

SUCCESS FACTORS OF CHANGE MANAGEMENT IN THE EUROPEAN STEEL MARKET



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ABSTRACT

Information technology (IT) has become the basis for organisational processes, productivity and competitiveness. IT thus has become one of the top drivers for organisational change. The high rate of IT projects facing budget overruns and staying far behind expectations not only results in billion € in costs for organisations globally each year but can also threaten organisational competitiveness and survival. A major reason for the high failure rate of IT projects is the lack of focus on human aspects of organisational change management. Managing IT projects efficiently and effectively has become of increasing importance for the competitiveness of the European steel industry, which faced a turbulent global downturn in 2009, a highly competitive global market, strong buyer automotive customers and dramatically rising raw material costs.

The research objective is to examine the extent, to which aspects of change management such as knowledge of change management, readiness for change and participative change implementation style have an influence on the success of IT projects and the realisation of resulting organisational changes.

The importance of the European steel industry for the European economy, the impact of economic influences on its competitiveness and the resulting relevance of effective and efficient IT project realisation were presented. The examination of current change management practices in Europe, of existing change management theory and models support the research justification, to quantitatively analyse organisational change management approaches as success factors for IT projects in the European steel industry. Information analysed were obtained from an online questionnaire distributed via the confederation of European Iron and Steel Industries – EUROFER – to its member companies and national organisations. The analysis identified the significant influence of readiness for change on perceived IT Success and the commitment to change. While a meaningful influence of participation and involvement could be found on readiness for change and commitment to change, IT Success and commitment to change were both found to influence the perception of an overall project success nearly equally. With these results, the analysis could present statistical evidence that organisational change approaches could not only positively contribute to the realisation of organisational changes but also on the IT success and the success of the overall project.

Certification of dissertation

CERTIFICATION OF DISSERTATION

I certify that ideas, experimental work, results, analyses and conclusions reported in this dissertation are entirely my own effort, expected where otherwise acknowledged. I also certify that the work is original and has not been previously submitted for any other award, except where otherwise acknowledged.

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Signature of Candidate

.....

Date

ENDORSEMENT

.....

Signature of Supervisor/s

.....

Date

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CHAPTER ONE - INTRODUCTION

1.1 Background

1.1.1 Background to the study

Information technology (IT) has developed as an essential component of most organisations and their daily operations (Laudon & Laudon 2000; McNurlin & Sprague 1998). With its increasing importance for the operability of organisations, IT has also become one of the top drivers for organisational change (Böhm, Vanden Eynde & Pirker 2007; Claßen, Arnold & Papritz 2005; Litzcke & Nolte 2008; Neumann, R. 2007). During the last decades, IT has led to radical changes in the working environment (Bungard 2005a; Laudon & Laudon 2000; Schwalbe 2002). Depending on the size and characteristics of a single IT-project, resulting changes can range from pure automation to reengineering including possibly necessary shifts of work processes and behaviour (Laudon & Laudon 2000). But many studies over the last decades have shown that IT projects often exceed their projected times and budgets, were never completed or even failed to deliver the expected business effects (Froehlich 2002; Keil, Mann & Rai 2000; Peters 2005). The lack of managerial attention to human aspects of change and the resulting lack of employee acceptance is seen as a major reason for the high failure rate and disappointed managerial expectations (Bungard 2005a; Mütter & Feldmüller 2008a; Neumann, R. 2007). IT projects therefore represent a special field of applying change management practices. One way developed to optimise the intersection of technology and human processes and the organizational design are socio-technical systems, which became an effective tool for change (Laudon & Laudon 2000; Trist 1981; Zuboff 1988).

Change management can be understood as the sum of all activities to plan, steer and realise organisational change (Al-Ani & Kaßner 2000; Doppler 2011). But even after decades of research there is no widely accepted definition of change management yet (Claßen, Arnold & Papritz 2005). Change Management is a growing area of study and is still of considerable interest to management and academics as the ability of organisations, to continuously adapt and align to changes is thereby regarded as the future basis for innovation and competitiveness (Dawson 2001; Dobiéy & Wargin 2001; Hall, Rosenthal & Wade 1993; Hamel & Välikangas 2004; Kotter 1996; Leban & Stone 2008).

As a traditional and important backbone of the European economy, the European steel industry was hit hard by the unexpected and sudden market downturn from the end of 2008 onward. As a consequence, there was a growing interest in IT solutions as a means to establish leaner work processes. Limited by tight budgets and cost saving expectations also in the area of IT, the pressure on IT projects as a tool grew to increase project effectiveness and efficiency. A better understanding of human change management factors for improving the change and business success rate of IT projects was sought in order to provide European steel producers and distributors with the necessary basis to establish more effective and efficient ways of implementing IT projects. This in turn was intended to supply the work process efficiency improvements needed whilst remaining within the limited IT budgets (Gilley, Dixon & Gilley 2008; Mütter & Feldmüller 2008a; Parish, Cadwallader & Busch 2008).

With only a handful of studies having quantitatively researched the influence on change management practices on the business success of projects, the practical and theoretical contribution of this research will provide a better understanding of the role of organisational change in IT projects and to help European steel producers master the current volatility of the global steel market by benefiting from more efficient and effective IT projects.

The following sections 1.1.2 and 1.1.3 provide a background understanding of IT projects and the European steel industry while section 1.2 and 1.3 provides background justification for the research, the statement of the research problem and the research questions as well as a brief overview of the methodology employed.

1.1.2 Background to IT projects

IT has become the backbone of business communication, transaction processing and decision-taking (Dutta & Manzoni 1999; Leban & Stone 2008; Moreton & Chester 1997). IT is mainly used in organisations to redesign, streamline and automate organisational processes (Bungard 2005a; Herzig & Jimmieson 2006; Mütter & Feldmüller 2008b). Depending on the size and characteristics of a single IT-project, resulting changes can range from pure automation to reengineering and paradigm shifts (Laudon & Laudon 2000). Incremental changes such as automation are focused on electronically supporting existing processes and ways of working while transitional changes such as reengineering in contrast ask employees to adapt new work processes and behaviour (Dutta & Manzoni 1999; Jones, Jimmieson &

Griffiths 2005; Price & Chahal 2006). Due to the increasing impact of IT projects on organisational structures and processes, many IT projects could also be regarded as transformation or extensive organisational development projects (Claßen, Arnold & Papritz 2005; Jones, Jimmieson & Griffiths 2005; Paré & Jutras 2004). Consequently, independent of their sizes, IT projects have to be regarded as organisational interventions (Markus & Benjamin 1996).

Focusing on the high failure rate of IT projects, it is argued that the success of IT projects is not just limited to hard IT facts such as software licences, programming, technical implementation and processes but that it is also strongly linked to the human aspects of change intrinsic in such IT projects (Bungard 2005a; Cicmil 1999; Neumann, R. 2007). The manner, in which these IT projects are implemented, was found to represent a major factor for achieving business results in IT projects (Markus & Benjamin 1996; Paré & Jutras 2004). Poor or no change management were identified as factors leading to high follow-up and sunk costs for companies if IT projects failed (Böhm, Vanden Eynde & Pirker 2007; Jorgensen, Albrecht & Neus 2007; Uebel, Helmke & Dangelmaier 2004). After insufficient implementations, IT-systems were often found not to have been used in the manner intended. Employees showed resistance by developing parallel manual processes or continued working in existing manual processes even when technical issues were resolved (Jones, Jimmieson & Griffiths 2005; Keen 1981; Laudon & Laudon 2000; Markus & Benjamin 1996).

The lack of managerial attention to these human aspects and the resulting lack of employee acceptance is thus seen as a major reason for the failure and dissatisfaction with so many IT projects (Fernis 2006; Fleck & Howells 2001; James 2005). Change management could therefore be regarded as a potential foothold for a more efficient and effective achievement of change and business results in IT projects (Barret, Grant & Wailes 2006; Kohnke 2005; Kurupparachchi, Mandal & Smith 2002; Legris & Collerette 2006). The relevance of more successful IT projects for the European steel industry is laid out together with an industry portray in the next section.

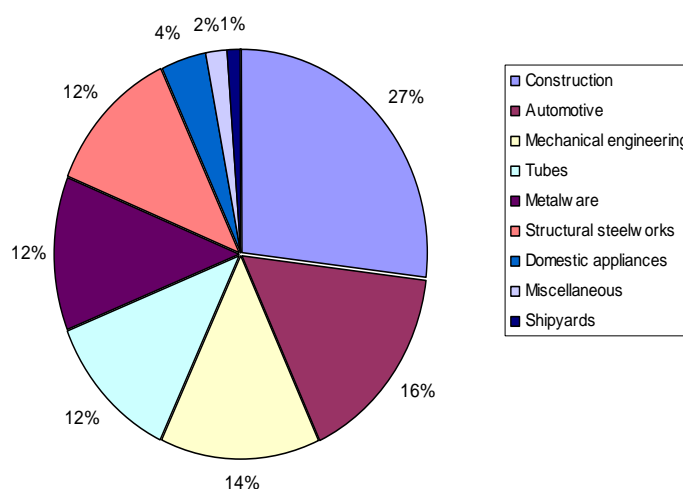
1.1.3 Background to the European steel industry

With more than 1.343 million tonnes of crude steel produced, representing a value of about \$ 730 billion in 2007, steel is one of the most important resources for the global economy and has become a symbol of economic growth and welfare (Stramka 2008 p.1). Shaped by

hundreds of years of history and tradition, the European steel industry is still an important industry in Europe. The European steel producers alone employ 420,000 people, produce 200 Mio tonnes of crude steel per year and generate an annual revenue of € 200 billion. More than 500 steel production sites in 23 EU Member States provide direct and indirect employment and a living for millions of European citizens (Eurofer 2010b). The main consumer sectors of European steel products are the construction and automotive industries and mechanical engineering.

In addition to its importance for the European industry sectors and the European economy in general, the European steel industry also represents an important factor for Europe as a location for research and innovation. In addition to the research and development facilities of the European steel producers more the 82 European research institutes undertake research work in the area of steel production and steel processing (Eurofer 2007).

Figure 1.1 – Sector Shares in total of European Steel Consumption



(Eurofer 2010a p.8)

The European steel producers are organised in the Association of European Iron and Steel Industries – EUROFER, located in Brussels in Belgium. Eurofer combines the interests of 17 national steel producer federations, 42 direct member companies and associated federations and producers from Switzerland and Turkey (Eurofer 2010b).

As a former the driver of the industry revolution, the European steel industry had to constantly change over the years in order to survive and stay competitive. In the 1970s, the industry was suddenly confronted with cooled down economic conditions. The European

steel market was saturated and showed only minor growth until 2000 (Kerkhoff 2007). Coming from the booming 1960s, the results for the steel industry were overcapacities and a ruinous price war. This situation changed the face of the European steel industry significantly. The 1980s and 1990s brought a strong concentration of market player in Europe, a shut down of many smaller mill with 10.000s of employees released and investments in productivity and production and product innovations (Kerkhoff 2008). Until mid 2008, the European steel industry did its best to survive and stay competitive in a strong changing global steel market. On the macroeconomic level, the European steel industry faced a high unionisation, high labour costs, strict employment laws, saturated local markets with only small growth rates, low birth rates and an aging society, a increase focus on environmental protection and a focus on renewal energy sources (Kerkhoff 2011b). Several traditional strong steel consuming industries in Europe either stagnated, such as constructions, or even decreased, such as ship-building. But the European steel industry not only on faced change forces on economic level also on market level. On the sourcing side, the industry faced an oligopoly of three global mining companies controlling >80% of the global market fro iron ore and coal and driving global raw material prices. On the sales side, the steel industry faced a concentration of players in the global automotive market. Furthermore did the increasing globalisation increase the pressure on the European steel industry to ensure global availability of high innovative steel products. The threat of steel substituting products grows due to technical innovation. Key customer industries, such as automotive, are focusing on light and innovative substitutes for steel such as aluminium or carbon fibber to reduce the weight and CO2-emission of cars and trucks. New entrants have continually changed the face of the European steel industry since the beginning of this century. Fro example the Indian steel company Mittal which took over the French Arcelor and became the world leader steel producer or the Indian Tata Steel which took over the Dutch-Anglo Corus Group or Russian steel companies which took over smaller mills in Southern – and Western Europe (Ameling 2007b, 2007a; Nusser 2009). The biggest change driving force of the global steel market also did not leave the European steel industry unaffected, China. Fuelled by strong economic growth in China, global steel production rose significantly over several years until the middle of 2008 (Ameling 2008b p.6). As a result of China's economic growth, global prices of raw materials such as coal, iron ore and alloys increased by a factor of 5 to 6 in only a few years ('Rohstoffpreise explodieren' 2010; Ameling 2008a p.14-15+19). The European steel industry tried hard to transfer these extra costs to customers (Fischer, Smith & Blas 2010). The economical boom of China also led to

a dramatic growth of the Chinese steel industry. In less than 15 year, the Chinese steel production has gain a global market share of approx. 45% of the global market (Kerkhoff 2011a). This growth also changed the global steel export market dramatically. While North America and Europe still controlled >80 of all steel exports in the 1980s, nearly 50% of the global steel exports come from emerging countries especially China these day (Kerkhoff 2007). The strong growth also led to a significant increase of steel imports from to the European market as China built up more production capacity than locally needed (Kerkhoff 2011a). This increase the pressure on prices of European producers (Kerkhoff 2008).

The financial crisis and resulting economic turbulences from end of 2008 on caught the European steel industry not only by surprise in a middle of a boom phase but also with an speed and intensity which was unknown and unexperienced until than. In less than six months the steel prices and sales volumes dropped by >50 percent (Eurometal 2009 p.11; Machale 2009; 2009; Ruch 2009 p.4). Tied by an inflexibly high block of fix costs, long raw material supply chain and contracts, high labour costs and a high level of dependence on expensive raw materials, the European steel companies had problems to adopt the new situation in such a short time and were soon struggling heavily for survival.

Figure 1.2 – Economic and market challenges of the European steel industry



Source: Hetkamp 2011; developed for this study

On the short term, cost saving and restructuring programs were initiated (*Stahlindustrie soll Werke in Europa schließen* 2009; *Stahlproduktion stürzt auf 50-Jahres-Tief* 2009; Bialdiga 2009; Gassmann 2009; Knapp 2008; Ruch 2009). But staying alive and competitive in insecure and unpredictable market conditions, volatile raw material prices and fixed long term delivery contracts with strong customer groups such as the automotive OEMs, ask more of the European steel industry than short term cost-cutting programs (Bialdiga, Fischer & Haake 2010). In order to regain their competitiveness, the European steel industry will have to intensify its focus on those recipes which already helped them before begin of the financial crisis. Those approaches are focus on innovative premium products, engineering excellence, resource efficiency, price before volume sales policy and focus on profitable niche markets.

Since the end of World War II ,the European steel producers have already achieved a per capita productivity increase of 650 percent (*50 Jahre Montanunion und fünf Lehren für die Zukunft* 2009). While the global steel industry faces comparably uniform high raw material costs all over the world, the regional productivity level differs markedly. In the steel producing sector, the highly efficient U.S. mini mills dominate the efficiency rating with 1000 and more tonnes per capita (Mansfield et al. 2002 p.248-249), followed by the West-European steel producers with about 600 – 750 tonnes per capita. In particular in Europe and North America, due to high labour costs, the production and processing of steel has transformed into a high-technology industry, which has been heavily fuelled by the use of modern information technology (Waechter 1997). Further increase of process automation using IT solutions will help European steel producers on the one hand to further increase labour productivity in order compensate labour cost disadvantages compared to lower cost countries (Muetze 2009). On the other hand, will modern IT solutions help European steel producers to produce and flexibly deliver innovative products with premium quality and characteristics using highly efficient supply chain in profitable market niches. Successfully realized information technology could therefore be one key for the European steel industry to successfully master the current economic and market challenges.

1.2 Justification for the research and problem statement

The undertaking of this research has been justified on the basis of

- the identification of a lack of research in quantitative analysis of human change management aspects as footholds for improving the change and business success rates of IT projects,
- the increasing relevance of IT projects and IT-project failure costs for organisations in general
- the economic importance of more efficient and effective IT projects for the struggling European steel producers and distributors as a means to reduce costs and maintain international competitiveness.

IT was found to be one of the top change drivers for organisations while IT projects showed a high failure rate resulting in significant extra costs and in unfulfilled business expectations for organisations (Appleton 1997; Froehlich 2002; Martin, M. H. 1998; Peters 2005; Schwalbe 2002). As only a few research studies could be identified as having delivered quantitative indications of a supportive effect of change management practices on the achievement of business results in general (Claßen & von Kyaw 2010; Grover 1999; Holt et al. 2007; Houben & Frigge 2007; Huat 2004; Inversini 2005; Parish, Cadwallader & Busch 2008; Püttgen & Roe 2005; Taskinen & Smeds 1999; Waldersee & Griffiths 2004; WatsonWyatt 2002), a lack of sufficient research was identified for human change management practices as footholds for achieving change and business success of IT projects in Europe.

There were high expectations for efficiency gains and cost reduction through IT projects by European steel producers. The industry was hard-hit by the downturn of the global steel market from the end of 2008 onwards. As profit margins eroded and large cost blocks were fixed, companies struggled for survival. In order to regain global competitiveness, process cost reduction came into the major focus of many steel managers. IT projects were identified as an essential factor for their success and survival as they represented a means to drive the expected productivity increase and cost reduction. There was a growing pressure for the more efficient and effective realisation of IT projects as IT projects overall had a rather high failure rate, which cost organisations significantly extra time and resources. Change Management was identified as a potential foothold for improving the change and business success delivery of such IT projects and in turn, to meet the productivity gain and cost

reduction expectations inherent in the project. The overall importance of change management for the industry was already highlighted by the German steel federation at an annual branch summit in 2002 (Kruse 2002).

The three theoretical approaches, knowledge of change management, readiness for change and a participative implementation style were selected based on previous significant research, which demonstrated their potential relevance for achieving change and business success (Holt et al. 2007; Siegal 1996; Waldersee & Griffiths 2004). All three approaches can be characterised as targeting human behaviour, were assumed to support the achievement of change and business results of projects by creating a positive change attitude and could be influenced by functional managers (Helmke, Brinker & Wessoly 2008; Koenigswieser & Kropiunik 2005; Siegal 1996; Uebel, Helmke & Dangelmaier 2004). As the human factors of managing changes were neglected for a long time or received minor attention in IT projects, the unique combination of these three approaches and the empirical linking of them to change and business success of IT projects were assumed to be of high relevance for managers confronted with changes resulting from IT projects. Alternative approaches targeting to improve human behaviour and acceptance of IT such as human processes and social-technical systems were not part of this research. In contrast to the above listed three approaches are those approaches more IT driven. A detailed discussion of change management models and the three selected theoretical approaches is provided in Chapter 2.

