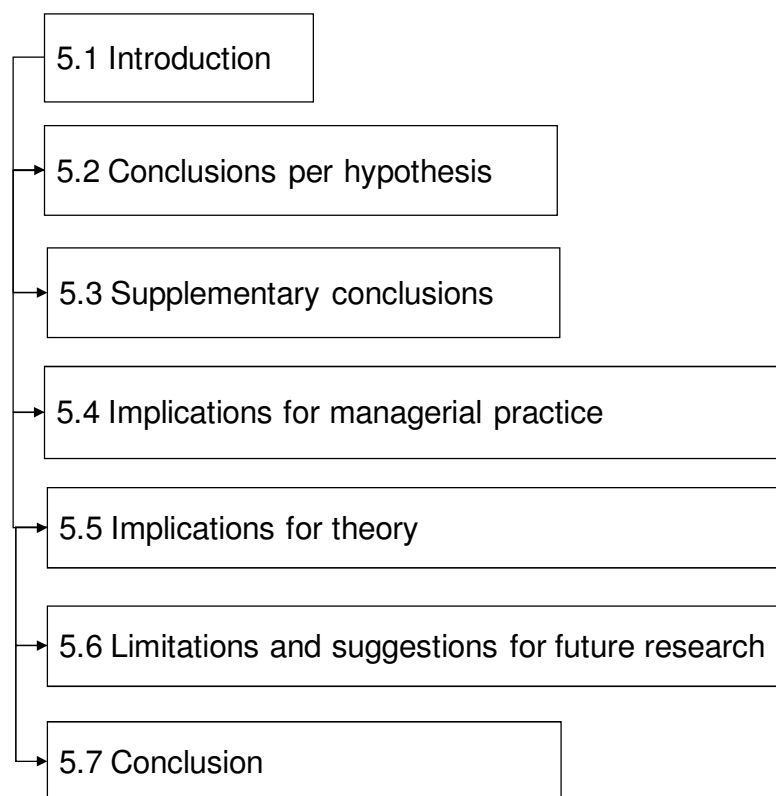
Source: Developed for this research

The overall aim of this chapter is to answer the research question stated for this research:

> *To what extent are transformational / transactional leadership and elements of IT capability related to firm performance in IT organisations of companies of the Swiss financial sector?*

The research question was answered in the overall context of the conceptual framework presented in chapter 2. However, as a guiding illustration, the concept on how resources can be turned in to competitive advantage from the RBV theory (see Grant 1995) was used (see chapter 2). Figure 5-2 shows how the two pictures fit together.

Figure 5-2 – Matching the conceptual framework and the RBV concept
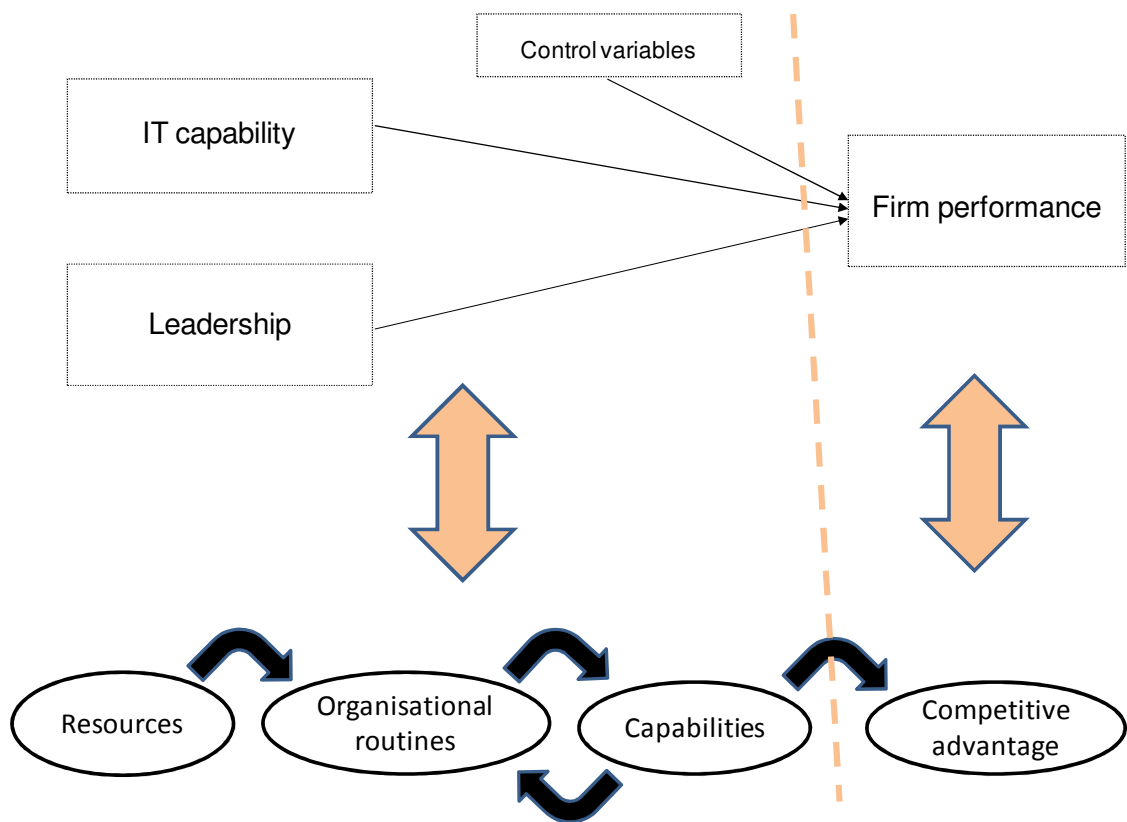
Adapted from Grant (1995)

Figure 5-2 illustrates that the independent variables from the framework match with Grant's (1995) activities on how resources form capabilities through organisational routines and that the dependent variables correspond to competitive advantage.

Grant's (1995) concept was extended by five descriptions in order for the conclusions to be presented more clearly and precisely. These descriptions are labelled in Figure 5-3 as aspects A) to E).

Figure 5-3 – Turning resources into competitive advantage
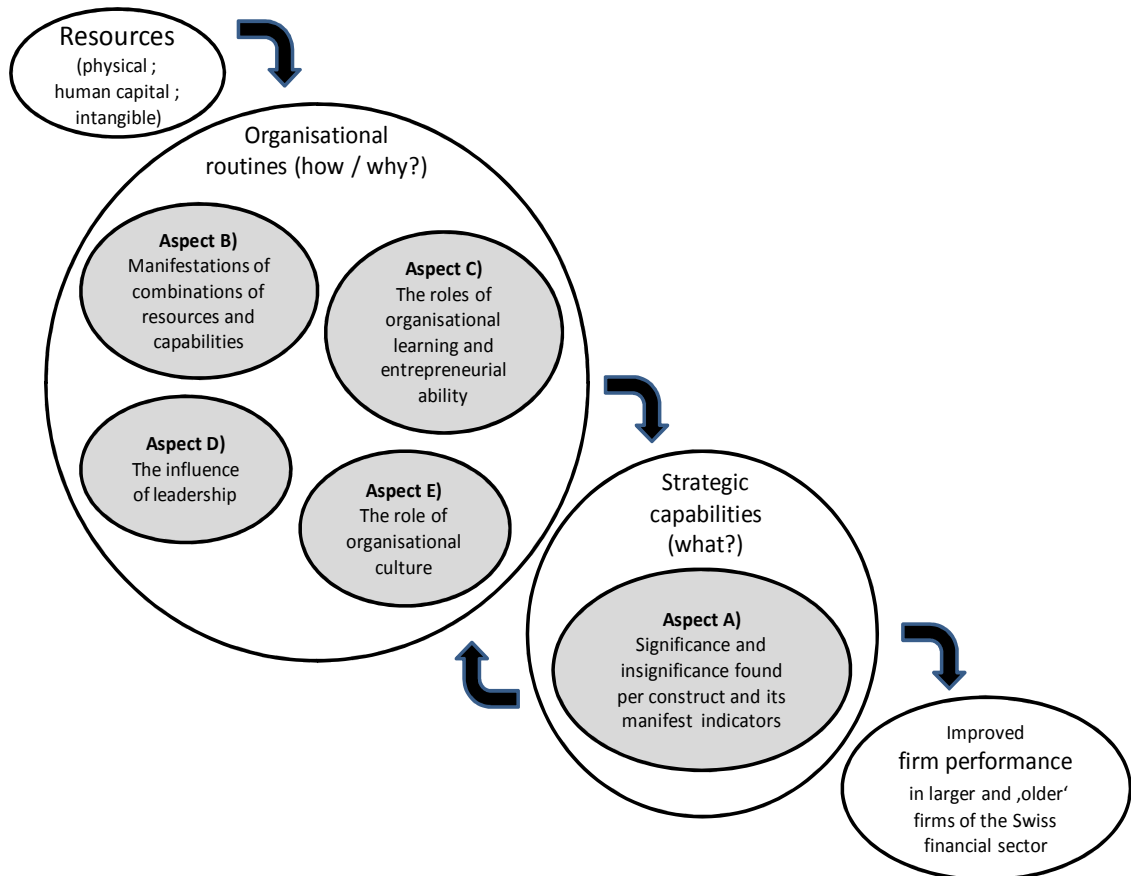
Adapted from Grant (1995) and extended by 4 aspects

Aspect A) summarises the significances and insignificances found in the previous chapter for the relationships hypothesised in chapter 2 and provides discussions of relevant literature that can be associated with the findings. In order to provide a solid basis for specific managerial implications, it attempts to give information about possible organisational routines that can be potential reasons for the emergence of strategic capabilities which lead to competitive advantage in the context of this study.

Consequently, aspects B) to E) are used to provide examples of what the author believes could be coordinated actions carried out in larger and 'older' firms of the Swiss financial sector targeted at improving firm performance.

5.2   Conclusions per hypothesis

5.2.1   Transformational leadership and firm performance (hypothesis 1)

Based on the work of Barney (1991), Becker (1964) and Tomer (1987), it was Barney & Zajac (1994) who mentioned that the 'people' aspect in strategic capability could be far more than technical and business skills and managerial work from the top.

Grounded in the work of Bass (1985) and Burns (1978) and extended by elements of the charismatic leadership theory of House (1977) and Conger and Kanungo (1994; 1998), Bass and Avolio (2004) established the theory of transformational leadership with its elements 'Individualised Consideration (IC)', 'Intellectual Stimulation (IS)', 'Inspirational Motivation (IM)' and 'Idealised Influence (II)'. The construct was consistently reported as being valid (Judge & Piccolo 2004) and was found as being positively related to firm performance in many firms, industries and different organisational settings (Dumdum 2002; Lowe et al 1996). Particularly in fast changing environments (such as the financial sector in Switzerland), the concept of transformational leadership has been found to be very effective (Bass 1985; Bass & Avolio 1997).

Based on the theory of strategic capabilities and the resource-based view of the firm (RBV), transformational leadership could therefore be understood as a complementing element to IT capability.

It was proposed that transformational leadership is positively related to firm performance (measured by financial variables) in firms of the financial sector (Avolio & Howell 1992; Geyer & Steyrer 1998). Furthermore, although transformational leadership was found as being effective in contexts of IT organisations (Ahn & Wkon 2001; Galadima & Gan 2007), firm performance impacts were not captured in these studies. However, Glen (2003) indicated that successful IT leadership might include transformational elements.

Consequently, and based on the statements made in the previous paragraphs, hypothesis 1 proposed that transformational leadership is positively related to firm performance in IT organisations in the Swiss financial sector.

Conclusion 1:

In terms of aspect A) in figure 5-3, the data gathered in this study and the results shown in chapter 4 did not support hypothesis 1. Therefore, in the context given, transformational leadership cannot be understood as a strategic capability that has a direct impact on firm performance.

These findings are contradictory to earlier studies that found a positive direct relationship between transformational leadership and firm performance in different industries, geographical areas and competitive settings (Koene et al 2002; Ling et al 2008; Rowold & Heinitz 2007), and in the banking industry as well (Geyer & Steyrer 1998). Furthermore, despite the fact that, in this study, survey participants had perceived their environment as being rather dynamic (see statements made in section 4.3.2), results of earlier studies that proposed transformational leadership as being particularly effective in such environments (Bass & Avolio 2004; De Hoogh et al 2004) could not be confirmed. The insufficient construct validity illustrated in the next conclusion could be one reason for the insignificant relationship found.

Another reason for the insignificant relationship found could be the effect of the 'Individualised Consideration' (IC) element within transformational leadership in this study. On one hand, IC might contain 'supporting elements' (Yukl 1989, p. 288) which were previously found to have only weak effects on performance (Yukl 2002). On the other hand, this effect might have been fortified by the contextual factor that many lower level-leaders were included in this study (see section 4.4.2); together with indications that IC might be more evident on lower organisational levels (Antonakis et al 2003).

Conclusion 2:

Related to aspect A) in figure 5-3 as well, insufficient construct validity was found for the transformational leadership construct. The results presented in chapter 4 imply that the four dimensions of transformational leadership (first-order factors) could be partly overlapping as claimed by Yukl (1999, pp. 288-9) and as already stated in chapter 2. Notably, the observations made are in line with Thite (1997) who reported 'high correlations between the subscales of transformational leadership' (p. 259) based on quantitative research results of a study on leadership in technical project management. Similarly, intercorrelations between the first-order constructs were reported by Tejada et al (2001). The latter researchers observed such problems when using four independent samples from three different organisational contextual settings in the United States. However, the conclusion is contradictory to recent findings of Antonakis et al (2003) who suggested the first-order factor structure of the latest MLQ (5X) as possessing adequate fits.

As an illustrating example, analysis in section 4.9 revealed the dimension 'Idealised Influence' (II) as being highly overlapping with the other three dimensions of transformational leadership. This finding confirms Yukl's statement that II is 'not clearly differentiated' (1989, p. 289). It could therefore be that the insufficient construct validity can be partially attributed to these missing differentiations.

It might be that important behavioural aspects in transformational leadership are not captured well enough by the MLQ (see Yukl 1999, p. 290). As Yukl states, elements of such as 'inspiring, developing and empowering' could be (partly) missing in the MLQ.

As an example, Yukl mentions aspects such as 'delegating and consulting' (p. 290) as potential missing aspects of empowering. Furthermore, Yukl claims that other behaviours such as e.g. 'task-oriented' elements (p. 290) might be missing in the MLQ.

Based on Yukl's statements, it could therefore be that construct validity of transformational leadership suffered because of an incomplete capturing of the underlying latent phenomenon, which is a problem when using formative constructs (Weiber & Mühlhaus, pp. 203-5) as it was done in this study on the second level (second-order constructs).

However, despite the fact that this study used a single-industry setting and did not find significant influences of environmental dynamism and the organisational level of the leader, it might be that other contextual factors (that were not measured and included in the measurement models of this study) have caused the validity problems illustrated. As mentioned by Antonakis et al (2003), such factors might include various organisational characteristics, demographic variables or external environmental factors.

5.2.2 Transactional leadership and firm performance (hypothesis 2)

Burns (1978) understood transactional leaders as being people who mainly focus on rewarding others for performance and punishing them for non-performance. Bass (1985), as well as Bass and Avolio (1997; 2004), found that transactional leadership often focuses on efficiency and that this style might work well in more stable, lower-risk environments. As two of the elements of transactional leadership, 'Contingent Reward (CR)' and 'Management-By-Exception Active (MBEA)' were found to be complementary to transformational leadership and positively related to different performance measurements in various contexts (Bass & Avolio 2004; Dumdum 2002; Lowe et al 1996), this study conjectured in hypothesis 2 that transactional leadership is positively related to firm performance in IT organisations in the Swiss financial sector.

Conclusion 3:

As to aspect A) in figure 5-3, the data gathered and analysed in this study did not support hypothesis 2. Hence, and similar to the conclusion stated for hypothesis 1, transactional leadership cannot be understood as a strategic capability that directly affects the performance of Swiss financial firms.

This finding is contrary to results of earlier studies (e.g. Rowold & Heinitz 2007) where transactional leadership was found as being positively related to firm performance. The results of the analysis also question whether leadership behaviours that carry transactional characteristics and which were suggested by Glen (2003) as being favourable in IT settings (see section 2.4.4.3), do indeed have a direct impact on the performance of firms.

Similarly, the results are contradictory to findings by Thite (1999) who reported that technical project managers of 111 Australian organisations who showed higher levels of 'Contingent Reward' (CR) and 'Management-By-Exception Active' (MBEA) led projects that were rated by senior managers as being significantly more successful than projects that were led by people who did show lower levels of these behaviours.

Conclusion 4:

Again with reference to aspect A) in figure 5-3, unsatisfactory construct validity was observed for transactional leadership. From the results presented in the previous chapter, it can be inferred that (1) the 'Contingent Reward' (CR) component gained from the variables had a negative effect on transactional leadership and that (2) the variables defining 'Management-By-Exception Active (MBEA)' did not share enough meaning so that no principal components could be extracted from them.

Both observations imply that claims on the ambiguity of CR and MBEA made by Yukl (1999, p. 289) and stated in chapter 2 could be justified as it is possible that the two elements include aspects of transformational leadership and can, therefore, not be precisely separated from the latter. The claim by Yukl is supported as well by prior and later research that found similar problems (Tejada et al 2001; Tepper & Percy 1994; Yammarino et al 1998).

5.2.3 Physical IT infrastructure components and firm performance (hypothesis 3)

Williamson (1975) posited that physical and tangible assets represent resources a firm could use to create competitive advantage. This was later described by the theory of the resource-based view (RBV) of the firm (Wernerfelt 1984; Barney 1991; Grant 1991).

Broadbent and Weill (1997), as well as Bharadwaj (2000), identified physical IT infrastructure as being an essential ingredient of IT capability that firms develop to be successful. More specifically, Duncan (1995) found that superior combinations of physical IT infrastructure components might be enablers of innovation and continuous improvement of products; and Byrd and Turner (2001) suggested that flexible and modular IT infrastructure platforms could serve as a basis for business applications companies use to integrate and automate business processes in order to increase efficiency.

In light of these findings in previous studies, hypothesis 3 put forward that physical IT infrastructure is positively related to firm performance in IT organisations in the Swiss financial sector.

Conclusion 5:

With regard to aspect A) in figure 5-3, this study found a consistent, positive relationship between physical IT infrastructure and firm performance so that hypothesis 3 was supported by the results. This finding supported suggestions made by Weill and Broadbent (1998) who, after reviewing many prior studies on investments into IT infrastructure, proposed that most businesses benefit from establishing such infrastructures, especially those who look at physical IT infrastructure as a strategic asset and thus align investments carefully with business strategies.

Moreover, Weill and Broadbent (1998) confirm that firms in the financial sector with more and superior IT infrastructure tend to have better financial performance on a business unit (BU)-level (p. 59). The aspects of using IT infrastructure as a platform for business application as measured by variable 'I_INFRA1' and as a basis for innovation and continuous improvement of products as measured by 'I_INFRA2' made the largest contributions to explaining IT infrastructure as a construct and thus indirectly confirmed the studies of Byrd and Turner (2001) and Duncan (1995). The results are also consistent with the IT assimilation model developed by Armstrong and Sambamurthy (1999) discussed in chapter 3.

Conclusion 6:

In terms of aspect A) in figure 5-3 but in contrast to the previous conclusion, the adequate degree of IT infrastructure integration as measured by 'I_INFRA5' consistently contributed negatively to the construct. While it is intuitively beneficial for a company to integrate its IT infrastructure in a way that links business units internally and even external stakeholders so that information can be processed seamlessly and fast, the results of this study suggest that the business managers of larger and 'older' Swiss financial firms rate the variable as being high on average (which is consistent with findings by Bradley et al 1993), but do not perceive this aspect as being a key component that can improve the success of the firm.

Contrariwise, the data analysed implies that its effect might be negative. One possible explanation for this could be the high investment costs associated with a high degree of integration (Weill & Broadbent 1998) which, in turn, can lead to lower profits. Furthermore, Bharadwaj (2000) indicated that possible reasons for the negative impact effect might come from inadequate or insufficient choice and combinations of IT infrastructure resources in the specific strategic setting so that part of the problem might also reside in the 'creation' process of the respective capability, particularly in aspect B) in figure 5-3.

5.2.4   Human IT capital and firm performance (hypothesis 4)

Becker (1964) understood the intellectual assets of a company to form a human capital that could be of value for a company. This suggestion laid the foundation for Barney (1991) and Wright et al (1994) who proposed organisational human aspects as being one of the main resource categories of the RBV.

Besides the need to have superior managerial IT skills (Ferratt et al 1992; Mata et al 1995), research posited to focus on technical and business knowledge, as well as interpersonal skills (Lee et al 1995; Rockart et al 1996). Based on this broader understanding of what is needed to build a competitive advantage based on human capital, Bharadwaj (2000) suggested that firms create a human IT capability as measured and analysed in this study.

Inferred from this strategic perspective of human IT capital, hypothesis 4 therefore suggested that human IT capital is positively related to firm performance in IT organisations in the Swiss financial sector. Conclusion 14 in section 5.3 illustrates this controversy in more detail.

Conclusion 7:

With reference to aspect A) in figure 5-3, this study did not find a significant positive and direct relationship between human IT capital and firm performance so that consequently, hypothesis 4 was not supported by the data and analysis. Although the results presented in the previous chapter indicate that this construct should not be completely neglected in the context given, the relationship measured remained too weak, even when considering that the statistical method applied to test the hypothesis tends to underestimate the strengths of relationship between constructs (see chapter 3 for details).