The study focused on change management in the European steel industry and more specifically addressed the influence of knowledge of change management, employee readiness for change and change management style on the successful realisation of organisational changes resulting from IT projects. To this end, the **research objective** of this study was:

To examine the extent, to which aspects of change management such as knowledge of change management, readiness for change and participative change implementation style, have an influence on the success of IT projects and the realisation of resulting organisational changes.

In addition, the following research questions were formulated to examine the research objective. For each assumed influence factors at first the question was if evidence can be found that a statistically significant and meaningful influence exists. Secondly, the question was to identify the strength of the influence.

- **RQ 1 – Is there a relationship between knowledge of change management and the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 2 – What is the impact of knowledge of change management on the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 3 – Is there a relationship between readiness for change and the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 4 – What is the impact of readiness for change on the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 5 – Is there a relationship between a participative change implementation style and the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 6 – What is the impact of a participative change implementation style on the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 7 – Is there an influence from project- and personal characteristics on the potential relationships of knowledge of change management, readiness for change and a participative change style with the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 8 – What is the impact of project- and personal characteristics on the potential relationships of knowledge of change management, readiness for change and a participative change style with the successful realisation of IT solutions and resulting organisational changes?**

- **RQ 9 – Is there an influence of successful IT solutions and a successful management of related organisational changes on the overall successful realisation of IT projects?**
- **RQ10 – What is the impact of successful IT solutions and a successful management of related organisational changes on the overall successful realisation of IT projects?**

1.3 Brief overview of methodology

A quantitative research method is used, to statistically analyse a large representative database in a structured manner. The objective of a quantitative research method is to quantify and generalise data from a sample by providing explanations and predictions about the phenomena observed (Leedy & Ormrod 2005). In this study, a quantitative research method enabled the analysis of relationships between the three change management approaches selected (manager knowledge of change management, employee readiness for change and change style), the successful realisation of IT solutions, the realisation of resulting organisational changes and the overall IT project success. It furthermore helped to generalise and document the relationships identified between the research variables from the analysed sample of IT projects.

This study used a multi-lingual cross-sectional ex post facto survey approach collecting data from IT projects realised in the period from 2005 - 2010. An ex post facto approach was chosen as the manipulation of certain variables to investigate their potential influence on other variables was not possible (Leedy & Ormrod 2005). As is characteristic for a cross-sectional approach (Leedy & Ormrod 2005) the data of change projects was only collected at a certain time from the respective IT projects.

1.4 Delimitation of scope and key assumptions

The scope of the study is limited to examining the influence of manager knowledge of change management, employee readiness for change and change style on the successful realisation of IT solutions, realising resulting organisational changes and overall IT project success. The reason for the concentration of the study on only three research constructs was

the focus on change management as part of the implementation phase of IT projects (Kezar 2001). As IT projects are regarded by researchers and managers as belonging to the top change drivers, the focus was also on identifying the strengths of the construct influences on three success variables. Finally, the European steel industry was selected as being a manageable, geographically and culturally similar and homogenous target for the study, which was readily accessible via the European steel federation Eurofer.

The methodology itself had some inherent limitations. A quantitative questionnaire lacks the qualitative component to give respondents the ability to offer explanations and clarifications in addition to their answers (Di Pofi 2002; Leedy & Ormrod 2005). The target population was a randomised sample of managers and employees of European steel producers.

1.5 Structure of the study

The literature review chapter is presented to provide the theoretical context for the research questions examined in this study relating to the change management focus of this study (Chapter 2). Great expectations are being placed on IT projects by the European steel industry as a way to establish more effective and efficient work processes. A focus on leaner processes was needed for European steel producers and distributors in order to overcome the global market crisis, which started at the end of 2008 and to keep their competitiveness on the global market. More transparency of factor relationships between change approaches, IT solutions, handling organisational changes and overall success of IT projects was the area of research identified facilitating any improvements in efficiency and effectiveness needed.

The literature review identified a lack of quantitative research on drivers for business success of change management in general. There is also a specific lack of quantitative research on manager knowledge of change management, employee readiness for change and change style with regard to its impact on the successful realisation of IT solutions, organisational changes and overall IT projects success. A detailed discussion of these factors has been included in Chapter 2.

Chapter 3 provides details on the research methodology used to investigate the research questions. A quantitative survey of all European steel producers was undertaken to gain an understanding of change approaches and success criteria. Analysis of the data from the survey has been provided in Chapter 5, uncovering the relationships of the three specific

change management research constructs manager knowledge of change management, employee readiness for change, change style and the defined moderation variables on the successful realisation of IT solutions, organisational changes and the overall IT project success.

Chapter 6 closes the study with discussions and conclusions relative to the findings and also identifies directions of future research.

1.6 Summary

This chapter introduces the vital roles that IT projects and the successful handling of change plays for European steel producers. While IT projects belong to the top change drivers, it was shown that they also represent a special field of application for change management.

The research questions explored in this study were introduced in this chapter along with a brief overview of the research methodology. The major objective of the research was to investigate the relationship between the three change management factors in focus (knowledge of change management, readiness for change and change style) and the successful realisation of IT projects and related organisational changes. The value of this research should be found in bringing about a better and more transparent understanding of human factors, their relationships and their influence on more successfully achieving organisational changes and business results of IT projects. In this way, the research is expected to help managers to realise the valuable contribution of IT projects more efficiently and effectively.

The potential limitations inherent in the study were briefly reviewed and finally the structure of the research and a chapter outline presented. To provide the theoretical background to this study, the appropriate literature is reviewed in the next chapters.

CHAPTER TWO - LITERATURE REVIEW: CHANGE MANAGEMENT

2.1 Introduction

Facing and reacting to changing environments is not a new phenomenon. In his evolution theory, Charles Darwin pointed out the natural process of adaptation and mutation of species in order to survive in changing environments (Doppler 2011; Graetz & Smith 2010; Mütter & Feldmüller 2008a). Since ancient times, organisations and people regularly faced and dealt with serious political, technological, legal and social changes. The current difference is the speed and frequency of change, which is constantly escalating, leaving organisations and people struggling to keep pace (Doppler 2011; Rohe 1999; Spalink 1999). Globalisation, new approaches in logistics, information technology and communication, reduced cycle times, decreasing global trade barriers, increasing numbers of scientific research, political and social changes all result in an increasing rate of change (Leban & Stone 2008; Mohr et al. 2010; Neumann, R. 2007; Todnem 2005). Change thereby is no longer to be regarded as a limited phenomenon between two periods of equilibrium but rather a constantly increasing dynamic drive. (Boos, Heitger & Hummer 2004).

Even though management of change is not a new challenge (Hosking & Anderson 1992), its scope and frequency result in a growing importance of the organisational ability to adapt. The ability to continuously and successfully adapt to these changes is regarded as the basis for long-term competitiveness (Al-Ani & Gattermeyer 2001b; Hamel & Välikangas 2003; Krueger 2009; Reiß, von Rosenstiel & Lanz 1997). The ability to manage change has thus become an essential managerial skill and has developed into a success factor for organisations (Ashurst & Hodges 2010; Jordan; Whelan-Berry & Somerville 2010).

Change management as a research discipline has its roots in organisational theory with early change-related research work beginning at the end 1940s until the mid 1950s (Armenakis, Harris & Mossholder 1993; Bamford & Forrester 2003; Dawson 2001). In particular Lewin's work has had a long-lasting influence on change management research until today (Dawson 2001). Change Management is still of considerable interest to management and academics, and due to the failing focus on people in many business process reengineering projects (Al-Ani & Kaßner 2000; Grover 1999; Hall, Rosenthal & Wade 1993), it is expected to further increase in importance in the coming decades (Kotter 1996; Kutasi, Lassalle & El Ganady

2008). The large share of disappointing results of many change initiatives will also contribute to this factor (Beer & Nohria 2000; Herzig & Jimmieson 2006; Kotter 2008).

Following the identification and short explanation of the research problem, it is the overall purpose of this chapter to build the theoretical foundation for this research by reviewing relevant literature, identifying the necessity for research and, in addition, by developing and discussing the research framework. This includes a review of characteristics and shortcomings of current change management practices in Europe and of the special application of organisational change resulting from IT projects. The lack of emphasis on human factors in organisational change resulting from IT projects in Europe is concluded from this practical review. It is followed by an overview of literature displaying the effects of organisational change on individuals and organisations. As models of organisational change can be regarded as theoretical guidelines for change management practice, selected theoretical change management models and frameworks are critically reviewed with regard to their applicability for the identified challenges and shortcomings. The lack of emphasis on human factors of organisational change is also concluded from this theoretical review of currently used change management models. Finally the conceptual research framework to investigate the relationship between the three human change management factors in focus (knowledge of change management, readiness for change and change style) and the successful realisation of IT projects as well as related organisational changes is developed and critically discussed. The research results of European, IT-project related organisational changes should help to close the identified theoretical and practical lack of focus on the human factor of current change management models and approaches.

2.2 Current status and shortcomings of change management practice in European IT projects

2.2.1 Current status and shortcomings of change management practice in Europe

While the management of change has become a highly valued managerial skill in today's business world, it is the purpose of this section to provide an overview of change management practices in Europe and to identify commonly shared patterns and shortcomings. To this end, 14 recent studies on the status of change management could be identified in the internet and were summarised in the following table.

Chapter two - Literature review: change management

Table 2.1– Overview of studies with regard to the status of change management in Europe

Author/ Titel/ Ref	Key Findings
<p>CMI Study (2003)</p> <p>(Vahs 2003)</p> <p>N = 178</p> <p>Survey of mainly medium sized companies from the Stuttgart region</p>	<p>The majority of participants regarded the business environment as difficult. Top drivers for change were reorganisation, new strategies and IT. Timelines and project budgets were exceeded. Change style was mainly participative. Training and participation, open communication & information, managerial support, clear goals and timelines and individual motivation for change were identified as success factors</p>
<p>Coverdale Study (2004)</p> <p>(Coverdale 2004)</p> <p>N = 68</p> <p>Telephone survey with 68 German companies</p>	<p>It was found that nearly all companies run several change programmes parallel in an uncoordinated way. This negatively influenced working climate and motivation of employees and managers. A lack of change management skills could be identified. Furthermore it was identified that more employee focus was needed on reasons for and the goals of change, which should be shared and accepted, on emotions and resistance as important indicators for managing change and on involvement of employees and managers affected</p>
<p>Akademie Deutscher Genossenschaftsbanken (2004)</p> <p>(Drahtschmied 2004)</p> <p>N = 80</p> <p>Survey of 80 German Mutual Saving Banks</p>	<p>It was found that the majority of change projects were delivered on time and in budget. Less than 2/3 delivered satisfactory results. 1/3 of all change projects are regarded to be a failure. Informing and involving employees was found to be of high relevance. Main problems for change implementation were seen in negative attitudes of employees towards change, in a lack of consistent project implementation, in over-asked project teams and employees, in change barriers, in long change durations, in a lack of employee commitment and in involving employees were found to be one major driver for change project success.</p>
<p>CapGemini (2005)</p> <p>(Claßen, Arnold & Papritz 2005)</p> <p>N = 114</p> <p>Survey of 1900 medium and large-sized companies in Germany, Austria and Switzerland</p>	<p>Change management was found to be of increasing importance in the future. Restructuring, cost saving and IT innovations were the main drivers for change. Managers were found to use change management due to positive personal experiences. Participation was identified to further increase in its importance for successful change management in the future. A negative view of change was identified on employee and middle managers level. A lack of planning and goal congruence was regarded as the main problem for implementing change, followed by lacks in support, change competencies and change management activities in general. Deficits in change commitment, support and goal communication were found to result in a significant decrease in work productivity.</p>
<p>Projekt Management Partner (2005)</p> <p>(Poepl & Kraus 2005)</p> <p>N = 120</p> <p>Qualitative study of 120 German medium size companies</p>	<p>It was found that restructuring was the main driver for change. Sharing and winning employees for change goals were considered to be of high importance. Change project management was deemed to significantly reduce cost of change. On time delivery of project results was found to be supported by project transparency and communication.</p>
<p>C4 Consulting (2007)</p> <p>(Houben & Frigge 2007)</p> <p>A survey of all German companies with > 1000 employees</p>	<p>A generally low motivation level of employees for change was found. The majority of employees resisted change. Major problems for change management detected were a lack of reasons and perspective for change at employee level, frequently low focus on the human side of change, a lack of management support, a lack of goal congruency between change initiatives/ activities and a lack of managerial skills when handling the human side of change. A combination of hard and soft aspects of change management and the support/ commitment of high and middle management were identified as the basis for change success while communication alone was not regarded to be enough to motivate employees for change. A significant relationship between successful change management and business success of projects could be identified.</p>
<p>Bearing Point (2007)</p> <p>(Böhm, Vanden Eynde &</p>	<p>It was found that main drivers for change projects were reorganisation/ restructuring and IT projects. Change management was regarded to have a positive influence on the result of a project. Less than the half the surveyed managers used change management, mainly because of earlier positive experience. Major problems for change management detected were informing</p>

Chapter two - Literature review: change management

<p>Pirker (2007)</p> <p>N = 45</p> <p>Survey of 180 large German enterprises</p>	<p>and involving employees too late, a lack of goal setting and general communication, a lack of change acceptance through employees, continuous restructuring/ change, a lack of managerial change commitment, a lack of goal congruency and a commonly shared view. The study concluded that deficits in change management lead to resistance, decreasing motivation and an increase in fluctuation quota.</p>
<p>IBM (2007)</p> <p>(Jorgensen, Albrecht & Neus 2007)</p> <p>N = 220</p> <p>Survey of 140 companies in Germany, Austria and Switzerland</p>	<p>It was found that less than half of all projects was considered to be successful. A significant number of participants saw a lack of internal change management competencies. Major problems for change management detected were a lack of mental change in employees, a lack of commitment and underestimated complexity, a lack of transparency and communication, and a lack of motivation. Management support, early and clear communication and employee involvement were found to be important aspects for change. A high level of change readiness was found in the majority of successful projects. Project problems due to change management deficits were found to have a significant influence on budget overruns.</p>
<p>University of Marbor for the presidency of the EU of Slovenia (2008)</p> <p>(Pagon, Bamutai & Bizjak 2008)</p> <p>N = 284</p> <p>Survey of Public Administration managers of 28 EU states</p>	<p>Important competencies for successful change management were found to be cultural skills, emotional intelligence, people skills and skills to understand, innovate and change organizations</p>
<p>University of Applied Science Braunschweig/Wolfsbüttel (2009)</p> <p>(Michalke & Henke 2009)</p> <p>N = 40</p> <p>Survey of 40 German managers</p>	<p>It was found that change management is widely expected to further rise in importance in the future. The majority of change projects had a focus on cost reduction, restructuring etc. Major change problems were found to result from a lack of change commitment, a lack of goal congruency and time pressure for change agents, which make high demands on the resources available. The study concluded that managers mainly do not see/ recognise main change barriers on operational/ employee level and that more focus is needed on the emotional and logical aspects behind change.</p>
<p>KPMG (2009)</p> <p>(Reinmann, Dinges & Krüger 2009)</p> <p>N = 100</p> <p>Analysis of 100 top change projects of 98 of the German Fortune100 enterprises.</p>	<p>It was found that restructuring and reorganisation are the top drivers for change. While the majority of the projects achieved set goals, most participants saw an increasing importance of change management in the future. In many projects change management was not part of project management while change management competencies was found to have a medium effect on keeping within the project budget. While hard factors of change management were found to be well known and used, a greater focus on conflict management and avoiding negative consequences of change management was identified to further increase project success.</p>
<p>Boston Consulting Group (2009)</p> <p>(ProCedera 2010)</p> <p>N = 1000</p> <p>Survey of 1000 managers, 40 expert interviews and 100 project cases from Germany, Austria and Switzerland</p>	<p>It was found that change management was one of the top10 soft skill competencies for companies. The future importance of change management is expected to further increase. Process optimisation, restructuring and cost reduction were identified as the main drivers for change projects. Employee motivation for change was found that have a significant influence on achieving business success.</p>
<p>PA Consulting / GFO (2009)</p> <p>(ProCedera 2010)</p> <p>N = 121</p> <p>Survey of 121 companies of which 60 percent located in Germany</p>	<p>Found that process optimisation, restructuring and cost reduction were the main drivers for change projects. IT projects were number 4 change driver. Change management competencies to create change readiness were not systematically used. The use of systematic change management was found to be based on individual experience. A major area for improvement found was the enhancement of skills and competencies to create change readiness in employees and managers. Furthermore employees should be more involved and carrying responsibility for the realisation of change.</p>

Chapter two - Literature review: change management

<p>CapGemini Consulting (2010)</p> <p>(Claßen & von Kyaw 2010)</p> <p>N = 116</p> <p>Survey of 116 German, Austrian and Swiss enterprises</p>	<p>It was found that the nearly all participants regarded change management to be of increasing importance in the future. Only 2/3 of the projects were regarded as successful. Cost reduction and reorganisation were major change drivers. Uncoordinated, parallel change projects, a low level of change readiness, a lack of managerial change management competences were all found to be a cause for unsatisfactory results. In contrast, change commitment and people focus were found significantly to be of increasing relevance.</p> <p>Furthermore, a decreasing motivation for change management could already be found at senior management level. With a low acceptance and commitment level for change, change resistance and tiredness already seem to start at a senior level. Top problems of change management were identified in a lack of creation of change acceptance and readiness, a lack of focus on emotions linked to changes happening and a lack of analysis and understanding of the given situation. Deficits in change management were found to have a significant effect on productivity and fluctuation. It was concluded that successful change management is a combination of hard and soft, emotional factors.</p>
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Source: Hetkamp 2011; developed for this study

Even though all studies were not conducted using the same research methodology, the same research population or the same research focus, several tendencies and patterns can be found, which provide some indications about the current change management status in Europe.

Observation No 1 – The interest in change management in Germany

These studies on change management were mainly conducted in Germany or in the German speaking regions (including Austria and Switzerland). Furthermore it can be seen that the majority of change management studies were undertaken by consulting firms with the statistical support of local universities. Some authors criticise those studies as they would mainly only show a problematic picture of change management practices and could therefore also be seen as a pseudo scientific sales argument for consulting companies (Kuehl 2011).