An incomplete or inadequate capturing of the phenomenon of human IT capital could be amongst the reasons why no significant relationship was found. Alternatively, it could be that the value of human IT capital in the context given could only unfold in a different mixture (together with other resources and capabilities) not measured by this study (aspect B in figure 5-3), or through the organisational routines (aspect C in figure 5-3). Conclusion 17 and the last conclusion describe such possible phenomena.

Conclusion 8:

With regard to aspect A) in figure 5-3, the study results indicated that human IT skills other than technical and managerial knowledge and experience might become more important for IT organisations in the Swiss financial industry. The results suggest that the ability to anticipate future business needs as measured by 'I_STAFF7', the ability to integrate business and IT planning processes as captured by 'I_STAFF3', and superior IT project management practice as measured by 'I_STAFF6' explained most of the IT human capital construct. This finding implies that those abilities have become more important for the industry analysed in this study. This conclusion is in line with findings and suggestions of other current research in this field (Gallagher et al 2010; Joseph et al 2010), but must be seen as contradictory to what Mata et al (1995) and Dehning and Stratopoulos (2002) found.

5.2.5 IT-enabled organisational intangibles and firm performance (hypothesis 5)

The intangible capital gained mainly from a firm's organisation was proposed as being the third group of resources that could provide a firm with extraordinary value according to the resource-based view of the firm (Tomer 1987). Based on this, the IT capability construct definition by Bharadwaj (2000) included IT-enabled organisational elements that are intangible in nature, that root in the structure and processes of the firm and typically unfold their value through interaction of people inside and outside of the firm. The role of IT in this is to create and provide an enabling effect where information and data exchange is facilitated and accelerated amongst business units, as well as with suppliers, customers and other stakeholders.

Examples of variables of IT-enabled organisational intangibles therefore include superior abilities to transfer and apply knowledge (see e.g. Chen & Edgington 2005), to respond to environmental changes quickly and adequately (which corresponds to agility and flexibility as used by, for example, Oosterhout et al 2006) and to realise cost and demand synergies by marketing new products and services at little added cost (see e.g. Barczak et al 2007). Using Bharadwaj's concept, hypothesis 5 therefore suggested that IT-enabled organisational intangibles are positively related to firm performance in IT organisations of Swiss financial firms.

Conclusion 9:

Related to aspect A) in the figure 5-3, hypothesis 5 was uniformly supported by the data. The study results suggest that (besides physical IT infrastructure) IT-enabled organisational intangibles represent the second element of IT capability that provides firms with competitive advantage in the context of this study. The results confirm findings of earlier research such as, for example, Brynjolfsson and Hitt (1997), and the finding is in line with Huang (2006) who concluded in their study amongst 155 enterprises from 18 different industries in Taiwan that IT-enabled organisational intangibles had the strongest effect on firm performance out of all elements of IT capability.

Furthermore, and most notably, the results of the analysis revealed that IT-enabled organisational intangibles have the most significant positive relationship with firm performance which, in turn, indirectly confirms Bharadwaj's (2000) view that IT-enabled organisational intangibles might become the most important element of IT capabilities for firms as they may unfold competitive advantage through playing an 'enabling role' (p. 174) by boosting/leveraging other resources and capabilities of the firm, e.g. in the areas of customer orientation/service or product quality.

Conclusion 10:

'I_INTAN2' (flexibility and agility) and well as 'I_INTAN7' (realising synergies from IT usage) explained significant portions of IT-enabled organisational intangibles so that flexible IT systems might indeed favour the realisation of synergies as stated by Bharadwaj (2000, p. 176). The important aspects of IT to provide flexibility/agility, as well as realising synergies from IT usage, were mentioned in literature already more than 15 years ago, as the multiple-case study research by Quinn and Baily (1994) shows. This seems to be a manifestation of an intentional combination of resources and capabilities as illustrated by aspect B) in figure 5-3. Most notably, the finding implies that flexibility/agility is not only an essential IT capability that provides advantages to firms in industries that use IT to improve product design and manufacturing as illustrated by Lei et al (1996) and Sanchez (1995) but, rather, the findings suggest that new financial services creation and marketing might be improved by this capability in the Swiss financial sector.

5.2.6 The moderation effect of leadership (hypothesis 6a)

Past research around strategic human resource capabilities indicated that the managerial knowledge aspect could be complemented by adding elements of transformational and transactional leadership such as giving strategic direction (Luftman & Brier 1999) or fostering the need to change (Roepke et al 2000). In addition, Mithas et al (2004) signified that leadership could possibly enhance the effect of IT capabilities on firm performance.

Consequently, hypothesis 6a in this study proposed that, in the Swiss financial sector, transactional and transformational leadership moderate the relationship between IT capability and firm performance in a way that leadership acts as an enhancer.

Conclusion 11:

In terms of aspect A) in figure 5-3, the study results partially supported hypothesis 6a as the effect of IT-enabled organisational intangibles on firm performance was mainly moderated by transformational leadership and as there was no moderating effect for other elements of IT capability. These findings indirectly confirm earlier research (Luftman & Brier 1999; Mithas et al 2004; Roepke et al 2000) and its indications that such an effect could be observed, as outlined above. However, a moderating effect of transformational leadership has not been measured in a quantitative study previously. In search for explanations how this partial moderating effect could be understood in light of the resource-based view (RBV), literature indicates that this effect found could actually be interpreted as an influencing effect of transformational leadership on the organisational routines labelled as aspect D) in figure 5-3. Conclusion 18 in section 5.3 therefore provides more details on this indication.

5.2.7 The mediating effect of IT capability (hypothesis 6b)

It is understood in social research studies (see e.g. Sosik & Dinger 2007) to be best practice to test whether the effect of human behaviour is mainly or partially transferred through a mediating element. Based on the IT research mentioned in section 5.2.6, this study therefore suggested in hypothesis 6b that IT capability mediates the relationship between transactional and transformational leadership and firm performance in IT organisations in the Swiss financial sector.

Conclusion 12:

With regard to aspect A) in figure 5-3 again, the data and analysis carried out did not support hypothesis 6b. The results were consistent throughout all three data matrices used. From this finding, it can be concluded that no significant portion of the effect of leadership on firm performance is transmitted through IT capability in the context given. Particularly, the indication by Agarwal and Ferratt (2002) that the effect of leadership could potentially unfold through elements of human IT capital could not be confirmed by the results of the analysis done in this study. Furthermore, the results do not indicate that transactional and transformational leadership unfold their value through IT capability in a way similar to how Major et al (2007) describe IT supervision skills do disclose their effect through best (supervisory) practices. As the mediated model was not found to hold, a further consequence of the results of the hypothesis test for 6b is that the moderated model and the mediated do not seem to contradict each other. Moreover, the missing support for hypotheses 1, 2 and 6b (all together) reinforces the previous conclusion.

5.2.8   The effects of the control variables

As discussed in chapter 3, literature suggested that organisational size and age, the degree to which the IT function is outsourced to an external provider, the perceived amount of change in the environment of the firm—as well as the gender of the leader—could potentially influence the hypothesised relationships. The five elements were therefore incorporated into the measurement models. In order to check for potential response bias, the organisational level of the person answering the questionnaire, as well as the point in time when the answer was given, were added as independent variables.

Conclusion 13:

For all but leader gender, the study results suggest that no direct significant influences of these control variables on firm performance were present in the study.

In terms of the insignificant influence of the degree of outsourcing, the finding is largely in line with Lee et al (2004), but contradictory to Lacity and Willcocks (1998) who found different levels of values gained for firms that outsourced minimal proportions and others that prefer to outsource more comprehensively. In terms of the size of the organisations, the findings are consistent with the results of Ravichandran and Lertwongsatien (2005) and Liu et al (2008), neither of whom found an influence of this aspect on the performance of the firms in their samples.

Despite strong indications in literature (see Antonakis et al 2003 for a list of literature) that leadership behaviours vary dependent on the organisational level of the leader, the latter did not show a significant impact on the performance of the firms.

While the impact of leader gender could not be tested due to a lack of female leaders, the results propose that the firm performance ratings given by the business managers of Swiss financial firms were not significantly dependent from the control variables mentioned. Thus, the conclusions presented in this chapter appear to be consistently valid for all firms included in the study, although mainly larger firms that have been in the business for many decades ('older' firms) were represented by the data.

Most notably, the insignificant influence of the degree of IT outsourcing implies that business managers in larger and 'older' Swiss financial firms do not perceive the level of value generated by IT to depend on what party delivers the IT function.

5.3   Supplementary conclusions

From analysing the results, a second set of conclusions emerged. Even though they were not directly related to the hypothesis testings, these conclusions provide additional insights into how and why strategic capabilities might be built in IT organisations of the Swiss financial sector.

Conclusion 14:

Related to aspect B) in figure 5-3, the controversial effect of the degree of integration of IT infrastructure as measured by variable 'I_INFRA5' might be the consequence of unbalanced mixes of resources and capabilities, resulting in decreased flexibility of the infrastructure. As well-illustrated by Broadbent et al (1999, p. 177), finding a good balance between providing an adequate degree of integration and maintaining flexibility and agility of the infrastructure at the same time is difficult. In other words, an integration that is too tight or is not based on open standards might decrease flexibility and agility.

Similar observations were made by Van Oosterhout et al (2006, p. 140) who particularly mentioned that in their study, many companies weakened agility by large investments into integration of infrastructure, not leaving sufficient budget to be invested into other IT initiatives. In addition, the latter authors report on 'rigid IT architectures' that caused severe barriers to agility, even in larger European banks. It might thus be assumed that the shared and integrated IT infrastructure provided sometimes includes restrictions that are incompatible with the needs of business managers in larger and 'older' Swiss financial firms who want to make changes to their business processes. The result of this could impede the creation of competitive advantage.

Conclusion 15:

Again in terms of aspect B) in figure 5-3, the combination of the significance of the variables 'I_INFRA1' (platform for launching business applications), 'I_INFRA2' (basis for innovation and continuous improvement of products), 'I_INTAN2' (flexibility and agility) and 'I_INTAN7' (realising synergies from IT usage) should not be attributed to chance but, rather, should be interpreted as the result of a systematic combination of abilities in order for larger and 'older' firms in the Swiss financial sector to gain a competitive advantage. There is a substantial body of empirical research around the resource-based view of the firm that illustrates how combinations of these variables might produce valuable strategic IT capabilities.

A first example is provided by Weill et al (2002) who point out that investments in IT infrastructure in some industries require a specific focus on agility, so that the buying and implementing of infrastructure is based on the need to innovate new products or services. Secondly, a recent study by Goodhue et al (2009) illustrates the strategies firms use in order to overcome agility challenges. Those strategies include the predominant approaches of providing platforms for launching business applications such as Enterprise Systems (ES) that provide a broad set of functionality to support integrated business processes or using Enterprise Application Integration (EAI) software packages to create missing integration between legacy applications.