Observation No 2 – High relevance of change management

A common consensus in all studies can be found in that the majority of managers regard change management as being an important and necessary managerial competence for organisations, which will further increase in importance in the future. Two studies also reflected that many managers agreed that change is a constant factor in today's business world.

Observation No 3 – High rates and costs of failing change management

With a wide range of change projects being perceived as being mainly successful, between 20 percent - 80 percent, and a range of change projects, which clearly failed, between 16 percent - 30 percent, the recent status of change management in Europe seems to be more successful but still in line with international publications and findings on high change failure rates (Armenakis & Harris 2001 p. 169; Balogun & Hope Hailey 2004 p.1; Beer & Nohria 2000 p.1 ; Herzig & Jimmieson 2006 p.628; Leban & Stone 2008 p.55; Meaney & Pung

2008; Siegal 1996 p.54-55; Waldersee & Griffiths 2004 p.424; Whelan-Berry & Somerville 2010 p.176).

Four studies analysed the consequences of change management deficits and concluded that due to significant business consequences and follow up costs for organisations such as e.g. a potential productivity decrease of >20 percent, a significant rise in fluctuation rates or the identified link between change management deficits and projects budget overruns, change projects should be regarded and managed as a business risk (Böhm, Vanden Eynde & Pirker 2007; Claßen, Arnold & Papritz 2005; Claßen & von Kyaw 2010; Houben & Frigge 2007; Jorgensen, Albrecht & Neus 2007; Vahs 2003). On the other hand some studies could indicate that successful change management could have a positive influence on keeping within project budgets and reaching the business targets of projects (Houben & Frigge 2007; ProCedera 2010; Reinmann, Dinges & Krüger 2009; Vahs 2003).

The findings point to the economic importance and benefit for organisations to handle and manage organisational change more successfully.

Observation No 4 – Change Management a matter of individual experience

Restructuring, reorganisation and cost reduction were found to be the primary reason for organisations to use change management. While these three aspects were found to be of constant top priority over the last 5 years, other aspects such as customer orientation, growth strategies or IT innovation were found to fluctuate in their importance over the period (Claßen & von Kyaw 2010).

In contrast to some studies, which found that change management competencies improved and that change management had been established as a fixed component of main organisational training schedules, the majority of studies showed that change management is not consistently used or even not used at all. It was even shown that the use of change management and the way it is carried out is mainly based on personal beliefs and the experiences of managers. These findings go hand in hand with the general lack of change management competencies in many organisations. Recruiting external expertise to overcome this internal vacuum seems to offer no alternative. The academy of German mutual saving banks concluded that although assistance was judged to be very helpful, no significant effect from the use of change management consultants could be found on the success of change

projects (Drahtschmied 2004). Many managers would therefore prefer to gain more personal change management experience and would prefer a more project management oriented standardised change management approach in order to handle the complexity of managing organisational changes better.

The findings point to a need to improve and sustain managerial change management competencies and a need to establish a standard change implementation methodology for any project initiating organisational changes.

Observation No 5 – Support for change is decreasing

The CapGemini study 2005 pointed out that organisational change is perceived to be hierarchically distributed like a pyramid with the largest effects on operational levels whereas the influence on organisational change and the way it is achieved is regarded as an inverted pyramid with the largest influence at the top management level (Claßen, Arnold & Papritz 2005 p.31). The CMI study included partially contradicting findings showing that lower and middle management had the most influence on change while top management was found to only have small influencing ability (Vahs 2003).

While some studies pointed out that long and continuous change processes had been negatively perceived by employees and managers, the majority of studies identified the negative influence of parallel and badly coordinated change projects, frequently with conflicting goals and high time pressure. All these aspects would have a negative influence on the acceptance, motivation and willingness to support change attempts. The CapGemini study 2010 pointed to the phenomena that there is not only a decreasing support for change over time but also across levels of hierarchy. In the last 5 years not only has the support for change decreased on an operational level but also on middle and senior management levels (Claßen & von Kyaw 2010). Other studies reported that 40 – 50 percent of the employees would be against change and only 25 percent or less would still welcome it (Claßen, Arnold & Papritz 2005 p.34; Houben & Frigge 2007 p.5).

These findings indicate a potential mismatch between the frequency and pace of change, the way change is approached and implemented and the local cultures and change orientation in organisations. It seems that employees and managers are not against change in principal, but

tired and de-motivated by the way and pace, in which change currently occurs in their organisations.

Observation 6 – Major shortcomings of current change management practice

Common change management deficits named in most studies were the lack of employee readiness, acceptance, involvement and commitment to change, the lack of managerial support and commitment to change, a lack of transparency with regard to change and the lack in focus on the human, emotional side of managing organisational change. While a lack of budget or resources were hardly mentioned, several studies pointed out a lack of managerial change competencies and gave indications that a stronger focus should be placed on such themes for greater success in the future. (Drahtschmied 2004; Reinmann, Dinges & Krüger 2009; Vahs 2003).

Aspects, which were only mentioned in a few studies, were the absence of conducting a complete situational analysis before setting up appropriate change methods, the fact that in times of trouble change project resources and budgets are always the first to be cut and also a significant relationship was identified between monetary incentives and the achievement of change project goals and results (Claßen & von Kyaw 2010; Jorgensen, Albrecht & Neus 2007; Michalke & Henke 2009).

Several authors concluded these findings by stating that successful change management is a combination of hard and soft factors. While the hard factors seem mostly to be managed quite well by organisations, there is a clear deficit and lack of focus and competence in handling the soft side of organisational change (Claßen & von Kyaw 2010; Houben & Frigge 2007; Vahs 2003, 2010).

2.2.2 IT Projects and change-management

Developments in information technology and telecommunications (IT) have been a constant driver for change (Housel & Skopec 2001; Schwarz 2000). Since the 1950s, IT has developed into a fundamental part of today's business world (Doujak, Endres & Schubert 2004; Laudon & Laudon 2000; McNurlin & Sprague 1998; Schwalbe 2002). As such, IT is regarded as a competitive factor for organisations and is counted among the main drivers for organisational change (Dobiéy & Wargin 2001; Litzcke & Nolte 2008 ; Neumann, R. 2007). The influence of IT as a driver for change can not only be traced by causing significant

changes to whole branches of industry such as the retail sector, the post office and telecommunications sector, the finance sector or the entertainment sector but also in fundamental changes in work-environments (Bungard 2005a; Evans & Wurster 1999; Laudon & Laudon 2000; Porter 2002; Schwarz 2000). The way administrations and offices work has significantly changed with the increasing use of information technology (Dobiéy & Wargin 2001; Robbins et al. 2001). The changing influence of IT is thereby said to continue. As more and more is computerised, IT will continue to further change our private and working environment (Doppler 2011)

For years there has been an ongoing discussion about whether IT itself can be regarded as a competitive factor for organisations. On the one hand, several authors argue that due to new inventions in information technology, pioneering companies have been able to change and dramatically influence business models and structures of entire branches of industry. IT should therefore be regarded as a factor for organisational competitiveness (Bungard 2005a; Doujak, Endres & Schubert 2004; McNisch 2001). On the other hand, authors point to research studies, which could not identify a significant relationship between expenditures in IT and the business success of organisations. Even though IT has undoubtedly helped to initiate such gigantic change, the adaptation and use of information technology is said to be shaped by non-technical factors such as strategy or process changes (Haiss 2001; Kempis & Ringbeck 1998; Scheer 1998; Schwarz 2000; Yates & Van Maanen 2001). An alternative view regards the competitive advantage of IT as resulting from the ability to constantly deliver solutions to generate temporary business advantages (Ashurst & Hodges 2010).

In organisational practice, information technology is mainly used in ways to raise process speed, efficiency and effectiveness. These process improvements help a company to reduce costs, raise operational performance and act as a vehicle for organisations to align with environmental changes (Ashurst & Hodges 2010; Mütter & Feldmüller 2008a; Schwarz 2000). Depending on the size and characteristics of IT, its effect on processes can range from pure automation to reengineering and transformation (Laudon & Laudon 2000). While the automation of existing processes only has a limited effect on the way work is done, transitional changes such as reengineering projects ask employees and organisations to adapt and learn completely new work processes (Dutta & Manzoni 1999; Jones, Jimmieson & Griffiths 2005; Price & Chahal 2006). Some authors even regard performance improvement as the overall objective of IT (McNurlin & Sprague 1998). In order to achieve the

performance and cost improvements targeted, processes and ways, in which people work have to be adapted, changed and relearned in response to the introduction of information technology. Without such a combined alignment of information technology, work process, organisational structures and skills, organisations run the risk that IT projects can decrease rather than increase organisational performance (Doujak, Endres & Schubert 2004; Kurupparachchi, Mandal & Smith 2002; Mütter & Feldmüller 2008a). A lack of organisational alignment in IT projects can not only lead to a lack of economic value add of IT projects but can furthermore have a negative effect on the user-acceptance of the IT-system, which further fuels the negative outcome of such projects (Schwarz 2000). A comparable observation and conclusion was made in the 1980s known as the productivity paradox. Researches showed that automation of production processes only gain real value for companies when change was done holistically incl. processes redesign and human aspects (Skinner 1986). For IT projects this means that they only provide value and benefit in the right work environment and if they perfectly fit in there (Ciborra & Hanseth 1998).

IT projects were found to increasingly be a driver behind planned organisational interventions. As such, IT projects have the potential of leading to significant and often unanticipated organisational changes and thus to intra-organisational tensions (Barret, Grant & Wailes 2006; Kurupparachchi, Mandal & Smith 2002 ; McNish 2001). As a consequence, IT experts face a climate of mild resistance in most projects (Markus 1983). It is therefore logical that the management of IT projects should not only focus on technical and economic aspects but also on the sociological context. Achieving user acceptance and a special focus on the project implementation and post-implementation phase is considered to be of vital importance for the success of IT projects (Abdinnour-Helm, Lengnick-Hall & Lengnick-Hall 2003; Fleck & Howells 2001; Joshi 1991; Reiß, von Rosenstiel & Lanz 1997). In order to master this important implementation process and with it the success of the IT project, it is recommended to recognise the implementation as a change process (Joshi 1991). But current project management methodology is claimed not to contain such relevant change management requirements for IT projects sufficiently (Kurupparachchi, Mandal & Smith 2002; Mütter & Feldmüller 2008a; Schwarz 2000). It is furthermore argued that information technology has long been dominated by a technological deterministic view, which considered technology as a determinant of work process, organisational structure and organisational behaviour, ignoring human aspects of IT (Barret, Grant & Wailes 2006; Ulich 2005; Yates & Van Maanen 2001). Resistance to technological change therefore also argued

to be a response to this technological determinism of managers and their failure to accept and promote a more organic adaptation process (Fairhurst 2009). This deterministic view seems to be particularly favoured by technicians, natural scientists and legal experts due to the characteristics of their training and education programmes (Mütter & Feldmüller 2008a). Other authors spotlight that IT projects have frequently been used as a means to realise process redesign and reorganisation through the backdoor (Schwarz 2000).

The relationship between organisational change and IT projects are frequently not considered to be a single, linear, one-time approach but rather a continuous interdependent process of high relevance for organisations. It is for example argued that rapid changes in the field of technology force organisations, to regularly evaluate, upgrade and adopt existing IT-systems, which again results in organisational changes in work processes and changed skill requirements (Daft 2002 p.579). Sometimes the speed of technological change can also be found to outpace the human desire for change (McNish 2001). Other authors claim that the combined approach of using IT and organisational change would be an important approach for the organisational structure to align and react to the constantly changing external environment (Schwarz 2000). IT projects therefore lead to organisational changes, which have to be suitably managed in order to attain the business benefits targeted, while the realisation of organisational changes and the constant striving for organisational improvements again lead to new inputs to upgrade or align current IT-systems (Doujak, Endres & Schubert 2004; Schwarz 2000). The resulting carousel of organisational change and IT projects further increases the importance of user acceptance for the success of IT projects (Fernis 2006). Other authors regard this interaction as a continuous metamorphosis of small, daily IT improvisation and adaptations and related continuous organisational change (Orlikowski 1996). It can therefore be concluded that a continuous alignment of business process and IT is a continuous necessity and responsibility (Ciborra & Hanseth 1998).

Since the 1980s, several studies and authors referred to the high rate of IT projects exceeding timelines and budgets, being incomplete and not meeting business expectations (Doujak, Endres & Schubert 2004; Froehlich 2002; Keil, Mann & Rai 2000; Peters 2005; Ulich 2005). It is argued that the failure of IT projects is strongly linked to a lack of attention to human and organisational aspects of change (Cicmil 1999; Dutta & Manzoni 1999; Kohnke, Bungard & Madukanya 2005; Neumann, R. 2007). The manner, in which these IT projects were implemented, was found to represent a major factor for achieving business results of IT

projects (Paré & Jutras 2004; Spalink 1999). Poor or no change management were seen to lead to high follow-up costs, lost investment and a possible loss in productivity resulting from failed IT projects (Böhm, Vanden Eynde & Pirker 2007; Claßen, Arnold & Papritz 2005; Jorgensen, Albrecht & Neus 2007). Following dissatisfactory implementation, IT-systems were often found to be used incorrectly and employees continued to show resistance even when technical complaints had been resolved (Jones, Jimmieson & Griffiths 2005; Laudon & Laudon 2000). The tendency towards resistance here is not a matter of profession. Even IT-oriented employees and experts were found to resist change they did not support (Conner 1992). The lack of managerial attention to human aspects of change and the resulting lack of employee acceptance is thus seen as a major reason for the failure and dissatisfaction with so many IT projects (Bungard 2005a; Fernis 2006; James 2005; Neumann, R. 2007). The lack of awareness and managerial change management competences is not the only reason behind these findings. Shared responsibilities and a separated and uncoordinated behaviour of IT- and organisational change experts in organisations are also regarded as a potential burden for the success of many IT projects (Doujak, Endres & Schubert 2004). IT implementation and change management will therefore stay of importance and difficulty for organisations (Markus & Benjamin 1996).

To summarise the above discussion on information technology and change management, it can be said that IT has become an important factor in the competitiveness of companies in today's business world. IT is commonly used in company organisations to reduce costs and improve performance. As such, the effect of IT projects on processes can range from process acceleration and automation up to business process transformation. Many authors therefore claim that IT projects should not be regarded as stand-alone and pure IT issues but rather as linked to process redesign, organisational structures and individual skills and behaviour. Successful IT projects ask for the combined management of hard and soft factors of change. A lack of focus on the human aspects and on building acceptance and commitment e.g. by more participation and involvement, in the way to manage and implement current IT projects is considered to be one of the main reasons why so many IT projects and initiatives fall behind their expectations or significantly overrun budgets and timelines.

2.2.3 Conclusion - Management of organisational change as part of IT projects in Europe

The previous analysis of the current status of change management in Europe and of change management in IT projects showed several overlapping themes and could act as a point of orientation, to better understand the current status and challenges change management faces as a part of IT projects in Europe.

While IT projects were considered to be important change drivers, top change drivers in Europe were identified to be restructuring programs, cost savings and reorganisation programs. For IT projects, the main motivation behind implementing and extending the use of IT was found to be in the improvement of processes as a means to increase organisational performance. By supporting restructuring and cost-reduction initiatives, IT projects could be regarded as an important approach for companies to improve organisational performance and cost structures.

It can be concluded that the overall success rate of change management projects in Europe was found to be higher than in comparable international studies. The difference in the figures reported might be caused by time discrepancies in the data collection and an improvement in change management skills, better change management capabilities in European organisations as mentioned in several of the analysed management studies or limited honesty of the participants in the study. It could thus be possible that the success rate of IT projects and the success rate of handling related organisational change in Europe have also improved when compared to figures of earlier publications. Nevertheless, even these improved success figures still mean that every second IT project partially or completely failed to meet business expectations. Bearing in mind the huge amounts of annual IT expenditure at European organisations and the high costs of completely or partially failed IT projects, a significant business requirement for further improvements in IT projects and related organisational changes clearly remains.

Another conclusion is the general level of dissatisfaction with the project management methods employed. On the one hand, it was claimed that project management approaches did not focus enough on change management aspects whereby other managers called for more standardised and transparent guidelines similar to the project management methodology for managing organisational change. This call for a more structured, transparent and integrated

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approach for handling organisational change supports the idea that even though many European managers seem to know the importance of change management, many organisations in Europe managing IT projects obviously lack sufficient change management competencies. Also the selection of certain change management approaches was found to be based mainly on personal beliefs and on previous managerial experience. It can thus be concluded that greater transparency for single influencing factors and a more integrated approach for the successful handling of organisational change are needed to give better guidance and assistance to managers of change projects.

Similarities between both analyses could also be found in the area of shortcomings. First it can be concluded that the currently used change management approaches seem to lack the necessary focus on the human aspect of organisational change. This includes aspects of supporting employees and managers to accept and be ready and committed to change, and to manage emotions linked to change thus facilitating the learning of new work processes and behaviour. A growing focus on participation and involvement could be identified as one way to approach this. At the same time it was found that the general support of employees and managers for change management initiative in Europe has strongly decreased. Potential reasons were assumed to be rooted in the uncoordinated parallels between too many change projects and in the lack of human focus of many interventions. As a consequence, it could be assumed that many employees and managers felt left alone when handling these many changes, which may in turn have lead to a feeling of de-motivation and passive resistance to further change. It could therefore be concluded that even though European managers seem to have the necessary competencies for successfully handling the hard factors of managing change, more awareness and competencies with regard to the human side of changes such as building change acceptance and commitment e.g. by more participation and involvement, are also necessary for improved coordination of projects and initiatives designed to increase the success rate of change management in general and of organisational change related to IT projects in Europe in particular.

2.3 How change affects individuals and organisations

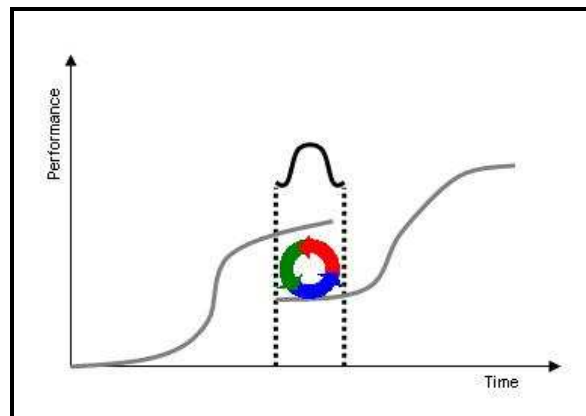
In the same manner the previous section identified a lack of focus on the human aspects in current change management practice and especially in the way organisational change related to IT projects is handled, so this section will summarize the effect organisational change is said to have on individuals and organisations using the examples of current literature.