It should be noted at this point that there are indications in literature that implementations of Enterprise Systems aimed at increasing efficiency and integration sometimes result in inflexibility as mentioned in the previous conclusion (see e.g. Wright & Snell 1998). In such situations, a stronger focus on increasing flexibility/agility of systems might actually lead to improved value from Enterprise Systems projects (Newell et al 2003).

Other manifestations of successful combinations of the four variables given include firm's efforts to provide a high level of connectivity through the usage of IT, both to its employees and external stakeholders. As Broadbent et al (1999) illustrate, this leads to an increase in flexibility by linking people and systems together in larger firms. Furthermore, improved connectivity can support the innovation process (Sambamurthy et al 2003). Huang et al (2009) even suggest, as a result of their recent study amongst 400 Asian financial services firms, that the institutionalised sharing of information and knowledge (provided that this results from an improved connectivity) might be the indispensable mediator between IT capability and the innovativeness of the companies. Finally, Van Grembergen and Van Belle (1999) make a convincing case for achieving synergies by re-designing business processes with the help of contemporary computer network technology and workflow management software in a larger European financial services company.

Consequently, the work of all these scholars indicates that the specific combination of the four variables mentioned could indeed create competitive advantage in the context given.

Conclusion 16:

With regard to aspect C) in figure 5-3, literature suggests that organisational routines applied in order to create valuable capabilities might, in the context of this study, potentially be formed through a phenomenon such as organisational learning (Argyris & Schön 1978; Kim 1993; Senge 1990). Using the resource-based view of the firm as the underlying strategic theory, Andreu and Ciborra (1996) proposed that the degree to which organisations are capable of learning to combine and use resources and capabilities in specific organisational contexts plays an important role since the learning processes create and recreate organisational routines that are applied in firms; and these processes affect the extent to which resulting capabilities are rare, imitable and difficult to substitute (Barney 1991) and, by that, become valuable.

Andreu and Ciborra (1996) illustrated in what they called 'capability learning loop' that the interlinking of IT and organisational learning is twofold. Firstly, organisational learning can be seen as the process that makes possible the idiosyncratic combination of IT resources and capabilities in order to create valuable capabilities (as expressed by aspect B in the figure presented initially), for example by providing better connectivity and communication (pp. 120-1) as described in the previous conclusion as well.

Secondly, Andreu and Ciborra (1996) describe that IT can foster and improve organisational learning whenever IT triggers learning in specific contexts, for example when a new technology that solved a very specific problem is applied to overcome a larger issue, or when the technology is made available to a greater part of the organisation (p. 119). Specifically, the two authors describe how an existing business application was used to support a strategic change of decentralising commercial responsibility to local branch managers in a European bank (p. 120) when people realised that this application could serve as a foundation to implement the organisational change. The last example is especially notable for the Swiss financial industry since it describes very well how organisational learning can be used to cope with challenges in a dynamic environment.

Consequently, literature indicates that organisational learning might be an indispensable component of creating competitive advantage out of capabilities based on IT as discussed in the context of this study as this ability shapes the development of organisational routines.

Conclusion 17:

Complementary to the prior conclusion and with regard to aspect C) in figure 5-3, literature suggests that, in the context of this study, organisational routines might well be shaped by entrepreneurial abilities (Hayek 1945; Penrose 1959; Schumpeter 1936). In their discussion of the RBV, Godfrey and Gregersen (1999) indicated that entrepreneurial ability might affect the process of creating organisational routines as well.

The two researchers synthesise from previous literature that the entrepreneurial ability of the organisation, understood as the capability to distinguish between resource and capability combinations that provide firms with higher or lower economic rents in the face of competition, might be a phenomenon by which a 'function' (p. 42) is generated in a firm that identifies the most valuable combinations of resources and capabilities in a specific organisational setting.

According to Godfrey and Gregersen (1999), the process of establishing this function includes the acquisition of knowledge about what is successful and what is not in certain business situations, gained through experimentation and learning (see previous conclusion). Sambamurthy et al (2003) propose that the process of gaining competitive advantage from IT might include an element they called 'entrepreneurial alertness', describing it as a firm's ability to be 'constantly on the lookout for previously unnoticed aspects of the market through imagination, trial-and-error experimentation, probing and learning from successes and failures' (p. 242). The researchers added to that the ability to act on promising opportunities in order to generate a competitive advantage, an element they called 'entrepreneurial action' and viewed as a complement to the capability-building process.

Sambamurthy et al (2003) suggest their concept could be well applied to firms in financial services industries because of their great need to be more flexible and faster than competitors.

By applying a similar concept to the above, Hult et al (2004) found that 'entrepreneurial orientation' and 'learning orientation' together improved the performance of larger firms, even independently from the degree of environmental change perceived by respondents. In addition, Hult et al (2004) revealed a positive impact of the entrepreneurial ability on the success of firms' innovation initiatives.

From these indications in literature, it could therefore be concluded that the entrepreneurial ability of IT organisations might indeed influence the creation and usage of organisational routines in Swiss financial firms.

Conclusion 18:

As a supplement to the statements made in the previous conclusions and related to aspect D) in figure 5-3, literature suggests that, in the given context, leadership might in fact be a part of the organisational routines firms employ to create valuable and unique strategic capabilities. This conclusion is in line with the proposal by Barney and Zajac (1994) who found that leadership elements specifically belonged to organisational behaviours. It builds on the critique by Yukl who raised the concern that the transformational leadership theory might not account sufficiently for the influence of leadership behaviour on the 'organisational processes' (1999, p. 288).

A confirming discussion on this aspect was provided by Bennis and Nanus (2003, pp. 176-8) who stated that, not only are 'leaders (...) perpetual learners', but that they 'learn in an organisational context', making the point that successful leaders regard themselves as being part of organisational learning (see previous conclusions) in that they constantly challenge themselves but also provide an environment where people can learn together and from others (for example by providing people with a shared vision) (Senge 1990). In addition, Bennis and Nanus (1999, p. 182) specifically highlighted the importance of fostering innovation by using the term 'innovative learning'.

A very recent study by Gumusluolu and Arzu (2009) suggested that transformational leadership has a positive effect on firm performance through advancing the capability of the organisation to foster innovation. Most contemporary research by Schweitzer and Gudergan (2010) supports this proposition as well. Furthermore, García-Morales et al (2008) in their study found that transformational leadership had a positive impact on organisational learning which, in turn, influenced innovation positively.

Furthermore, and in addition to the prior conclusion, it shall be noted that the comprehensive literature review and analysis by Cogliser and Brigham (2004) revealed that transformational leadership and entrepreneurial behaviour share fundamental ideas, e.g. leaders inspire followers by providing a vision of what should be accomplished and similarly entrepreneurs use a vision to give their business ideas and opportunities a consistent, comprehensible image.

The two researchers stated that the aspect of influencing others is very similar, e.g. leaders might guide creative people towards a common goal and entrepreneurs might persuade others of their own (creative) ideas in order to have them transformed into successful products and services. One could thus argue that, based on Cogliser and Brigham's (2004) work, leadership and entrepreneurial ability might actually co-exist in the context researched in this study. Collectively, the indications in the literature mentioned in the last three paragraphs provide much support for the conclusion made.

Conclusion 19:

Finally, and with regard to aspect E) in figure 5-3, literature suggests that, through organisational routines, a favourable organisational culture might have been established in IT organisations of firms that were observed as being more successful in the Swiss financial industry. The conclusion is drawn from three points of view. Firstly, the work by Schein (2004) indicated that organisational culture, understood as the values, beliefs and assumptions held by members of an organisation, are created and changed by leaders and that leadership therefore unfolds its value through shaping the respective culture that, for instance, makes change possible.

Secondly, some of the characteristics of the manifest indicators of IT capability that were found to have a significant impact on the success of Swiss financial firms, such as capabilities to foster innovation and flexibility, were previously identified by researchers as requiring a specific organisational culture.

Barney (1986) states that 'it is these core values (...) that foster innovativeness and flexibility in firms; when they are linked with management control, they are thought to lead to sustained superior financial performance' (p. 656), assuming that the culture then enables the creation of capabilities that are valuable, inimitable and rare.

Another illustrating example of this aspect is by Xiao (2008) who found a combination of culture together with IT capability extended by 'IT reconfigurability' (which is a set of variables specifically focussing on flexibility/agility of IT) to be positively related with firm performance.

Lastly, a substantial number of research studies on IT capabilities exist which explicitly highlight that firms which aim at optimising their return from IT are more successful if they pay attention to how organisational culture is created and shaped (Claver et al 2001; Doherty & Terry 2009; Harrington & Guimaraes 2005; Xiao 2008).

Inferred from the three points described, it seems very likely that a fruitful 'IT organisational culture' created by leadership improves the value created in IT organisations of successful larger and 'older' Swiss financial firms.

5.4 Implications for managerial practice

The implications for IT and business managers that arise from the study results and the conclusions stated in the previous section are manifold. The resulting contributions to practice are summarised in the following paragraphs.

The researcher suggests that Swiss financial firms put significant effort into the building and further development of specific combinations of strategic IT capabilities as the latter might contribute positively to competitive advantage. Particularly, well-chosen combinations of elements of physical IT infrastructure and IT-enabled organisational intangibles might provide firms with such value.

In terms of physical IT infrastructure, platforms that serve as a basis for innovation and business applications should be advanced. With regard to intangibles, abilities that foster flexibility should be viewed by managers as most important as they favour the realisation of synergies when marketing new financial products and services. In addition, managers might want to carefully shape and monitor the degree of IT infrastructure integration as the effect could be both positive and negative (e.g. on flexibility), dependent on the specific business situation.

The results imply that making the right decisions about what combinations of IT infrastructure should be used needs to be viewed a key task in every IT strategy (Weill 2004) developed and implemented by Swiss financial firms.

IT managers in Swiss financial firms are advised that human IT capital should not be completely neglected, but that some attention should be given to the fostering of skills other than technical and managerial, as these might become more important going forward. Promising factors include abilities that focus more on the co-operation with business units, such as anticipating future needs of the business and well-integrated planning of IT and business activities and project management, as all these elements might play a role in building valuable organisational routines.

The presence of a partial moderating effect of leadership between IT-enabled organisational intangibles and firm performance and the absence of a direct effect of leadership on firm performance implies that business managers might need to focus on fostering intangibles together with transformational leadership as the advancement of transformational leadership on its own might not create value and competitive advantage.

In light of the partial moderating effect of transformational leadership mentioned, the researcher further proposes that managers consider leadership development programmes since literature suggests that such behaviour can actually be learnt and is not just attributed (Parry & Sinha 2005) and that transformational leadership programs can lead to sustainable and positive behavioural changes (Kets de Vries et al 2008). Such training would ideally be designed for a specific context of a firm and aligned with other actions suggested in this section. Most importantly, such programmes should be designed for people on several organisational levels, as the results of this study imply.

In terms of the roles of organisational learning, entrepreneurial ability and organisational culture, the conclusions made in the previous sections show that an isolated view of the individual elements might not be adequate, therefore, the researcher suggests that managers create and apply something that could be called 'a plan for organisational routines' that describes why certain strategic capabilities are important to the firm and how they should be built and improved in that specific organisational setting. Such a plan could help minimize causal ambiguities (described in section 2.2.). As a guiding concept, managers could try to view the aspects mentioned in the 'organisational routines' circle given in figures 5-3 as factors that are tied to the change that must take place when valuable strategic capabilities are created. Based on this, IT managers could make use of insights gained by scholars who have systematically and holistically researched how change can be successfully implemented.

Preparing and implementing such a set of actions for change dependent on the specific business problem would ideally include a selection of elements from advice given by authorities in this research field, e.g. from the plan for leading and implementing change by Kotter (1990; 1996). Potentially, such a plan could be developed in a leadership programme mentioned above in order to involve people early and in order to form 'a powerful, guiding coalition' (Kotter 1996, p. 79) that might be needed to implement the change.

Finally, whilst the insignificant influence of the degree of outsourcing might be confirming and encouraging for firms who already manage to profit from external services, the findings made in this study imply that firms which now rely more on internal IT might actually benefit from outsourcing, given that this is compatible with the business strategy and that the firm has access to knowledge and experience on how outsourcing is done best in the individual situation the firm is facing. This implication is enforced by the fact that different sourcing concepts were included in the sample analysed (see section 4.3.2 and the comments on the distribution of the outsourcing variable).

5.5   Implications for theory

As stated in the introductory chapter, the study made significant contributions to theory. Firstly, by establishing that transformational and transactional leadership were not directly related to firm performance but, rather, that it was mainly transformational leadership which moderated the relationship between IT capability and firm performance it indicates that, in light of the RBV, leadership should be understood as a contributor to the organisational routines as discussed in the previous sections. This finding is significant as it provides new insights into how the organisational routines are created in contexts of IT organisations.

Secondly, the results of this research contribute to the call by Melville et al (2004) who asked for more industry-specific research on IT value generation based on the RBV. More precisely, the specific combinations of capabilities found as being valuable reflect the idiosyncratic needs of this industry with its high IT intensity. Hence, further research in this area might be stimulated by the study results.

Findings by Lin (2007) from a study of 155 US banking firms were confirmed in terms of positive impacts of physical IT infrastructure and IT-enabled organisational intangibles. Although in terms of human IT capital the results found were not in line with findings by Bharadwaj (2000), this study confirms research by Ives and Olson (1981), as well as that of Gallagher et al (2010) and Joseph et al (2010) who all found elements other than managerial IT skills and technical IT skills to be of increasing importance.

Unexpectedly, the results imply that both transactional and transformational leadership might actually suffer from certain construct validity problems and within the theories more focus should be put on organisational elements. Moreover, the MLQ should potentially be extended so that it captures the underlying phenomenon more holistically. Both aspects confirm findings by Yukl (1999). The related findings are particularly relevant since the MLQ is used by many researchers.

As a further contribution to theory, it can be observed that the results provide support for the model on how resources can be turned into valuable capabilities (Grant 1995; see figure 5-3). This implication is important since Grant's model, particularly the element on organisational routines, could serve future IT/IS researchers as a conceptual basis.

Lastly, this research has contributed to methodical knowledge by providing a comprehensive discussion on and an illustrative case about the handling of missing data and a successful application of a Multiple Imputation (MI) approach in the context of an IT management study.

This aspect is significant since most research in this scientific area in the past has not paid a lot of attention to this problem; while the possible negative impact inaccurate methods might have on the outcomes of quantitative studies in the context of IT management may be underestimated by researchers.

5.6   Limitations and suggestions for future research

The limitations from methodological aspects of the study were already presented in chapter 3 and those arising from preparing the results were stated in chapter 4. As the delimitations of the scope of the study (see chapter 1) were determined prior to conducting it, an important constraint only appeared while interpreting the results from chapter 4 in a broader context (see figure 5-3 and statements in section 5.1). Thus, the supplementary conclusions provided in section 5.3 and the respective managerial implications stated in 5.4 are partly based on literature reviews of theoretically related phenomena rather than actual observations and measurements made. Consequently, the according statements made in sections 5.3 and 5.4 should be interpreted and applied with care.

As noted in the initial section of this chapter, the purpose of this study was to find out to what extent IT capability and transformational/transactional leadership as strategic capabilities were related to firm performance. The research did not, therefore, concentrate mainly on how Swiss financial firms create and develop strategic capabilities in their IT organisations, but on what capabilities are more important than others.

Thus, more research around the 'how' in financial sectors of other countries could provide further insights and valuable managerial implications. In addition, the role of human IT capital would need to be clarified further as, contrary to expectation, no significant relationship with firm performance could be observed.

The model by Grant (1995) used in figure 5-3 and the element of 'organisational routines' could serve as a basis in such research work, e.g. in an attempt to find out about possible intervening variables between human IT capital and firm performance.

Finally, scholars and practitioners would both benefit from research undertaken in order to confirm the results of this study as the data used was from 45 companies only, it was cross-sectional, not from a stratified sample and mainly from larger firms that have been in the business for several decades.

5.7   Conclusion

The last chapter of this dissertation stated the conclusions drawn from the results in chapter 4. By comparing the results of the tests per hypothesis with relevant literature, the reader was provided with detailed information that answers the research question. This chapter further provided supplementary conclusions that were inferred from analysing the results and literature in related areas, specifically on phenomena known to influence organisational routines.

By incorporating results and conclusions, implications for managerial practices were provided that could serve managers in the Swiss financial sector in shaping the creation and development of valuable strategic IT capabilities in the future. Based on the results and conclusions, contributions to theory were stated. Finally, this chapter provided information on what limitations arose from analysing and interpreting the results and suggestions for future research were made.

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Appendix A - Definitions

Besides the definitions made explicitly in this study, there are several other key concepts and approaches that are used in this document. In order for the reader to get a clear picture of what these terms shall mean in the context given in this paper, the following paragraphs introduce the most important terms.

Firm resources and capabilities as elements of strategy management are used as defined by Grant (1991). He understood resources as the fundamental corporate basis of what a company owned and used in order to generate economically valuable goods. According to this view, categories of resources include financial, physical, human, technological and organizational resources and reputation. Barney (1991) later on suggested that a resource should be 'valuable, rare, imperfectly imitable and not easy to substitute'. Capabilities are formed out of a mix of a firm's resources and are the source of its competitive advantage (Barney 1991; Grant 1991).

The Multifactor Leadership Questionnaire (MLQ) and its leadership styles (behaviours) are used as defined by Bass and Avolio (2004). According to these scholars, the styles include transactional elements (focusing on goal setting and rewarding behaviour that leads to achieving these objectives), transformational aspects (focusing more on motivating and inspiring subordinates; giving them visions and stimulating them in order to maximize business outcomes) and passive/avoidant behaviours (where leaders tend to not act, do not get involved and do not decide or tend to be too late).

Swiss financial companies are defined as those banks, security dealers, fund management and asset management companies that form the population of this study and that are either a member of the Swiss Bankers Association (http://www.swissbanking.org) and/or are under the supervision of the Swiss Financial Market Supervisory Authority (http://www.finma.ch).

IT organisations are understood as the main/overall functions of a company that provide the firm with (commercial) IT services. The latter might typically include elements such as IT infrastructure, software and communication equipment, IT staff and skills and IT knowledge management.

Appendix B - Questionnaires

The following screen shots provide details on the two web-based questionnaires used.

Survey for business managers

SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

This survey is password protected. You can find the password in the email / letter you received (survey invitation). In case of questions, please contact: Stefan Küenzi, Zurich University of Applied Sciences, +41 77 259 81 62, email: kuen@zhaw.ch

Password [   ]   **Enter**

SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
INTRODUCTION

Thank you for taking the time to participate in this survey.

The following survey is part of a scientific research study conducted by the Zurich University of Applied Sciences in collaboration with the University of Southern Queensland in Australia and the University of Applied Sciences in Business Administration Zurich.

The goal of the study is to measure the potential effect of the quality of an IT organisation within a Swiss Financial company on the company's overall performance. All participants can get access to the results report of this research study which should be available in the first half of 2011.

This survey is designed for business people in a managerial position. Staff of Information Technology organisations are kindly asked to take the separate IT staff survey.

Participants are kindly asked to answer questions about
· the company they work for
· Information Technology resources and capabilities in their organisation
· the performance of their company

PLEASE PRESS THE <NEXT> BUTTON

Quit   **Next**

SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

INTRODUCTION

No further obligations are tied to the participation. The survey consists of 26 questions. It is estimated that it takes about 15-20 minutes to complete.

In case you do not know the answer to a question, please select "Don't know" or leave the answer blank.

Please note that this survey is voluntary and that all participants have the right to withdraw from the project at any time (and take any previously provided information). The data retrieved from this survey will be handled in strict confidentiality. It will be used solely for this study. It will neither be used for any kind of commercial activity nor will it be shared with any third party without having been made completely anonymous. Participants will not be quoted. Sponsoring partners won't get access to the data.

In case you have questions regarding this survey, please contact the responsible project manager:

Name: Stefan Kueenzi, Zurich University of Applied Sciences
eMail: kuen@zhaw.ch
Phone: +41 77 259 81 62

PLEASE NOTE THAT BY PRESSING THE <NEXT> BUTTON AND PARTICIPATING IN THIS SURVEY, YOU CONFIRM THAT YOU HAVE READ THESE TERMS AND THAT YOU ACCEPT THEM.

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

DEMOGRAPHIC QUESTIONS

Please provide us with the following demographic data about your firm:

1. Please select **your company** from the following list. In case your company is not in this list, please select the entry "Other (please specify):" from the list (it is the last entry in the list) and type the name of your company in the box below.