2.3.1 The effect of organisational change on organisations

Organisations face an increasing number of social, political, technical and structural changes in their business environment today (Daft 2002; Doppler 2011). The ability to react and adapt to change has become a competitive factor for survival and the success of organisations (Ashurst & Hodges 2010; Boos, Heitger & Hummer 2004; Karp 2005) . Organisational change can therefore be regarded as a necessary organisational activity to ensure the optimal organisational alignment of an organisation with its environment (Haiss 2001; Mütter & Feldmüller 2008b). However, in addition to its importance for organisations, organisational change projects also represent a generator of cost and business risks for organisations (Spalink 1999).

One risk for organisations associated with organisational change is simply not to take them. Organisations, which not adapt to a changing environment, risk their future success and survival (Hamel & Välikangas 2003). A second kind of risk associated with change is the cost of the performance loss during the change period. Organisational change requires organisations to change old organisational structures, responsibilities, work processes and behaviour. An organisation therefore has to leave current and well established ways of working. As the organisation lacks the experience with the new structure of work, an organisational learning phase is needed until the organisation again reaches the old performance level, or even exceeds it (see figure 2.1)(Lines, Sáenz & Aramburu 2011; Markus et al. 2000; Mueller-Stewens & Lechner 2001). It is argued that change can not be implemented without having a negative effect on daily business (Jorgensen, Albrecht & Neus 2007). This organisational process of learning and adapting new ways of working is therefore directly and indirectly associated with costs for organisations (Al-Ani & Gattermeyer 2001a; Boos, Heitger & Hummer 2004; Bungard 2005b; Jorgensen, Albrecht & Neus 2007; Mueller-Stewens & Lechner 2001).

Figure 2.1 – Transition period in a change process



(Mueller-Stewens & Lechner 2001 p.412)

A third risk associated with organisational change is the financial risk of delayed projects. It is already shown above just how organisational change projects have a comparably low success rate (Claßen & von Kyaw 2010; Houben & Frigge 2007; Leban & Stone 2008). While success is mainly understood as an on time and budget conform delivery of the managerial expectations and effects of a project, any project delay means an increase in project budgets and additional costs for companies (Drahtschmied 2004; Jorgensen, Albrecht & Neus 2007; Turner 1998). Consequently, the payback period for a company to benefit from an initiated change is further postponed. Additionally, while costs for a change project increase, the return on investment for a project also decreases. Rising cost and static project benefits erode the project value adds for organisations. A fourth risk associated with organisational change is the risk of a complete project failure. As a significant number of the change projects run the risk of becoming a complete failure (Claßen & von Kyaw 2010; Turner 1998), organisations have to write off such project expenditure as sunk costs with no further chance of benefits or paybacks. Furthermore, failed projects were found to have significant effects on organisations as they lead to frustrated staff, a significant loss in productivity and an increasing turn over rate of managers and employees (Böhm, Vanden Eynde & Pirker 2007; Claßen & von Kyaw 2010). With the risk of change projects failing, companies not only risk losing financial resources but also facing significantly more organisational consequences, which could also turn out to be a risk for the survival of the continued existence of the company (Spalink 1999).

In summary it can be said that companies are caught in the dilemma of having to change in order to survive and stay competitive but face significant business risk if change projects fail.

Therefore it can be said that initiating and managing organisational change successfully has become a key competence for continued success and survival.

The possibilities and ways to initiate and manage organisational change thereby is said to be strongly dependent on personal perspectives. Each perspective represents a theoretical reference framework, which includes assumptions and paradigms about how an organisation works, reacts and can be changed. All kinds of managerial visions, strategies and actions are shaped by this special reference framework. Managerial decisions, tools and approaches chosen to undertake an organisational change are therefore only as good as the inherent perspective, which explains the real situation (Graetz & Smith 2010; Krueger 2009; Mueller-Stewens & Lechner 2001; Neumann, R. 2007).

An organisation can be defined as a social construct, which represents a formal structure and is oriented to achieve a lasting goal. As such, an organisation can be viewed as a vehicle to combine a certain group of individuals and to align and focus their activities on common goals (Inversini 2005). One view of organisations is that they can be regarded as the sum of its individuals, their views, values, characters and ideas. Organisational characteristics could therefore be concluded to be the sum of characteristics of its members. The fact that experts implicitly share this view are evidenced in such statements as “people change not organisations” (Martin, T. M. & Ziaul 2007 p.126). Those authors share the idea that organisational change takes place on behavioural and individual, psychological levels (as discussed in detail in chapter 2.3.2 below).

A contrasting perspective to the view of the dominant influence of individuals on organisational change is viewing organisations as social systems. A social system is said to define itself by focusing internally on common, shared goals and similarities while delimiting itself from its environment by focusing on differences. An organisation develops its own unique values, views, structure and norms. These organisational values and norms de-individualise each member, create internal transparency and focus the behaviour and effort of every member on the survival and success of the organisation. These unique values and norms are also called organisational cultures and identities. They form the basis for the functioning of an organisation, are mainly invisible to its members and strongly influence the behaviour and actions of its members (Doppler & Lauterburg 2005 p.454-458; Inversini 2005 p.17; Klewes & Langen 2008 p.3; Mohr et al. 2010 p.173-174; Neumann, R. 2007

p.198). This organisational culture and identity on the one hand is regarded as being influenced by organisational memory. Negative or positive organisational experiences for example with change are said to influence the present organisational attitude to change (Marchant 2000 p.54; Mütter & Feldmüller 2008b p.392). On the other hand, such organisational values and norms are seen to act as a filter to view and process information from the external environment and used as a basis for organisational reproduction. The selection, processing and interpretation of external information is guided by organisational norms and values and is used as input in the organisational reproduction process of the social system itself (Armenakis & Bedeian 1999 p.299; Mueller-Stewens & Lechner 2001 p.383; Neumann, R. 2007 p.187). Organisations are therefore often described as conservative, oriented on stability and routines and slow in changing. Organisational resistance to change should therefore not be regarded as a rejection of the change itself but as an inability of an organisation to leave the existing order and habits (Al-Ani & Gattermeyer 2001a p.15; Reiß, von Rosenstiel & Lanz 1997 p.210; Robbins et al. 2001 p.707). Following the view of organisations as social systems means that in order to initiate intended organisational change initiatives, such initiatives have to be seen as impulses, which stimulate an organisational learning and self-reflection process (Boos, Heitger & Hummer 2004; Doppler 2011; Mueller-Stewens & Lechner 2001; Neumann, R. 2007). The manager role here can be better described as “change facilitator” (Bamford & Forrester 2003 p.557).

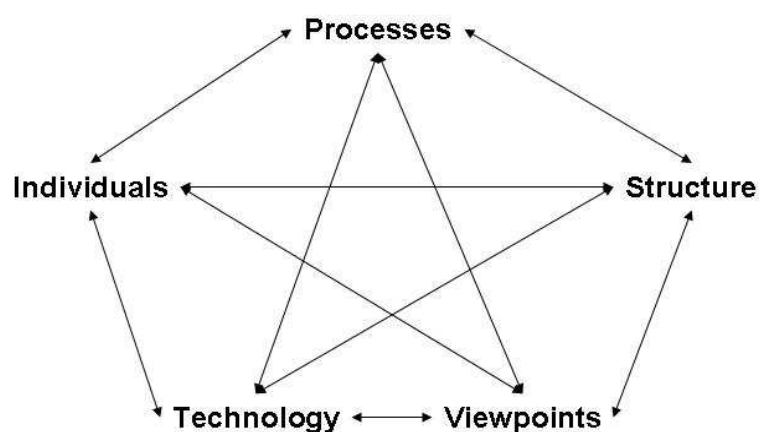
The organisational ability to reflect and change its reproduction rules to initiate and successfully achieve change on an ongoing basis is regarded as an organisational capacity for change and as an organisational core competence. However many organisations are said to lack this capacity. They are dominated by a conservative characteristic and focused on organisational routines, which create stability and avoid changes in the way an organisational system reproduces and changes itself (Al-Ani & Gattermeyer 2001a; Boos, Heitger & Hummer 2004; Pagliarella 2001; Robbins et al. 2001). A temporary change in organisational behaviour is said to be enforceable using external pressure but without an inherent change from inside, the organisation will return to its old routines and views as soon as the pressure is reduced (Krueger 2009).

A different organisation perspective is followed in the concept of a socio-technical system. Following this concept, an organisation is regarded as a combined system of a technical sub-system including aspects of technology, facilities and assets and a social sub-system, which

includes the organisational members, their individual and group-specific needs. In order to reach an optimum solution, system interventions such as new IT-systems have to involve and balance both sub-systems equally. Otherwise the intervention will lead to suboptimal results. Leavitt's diamond indicates that any change in process will impact any other element of the socio-technical framework (see figure 2.2) (Fernis 2006; Galliers & Baker 1995; Ulich 2005).

In summary, it can be said that the ability to successfully initiate and realize organisational change has become an important competence for the survival and competitiveness of the organisation. The consequences of failed change projects could here be as damaging for organisations as it could be not to adapt to changing environments. While the limited predictability of human behaviour already makes change complex, change on an organisational level is an even more complex challenge (Al-Ani & Gattermeyer 2001b). To regard organisations as shapeable objects, which can intentionally be changed, is argued by many authors as a too simplistic perspective. Instead, organisations should be regarded as systems, which have their own character and identity and which have the ability to learn, to reflect and to reproduce. Organisational change should therefore be viewed as a combination of intended and controllable managerial intentions with unpredictable individual and system components where change happens in a process of reflection and learning.

Figure 2.2 – Amended Leavitt's diamond



(Galliers & Baker 1995 p.267)

One possible approach to realize this combined perspective is to keep change at a low level in order to keep the organisational reaction and the organisational learning on a manageable level (Haiss 2001). Another proposed approach for larger scale changes comes from

Accenture and starts with a pure managerially driven and intended change initiative, which step by step, is turned into a supported system before finally becoming a system driven change initiative (Haiss 2001).

2.3.2 The effect of organisational change on individuals

As shown above, it is argued that while the speed of change increases, the management of this change is a critical factor for organisations. The fact that organisational change often does not lead to the expected results is considered not to be traced to a technical issue but to a lack of focus of human factors associated with change (McNish 2001; Safar et al. 2006; Self, Armenakis & Schraedder 2007; Spalink 1999). As organisations consist of individuals, it is concluded that organisational change can only to be realised if individuals change. The fact that organisational change driven by IT does not always lead to the same results in organisations is said to be explained by the difference in interests of local of individuals and groups (Barret, Grant & Wailes 2006). The way, in which individuals adopt new processes and behaviour, is therefore regarded as representing the key to successful change management (Armenakis & Bedeian 1999; Whelan-Berry & Somerville 2010). Individual change can thus be understood as the combination of practical skills and the personal willingness to change (Al-Ani & Gattermeyer 2001b; Martin, T. M. & Ziaul 2007; Reiß, von Rosenstiel & Lanz 1997).

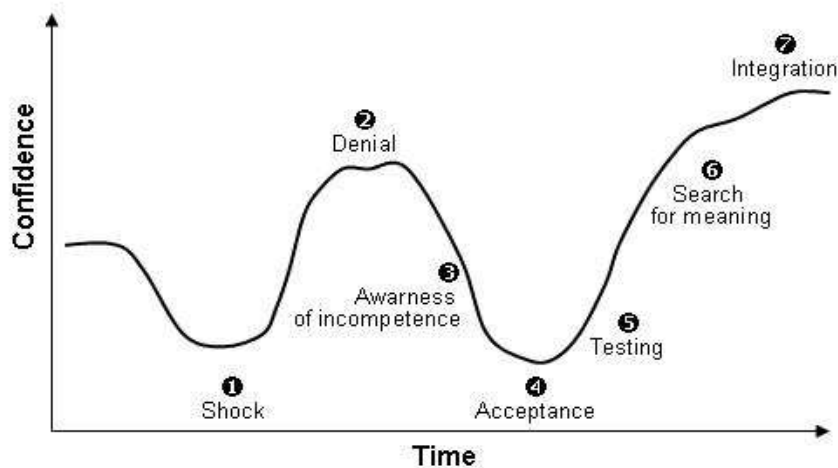
One aspect of individual change can be found in the emotional reaction to change. Empirical studies have shown that individuals go through several emotional phases until change is finally accepted (Dobiéy & Wargin 2001; Haiss 2001; Liu, Y. & L. 2005; Robbins et al. 2001). Each stage of the personal transition curve an individual has to go through (see figure 2.3) is linked to a certain set of emotions, which range from shock and fear via anger and uncertainty to hope and confidence. At the end of this personal transition, the new situation is accepted and seen realistically. It is argued that the final stage of this transition process can only be reached when individuals acknowledge and accept various losses experienced during the transition process (Siegal 1996).

A comparable approach of Leban and Stone (2008) describes the personal transition process as a four step curve. With this approach, an individual starts a change process with uneducated optimism, which soon develops to educated pessimism. Only if managed

successfully can this educated pessimism be turned into educated optimism and finally into educated commitment (Leban & Stone 2008).

Comparable aspects, which could be found in both approaches, are that individuals have to pass through different emotional stages before change is accepted, that the whole process needs time and that the time an individual needs differs (Balogun & Hope Hailey 2004; Dobiéy & Wargin 2001; Leban & Stone 2008). The main differences in Leban and Stone's (2008) process approach are the possibility that change can fail if no educated optimism can be extracted from the educated pessimism phase and that the approach ends with a commitment to change.

Figure 2.3 – Personal transition curve

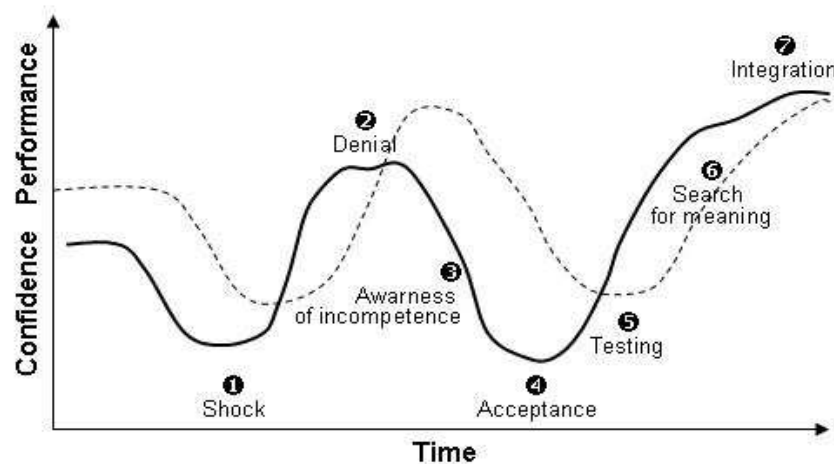


(Balogun & Hope Hailey 2004)

A personal commitment to change in Leban and Stone's approach can be valued as a stronger and more positive view of change compared to a neutral acceptance of change such as in the transition curve approach. Al-Ani and Kaßner's change curve focuses completely on establishing individual change acceptance and identification as the key for successful change management. The argument is that individual change is concerned with the development of personal change identification over a period of time, starting with change awareness and developing to change acceptance and change identification (Al-Ani & Kaßner 2000). A combination of the aspects discussed above is included in an approach by Krüger (2009).

As the way and rate this personal transition is managed differs individually, irritations and communication problems could arise when managers are already ahead of employees in this transition process (Leban & Stone 2008). Beside emotional consequences and irritation resulting from communication, there could also be a loss of individual performance during a personal transition (see figure 2.4). It is argued that the personal performance of an individual facing change has a delayed reaction but runs parallel to the emotional process. As these are emotionally negative phases followed by a decreasing individual performance level, only if a manager succeeds in supporting employees to successfully manage the personal transition, would it be possible for an individual to achieve a comparable or higher performance level than before change started (Bungard 2005a; Carnall 1990; Nehls & Kautzsch 2000). The individual emotional coping process of an organisational change is therefore regarded as a determinate for a successful change outcome (Klarner, Todnem & Diefenbach 2011).

Figure 2.4 – Personal performance during a personal change process



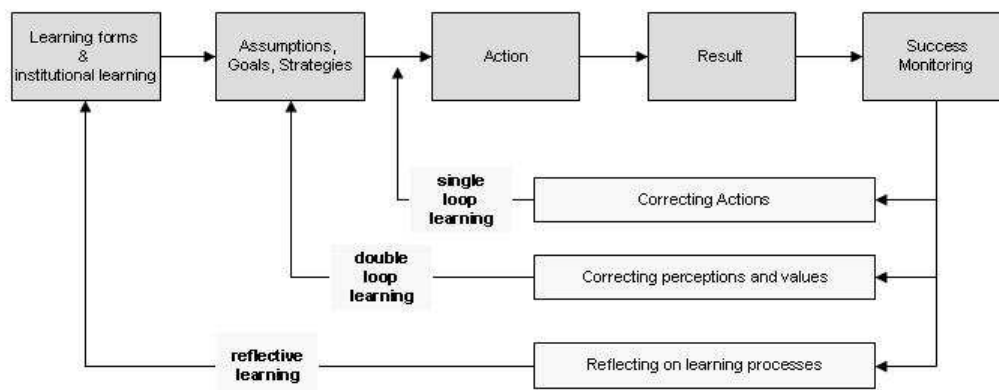
(Balogun & Hope Hailey 2004; Carnall 1990)

In addition to the personal emotional adaptation process of change, researchers also cite individual learning as a determinant for change duration and success (Kraus 2009). It is argued that managers and employees have the skill to learn from experiences and behaviour. The individual change process could therefore also be seen as an individual learning process, which is dominated by the individual's level of ability and willingness to learn (Reiß, von Rosenstiel & Lanz 1997). The intensity of the learning varies between single loop learning, double loop learning and reflective learning (see figure 2.5). As an individual's double and third loop learning process takes time to re-conceptualise personal beliefs and unlearn

inappropriate behaviour, it is important that managers support employees during this process by positively acknowledging and recognising new ways of working and modes of behaviour. Some authors point on the difference in the learning process of children and adults. As adults already learned and experienced a lot, the phase of unlearning and forgetting wrong and outdated knowledge is highly importance and need to be taken in regard before new concepts, behaviour and processes can learned (Doppler 2011). Further it is argued that an individual only changes and continuous to change if arguments and perceived benefits outweigh costs and counter arguments (Krueger 2009; Mütter & Feldmüller 2008b).