Other (Please Specify):

2. For how many **years** has your company been established (been in business)?
- ☐ up to 5 years
- ☐ > 5 to 10 years
- ☐ > 10 to 20 years
- ☐ > 20 to 50 years
- ☐ more than 50 years
- ☐ Don't know

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

DEMOGRAPHIC QUESTIONS

Please provide us with the following demographic data about your firm:

3. What is the total **number of full-time employees** in your firm?
- ○ up to 25 full-time employees
- ○ 26 to 100 full-time employees
- ○ 101 to 500 full-time employees
- ○ 501-2'500 full-time employees
- ○ more than 2'500 full-time employees
- ○ Don't know

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

DEMOGRAPHIC QUESTIONS

Please provide us with the following demographic data about your your position and your firm:

4. In your business organisation, what is your **position**?
- ○ I am the CEO (=highest ranking officer) of this company.
- ○ I report directly to the CEO.
- ○ The CEO is two hierarchical levels above my position.
- ○ The CEO is three hierarchical levels above my position.
- ○ The CEO is more than three hierarchical levels above my position.
- ○ Don't know

5. Please select the item that **describes the current external environment** of your organisation / firm **the best**.
- ○ Very safe; little threat to survival and well-being of the organisation
- ○ Safe; some threat to survivial and well-being of the organisation
- ○ A bit risky; only a great mistake can mean problems for the organisation
- ○ Risky; a mistake can mean problems for the organisation
- ○ Very risky; a mistake can mean very serious problems for the organisation
- ○ Don't know

    Reset

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

DEMOGRAPHIC QUESTIONS

Please provide us with the following demographic data about your firm:

6. How **frequently** are there **substantial changes** in the external environment of your firm?

- ☐ Almost daily
- ☐ About weekly
- ☐ About monthly
- ☐ Only a few times per year
- ☐ Not at all
- ☐ Don't know

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

QUESTIONS ABOUT THE IT INFRASTRUCTURE OF YOUR FIRM

The following statements are related to the **Information Technology (IT) infrastructure** of your firm. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

7. **Please indicate the extent to which the following aspects are found in your organisation:**

	1= Not at all	2= To a small degree	3= To a medium degree	4= To a large degree	5= To an optimal degree	0= Don't know
Excellent IT infrastructure for launching business applications	☐	☐	☐	☐	☐	☐
IT infrastructure resources that make feasible innovation and continuous improvement of products	☐	☐	☐	☐	☐	☐
Appropriate computer and communication technologies	☐	☐	☐	☐	☐	☐

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
QUESTIONS ABOUT THE IT INFRASTRUCTURE OF YOUR FIRM

The following statements are related to the **Information Technology (IT) infrastructure** of your firm. Please answer all items if possible; based on what you know or how you perceive the situation If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

8. Please indicate the extent to which the following aspects are found in your organisation:

	1= Not at all	2= To a small degree	3= To a medium degree	4= To a large degree	5= To an optimal degree	0= Don't know
Appropriate corporate databases	○	○	○	○	○	○
Appropriate degree of integration of IT infrastructure	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
QUESTIONS ABOUT THE IT STAFF (IT HUMAN RESOURCE) OF YOUR FIRM

The following statements are related to the **Information Technology (IT) staff** (Human Resources) of your firm. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

9. Please indicate the extent to which the following aspects are found in your organisation:

	1= Not at all	2= To a small degree	3= To a medium degree	4= To a large degree	5= To an optimal degree	0= Don't know
Technical skills and experience in the IT organisation	○	○	○	○	○	○
Managerial skills and experience in the IT organisation	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

QUESTIONS ABOUT THE IT STAFF (IT HUMAN RESOURCE) OF YOUR FIRM

The following statements are related to the **Information Technology (IT) staff** (Human Resources) of your firm. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

10. Please indicate the extent to which the following aspects are found in your organisation:

	1= Not at all	2= To a small degree	3= To a medium degree	4= To a large degree	5= To an optimal degree	0= Don't know
Ability of our IT organisation to integrate IT and business planning processes more effectively than competitors	○	○	○	○	○	○
Ability of our IT organisation to develop reliable and cost effective applications that support the business needs of the firm; faster than competition	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

QUESTIONS ABOUT THE IT STAFF (IT HUMAN RESOURCE) OF YOUR FIRM

The following statements are related to the **Information Technology (IT) staff** (Human Resources) of your firm. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

11. Please indicate the extent to which the following aspects are found in your organisation:

	1= Not at all	2= To a small degree	3= To a medium degree	4= To a large degree	5= To an optimal degree	0= Don't know
Ability of our IT organisation to communicate and work with business units more efficiently than competitors	○	○	○	○	○	○
Superior IT project management practice	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

QUESTIONS ABOUT THE IT STAFF (IT HUMAN RESOURCE) OF YOUR FIRM

The following statement is related to the **Information Technology (IT) staff** (Human Resources) of your firm. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

12. Please indicate the extent to which the following aspect is found in your organisation:

	1= Not at all	2= To a small degree	3= To a medium degree	4= To a large degree	5= To an optimal degree	0= Don't know
Ability of our IT organisation to anticipate future business needs of the firm and innovate valuable new product features before competitors	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

QUESTIONS ABOUT IT-ENABLED ORGANISATIONAL INTANGIBLES IN YOUR FIRM

The following statements are related to the **Information Technology (IT) - enabled intangible organisational capabilities** of your firm. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

13. Please indicate the extent to which the following aspects are found in your organisation:

	1= Not at all	2= To a small degree	3= To a medium degree	4= To a large degree	5= To an optimal degree	0= Don't know
IT-enabled ability to transfer and apply knowledge	○	○	○	○	○	○
IT-enabled ability to respond to environmental changes quickly and adequatly	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

QUESTIONS ABOUT IT-ENABLED ORGANISATIONAL INTANGIBLES IN YOUR FIRM

The following statements are related to the **Information Technology (IT) - enabled intangible organisational capabilities** of your firm. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

14. Please indicate the extent to which the following aspects are found in your organisation:

	1= Not at all	2= To a small degree	3= To a medium degree	4= To a large degree	5= To an optimal degree	0= Don't know
IT-enabled excellence in customer relationship management	○	○	○	○	○	○
IT-enabled ability to track and predict changing customer preferences rapidly	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

QUESTIONS ABOUT IT-ENABLED ORGANISATIONAL INTANGIBLES IN YOUR FIRM

The following statements are related to the **Information Technology (IT) - enabled intangible organisational capabilities** of your firm. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

15. Please indicate the extent to which the following aspects are found in your organisation:

	1= Not at all	2= To a small degree	3= To a medium degree	4= To a large degree	5= To an optimal degree	0= Don't know
IT-enabled excellence in sharing of resources and capabilities across organisational divisions	○	○	○	○	○	○
IT-enabled ability to remove physical, spatial and temporal limitations to communication	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
QUESTIONS ABOUT IT-ENABLED ORGANISATIONAL INTANGIBLES IN YOUR FIRM

The following statement is related to the **Information Technology (IT) - enabled intangible organisational capabilities** of your firm. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

16. **Please indicate the extent to which the following aspect is found in your organisation:**

	1= Not at all	2= To a small degree	3= To a medium degree	4= To a large degree	5= To an optimal degree	0= Don't know
IT-enabled ability to realize cost and demand synergies by marketing new products and services at little added cost	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
QUESTIONS ABOUT THE PERFORMANCE OF YOUR FIRM

The following question is about **the market-based performance** of the company you work for. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

17. Please estimate the **percentage of total corporate revenue in this fiscal year's sales** from products / services <u>brought to market in the past 2 years</u>.

○ 0% up to 20%
○ >20% up to 40%
○ >40% up to 60%
○ >60% up to 80%
○ >80%
○ Don't know

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
QUESTIONS ABOUT THE PERFORMANCE OF YOUR FIRM

The following question is about **the market-based performance** of the company you work for. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

18. Please estimate the **percentage of this fiscal year's sales** to be generated by products / services dependent on technology which did <u>not exist or was not commercially feasible five years ago</u>.

- ○ 0% up to 20%
- ○ >20% up to 40%
- ○ >40% up to 60%
- ○ >60% up to 80%
- ○ >80%
- ○ Don't know

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
QUESTIONS ABOUT THE PERFORMANCE OF YOUR FIRM

The following question is about **the market-based performance** of the company you work for. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

19. When launching new products or services, in what percentage of them is your company **first to market**?

- ○ At most in 20% of the cases
- ○ At most in 40% of the cases
- ○ At most in 60% of the cases
- ○ At most in 80% of the cases
- ○ In more than 80% of the cases
- ○ Don't know

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

QUESTIONS ABOUT THE PERFORMANCE OF YOUR FIRM

The following question is about **the market-based performance** of the company you work for. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

20. When launching new products or services, what percentage of them use **cutting edge technology?**

○ At most in 20% of the cases

○ At most in 40% of the cases

○ At most in 60% of the cases

○ At most in 80% of the cases

○ In more than 80% of the cases

○ Don't know

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

QUESTIONS ABOUT THE PERFORMANCE OF YOUR FIRM

The items of this question are about **the operating performance** of the company you work for. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

21. **Please indicate the extent to which you agree or disagree with the following statements:**

	1= Strongly disagree	2= Disagree	3= Undecided	4= Agree	5= Strongly agree	0= Don't know
New information technologies have dramatically increased our productivity	○	○	○	○	○	○
New information technologies have improved our competitive position	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
QUESTIONS ABOUT THE PERFORMANCE OF YOUR FIRM

The items of this question are about **the operating performance** of the company you work for. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

22. Please indicate the extent to which you agree or disagree with the following statements:

	1= Strongly disagree	2= Disagree	3= Undecided	4= Agree	5= Strongly agree	0= Don't know
New information technologies have dramatically increased our sales	○	○	○	○	○	○
New information technologies have dramatically increased our profitability	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
QUESTIONS ABOUT THE PERFORMANCE OF YOUR FIRM

The items of this question are about **the operating performance** of the company you work for. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

23. Please indicate the extent to which you agree or disagree with the following statements:

	1= Strongly disagree	2= Disagree	3= Undecided	4= Agree	5= Strongly agree	0= Don't know
New information technologies have improved our overall performance	○	○	○	○	○	○
Over the past 3 years, our financial performance has been outstanding	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
QUESTIONS ABOUT THE PERFORMANCE OF YOUR FIRM

The items of this question are about **the operating performance** of the company you work for. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

24. Please indicate the extent to which you agree or disagree with the following statements:

	1= Strongly disagree	2= Disagree	3= Undecided	4= Agree	5= Strongly agree	0= Don't know
Over the past 3 years, our financial performance has exceeded our competitors'	○	○	○	○	○	○
Over the past 3 years, our sales growth has been outstanding	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
QUESTIONS ABOUT THE PERFORMANCE OF YOUR FIRM

The items of this question are about **the operating performance** of the company you work for. Please answer all items if possible; based on what you know or how you perceive the situation. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

25. Please indicate the extent to which you agree or disagree with the following statements:

	1= Strongly disagree	2= Disagree	3= Undecided	4= Agree	5= Strongly agree	0= Don't know
Over the past 3 years, we have been more profitable than our competitors	○	○	○	○	○	○
Over the past 3 years, our sales growth has exceeded our competitors'	○	○	○	○	○	○

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

END OF SURVEY

26. In case you would like to participate in the sweepstake and would like to get access to the results of this study, please provide us with your email address (please make sure your address is correct):

THANK YOU AGAIN FOR TAKING THE TIME TO PARTICIPATE IN THIS SURVEY!

Please note that if you have indicated your email address, you will get access to the results of this study (available approximately in the first half of 2011) and you will participate in the sweepstake end of May 2010 (you will be contacted in case you win; legal recourse is excluded).

Please note (again), that
a) this survey is voluntary and that all participants have the right to withdraw from the project at any time (and take any previously provided information).
b) the data retrieved from this survey will be handled strictly confidential. It will be used solely for academic research purposes. It will neither be used for any kind of commercial activity nor will it be shared with any third party without having been made completely anonymous. Participants will not be quoted.

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SURVEY OF MANAGERS IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

END OF SURVEY

In case you have questions or problems related to this survey, please contact the project manager:
Stefan Kueenzi, Zurich University of Applied Sciences
eMail: kuen@zhaw.ch ; Phone: +41 77 259 81 62

In case you have a concern regarding this project that you would like to lodge with somebody other than the project manager, please contact

a) the Secretary of the Human Research Ethics Committee of the University of Southern Queensland (Australia):
eMail: ethics@usq.edu.au ; Phone: +61 7 4631 2690

b) Prof. Dr. Walter Kuhn, Member of the Board of Directors of the University of Applied Sciences for Business Administration Zurich: eMail: walter.kuhn@fh-hwz.ch ; Phone: +41 43 322 26 64

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Survey for IT staff

SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

This survey is password protected. You can find the password in the email / letter you received (survey invitation). In case of questions, please contact: Stefan Küenzi, Zurich University of Applied Sciences, +41 77 259 81 62, email: kuen@zhaw.ch

Password [ ]   **Enter**

SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
INTRODUCTION

Thank you for taking the time to participate in this survey.

The following survey is part of a scientific research study conducted by the Zurich University of Applied Sciences in collaboration with the University of Southern Queensland in Australia and the University of Applied Sciences in Business Administration Zurich.

The goal of the study is to measure the potential effect of the quality of an IT organisation within a Swiss Financial company on the company's overall performance. All participants can get access to the results report of this research study which should be available in the first half of 2011.

This survey is designed for IT staff. Business people in a managerial position are kindly asked to take the separate survey for managers.

Participants are kindly asked to answer questions about
· the company they work for
· the leadership behaviour and style of their immediate superior within the organisation

PLEASE PRESS THE <NEXT> BUTTON

Quit   **Next**

SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

INTRODUCTION

No further obligations are tied to the participation. The survey consists of 17 questions. It is estimated that it takes about 15-20 minutes to complete.

In case you do not know the answer to a question, please select "Don't know" or leave the answer blank.

Please note that this survey is voluntary and that all participants have the right to withdraw from the project at any time (and take any previously provided information). The data retrieved from this survey will be handled in strict confidentiality. It will be used solely for this study. It will neither be used for any kind of commercial activity nor will it be shared with any third party without having been made completely anonymous. Participants will not be quoted. Sponsoring partners won't get access to the data.

In case you have questions regarding this survey, please contact the responsible project manager:
Stefan Kueenzi, Zurich University of Applied Sciences
eMail: kuen@zhaw.ch ; Phone: +41 77 259 81 62

PLEASE NOTE THAT BY PRESSING THE <NEXT> BUTTON AND PARTICIPATING IN THIS SURVEY, YOU CONFIRM THAT YOU HAVE READ THESE TERMS AND THAT YOU ACCEPT THEM.

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SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

DEMOGRAPHIC QUESTIONS

Please provide us with the following demographic data about your firm:

1. Please select **your company** from the following list. In case your company is not in this list, please select the entry "Other (please specify):" from the list (it is the last entry in the list) and type the name of your company in the box below.

[▼]

Other (please specify):

[   ]

2. In your firm, what is the **percentage** of IT services outsourced to an external provider?

- ○ 0% to 20% is outsourced
- ○ > 20% to 40% is outsourced
- ○ > 40% to 60% is outsourced
- ○ > 60% to 80% is outsourced
- ○ more than 80% is outsourced
- ○ Don't know

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SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

DEMOGRAPHIC QUESTIONS

Please provide us with the following demographic data about your firm:

3. In your company's Information Technology (IT) organisation, what is your **position?**

- ○ I am the CIO (=highest ranking IT officer) in this company
- ○ I report directly to the CIO.
- ○ The CIO is two hierarchical levels above my position.
- ○ The CIO is three herarchical levels above my position.
- ○ The CIO is more than three hierarchical levels above my position.
- ○ Don't know

4. My immediate superior is

- ○ Male   ○ Female   ○ Don't know

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SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

QUESTIONS ABOUT THE LEADERSHIP STYLE OF YOUR SUPERIOR

(MLQ Form 5X Short, © 1995 Bruce Avolio and Bernard Bass. All Rights Reserved.
Published by Mind Garden, Inc., www.mindgarden.com)

The items of this question are to describe the leadership style **of your immediate superior/manager** as you perceive it.
Please judge how frequently each statement fits the person you are describing.
Please answer all items if possible. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

5. **The person I am rating...**

	1= Not at all	2= Once in a while	3= Sometimes	4= Fairly often	5= Frequently, if not always	0= Don't know
Provides me with with assistance in exchange for my efforts	○	○	○	○	○	○
Re-examines critical assumptions to questions whether they are appropriate	○	○	○	○	○	○
Fails to interfere until problems become serious	○	○	○	○	○	○
Focuses attention on irregularities, mistakes, exceptions, and deviations from standards	○	○	○	○	○	○

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SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

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Please answer all items if possible. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

6. The person I am rating...

	1= Not at all	2= Once in a while	3= Sometimes	4= Fairly often	5= Frequently, if not always	0= Don't know
Avoids getting involved when important issues arise	○	○	○	○	○	○
Talks about his/her important values and beliefs	○	○	○	○	○	○
Is absent when needed	○	○	○	○	○	○

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SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

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Please judge how frequently each statement fits the person you are describing.
Please answer all items if possible. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

7. The person I am rating...

	1= Not at all	2= Once in a while	3= Sometimes	4= Fairly often	5= Frequently, if not always	0= Don't know
Seeks differing perspectives when solving problems	○	○	○	○	○	○
Talks optimistically about the future	○	○	○	○	○	○
Instills pride in others for being associated with him/her	○	○	○	○	○	○
Discusses in specific terms who is responsible for achieving performance targets	○	○	○	○	○	○

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SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

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Please answer all items if possible. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

8. The person I am rating...

	1= Not at all	2= Once in a while	3= Sometimes	4= Fairly often	5= Frequently, if not always	0= Don't know
Waits for things to go wrong before taking action	○	○	○	○	○	○
Talks enthusiastically about what needs to be accomplished	○	○	○	○	○	○
Specifies the importance of having a strong sense of purpose	○	○	○	○	○	○

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SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

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Please answer all items if possible. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

9. The person I am rating...

	1= Not at all	2= Once in a while	3= Sometimes	4= Fairly often	5= Frequently, if not always	0= Don't know
Spends time teaching and coaching	○	○	○	○	○	○
Makes clear what one can expect to receive when performance goals are achieved	○	○	○	○	○	○
Shows that he/she is a firm believer in "if it ain't broke, don't fix it"	○	○	○	○	○	○
Goes beyond self-interest for the good of the goup	○	○	○	○	○	○

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SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

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Please answer all items if possible. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

10. The person I am rating...

	1= Not at all	2= Once in a while	3= Sometimes	4= Fairly often	5= Frequently, if not always	0= Don't know
Treats me as an individual rather than just as a member of the group	○	○	○	○	○	○
Demonstrates that problems must become chronic before taking action	○	○	○	○	○	○
Acts in ways that builds my respect	○	○	○	○	○	○

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Please answer all items if possible. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

11. The person I am rating...

	1= Not at all	2= Once in a while	3= Sometimes	4= Fairly often	5= Frequently, if not always	0= Don't know
Concentrates his/her full attention on dealing with mistakes, complaints, and failures	○	○	○	○	○	○
Considers the moral and ethical consequences of decisions	○	○	○	○	○	○
Keeps track of all mistakes	○	○	○	○	○	○
Displays a sense of power and confidence	○	○	○	○	○	○

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Please answer all items if possible. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

12. The person I am rating...

	1= Not at all	2= Once in a while	3= Sometimes	4= Fairly often	5= Frequently, if not always	0= Don't know
Articulates a compelling vision of the future	○	○	○	○	○	○
Directs my attention toward failures to meet standards	○	○	○	○	○	○
Avoids making decisions	○	○	○	○	○	○
Considers me as having different needs, abilities, and aspirations from others	○	○	○	○	○	○

Quit   Back   Next

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13. The person I am rating...

	1= Not at all	2= Once in a while	3= Sometimes	4= Fairly often	5= Frequently, if not always	0= Don't know
Gets me to look at problems from many different angles	○	○	○	○	○	○
Helps me to develop my strenghts	○	○	○	○	○	○
Suggests new ways of looking at how to complete assignments	○	○	○	○	○	○
Delays responding to urgent questions	○	○	○	○	○	○

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SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

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Please judge how frequently each statement fits the person you are describing.
Please answer all items if possible. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

14. The person I am rating...

	1= Not at all	2= Once in a while	3= Sometimes	4= Fairly often	5= Frequently, if not always	0= Don't know
Emphasizes the importance of having a collective sense of mission	○	○	○	○	○	○
Expresses satisfaction when I meet expectations	○	○	○	○	○	○
Expresses confidence that goals will be achieved	○	○	○	○	○	○
Is effective in meeting my job-related needs	○	○	○	○	○	○

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Please judge how frequently each statement fits the person you are describing.
Please answer all items if possible. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

15. The person I am rating...

	1= Not at all	2= Once in a while	3= Sometimes	4= Fairly often	5= Frequently, if not always	0= Don't know
Uses methods of leadership that are satisfying	○	○	○	○	○	○
Gets me to do more than I expected to do	○	○	○	○	○	○
Is effective in representing me to higher authority	○	○	○	○	○	○
Works with me in a satisfactory way	○	○	○	○	○	○

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SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

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The items of this question are to describe the leadership style **of your immediate superior/manager** as you perceive it.
Please judge how frequently each statement fits the person you are describing.
Please answer all items if possible. If an item is irrelevant, or if you are unsure or do not know the answer, please select "Don't know" or leave the answer blank.

16. The person I am rating...

	1= Not at all	2= Once in a while	3= Sometimes	4= Fairly often	5= Frequently, if not always	0= Don't know
Heightens my desire to succeed	○	○	○	○	○	○
Is effective in meeting organizational requirements	○	○	○	○	○	○
Increases my willingness to try harder	○	○	○	○	○	○
Leads a group that is effective	○	○	○	○	○	○

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SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)

END OF SURVEY

17. In case you would like to participate in the sweepstake and would like to get access to the results of this study, please provide us with your email address (please make sure your address is correct):

THANK YOU AGAIN FOR TAKING THE TIME TO PARTICIPATE IN THIS SURVEY!