In summary, it can be said that the whole individual change process can be seen as a learning process, which can not be commanded by managers such as a gardener can not command flowers to grow (Doppler 2011). The individual reflection on a given organisational and individual situation builds change awareness and constantly energises further reflection until change adaptation and a behavioural change is finally achieved (Al-Ani & Gattermeyer 2001b; Neumann, R. 2007).

Figure 2.5– Different levels of learning



(Neumann, R. 2007)

However, learning is only regarded as a plus and not as a necessity for a change process to take place. The consequences of a change process without learning are to be seen when facing a lower level of engagement and commitment to change (Carnall 1990).

2.3.3 Resistance to change

An alternative approach to a personal learning path for change adaptation is presented in the social exchange theory. Reflection, support and commitment to organisational change are regarded as costs in this approach where such costs are only invested by managers and

employees so long as they receive something of value in exchange. Besides tangible incentives, openness, participation and/or fairness could be also be factors, to positively stimulate manager and employee willingness to change (*Leading Change* 1988; Dutta & Manzoni 1999; Michel 2008). The decision to support or resist change could be regarded as an individual perception of benefits and costs for a certain change project. Farr and Ford (1990) extended this approach by defining that the individual attitude to change would be the sum of four interrelated factors: perceived need for change, perceived benefit of change, skills to change and the ability to self-realise (Kersting 2005). Joshi (1991) developed a three-level process to evaluate and understand user's resistance to change related to new IT systems. The idea is that users evaluate their net gain from a change regarding their personal input and outcome and compare their relative outcome with those of colleagues and the organisation in total (Joshi 1991).

As an individual change process seen from a personal transition and individual learning perspective involves personal emotions, it leads to the conclusion that a certain level of negative feelings and resistance to change should be regarded as a normal aspect of every change process (Dobiéy & Wargin 2001; Dutta & Manzoni 1999; Hosking & Anderson 1992; Issabella 1990). However, managers are also warned that expecting strong resistance could possibly result in a self-fulfilling prophecy as the way a manager responds to threatened resistance could provoke just this (Dutta & Manzoni 1999). Negative individual feelings such as the fear of losing something of value or the feeling of uncertainty are regarded as main drivers for change resistance (Armenakis & Bedeian 1999; Daft 2002; Helmke, Brinker & Wessoly 2008; Kotter & Schlesinger 2008; Liu, Y. & L. 2005). Furthermore it is argued that managers and employees would not resist change in general but would resist being changed. This feeling can occur when change is forced without allowing an employee time to learn and adapt (Neumann, R. 2007; Woodward & Hendry 2004).

Contrary to the view that a negative attitude to change might lead to change resistance, researchers found that negative feelings and resistance during a change process were not necessarily anti-change or aspects of change itself but rather more deeply rooted individual or emotional factors even though change might be acceptable when seen from a rational perspective. Sources of resistance were argued to be located more on the emotional level such as in coping with uncertainty, facing a feeling of helplessness or in personally coping with changed cultural values and behaviour patterns (Gerhardt, Frey & Fischer 2008;

Hosking & Anderson 1992; Rafferty, A. E. & Griffin 2006; Ulich 2005; Yates & Van Maanen 2001).

Another explanation for negative reactions to change and change resistance is found in the perceived level of stress linked with organisational and individual change. Stress is understood as an unspecific reaction of the body to negative or positive experiences, with which individuals are unable to cope (Litzcke & Nolte 2008; Michel 2008). While a mid level stress intensity and involvement is said to result in a positive stress level and is regarded as supportive for individuals to adapt to change, a high level of stress and a passive role could lead to a negative, resistant attitude (Litzcke & Nolte 2008; Liu, W.-P., Liu & Man 2009 ; Neumann, R. 2007). As stress is an individual perception, it is emphasised that demanding too much from an employee's ability to change would automatically result in a high perceived stress level leading to feelings of fear, resistance and dissatisfaction. However, it is also argued that a perceived feeling of uncertainty and the fear of being unable to cope with a new situation increases the level of perceived stress. Hierarchical differences could hereby lead to different levels of stress perception, which in turn would make it difficult for managers to notice an existing high level of perceived stress for a particular project or to notice the general increasing sign of fatigue and stress related psychological problems at employee level (Armenakis & Bedeian 1999; Armenakis, Harris & Mossholder 1993; Conner 1992; Kohtes 2008; Mueller-Stewens & Lechner 2001; Safar et al. 2006). From this stress perspective, resistance is understood as a criticism of speed and frequency of change and not of the goal and idea of change itself.

An alternative view interprets resistance as a sign that managers and employees have not understood what and/or how change takes place, which could then lead to low morale, disinterest and confusion (Cicmil 1999). In contrast to the learning and personal transition discussed above, this view regards change acceptance as a matter of understanding change while understanding change can directly be influenced by managers.

An opposite view of resistance is not to perceive it as a potential threat but as helpful input for a change process. Instead of avoiding or reducing resistance and the motives behind it, it could give valuable insights to change managers as to how to successfully manage change. As already described above, resistance to change does not mean that people dislike the ideas behind change. There are mainly emotional reasons such as fear, uncertainty or stress or even

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more tangible reasons and arguments such as operational criticism or valuable losses, which lead to employees resisting change. Verbalizing this opposition and listening to criticism could help change managers to improve the actual change process and in so doing also to improve the level of change success (Markus 1983; Self & Schraedder 2008).

Knowing about the emotional adaptation process, stress and learning experience individuals have to go through during a change process and the limitations of individual rational thinking, expectations and perceptions can help managers, to actively support employees during these process steps (Jarrett 2004; Karp 2005; Klarner, Todnem & Diefenbach 2011; Krueger 2009; Somers & Nelson 2001). Nevertheless, manager should also be aware that change can never be perceived positively for everyone involved. There are always individuals who find good reasons to have a negative, resisting attitude to a certain change program. Managers also have to find ways to deal with these individuals (Daft 2002). By minimising resistance and extremely negative emotional reactions, and by keeping within the time period needed to realise the personal transition and the loss of individual performance at the lowest possible level, managers are seen not only to realise sustainable change but also at minimal costs for an organisation (Dobiéy & Wargin 2001).

A more differentiated view of the readiness of individuals for organisational change is that the interaction and exchange between individuals and groups in an organisation could sometimes have an unintended strengthening or weakening effect on the change willingness and readiness of an organisation. The social exchange and individual/group interest in an organisation could therefore limit the effect of the desired managerial change initiatives (Karp 2005; Oltmann, Oltmann & Körber-Weik 2008; Robbins et al. 2001). A more political perspective on resistance is provided by the political interaction theory. Resistance against IT systems for example is understood as a conflict between a system being implemented and the context of use. While a psychological view on resistance focuses on the individual, the political view focuses on the group and organisation level. Resistance as such is neither interpreted as positive or negative interpreted but a conflict of users for increased power. As such resistance not only needs to be overcome in projects but should be avoided upfront due to its negative influence on a project (Lapointe & Rivard 2005; Markus 1983).

Furthermore, researchers argue that incremental change approaches are preferred by organisations and employees. To introduce change in small steps would facilitate the

establishment of manager and employee commitment over a longer period by giving them time to learn and to become accustomed to new skills, routines and modes of behaviour. In contrast, a short term, fundamental change approach is considered necessary as in times of crisis the factor time and a rapid and fundamental reaction would be most important (Johnson, Scholes & Whittington 2005). In the special case of IT systems, it was found that resistance in an early implementation phase is individual and system-oriented while in a later phase resistance converge to political group level resistance. It is therefore recommended approach resistance differently, depending in which stage it already is. In an early stage the individual behaviour is recommended to be the focus of analysis while in a later phase the focus should be on understanding how and why individual resistance converge (Lapointe & Rivard 2005).

2.4 Theoretical perspectives of organisational change

2.4.1 Introduction

The way, in which managers should approach individual change, is a matter of discussion between experts and practitioners. The different opinions can roughly be divided in two contrasting theoretical perspectives. On the one hand there are those change approaches focusing on establishing individual support for change by targeting the reduction of emotional and stress factors of change by actively involving individuals and by building change readiness, change acceptance and commitment. These approaches are known as shared or participative change approaches, which at an early stage involve and prepare individuals for changes upfront in order to reduce uncertainty, to support learning and to build a positive attitude towards change (Krueger 2009; Lines 2004; Litzcke & Nolte 2008; Machin, Fogarty & Bannon 2006; Waddell, Cummings & Worley 2000). On the other hand there are those approaches, which regard change as happening through formal and impersonal control mechanisms (Greiner 1967). Structural changes happen first as personal attitudes and behavioural changes are regarded as a function of job roles, which thus automatically happen later. An individual is expected not to change his way of thinking and working before he is directly confronted with a change of work environment (Beer, Eisenstat & Spector 1990). These approaches are known as unilateral approaches (Walderssee & Griffiths 2004). There are diverse research findings about the impact and influence of both perspectives. While a unilateral approach was found to better support the realisation of business goals of change projects, other studies indicated that a participative approach would positively influence the achievement of a successful business outcome of change projects by

building individual commitment and motivation for change (Greiner 1967; Kersting 2005; Parish, Cadwallader & Busch 2008; Waldersee & Griffiths 2004).

2.4.2 Typologies of change

As discussed above, change and related activities and tools represent strong factors for the perspective on change. One of the most comprehensive typologies of change is found in the categories of change by Van De Ven and Poole. Each change category follows a distinct set of assumptions as to why it occurs, how it is initiated and takes place and what kind of outcome can be expected. The original theory only consists of four categories: life cycle, evolution, dialectic and teleologic. Eight further categories were suggested to be added (Graetz & Smith 2010; Kezar 2001). Table 2.2 provides a brief overview of all those 12 change categories regarding their specific assumptions, key activities and benefits/weaknesses.








Table 2.2– Overview of categories of change

Theory	Major Assumptions	Key Activities/ Individuals	Benefits / Criticism
Institutional	evolutionary nature of change org. are shaped by their environment change is initiated externally change as a function of shifts in the industrial landscape change is slow and on a small scale change is undirected and moderately certain	Managers to observe org. environment for patterns and structures of upcoming forces of change	+ org. change as a behaviour issue explanation of similarities between org. and org. arrangements ⚡ prevents internal influence on org. predicament
Contingency	org. performance reflects the degree of factor fit causal relations and connections of factors are difficult to predict change is situational. No general best practice alignment and best fit ensure stability and control change can be fast or slow, small, large, tight or not controlled, internally or externally driven, be of varying uncertainty levels	in the long run managers are forced to adjust to efficiency demands managers to focus on most relevant circumstances and acting with most appropriate actions	+ org. change as a behaviour issue situational view of change ⚡ no guidance for org. change no indication how a good/ best fit can be recognised
Resource	success of organisations by best possible acquisition, development and deployment of scarce resources and skills change begins by identifying the scarce resources/skills dependence on resources increase uncertainty for org. direction of uncertainty is predictable change is focuses on strategic capabilities change can be fast or slow but controllable and comparatively certain	seeking required resources as central activity to develop organisations employees reduced to resources or owners of certain skills resource and skill development as critical management task to achieve a successful organisation	+ focus on internal competences and capabilities as source of success view that the preconditions for successful change can be developed or acquired ⚡ ignorance of external change ignorance of social cognition, cultural and psychological aspects
Psychological e.g. OD, change	individuals and their experiences are the basis for change change success by identifying and removing fears and uncertainties and by managing emotions, feelings and learning	individuals are the key to organisational change leader can also send impulses to initiate and influence individual	+ inclusion of personal feelings and emotions recognition that each individual is

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<p>transition</p>	<p>change is slow and takes place on a small scale change as an internal, undirected and uncertain process</p>	<p>change</p>	<p>different</p> <p>⚡ ignorance of change in the external environment</p> <p>social cognition aspect only striven for. Change achieved through behavioural science</p>
<p>System</p>	<p>organisations as self-organised entities is organisations are sum of their parts organisational parts interrelate and influence each other imposed change leads to numerous effects in an organisation change to be introduced on a larger scale to be successful assumption eg organisational rationality parallel differentiation and integration needed change can be fast and large scale change is internally driven, controllable and certain</p>	<p>Individuals are part of the organisation and its sub-systems. They are de-individualised and contribute a small part to the org. sum of parts</p> <p>internal differentiation needed to identify the organisational sub-parts</p> <p>internal integration needed to prevent the org. breaking apart</p> <p>internal initiation of a self-reflective process for org. change as the key to change organisations</p>	<p>+</p> <p>constant striving for improvements and best practice</p> <p>Interrelation of org. parts as unique contribution of system view</p> <p>⚡ ignorance of change in the external environment</p> <p>no focus on where and when to apply best practices</p>
<p>Postmodern</p>	<p>change is a view of multiple persons about reality reality is fragmented and contradictory change is chaotic, fragmented, discontinuous but seeks ongoing improvements. change as a result of discourse within an organisation. Change is not rational. There is no universal way of seeing things. power as a means for change explication, not to achieve common goals power and knowledge are connected. change can take place at any time, scale and level of certainty</p>	<p>constant internal organisation discourse about views of reality and adaptive change needed to respond to external environment</p> <p>use of language and representation to create a social world and a view of reality</p>	<p>+</p> <p>notion of power and knowledge as a key to change exploitation</p> <p>no completely uniform view on relativity and facts between individuals</p> <p>change not purely rational approach</p> <p>⚡ far too abstract for managers</p> <p>change can not be directed</p> <p>there is no universal truth and reality</p>
<p>Evolutionary</p>	<p>based on dynamic, biological, evolutionary investigations of change change as a slow and incremental stream of mutations shaped by moderate environmental influences change is moderately controllable org. are open systems interacting with their environment inability of org. to plan and respond to change systematic and rational approach of stimuli and response cycle. All org. are const. changing unplanned and reactive process. Change as a process needed for survival new org. structures or principles as usual outcome</p>	<p>observation of the external environment</p> <p>analysis of the org. system</p> <p>constant creation of new org. structures and principles to respond to change</p>	<p>+</p> <p>novelty to describe change is unplanned</p> <p>re-conceptualise org. as systems</p> <p>empirical studies illustrated strength of evolutionary change for certain types of change</p> <p>strong empirical research tradition</p> <p>second most popular category of change in literature</p> <p>⚡ no regard for org. as social phenomena</p> <p>disregard complexity of org. life with a few factors</p> <p>inaccurate reference to natural evolution where species (industries) were concerned, not organisms (organisations)</p>
<p>Teleological</p> <p>e.g OD, TQM, BPR</p>	<p>org. are purposeful and adaptive change is rational, planned and linear. managers are instruments of the process. All outside events are exogenous mixed evidence about explanatory power some aspects such as incentives or visions</p>	<p>leaders are in the change process focus. Individuals are mostly unimportant</p> <p>change is initiated/planned by leaders</p> <p>more involvement of individuals in recent</p>	<p>+</p> <p>analysing and categorising as a basis for a change process</p> <p>key role of leaders and change agents</p> <p>collaboration and staff development as key concepts</p> <p>ability to forecast need for change</p>

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	<p>have been proven to contribute to change success</p> <p>new org. structure as change outcome</p> <p>metaphor of change master using rational scientific management tools</p>	<p>categories</p>	<p></p> <p>assumption of a rational and linear change process, which is internally directed, controlled and certain</p> <p>assumption of controllable and rational responding org. and individuals.</p> <p>org. are regarded to exist in a stable point</p> <p>change as a managerial order</p> <p>change as means to avoid negative consequences of no change</p> <p>no regard for change dynamics</p>
<p>Life cycle</p> <p>e.g. emotional intelligence, adaptability to change</p>	<p>focus on stages of growth, maturity and org. decline</p> <p>emphasis on systematic individual change</p> <p>change is part of a certain stage</p> <p>change is dynamic, progressive and rational. It can not be stopped</p> <p>change is happening slowly and incrementally</p> <p>change can only be moderately controlled</p> <p>new org. identity as change outcome</p> <p>metaphor of change teacher/ guide</p>	<p>emphasis on people as critical for the change process and success</p> <p>activities focus on overcoming fear, training and individual development</p> <p>leader need to monitor the environment and the need for training</p> <p>org. renewal and expansion</p>	<p></p> <p>org. are considered to pass through different phases</p> <p>explanation for change regression and irrationality</p> <p></p> <p>rather more conceptually than empirically focused</p> <p>deterministic character. Change is predetermined.</p> <p>inaccurate reference to natural evolution where species (industries) were concerned, not organisms (organisations)</p>
<p>Dialectical/ Political</p>	<p>change as a result of conflicting belief systems</p> <p>conflict is seen as an inherent attribute of human interaction</p> <p>modified org. identity as change outcome</p> <p>long periods of evolutionary change and short periods of unexpected revolutionary change</p> <p>persuasion, bargaining and influencing are predominant in the change process</p> <p>not necessarily focused on producing a "better" org.</p> <p>org. perceived as political entities with coalitions trying to preserve there power</p> <p>change managers are advised to build strong coalitions</p> <p>change stimuli can come from internal or external</p> <p>control is undirected and the change process is uncertain</p>	<p>focus on individuals as part of the dialectical change process</p> <p>conflict is a result of focusing on views of all</p> <p>a dominant ideology builds and maintains power. Tension building lead changes</p> <p>people interact in the change process</p>	<p></p> <p>departure form rationality and linearity focus</p> <p>explanation of regressive and irrational change</p> <p></p> <p>lack of emphasis on the environment</p> <p>little guidance offered for leaders</p>
<p>Social Cognition</p>	<p>change is tied to learning and making sense</p> <p>importance of individuals to learn new approaches in order to avoid resistance</p> <p>no external or internal influence necessary. individuals decide to change</p> <p>learning occurs out of conflicting information</p> <p>change as a multifaceted, interconnected and overlapping series of processes</p> <p>a new view of the world as outcome of change</p> <p>environment can only be interpreted and is therefore socially constructed</p>	<p>focus on individuals as key for understanding and facilitating change</p> <p>people interpret their environment differently</p> <p>leaders create change by altering shared norms and reframing in order to initiate double loop learning</p>	<p></p> <p>expanding the interpersonal and human aspect of change</p> <p>change fails as individuals do not understand it. Change is a about individual learning</p> <p>change can be helpful</p> <p>change is not always progressive and positive</p> <p>examining how change occurs</p> <p></p> <p>de-emphasise the effect of external forces and of the environment on change</p> <p>ignored values and feelings</p>

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Cultural	<p>change as a response to alternations in human environment. cultures are always changing</p> <p>change process long term and slow</p> <p>change process is natural. Imposing change means fighting existing sets of values and beliefs</p> <p>change in org. included changes of values, beliefs and rituals</p> <p>change is nonlinear, irrational, dynamic and unpredictable</p> <p>radical change needs changes of fundamental beliefs</p> <p>history of cultural and political changes show that change is not manageable, non-sequential and often long term</p>	<p>change as a collective process</p> <p>change as a collective experience with a shared set of values guiding it</p> <p>leaders have an ability to shape org. cultures</p> <p>key activities are modifying vision, developing enthusiasm, communicating values and beliefs</p>	<p>+</p> <p>emphasis on irrationality, spirit and complexity of org.</p> <p>emphasis on context, complexity and contradiction</p> <p>focus on values and beliefs</p> <p>⚡</p> <p>change as a long term and complex layer of culture is not usable for managerial application</p> <p>only focuses on organisational/ system level. Ignores individual aspects of change.</p>
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(Graetz & Smith 2010 p.140-148; Kezar 2001 p.25-53; Mueller-Stewens & Lechner 2001 p.380-381)

The teleological and planned view has long dominated organisational change research and practice. However, the idea of rationality, manageability and predictability of organisational change has been criticised as being too simple for most of the projects. It is argued that the planned approach ignores the human factor of change and the fact that managers only have a limited influence on the changes in organisations and individuals (Dawson 2001; Graetz & Smith 2010; Hosking & Anderson 1992; Spalink 1999). An alternative view states that change is strongly situational and context specific (Al-Ani & Gattermeyer 2001a; Dawson 2001). It is therefore suggested that organisational change can not completely be described by using only one of the theoretical perspectives introduced above and that change is neither purely a result of environmental influence nor managerial action. A number of different perspectives such as those summarised in table 2.2 is therefore needed in order to capture the complexity and dynamics linked to organisational change. Flexibility in combination with multiple theoretical views of change is recommended in order to benefit from the combination of different insights from various change perspectives and to glean an understanding of the multiple facets of a specific situation in order to select different ways of engagement (Graetz & Smith 2010; Kezar 2001).

IT projects and resulting organisational change can be described as typical of planned and intended change approaches (Reiß, von Rosenstiel & Lanz 1997). Recent authors criticise this view of IT projects. It is argued that the significant influence of social and political processes on the success or failure of IT projects creates the need to also include these aspects into a more complex and successful change model (Kurupparachchi, Mandal & Smith 2002; Nielsen 2008). This conclusion is also supported by identified shortcomings of

European IT projects and the resulting organisational change. The main shortcomings identified were the lack of focus on the human factor of change initiatives. These include a lack of participation, change readiness and commitment to manage emotions and stress and also of the learning time required as well as the ability to change. It was further shown that frequent change projects and uncoordinated parallel projects resulted in a high level of stress and a decreasing general motivation and agreement level to change over years. These findings and the discussion on the effect of organisational change on individuals and organisations above showed that the mainly teleological oriented approaches used in the above analysed European IT projects seem to lack aspects from the psychological category, the social cognition category, the system category and the cultural category. From the findings of European IT projects and the theoretical discussion it can be concluded that a larger influence and mix of a psychological, social cognitional, systematic and cultural change perspective in teleological oriented IT projects would be one way to increase the success rate of organisational change projects resulting from IT projects .

2.5 Organisational change models

The above discussion showed a high failure rate of change programmes in general but specifically of organisational change resulting from IT projects in Europe. It was also shown that a wide range of theoretical change theories and approaches to explain and help managers realise organisational change do exist. However, the above discussion also showed a gap between available theoretical theories and change approaches applied in practice. Furthermore, change managers were found to be aware of this gap and the need to improve change management practices but seem to have no idea about how to go about this.

Theoretical models of organisational change attempt to explain the process of change as it relates to organisations. They provide a framework for enabling managers to plan, implement and monitor change effectively. Yet, it is argued that still only a limited knowledge about how to plan and implement organisational change exists (Whelan-Berry & Somerville 2010).

A research review and qualitative analysis of selected organisational change models was undertaken to determine their applicability to organisational change related to European IT projects and to the shortcomings of the current change management practices identified above (see Appendix 1).

The selected models will first be presented and summarised. Next they will be reviewed in relation to their applicability to the lack of focus on human aspects of managing change in European IT projects (see Appendix 1) taking into consideration the main approaches of participation, build change readiness and commitment and support during the personal change process, which were discussed in the previous section.

Unless an organisational change model includes these aspects to manage the human side of organisational change, it is not possible to provide practical assistance and guidance for European managers to implement IT projects and related organisational changes more successfully.

Organisational development is mainly based on social science and focuses on small, planned interventions to move individuals and organisations to change themselves. It is intensively and empirically researched, is situational and takes place in small, participative steps. Participation is said to promote learning, readiness, willingness and commitment to change. The slow pace of an organisational development project is thus argued to be of help in preventing and reducing resistance (Boos, Heitger & Hummer 2004; Inversini 2005; Kleingarn 1997; Mueller-Stewens & Lechner 2001; Robbins et al. 2001). Compared with the identified shortcomings of organisational change resulting from European IT projects, the aspects of participation, building readiness and commitment through learning and the focus on avoiding change resistance could be regarded as a possible good fit. A limiting factor for the suitability of IT projects is that organisational development is understood as being a project in its own right while organisational change related to IT projects is only a part of a specific IT project. Furthermore, IT projects are mainly focused on creating organisational efficiency by redesigning and automating work processes while organisational development tries to improve the efficiency of organisations by improving attitudes and work quality. Finally, also the slow and evolutionary pace of organisation development conflicts with the better planned, intentional and mostly limited time approach of IT projects.

The different change models are discussed below and are critiqued in terms of their applicability to European IT projects. The summary is shown in table 2.3.

Greiner's successful change process (1967) can be described as an organisational development phase model. The step by step approach distinguishes Greiner's model from the

more evolutionary organisational development approach. In much the same way as the organisational development approach, Greiner's process model also includes the idea of participation and learning through experimentation. It is argued that both help to build change readiness, commitment and acceptance (Mueller-Stewens & Lechner 2001). The process model also includes a diagnosis phase, which makes sure that a change approach meets the situational requirements. The fixed and sequential process has to be regarded critically for the use in European IT projects as it leaves no room for situational process adaptation or parallel processes. Furthermore the compulsory role of external consultants and the lack of support for employees handling the personal change process can be viewed critically from an IT project perspective.

Lewin's change model describes a change of social systems as planned, three step process (see Appendix 1). Change is thereby seen as an internal system force, which can only partially be influenced from outside. Participation is regarded as one way of reducing resistance, building readiness for change and supporting change driving forces. A social system needs time for integration and consolidation in order to create a new quasi-stationary equilibrium. Change managers and agents have to intervene and reinforce the system with respect to a new organisational state including culture, norms, policies and structures. New behavioural aspects have to fit in order to avoid conflicts (Dawson 2001; Inversini 2005; Leban & Stone 2008). Lewin's use of participation early in a project to build readiness and commitment to change, to set the goal of change to increase organisational efficiency and the view that a social system and individuals have to change themselves from inside using a learning process in order to adapt to a new mode of behaviour, fit with the identified shortcomings of European IT projects. Also the idea to re-establish quasi-equilibrium at the end of the change process shows parallels to IT projects where a new set of processes and procedures is also meant to continue in a stable manner after a project has successfully been realised. The issues of three sequential phases and the little information managing human aspects of change during a change process can be seen more critically. The 3 sequential phases leave no room for situational process adaptation, parallel processes or a potential need to go back a step in the model. While staff participation and involvement are very present in the first change phase, for the second and the third phase the model understands change as an intensive self-driven psychological process.

The change models of Beckhard and Harris (1977), Kotter (1986), Kanter (1992), Tichy and Sherman (1993), Vollmann (1996) and Janes (2001) are said to be based on the logic and the sequential phase approach of Lewin and are also called transformational models (Mohr et al. 2010; Mueller-Stewens & Lechner 2001). Beckhard and Harris' (1977) transition management model regards an organisational change process as consisting of three planned phases. Parallel to the organisational development approach, the model also includes a diagnostic step of the given situation. A successful organisational change is seen to depend on good analysis of the current organisational situation and of a detailed developed description of the desired future state. This also includes the analysis of current change readiness, availability of necessary skills to change, required stimulus for change and where to best start a change project. The target is to establish change commitment at an early phase of the model. In contrast to organisational development approaches, this approach is only limited to key individuals and decision makers. Building commitment is therefore also a way to build and keep the political support for a change initiative (Mohr et al. 2010; Mueller-Stewens & Lechner 2001; Waddell, Cummings & Worley 2000). Helpful elements of Beckhard & Harris' model for European IT projects are found in the diagnostic approach to fit change action to local needs and the view of seeing the transition as a period of confusion and uncertainty where organisations and individuals face the old and concurrently the new way of working and behaviour. The lack of participation and the limited focus on build readiness and commitment to change limits the fit of the transition managing model for overcoming the shortcomings of European IT projects (see Table 2.3).

Tichy and Sherman's (1993) model regards a transformation process as a drama in three acts. The change in the organisation is seen separately from the individual change of its members. Like Lewin, the model strongly focuses on establishing readiness and acceptance for change in an early phase of the project. Tichy and Sherman clearly highlight the success of the individual change as the key component for any transformation. A change vision is needed as a point of orientation through the change process to help individuals to break with old attitudes and modes of behaviour (Mohr et al. 2010).

Janes' (2001) transformation management model tries to combine the aspects of organisational development and business process reengineering. The evolutionary and radical phase of change is initiated in this combination and coupled with timely participation of employees affected by the change in all its phases. The success of the model is also

intended to result from the internal support system for change. As a social system does not strive for change on its own accord, but has to be initiated in the way that offers benefits that outweigh disadvantages in order to activate forces for change inherent in the system. All three aspects can also be found in the change design: the learning aspect, the process aspect and the organisational aspect (Inversini 2005). With its flexibility to combine different paces of change and to include the focus on individual and system aspects of change, Jane's transformation management model combines many aspects of change management, which could be regarded as highly relevant for improving the management of organisational change in IT projects. As the model is based on theory, it lacks practical implementation experience and empirical evidence.

Carnall's (1990) managing major change model (see Appendix 1) is a sequential model. It is argued that only by synchronising the management of the change transition, organisational culture and organisational politics, can a work environment be established, which supports learning, creativity and risk-taking and which rebuilds self-esteem and performance after a change process. By creating the capabilities for problem solving and by creating a positive attitude to change, future effectiveness of the organisation can be increased (Carnall 1990). With regard to its fit with European IT projects and related management of organisational change, it can be said that Carnall's model covers the major and currently problematic areas such as change readiness and commitment, participation and supporting personal change. It includes aspects of organisational politics, culture and performance. The sequential and non dynamic, situational orientation of the model and the lack of practical experience and research evidence could be regarded as potential negative aspects of the model.

In contrast to Lewin's model and many other authors, Kanter's (1992) Ten commandments for executing change, Kotter's (1996) Eight-stage-process and Luecke's (2003) Several step approach are not a series of linear events but emergent approaches. The emergent character represents change as unpredictable and emphasises the importance of learning for a change process. Emergent change models therefore are more focused on establishing change readiness than setting up a detailed change plan. The two models of Kanter and Kotter are equal with regard to their contextual focus (Krueger 2009; Leban & Stone 2008; Todnem 2005). Interesting in Luecke's model is the early focus on building change energy and commitment through participation. The rejection of top down approaches and the monitoring aspect differentiates Luecke's model from Kanter's and Kotter's models. Compared to the

identified shortcomings of European IT projects, only Luecke can be found to have participation included as an aid to build change commitment. Kanter limits employee involvement to a later stage of a change process. Kotter's and Kanter's model include a stage where a sense of urgency is created in order to build change acceptance. The management of human aspects of organisational change can not be identified in any of the three models. The general ideas of emergent models with regard to the unpredictability of change and the high relevance for learning could be argued to be supportive for improving the management of organisational change in European IT projects as the individual and organisational reaction to IT projects can neither be correctly forecast nor do they occur in the same way for any particular organisation. Learning is thus an essential process for individuals and organisations to adopt change (see Table 2.3).

Woodward and Henry's (2004) leading and coping with change model is regarded as a dynamic, emergent and holistic model combining of flow of aspects of leading, learning and individual adaptation in a change process. Change is achieved by changing the capabilities, competences and relationships that define an organisation. A trustful and supportive relationship between employees and managers, involving employees and a positive view of an upcoming change is as important as the development of new skills and competencies (Woodward & Hendry 2004). The positive aspects of the leading and coping with change model with regard to European IT projects and organisational changes are that the model covers participative aspects, regards change readiness and change commitment as key issues and defines the manager role as the support of employees by managing the human side of change. Furthermore the model also provides managers with the concept of consequences if single change process steps should fail. The negative aspect of this model is the lack of practical experience and empirical evidence.

In contrast to authors such as Lewin and others, congruence models do not provide a general framework for understanding and managing organisational change but offer concepts for organisational fit (see Appendix 1). Change is seen as an integrated process, which impacts every aspect of an organisation. Nadler's (1988) congruence model for example is an organisational performance model, which regards an organisation as a system consisting of sub-systems, which can only perform optimally if there is a congruent fit between them. Nadler's model is a teleological model for managing discontinuous change, which was strongly influenced by Lewins research findings. Individuals should be motivated to avoid

resistance. The political dynamics should be managed in the informal organisation and a check should take place by managing the transition. The model is dynamic and helps to diagnose the current state of an organisation. As such, it constantly revises the model elements (Leban & Stone 2008; Mueller-Stewens & Lechner 2001). A positive factor of Nadler's congruence model is the good fit with organisational change related to European IT projects. Participation, change readiness and commitment and management of the human side of change are as much a part of the model as the diagnosis element, which helps to adapt specific situations. McKinsey's 7-S model by Watermann, Peters and Philips (1980) examines seven key areas of the company and the relationships of each of these elements to each other. The elements are grouped into two sub-categories of hard elements and soft elements. The hard elements represent company traits, which are relatively stable and simple to define, such as company strategy, structure and systems. The soft elements, on the other hand, represent more complex traits of the company, which are influenced by culture, environment and individuals. By asking questions to check the congruency of the key elements of a business, the 7-S model can help to effectively implement change (Dutta & Manzoni 1999). The applicability and fit of the 7-S model for change related to European IT projects can be viewed critically as neither participation, readiness, commitment nor support of the personal change process are part of the model. As the 7-S model is intended to be used for organizations, it seems to be too generalised for such specific aspects of change (see Table 2.3).

Another congruence model is Doppler's (2005) Charta of change management (see Appendix 1). It combines eight different hard and soft factors. Only by fulfilling all 8 factors for a given situation is it possible to enable managers to manage change successfully (Doppler & Lauterburg 2005). The positive point of Doppler's model is the combination of diagnostic, situational, participative, learning and holistic aspects. Also the creation of readiness and commitment to change and the support for employee management of change are included in this model. A major negative point of Doppler's model can be seen in the lack of scientific foundation and research validity. CapGemini's (2010) ten action fields of change management model represent ten interrelated influencing factors, which should ensure successful change management. Comparable to Doppler's Charta of change management, the CapGemini model also includes a diagnostic factor. Additionally, the model combines hard factors such as structure, processes, success and alignment with soft factors such as culture, commitment, reducing resistance and leadership (Claßen & von

Kyaw 2010). A positive fit of the model with identified shortcomings of change related to European IT projects were found in the situational orientation, the combination of hard and soft factors, the focus on readiness & commitment to change and reducing resistance. To be seen more critically are the lack of support for personal change and the practical and empirical evidence of the model.

The contingency approach is based on the assumption that the most appropriate change approach has to be analysed and chosen specifically based on a given situation. An appropriate change strategy is one, which achieves the optimal fit of an organisation with its environment. Tushman (1988) developed a change framework with two types of adaptive changes to support the match between an organisation strategy, structure, systems and processes and two radical changes to manage major changes such as reorganisation. Dunphy and Stace (1993) developed a matrix consisting of the dimension of change scale and leadership style (Dawson 2001; James 2005; Todnem 2005; Waddell, Cummings & Worley 2000). For the special case of organisational change related to IT projects, the situational and dynamic characteristic of a contingency approach could be regarded as a good fit. Another fit is the participative and incremental change focus on mainly IT projects. On the one hand, many IT projects would be classified as minor changes by both above mentioned contingency approaches. On the other hand, the analysis of European IT projects pointed to more participation to improve readiness and commitment to change and spotlighted that for many employees and managers changes happen too fast. To approach change related to IT projects in an incremental and participative way would fit these arguments. The fit of a contingency approach and organisational change related to IT projects has to be seen critically in terms of environmental adaptation and participation. While a contingency approach tries to offer managers the most appropriate strategy to adapt environmental changes, organisational change related to IT projects aims to adapt procedures and behaviour and to help individuals to work and behave in a different way. Furthermore, three fourths of Dunphy and Stace's model (1993) and Tushman's framework (1988) give preference to approaches different to participation. Finally, both contingency models introduced, miss the active support of the personal change process (see Table 2.3).

A rather novel, situational change model is the Accenture wheel of change. It consists of four major focus areas and is intended to include all activities needed to successfully implement change. The focus on a specific area varies with the current position of a change project in a

change curve. At the beginning of a change process, the aspects of change steering and leadership are the centre of focus while during a change process, the focus switches to building and supporting the ability for change. Finally, in the final part of a change process, the focus is on change identification for realising and anchoring change locally (Mohr et al. 2010). With regard to its fit for organisational change related to European IT projects, the explicit lack of participation, building change commitment and managing the human side of change have to be judged critically. Also with change readiness support is only foreseen but is not installed at an early change phase. Finally, the model is based on consultancy experience and lacks practical validity application and empirical evidence.