Please note that if you have indicated your email address, you will get access to the results of this study (available approximately in the first half of 2011) and you will participate in the sweepstake end of May 2010 (you will be contacted in case you win; legal recourse is excluded).

Please note (again), that
a) this survey is voluntary and that all participants have the right to withdraw from the project at any time (and take any previously provided information).
b) the data retrieved from this survey will be handled strictly confidential. It will be used solely for academic research purposes. It will neither be used for any kind of commercial activity nor will it be shared with any third party without having been made completely anonymous. Participants will not be quoted.

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SURVEY OF INFORMATION TECHNOLOGY (IT) STAFF IN FIRMS OF THE SWISS FINANCIAL SECTOR (GROUP 4)
END OF SURVEY

In case you have questions regarding this survey, please contact the project manager:
Stefan Kueenzi, Zurich University of Applied Sciences
eMail: kuen@zhaw.ch ; Phone: +41 77 259 81 62

In case you have a concern regarding this project that you would like to lodge with somebody other than the project manager, please contact

a) the Secretary of the Human Research Ethics Committee of the University of Southern Queensland (Australia):
eMail: ethics@usq.edu.au ; Phone: +61 7 4631 2690

b) Prof. Dr. Walter Kuhn, Member of the Board of Directors of the University of Applied Sciences for Business Administration Zurich: eMail: walter.kuhn@fh-hwz.ch ; Phone: +41 43 322 26 64

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Appendix C – Variables used

The following tables provide details on the variables used in the study. Information is listed per survey. Each item per survey can be linked to one particular variable.

Variables from survey for business managers

Construct	First-order	Manifest	Descriptions	Scales					
Control		C_COMP	Company number	Integer number (no meaning)					
		C_YOB	Number of years the firm is in business	1=up to 5 years	2= >5 to 10 years	3= > 10 to 20 years	4 = >20 to 50 years	5= more than 50 years	0 = don't know
		C_EMP	Number of full-time employees	1=up to 25	2= 26 to 100	3= 101 to 500	3= 501 to 2'500	5= more than 2500	0 = don't know
		C_POS1	Position in business organisation	1=CEO	2= direct report to CEO	3= two levels below CEO	4= three levels below CEO	5= more than 3 hierarchical levels below CEO	0 = don't know
		C_ENV1	Description of current environment	1=very safe	2= safe	3= a bit risky	4= risky	5=very risky	0 = don't know
		C_ENV2	Frequency of substantial changes (env)	1=almost daily	2= about weekly	3= about monthly	4= few times per year	5=not at all	0 = don't know
		C_TIME	Time when survey was answered	1=earlier 50%	NA	NA	NA	2=later 50%	NA
IT capability	Physical	I_INFRA1	Excellent IT infrastructure for launching business applications	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
	IT infrastructure	I_INFRA2	IT infrastructure resources that make feasible innovation and continuous improvement of products	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_INFRA3	Appropriate computer and communication technologies	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_INFRA4	Appropriate corporate databases	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_INFRA5	Appropriate degree of integration of IT infrastructure	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
				1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	
	Human IT capital	I_STAFF1	Technical skills and experience in the IT organisation	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_STAFF2	Managerial skills and experience in the IT organisation	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_STAFF3	Ability of our IT organisation to integrate IT and business planning processes more effectively than competitors	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_STAFF4	Ability of our IT organisation to develop reliable and cost effective applications that support the business needs of the firm; faster than competition	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_STAFF5	Ability of our IT organisation to communicate and work with business units more efficiently than competitors	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_STAFF6	Superior IT project management practice	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_STAFF7	Ability of our IT organisation to anticipate future business needs of the firm and innovate valuable new product features before competitors	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
				1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	
	IT-enabled organisational intangibles	I_INTAN1	IT-enabled ability to transfer and apply knowledge	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_INTAN2	IT-enabled ability to respond to environmental changes quickly and adequately	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_INTAN3	IT-enabled excellence in customer relationship management	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_INTAN4	IT-enabled ability to track and predict changing customer preferences rapidly	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_INTAN5	IT-enabled excellence in sharing of resources and capabilities across organisational divisions	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_INTAN6	IT-enabled ability to remove physical, spatial and temporal limitations to communication	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
		I_INTAN7	IT-enabled ability to realize cost and demand synergies by marketing new products and services at little added cost	1= not at all	2= to a small degree	3= to a medium degree	4= to a large degree	5= to an optimal degree	0 = don't know
Firm Performance	Subjective Market Performance	P_SMA1	% of total corporate revenue in this fiscal year's sales from products / services brought to market in the past 2 years	1= 0% to 20%	2= >20% up to 40%	3= >40% up to 60%	4= >60% up to 80%	5= >80%	0 = don't know
		P_SMA2	% of this fiscal year's sales to be generated by products / services dependent on technology which did not exist or was not commercially feasible five years ago	1= 0% to 20%	2= >20% up to 40%	3= >40% up to 60%	4= >60% up to 80%	5= >80%	0 = don't know
		P_SMA3	When launching new products or services, in what percentage of them is your company first to market?	1= at most in 20% of cases	2= at most in 40% of the cases	3= at most in 60% of the cases	4= at most in 80% of the cases	5= In more than 80% of the cases	0 = don't know
		P_SMA4	When launching new products or services, what percentage of them use cutting edge technology?	1= at most in 20% of cases	2= at most in 40% of the cases	3= at most in 60% of the cases	4= at most in 80% of the cases	5= In more than 80% of the cases	0 = don't know
	Subjective Operating Performance	P_SOP1	New information technologies have dramatically increased our productivity	1= strongly disagree	2= disagree	3= undecided	4= agree	5= strongly agree	0 = don't know
		P_SOP2	New information technologies have improved our competitive position	1= strongly disagree	2= disagree	3= undecided	4= agree	5= strongly agree	0 = don't know
		P_SOP3	New information technologies have dramatically increased our sales	1= strongly disagree	2= disagree	3= undecided	4= agree	5= strongly agree	0 = don't know
		P_SOP4	New information technologies have dramatically increased our profitability	1= strongly disagree	2= disagree	3= undecided	4= agree	5= strongly agree	0 = don't know
		P_SOP5	New information technologies have improved our overall performance	1= strongly disagree	2= disagree	3= undecided	4= agree	5= strongly agree	0 = don't know
		P_SOP6	Over the past 3 years, our financial performance has been outstanding	1= strongly disagree	2= disagree	3= undecided	4= agree	5= strongly agree	0 = don't know
		P_SOP7	Over the past 3 years, our financial performance has exceeded our competitors'	1= strongly disagree	2= disagree	3= undecided	4= agree	5= strongly agree	0 = don't know
		P_SOP8	Over the past 3 years, our sales growth has been outstanding	1= strongly disagree	2= disagree	3= undecided	4= agree	5= strongly agree	0 = don't know
		P_SOP9	Over the past 3 years, we have been more profitable than our competitors	1= strongly disagree	2= disagree	3= undecided	4= agree	5= strongly agree	0 = don't know
		P_SOP10	Over the past 3 years, our sales growth has exceeded our competitors'	1= strongly disagree	2= disagree	3= undecided	4= agree	5= strongly agree	0 = don't know

Survey for IT staff

Construct	Second-order	First-order	Manifest	Descriptions	Scales					
Control			C_COMP	Company number	Integer number (no meaning)					
			C_OUTS	% of IT outsourced	1=0% to 20%	2= >20% to 40%	3= >40% to 60%	4= >60% to 80%	5= more than 80%	0= don't know
			C_POS2	Position in IT organisation	1=CIO	2= report to CIO	3= two levels below CIO	4= three levels below CIO	5= more than 3 hierarchical levels below CIO	0= don't know
			C_SUP_G	Gender of superior	1=male	NA	NA	NA	2= female	0= don't know
Leadership	Transactional	Contingent Reward (CR)	L_TC_CR1	Provides me with with assistance in exchange for my efforts	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TC_CR11	Discusses in specific terms who is responsible for achieving performance targets	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TC_CR16	Makes clear what one can expect to receive when performance goals are achieved	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TC_CR35	Expresses satisfaction when I meet expectations	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
		Management-by-Ex (Active)	L_TC_MBEA4	Focuses attention on irregularities, mistakes, exceptions, and deviations from standards	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TC_MBEA22	Concentrates his/her full attention on dealing with mistakes, complaints, and failures	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TC_MBEA24	Keeps track of all mistakes	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TC_MBEA27	Directs my attention toward failures to meet standards	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
	Transformational	Intellectual Stimulation (IS)	L_TF_IS2	Re-examines critical assumptions to questions whether they are appropriate	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IS8	Seeks differing perspectives when solving problems	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IS30	Gets me to look at problems from many different angles	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IS32	Suggests new ways of looking at how to complete assignments	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
		Idealized Influence (II)	L_TF_IIA10	Instills pride in others for being associated with him/her	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IIA18	Goes beyond self-interest for the good of the goup	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IIA21	Acts in ways that builds my respect	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IIA25	Displays a sense of power and confidence	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IIB6	Talks about his/her important values and beliefs	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IIB14	Specifies the importance of having a strong sense of purpose	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IIB23	Considers the moral and ethical consequences of decisions	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IIB34	Emphasizes the importance of having a collective sense of mission	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
		Inspirational motivation (IM)	L_TF_IM9	Talks optimistically about the future	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IM13	Talks enthusiastically about what needs to be accomplished	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IM26	Articulates a compelling vision of the future	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IM36	Expresses confidence that goals will be achieved	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
		Individual Consideration (IC)	L_TF_IC15	Spends time teaching and coaching	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IC19	Treats me as an individual rather than just as a member of the group	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IC29	Considers me as having different needs, abilities, and aspirations from others	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know
			L_TF_IC31	Helps me to develop my strenghts	1= not at all	2= once in a while	3= sometimes	4= fairly often	5= frequently, if not always	0= don't know

Appendix D – Overview of detailed information on data and data analysis procedures

The following table provides an overview of what detailed information on the data and the data analysis procedures is available from the author on request.

Please send an email to the author (stefan@kueenzi.com) and indicate which of the following items you would like to get.

Item	Description
D-11.1	Details of final samples for both surveys
D-11.2	Details of data sets dropped
D-11.3	Details of data sets with high item non-response
D-11.4	Results from the multiple imputation (MI) procedures
D-11.5	Results from the data aggregation process (survey for IT staff)
D-11.6	Results from PC analysis for leadership and firm performance variables
D-11.7	PLS models for hypotheses 1 to 5
D-11.8	Results from validity tests for models 1 and 1b
D-11.9	Results from tests for hypotheses 1 and 1b
D-11.10	PLS models for hypothesis 6a
D-11.11	Results from validity tests for model 2
D-11.12	Bootstrapping results for multi group tests with model 2
D-11.13	Overview of the data and details behind the moderating effect
D-11.14	PLS model for hypothesis 6b
D-11.15	Results from validity tests for model 3
D-11.16	Results from tests for hypothesis 6b