Diagnostic models such as of Burke-Litwin (1992), Vollmann (1996), Balogun and Hope Hailey (2004) or Brettel, Reißig-Thust and Plag (2005) follow the idea of contingency models that an optimal change strategy is specific to context. Accompanied by a 150-item questionnaire, Burke-Litwin's (1994) content model of organisational change included predictions and the monitoring of factors such as leadership, strategy, individual and organisational performance. It covers transformational and transactional factors of a successful change. Vollman's (1996) imperative transformation model includes forty-eight facets and could be useful for complementing more generic change models. Balogun and Hope Hailey's (2004) change kaleidoscope consists of six change design choices and eight organisational context factors. Even though the contextual features remain the same, they are constantly reconfigured to produce different pictures for each organisational change situation. Brettel, Reißig-Thust and Plag's dice of change management offers twenty-seven facets of change management (Armenakis & Bedeian 1999; Balogun & Hope Hailey 2004; Brettel, Reißig-Thust & Plag 2005; Safar et al. 2006). Diagnostic models offer assistance to change managers to better understand the given situation, to draw a line under appropriate aspects of a change strategy from this and to make sure that the complex and interrelated details of a change process are not overseen. While the factors included in such models vary, these models are only tools offering a range of options for planning change. It is not the goal of these models to favour or recommend certain detailed change decisions.

Burke's (1988) managing change model tries to combine the single change management research streams in order to provide a more integrated and comprehensive understanding of managing organisational change. The managing change model represents a combined framework of change process model aspects, aspects of organisational transformation

management , aspects about the impact of change on individuals and is founded in social psychology, organisational theory and organisational behaviour (Paré & Jutras 2004; Siegal 1996). Compared to the identified shortcomings of organisational change related to European IT projects, the managing change model provides a positive fit with regard to a combination of hard and soft factors for change, i.e. supporting employees during the personal change process, participation, building readiness and commitment and helping managers to reflect their current change approaches. Furthermore, the model is situational and can be adapted to newly emerging facts. The only critical point is the lack of practical experience and empirical evidence as the model was only used for reflecting managerial knowledge about change.

Krueger's (2009) 3W-model is an orientation model for strategic renewal. The model is oriented on the change process but also includes holistic aspects and related areas needed to realize change successfully (Krueger 2009 p.26-37). Compared to the identified shortcomings of organisational change management related to European IT projects, the model included aspects of participation, building readiness and commitment and supporting employees managing the human side of change. The model is very detailed and gives managers orientation concerning state of the art alternatives in each step of a change project. Here the model is not sequential and offers situational and emerging adaptations to specific situations. The only critical factor is the lack of practical experience and empirical evidence of the model.

Table 2.3– Comparison of selected organisation change models

Name/ Author	Human aspects of Managing Change				Suitability for org. change related to IT project
	Participation	Creating Readiness	Creating Commitment	Support Personal Change	
<i>Organisational Development</i>	X	X	X	X	Limited suitability due to difference in orientation, pace and result focus
Lewin's <i>Change Model</i>	X	X	X	X	Limited suitability due to lack of situational process flexibility
Greiner's <i>A successful change process</i>	X	X	X	-	Limited suitability due to a lack of situational process flexibility, support for personal change management and due to the compulsory role of consultants
Beckhard & Harris <i>Managing the Transition Model</i>	-	(X)	(X)	X	Limited suitability due a lack of situational process flexibility, participation and the limited focus on build readiness and commitment to change for only key employees and managers
McKinsey's <i>7-S Modell</i>	-	-	-	-	Limited suitability due to a lack of participation, readiness / commitment to change and support of personal change.
Kotter's <i>Eight Stage Process for</i>	-	X	X	-	Limited suitability due to a lack of participation and personal support for change

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<i>Successful Organisational Transformation</i>					
Tushman et al. <i>'s Model</i>	-	-	-	-	Limited suitability due to a focus on organisational adaptation to the environment and a lack of participation, readiness and commitment and support for personal change.
Burke's <i>Managing Change Model</i>	X	X	X	X	Limited suitability due to a lack of practical experience and empirical evidence.
Nadler's <i>Congruence Model</i>	X	X	X	X	Limited suitability due a lack of situational process flexibility.
Carnall <i>Managing major changes</i>	X	X	X	X	Limited suitability due to a lack of situational process flexibility and lacking reports on practical experience and empirical evidence.
Kanter et al.'s <i>Ten Commandments for Executing Change</i>	X	X	X	-	Limited suitability due to a lack of support for personal change and a limitation of employee involvement in the later change phases.
Burke-Litwin <i>Model</i>	-	(X)	(X)	-	Limited suitability due to a lack of participation and support in personal change. Readiness and commitment for change are only partially included.
Tichy & Shermann <i>Transformation-modell</i>	-	X	X	X	Limited suitability due a lack of situational process flexibility and participation
Dunphy & Stace's <i>Contingency Model</i>	(X)	(X)	(X)	-	Limited suitability due to a focus on organisational adaptation to the environment and a lack of participation, readiness and commitment and support for personal change in ¾ of the model's change strategies.
Vollman's <i>Model of the transformation imperative</i>	-	-	-	X	Limited suitability due to a lack of participation, readiness and commitment to change.
Janes et al. <i>Transformations-management</i>	X	X	X	X	A relatively new model, which lacks reports on practical experience and empirical evidence.
Luecke's <i>Seven Steps</i>	X	X	X	X	A relatively new model, which lacks reports on practical experience and empirical evidence.
Woodward and Henry's <i>Leading and Coping with Change Model</i>	X	X	X	X	A relatively new model, which lacks reports on practical experience and empirical evidence.
Balogun/ Hope Hailey's <i>Change Kaleidoscope</i>	(X)	(X)	(X)	(X)	Limited suitability due to a lack of practical experience and empirical evidence.
Brettel, Reißig -Thust & Plag's <i>Dice of Change Management</i>	-	(X)	(X)	-	Limited suitability due to a lack of participation, support during personal change, practical experience and empirical evidence.
Doppler's <i>Charta of Change Management</i>	X	X	X	-	Limited suitability due to a lack of support of the personal change process, practical experience and empirical evidence.
Krüger's <i>Orientation model for strategic renewal (3W-Model)</i>	X	X	X	X	Limited suitability due to a lack of practical experience and empirical evidence.

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Capgemini Consulting <i>Transformation-Architecture Model</i>	-	X	X	X	Limited suitability due to a lack of participation, practical experience and empirical evidence.
Accenture's <i>Wheel of Change</i>	-	-	-	-	Limited suitability due to a lack of participation, building readiness and commitment, support of personal change, practical experience and empirical evidence.

Source: Hetkamp 2011; developed for this study

As summarized in table 2.3, from the analysis of 24 selected change management models with regard to their applicability to organisational change related to European IT projects and to the above identified shortcomings of current change management practices, only nine change management models were found, which cover the theory of the identified four main areas dealing with the human side of change. The lack of human change factors found in many change models is in line with the findings of other authors (Self, Armenakis & Schraedder 2007). This is all the more surprising as the need for organizational change models for monitoring and minimizing the likelihood of unfavourable employee reaction to change is not new (Armenakis & Bedeian 1999). Furthermore, for the majority of these models, neither in the general nor in the specific case of European IT projects could sufficient empirical evidence be found, which indicated the beneficial character of these models to improve change success in practice.

From the analysis of these 24 change management models it can therefore be concluded that, at least for the specific case of organisational change related to European IT projects, the statement of several authors seems to hold true that even though many change models and approaches have been developed in recent years, little empirical evidence exists to support their recommendations (Ashurst & Hodges 2010; Todnem 2005). The analysis therefore leads to the need for an empirically validated model of organisational change including the management of the human side of change for a more successful management of organisational change related to European IT projects.

2.6 Proposed research model and critical discussion

The three theoretical constructs knowledge of change management, readiness for change and a participative and supportive change style were selected based on the above identified

shortcomings of organisational change related to European IT projects and based on their significant prior research. The relevance of the research results achieved and the fact that all aspects are assumed to have an influence on a positive change attitude of employees in an early project phase, were decisive aspects for their selection. The combination of these three constructs and their relationships to change success and business change success of European IT-projects were assumed to enrich the understanding and provide empirical evidence of the effectiveness of human aspects of change. The research was therefore regarded to be of high relevance for European steel managers confronted with the need to more efficiently and effectively realise organisational changes resulting from IT projects. All constructs will be defined and discussed in detail in the following section.

2.6.1 Manager's knowledge of change management

Definition of knowledge of change mManagement

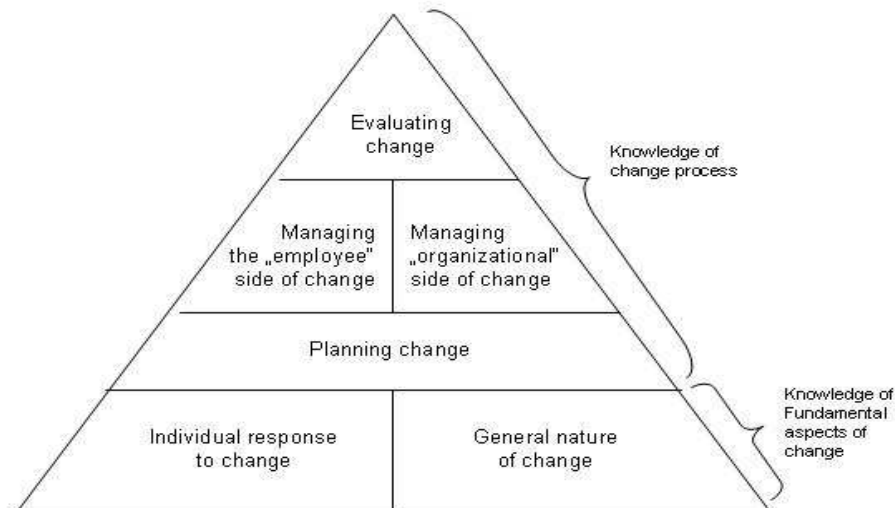
Siegal et al. (1996) used Burke's Managing Change Model and the related Managing Change Questionnaire (MCQ) to survey over 1,800 managers. Burke's Managing Change Model combines theoretical perspectives of patterns of change processes, changes to organisational identities and the effects on individuals in the six main model dimensions (see figure 2.6). Each of the dimensions focuses on organisational change seen from a broader and more general pattern of change, down to the difficult psychological adjustments individuals undergo. The Managing Change Model deals with causes for change barriers and with visions on how to research the targeted future state.

The dimension *managing employees* addresses principles and guidelines in the areas of leading and managing employees during a change process. It deals with communication and the psychological issues of the transition. The *managing the organisational side* dimension addresses organisational aspects such as reward systems and structures. It deals with structural issues and the design of long-term change efforts. Finally, the dimension *evaluating change* addresses monitoring change progress, feedback and the maintenance of momentum. It deals with indicators of change effectiveness (Church, Allan H., Waclawski & Burke 1996; Siegal 1996; Warner Burke Associates 1995).

As a result of Siegal et al.'s study, the three dimensions with the lowest overall agreement score found were: individual response to change, the general nature of change and the managing employee side of change. Siegal at al. concluded that managers and managerial

training programs might be more focused on managing the organisational aspects of change processes rather than on the human aspects. The underlying assumption of the authors is that the success rate of change projects could be enhanced by improving the knowledge of managing change in general and specifically in these areas (Church, Allan H., Waclawski & Burke 1996; Leban & Stone 2008; Siegal 1996; Warner Burke Associates 1995).

Figure 2.6 – Managing Change Model



(Siegal 1996 p.59)

Critical discussion and findings

Siegal et al.'s conclusion that the success rate of change projects could be enhanced by improving manager knowledge of the social/ behavioural dimensions of change and that successful change management is a combination of hard and soft factors, which is also supported by other studies (see table 2.4) and by other researchers (*Executing Change: Three Generic Strategies* 1993; Cicmil 1999; Litzcke & Nolte 2008; Mohr et al. 2010; Paré & Jutras 2004).

The general importance and lack of practical knowledge of change management is also supported by many other authors (*Leading Change* 1988; Bamford & Forrester 2003; Boos, Heitger & Hummer 2004; Whelan-Berry & Somerville 2010). In addition, Mueller-Stewens and Lechner (2001) also emphasise the multi-faceted characteristic knowledge of change management that managers need to cope with. While experts regard change as a complex and context-related challenge (Balogun & Hope Hailey 2004) the impression is given in practice that many organisations regard change as happening by itself or that local managers

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are perceived to have the necessary change expertise to handle it themselves (Mueller-Stewens & Lechner 2001). When amalgamating Siegal et al.'s study and Mueller-Stewens and Lechner's arguments, it can be concluded that the limited knowledge of change management possessed by managers might not only result from unbalanced managerial training but also from a false perception of organisations and a lack of quantity and quality in the change management expertise required by managers.

Table 2.4–Overview of studies with regard to change management knowledge

Year	Study characteristics	Study results
1996 Curch, Waclawski, Burke	Study of 1500 organisational development experts	Found comparable results such as Siegal et al. about the limited knowledge of managers regarding change management.
1999 Grover	Study of 105 participants of business process reengineering projects (BPR)	Found among other things that employee and manager oriented change management issues are of high relevance for the success of BPR projects
1999 Maxon	Study of 19 British senior HR managers	Found comparable results such as Siegal et al. about the limited knowledge of managers regarding change management.
2002 Kotter & Cohen	More than 200 interviews with organisations worldwide with regard to change management	Concluded that strategy, structure, culture and system are not central issues. In highly successful situations, behaviour change would happen by addressing employee feelings.
2004 Paré & Jutras	Survey of 380 Canadian IT professionals based on the managing change questionnaire	Found comparable results such as Siegal et al. about the limited knowledge of managers with regard to change management. Additionally found a sufficient reliability of the Managing Change Questionnaire used (MCQ).
2004 Huat	Survey of 61 Malaysian manufacturing managers	Found comparable results such as Siegal et al. about the limited knowledge of managers regarding change management. Additionally found a significant correlation between a high MCQ score and project success.
2005 Inversini	Study of 4 business cases, a survey of 78 and semi-structured interviews with 39 change consultants and managers.	Found among other things a significant link between existing knowledge of CM and a trend towards participation leadership, self-reflection and local decision making
2005 Puetzgen & Roe	Study of 48 SAP implementation projects with regard to the use and importance of change management	Even though the study found user enabling as a significant factor for the long term success of a SAP project, the study also concluded that the short and longer term success of an SAP project does not solely result from soft facts but from a combination of several change management practices.
2006 Herzig & Jimmieson	Study of 40 middle managers from 10 organisations using semi-structured interviews	Found that middle managers can play a central role in communicating and assisting employees during a change process if their own uncertainty e.g. with regard to CM procedures and concepts could be reduced
2007	Survey of medium-sized and	Confirmed a focus on the human side of change and concluded the importance of including all relevant components such as organisation, system, communication,

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Houben & Frigge	large German companies	managers, employees & culture in the change process in order to be successful
2007 Szabla	Survey of 281 employees from a US county government	Found that it is important for participants to have a good knowledge of change strategies and cognitive, emotional, and intentional responses to realise changes more effectively
2008 Andrew, Cameron & Harris	Study of 72 non-profit managers who completed a postgraduate module on organisational change between 1999 – 2005 at the Aston Business School/UK	Found that managers perceived the review of change management experience in a learning cycle to be very helpful. Managers furthermore valued theories and approaches directly related to their particular work. The theories and approaches learned in a classroom enabled these managers to reflect about change implementation.
2009 Reinmann, Dinges & Krüger	Analysis of 100 top change projects of 98 of the German Fortune100 enterprises.	Found that 40 percent of the managers facing change do not feel they have the necessary knowledge for this task.
2010 Claßen & von Kyaw	Survey of 116 German, Austrian and Swiss enterprises	Found that about 60 percent of the managers analysed perceived their change management knowledge/ competences to be on medium or even lower level
2010 PA Consulting / GFO	Survey of 121 companies, of which 60 percent located in Germany	Found that in many organisations change management knowledge is not regarded as a necessary organisational competence and that the use of change management depends on the personal competences and experiences of a manager

Source: Hetkamp 2011 developed for this study

Furthermore, it can be concluded that the knowledge and expertise required to handle change successfully is far more than the result of managerial training. While theoretical concepts are important factors, change management also demands experience in becoming accustomed to using such theories in a practical context and to have the ability to reflect upon practical experience in order to enhance one's own knowledge e.g. about change management (Kolb 1996; Self, Armenakis & Schraedder 2007). Siegal et al.'s recommendation to extend manager familiarity with an integrated change management model and to focus managerial education more on the soft factor related part of change (Siegal 1996) can be seen critically as the concept that familiarity with theoretical knowledge does not replace practical experience and reflection. Education alone is thus not enough to improve the management of change.

In addition to Siegal et al.'s recommendation, the Managing Change Questionnaire (MCQ) can also be viewed critically as manager knowledge of a specific topic no longer being the

sole important factor. Manager ability to learn and adapt to changing situations is of increasing relevance (Kolb 1996). Even though the Managing Change Questionnaire measures personal perceptions of the six key concepts of the Managing Change Model and not the knowledge of change management theories and models (Leban & Stone 2008; Siegal 1996), the Managing Change Questionnaire does not include such aspects as adaptability and reflection on change situations, which have been experienced.

Other authors are more critical about the assumption underlying Siegal et al.'s research that a high agreement score to the six dimensions of the Managing Change questionnaire would improve the change management success rate. It is argued that knowing relevant change management models and theories and sharing their basic perception is a very useful first step but that managers in practice would often lack suitable change tools and guidelines to achieve these change prerequisites (Hughes 2007; Mabin, Foregeson & Green 2001). Practical tools and skills needed for managers to manage change could for example be conflict management, project management, coaching or communication (Al-Ani & Kaßner 2000).

The existence and the strength of the link between change management knowledge of managers and change success as formulated in the research question one and two should be evaluated as part of this research by using the following hypothesis:

Hypothesis 1: Knowledge of change management is positively related to change success in IT projects.

2.6.2 Employee readiness for change

Definition of readiness for change

Employee readiness for change can be defined as the attitude and behaviour towards set targets and the individual actions of a change management process within an organisation by the managers and employees involved or affected (Kersting 2005). Jones (2005 p.362) defines readiness for change as “the extent to which employees hold positive views about the need for organisational change as well as the extent to which employees believe that such changes are likely to have positive implications for themselves and the wider organisation”. For Armenakis readiness of change represents the cognitive evaluation of individuals affected that can lead to a positive attitude and support for a change initiative (Armenakis,

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Harris & Mossholder 1993; Self & Schraedder 2008). Krueger adds that readiness for change is also based on a positive calculation of personal costs and benefits (Krueger 2009). It is proposed that readiness for change can be seen as the foundation for an adaptive reaction of employees to a change process. A positive attitude is said to build commitment and motivate employees to exert energy and effort to realise change (Holt et al. 2007; Self & Schraedder 2008; Waddell, Cummings & Worley 2000). Armenakis and colleagues first presented their readiness for change model in 1999. Only in 2007, could the qualitative and quantitative evidence for the reliability and validity of the model and the scale be presented (Armenakis, A. et al. 2007; Armenakis, Achilles et al. 2007; Holt et al. 2007). The model consists of the following five factors building readiness for change.

Discrepancy indicates how necessary an employee regards the change undertaken. Efficacy indicates to what extent an employee regarded the probability that a change could be implemented and realised. The factor of valence can be subdivided into personal and organisational valence. While personal valence gives an indication of how personally beneficial an employee regards a change, organisational valence shows how organisationally beneficial an employee judges a change undertaken.

Table 2.5 – Five most influential factors for change readiness

Discrepancy	Belief that change was necessary
Efficacy	Belief that the change could be implemented
Management Support	Belief that leaders were committed to the change
Personal Valence	Belief that the change would be personally beneficial
Organisational Valence	Belief that the change would be organisational beneficial

(Holt et al. 2007)

Finally, *management support* outlines the employee's impression of the level of commitment of leading managers toward the change targeted (Armenakis, A. et al. 2007; Armenakis, Achilles et al. 2007; Holt et al. 2007).

The underlying assumption of the readiness of change model is that a high readiness for change has a positive effect on the successful realisation of change. The authors have successfully measured the positive effect of a high readiness score e.g. on job satisfaction,

affective commitment and fluctuation rate (Armenakis, A. et al. 2007; Armenakis, Achilles et al. 2007; Holt et al. 2007).

Critical discussion and findings

The importance of determining and ensuring the readiness and willingness for change and findings of Armenakis and colleagues with regard to the achievement of business results are supported by further studies (see table 2.6) and shared by many other authors (*Leading Change* 1988; Al-Ani & Kaßner 2000; Balogun & Hope Hailey 2004; Beer, Eisenstat & Spector 1990; Doppler & Lauterburg 2005; Helmke, Brinker & Wessoly 2008; Kotter & Schlesinger 2008; Lohmer 2000; Paré & Jutras 2004; Reiß, von Rosenstiel & Lanz 1997; Waddell, Cummings & Worley 2000).

Table 2.6 – Overview of studies with regard to readiness for change

Year	Study characteristics	Study results
1967 Greiner	Survey study of 18 change projects	Found that successful change projects are positively perceived by staff
1981 Ginzberg	Survey of a Trust department of a large U.S. Bank	Found that a successful management of user expectations leads to a perception of a successful system implementation. It was concluded that management of expectations lead to attitudinal and behavioural change success.
1982 Nurick	A longitudinal field study of participation in organisational change involving 380 employees of an American utility company over 36 months	Found a) a positive effect of participation on the change process and b) a link between objective participation and psychological participation.
1991 Schweiger & Deninsi	Study of a Fortune-5000 company merger	Found that by using open and honest communication it is possible to establish a readiness for change and to prevent a decrease in operational performance even if employees are negatively affected by change
1999 Grover et al.	Study of major problems in Business Process Reengineering (BPR) projects	Found that 6/10 major problems of BPR projects relate to change management practices (e.g. communicating the project necessity or employee acceptance)
1999 Cicmil	Study of 12 organisations incl. 48 managers on change implementation	Found a correlation between implementation gaps and behavioural impediments related to organisational resistance
1999 Coyle-Shapiro	Study of organisational change interventions as part of a total quality project with 600 participants of a multinational UK based company	Found that a negative assumption of change intervention by employees and managers in an early project stage would lead to a lack of participation in later project phases
2000 Rhodie	Study of 3 business cases of organisational change programs targeted at improving declining organisational performance	Found the following key principles for managers and employees: <ul style="list-style-type: none"> - Understand necessity and goal of change - Transparency in change plans - Management support & training - A fair environment

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2002 Orth	Survey of 193 employees of a U.S. State Agency	Readiness for change as good predictor for commitment and support for change.
2002 Kotter & Cohen	More than 200 interviews with regard to change management with organisations worldwide	Concluded that strategy, structure, culture and system are not central issues. In highly successful situations, behaviour change would happen by addressing employee's feelings.
2002 Cunningham et al.	Survey of 880 employees of a large Canadian teaching hospital	Found that individual and organisational readiness for change are highly correlated. Furthermore, a high readiness for change and change self-efficacy early in a project was found to lead to a high readiness for change score at the end of a project.
2003 Vahs & Leiser	Regional study of 180 medium companies and enterprises in cooperation with the Stuttgart chamber of commerce and industries	Found that change readiness and motivation for change are an essential factors for change success
2003 Abdinnour-Helm, Lengnick-Hall & Lengnick Hall	Study of >900 employees of an U.S aircraft manufacturer during an SAP implementation	Found readiness to change to be influenced by company affiliation and profession. Newer employees and managers were found to be generally more positive than the organisation on average
2003 Schuster-Cotterell	Study of 21 international managers at a large pharmaceutical company by a survey and structured interviews	Found that managers who have a high commitment to change projects experience greater job satisfaction & motivation
Bernerth 2004	Case Study of a spin-off manufacturer of durable goods	Found that a failure to establish Readiness for Change lead to a high level of change resistance.
2005 Claßen, Arnold & Papritz	Study of 114 German companies with regard to change management	Found that employees generally have a sceptical and negative attitude to change. A focus on motivation and readiness for change would therefore be essential to make change happen.
2005 James	Survey of 63 managers of an Australian government-owned enterprise undergoing organisational changes.	Found that participation of employees and managers could increase the success of organisational change projects
2005 Inversini	Study of 4 business cases, a survey of 78 and semi-structured interviews with 39 change consultants and managers.	Found that even minimal forms of participation such as transparency about change planning can lead to employee support and commitment to change
2005 Kersting	3 rd part of a study involving 194 employees of a large German-American company with regard to change resistance	Found a correlation between job satisfaction and the agreement to a change necessity with the commitment to change
2005 Jones, Jimmieson & Griffiths	2 step study of 157 employees with regard to the readiness for change and implementation success of IT systems	Found a positive relation between readiness for change and user satisfaction
2005 Greif, Runde & Seeberg	Study referred to by Litzcke & Nolte (2008)	Found employee commitment e.g. through employee participation to be a major factor for a successful change process.
2005 Kohnke, Bungard &	Study of 210 members of the German SAP user group with regard to change management in SAP implementation	Found that the use of change management practices was positively linked to user acceptance of the SAP solution (user satisfaction, process and handling knowledge)

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Madukanya	projects	
2006 Rafferty & Restubog	Study of 311 employees of administrative, finance and HR departments of 5 Australian Organisations	Found that Readiness to Change is driven by different influencing factors depending on fine-tuning or how larger transformation change projects are investigated. However, employees who feel capable of supporting a fine-tuning change project were found also to feel capable of supporting a larger change project.
2007 Houben & Frigge	Survey of German medium and large sized companies	Found a) that the level of commitment has a strong influence on change process. B) that change has to be understood by employees both rationally and emotionally c) Commitment of senior and middle managers as important success factor and d) Communication is not a sufficient means to build commitment
2007 Brinkhoff & Thonemann	Study of 87 SCM projects with regard to success driving factors	Found that in 75 percent of the failed projects the employees were not committed to change whereas this was only the case for 19 percent of the successful projects
2007 Albion & Gagliardi	Study of 2,549 governmental employees undergoing major structural and procedural changes	Found that transformational leadership is related to job satisfaction during change through the construction of a change specific efficacy
2007 Böhm, Vanden Eynde & Pirker	Researched 45 organisations regarding change management	Found that lacking acceptance is the second most important barrier to change
2007 Walker, Armenakis & Bernerth	Survey of 117 workers at two production sites of a newly formed company	Found that readiness for change is positively related to commitment to change
2007 Machin & Albion	Two step study with 2,600 State governmental employees testing a prediction model for change success	Found supportive change management activities and a positive organisational climate contribute to an affective commitment to change and to change success.
2008 Helm, Hegenbart Gerking	Study of 3,000 retail customers and 70 retail stores with 100,000 availability tests	Found that a low commitment level of employees would reduce the possible added value potential of IT projects
2008 Parish, Cadwallader, Busch	Study of 191 employees with regard to the role of employee commitment in the success of organisational change	Found affective commitment to have the greatest influence on the outcome of change
2008 Michel	Study of >300 university employees	Found a significantly positive relationship between information and justification for perceived process fairness while process fairness was found to have a significantly positive relationship to change commitment.
2008 Kwahk & Kim	Study of 446 employees of 7 companies, which recently implemented a new ERP-system/module	Found that Readiness for Change is positively related to the intended usage of a new IT system. Also found that Commitment to Change and a perceived personal competence are positively related to readiness for change.
2009 Liu, Liu, Man	Study of 173 employees in Macau with regard to the relationship between personal change schemas, change behaviour and participation	Found that individual perception of change/ valence is positive related to change participation
2009	Study of 88 employees of a Portuguese public university	Found that the feelings of change appropriateness and change self-efficacy positively influenced commitment to change and reduced the turnover

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Neves		intention.
2010 PA Consulting / GFO	Survey of 121 companies, of which 60 percent located in Germany	Found that creating readiness for change is not regarded as a necessary leadership skill by most organisations

Source: Hetkamp 2011; developed for this study

An accurate perception of employee readiness for change is seen as being critical to the change process as more than twenty percent of the change success is deemed to be achieved by avoiding negative elements such as change barriers (Chrusciel & Field 2006; Litzcke & Nolte 2008). Furthermore, the level of change readiness can be regarded as highly relevant as it could make a difference to the approach used in managing the change (Balogun & Hope Hailey 2004) and as the long lasting effect of past change and restructuring programmes could influence the actual organisational readiness and willingness to change (Dutta & Manzoni 1999).

With the special focus on IT projects, it is argued that the technological component might be necessary but not a sufficient aspect to enable organisations to benefit from new IT. Without preparing employees and creating a positive attitude to using the new IT solution, there would only be a limited impact on organisations. Ensuring change readiness is thus regarded as a multiplier for the organisational benefit of IT projects (Abdinnour-Helm, Lengnick-Hall & Lengnick-Hall 2003).

Measuring and ensuring readiness for change as a preliminary project success factor is also viewed critically as it is argued that the main resistance to a project arises when managers and people face the change in practice. This it becomes a test of stress for employee readiness and willingness for change (Lohmer 2000). The representativeness and value of pre-project readiness measures and activities might therefore only be of limited use.

Some researchers question the idea of change readiness by emphasising that at the beginning of a change process only a small group of employees could be won over as supporters for the change process (Claßen, Arnold & Papritz 2005; Schuster-Cotterell 2003). These supporters won in the early stages have to be used as multipliers during the ongoing change process in order to expand the basis of supporters systematically (Litzcke & Nolte 2008). The question could be posed as to whether this approach really contradicts or complements Holt et al.'s findings. A higher level of change readiness could also stimulate a larger group of early

change supporters being formed, which would in turn increase the possible multiplication-effect during later project phases.

Other researchers do not regard organisational change readiness as a clear indicator but as a personal development path, which has to be differentiated yet further into content change and emotional change (Al-Ani & Kaßner 2000; Kotter & Schlesinger 2008; Litzcke & Nolte 2008). It is argued that emotional change and thus also the readiness for change occurs by re-conceptualising current goals and perceptions to incorporate change (Burt 2003). This could explain the existence of different levels of awareness and commitment levels in an organisation (Balogun & Hope Hailey 2004; Schuster-Cotterell 2003). It is furthermore emphasised that the agreement to the need for change and the reasons behind it do not automatically lead to a positive attitude to change. An employee for example might understand and accept the reasons for cost reduction but oppose change as he is afraid of losing his job. Change readiness therefore has to be established based on content and at an emotional level (Balogun & Hope Hailey 2004; Krueger 2009).

A general trend with regard to change readiness on different hierarchical levels was identified (Balogun & Hope Hailey 2004; Claßen, Arnold & Papritz 2005; Inversini 2005) demonstrating that there is a link between readiness and openness for change and hierarchical level. A possible explanation for this relationship could be seen in the fact that the more senior managers are in the organisational hierarchy and are less likely to be personally affected by the occurrence of change. Furthermore senior managers might regard change as an opportunity to strengthen and align business operations while middle managers and employees may experience change as a disruption of their work environment.

It is suggested that change readiness is also related to managerial behaviour and leadership. It is for example argued that in order to create change readiness a proactive coaching role should be used. When time is too short to improve a low readiness to change level, it weighs all the more on the management to demonstrate belief and commitment to change in order to act as a multiplier for a positive attitude to the said change (Armenakis, Harris & Mossholder 1993; Balogun & Jenkins 2003).

Kotter (1996) also emphasizes the importance of age as a factor with regard to readiness for change. Many middle aged and older managers and employees have already experienced periods of a slower moving business world, infrequent and incremental changes and lower

levels of productivity, quality expectations and speed of innovation. He postulates that these personal experiences make it difficult to accept the credibility of more frequent and transformational change (Kotter 1996).

Dutta/Manzoni (1999) and Lohmer (2000) added two additional factors for creating employee readiness for change. In addition to the emphasis placed on the existing hope of employees that their sacrifices will bear fruit for them in the foreseeable future, the perceived degree of fairness of the change process is also regarded as an additional driver for change acceptance (Chrusciel & Field 2006; Dutta & Manzoni 1999; Lohmer 2000; Michel 2008).

It is also argued that Armenakis and those colleague- related factors identified for change readiness are especially focused on employee willingness to change while the general factors needed for change acceptance should be regarded on a higher and wider level. In addition to the area of change willingness this would also include knowledge about the upcoming change and the ability and skills needed to adapt new work processes and tasks (Conner 1992; Kersting 2005; Krueger 2009; Neumann, R. 2007; Reiß, von Rosenstiel & Lanz 1997; Rhodie 2000). The focus on employee readiness for change is also criticised by Nehls and Kautzsch (2000). Even if the mobilisation of employees were an important aspect, it could be reasoned that the mobilisation of the change teams and the management levels have to happen first, as change success is very much in doubt without managerial commitment (Nehls & Kautzsch 2000).

Carnall (1990) argues that the personal energy for change is more than just change readiness. The energy for change is described as a product of perceived dissatisfaction with the present situation, the commitment to a shared vision or goal and the knowledge of the upcoming steps. The energy of change as a product of these factors, has to be considered as being larger than the perceived costs of change, both economically and psychologically (Carnall 1990). Furthermore it has been noted by researchers that increasing time pressure in organisation has often lead to many projects being carried out simultaneously. Consequently, these projects directly compete for executive and employee attention as well as human and economical resources (Claßen, Arnold & Papritz 2005; Mueller-Stewens & Lechner 2001; Nehls & Kautzsch 2000). The effect of readiness and commitment on a specific change project can be viewed critically with respect to these facts.

As change readiness is a personal factor, Dobiéy and Wargin (2001) emphasise the importance of an irrational human thinking horizon. They point out that game theory has proven that in the short term individuals can gain more by resisting while in the long term only a cooperative approach leads to success. Furthermore they add that even if research has proven that change happens exponentially, there still the dominant view of most managers and employees that change happens in a linear way. The consequence is that in short term change some possibilities are overestimated whereas in the long run they are underestimated. The overestimation automatically leads to a decrease in commitment and support when it becomes clear that the set short term goals are unrealistic. It is concluded that this short term focus proves the positive relationship between change justification and commitment to change. A longer term individual perspective and a greater focus on a short term justification are needed to successfully initiate and finalize change projects (Dobiéy & Wargin 2001; Michel 2008).

As formulated in research questions three and four, the research will investigate the existence and strength between readiness for change and successful change realisation using the formulated hypothesis:

Hypothesis 2: Readiness and agreement to change is positively related to the change success in IT projects.

2.6.3 Influence of change style on change success

Definition of implementation style

Waldersee and Griffiths (2004) analysed 408 change projects in 138 Australian companies with regard to the relationship between two major types of change (behavioural-social and technical-structural) and also examined two major implementation styles (unilateral and shared) and their relationship to the success of change programs.

A unilateral implementation style is understood to be based on authority and control (Waldersee & Griffiths 2004). Solutions are directed downwards through formal and impersonal control mechanisms (Greiner 1967). A unilateral implementation style follows the assumption that attitude and behavioural changes follow a structural change as both are a function of job roles (Beer, Eisenstat & Spector 1990). Advantages of a unilateral implementation style can also be seen in the control over the direction and content of change

and in faster decision making. It is argued, especially with regard to IT projects, that the speed of development represents a competitive success factor (Fernis 2006). These time advantages lead to low time requirements and therefore low costs in early project phases but there is the great risk of high follow-up costs later when resistance has to be faced (Fernis 2006; Scheer 1998). This implementation style is frequently used in large scale change projects and in times of crisis such as turnaround and restructuring projects (Balogun & Hope Hailey 2004; Dutta & Manzoni 1999; Palmer & Dunford 2002) and is viewed by managers as an efficient method for implementing change (Szabla 2007).

A shared implementation style is understood to be based on participation and involvement. It follows the assumption that employee support will lead to commitment and motivation to make change happen (Waldersee & Griffiths 2004). Allowing a limited involvement of how change will take place still enables a controlled framework. Some authors also argue that a shared implementation style can be very time consuming and thus also cost intensive in early project phases while only facing low costs at a later stage (Balogun & Hope Hailey 2004; Scheer 1998). Participation is thereby not understood as a loss of but as an alternative form of decision making and managerial control (Conner 1992).

As a result of their large study of Australian managers, Waldersee and Griffiths found evidence that a unilateral implementation style plays an important role in implementing technical-structural changes and that a shared approach is dominant in implementing behavioural-social changes. With regard to the influence on change success, the authors found evidence that the unilateral approach seems to be more effective in achieving change outcome independent of the type of change (Waldersee & Griffiths 2004). It is also argued that for larger scale and more transformational projects, a unilateral style should be adopted. A shared approach with participation is considered far too removed from individual interests in such cases (Waldersee & Griffiths 2004).

Critical discussion and findings

Waldersee and Griffiths' research findings contradict the trends in research publications (Balogun & Jenkins 2003; Kotter & Schlesinger 2008; Waddell, Cummings & Worley 2000) and studies on employee participation and support as a change success lever (see table 2.7).

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Table 2.7 –Overview of studies with regard to implementation style

Year	Study Characteristics	Study results
1948 Coch & French	Study of 4 comparison study groups with varying degrees of participation	Found that a work group with active participation had higher productivity and a lower level of change resistance
1967 Greiner	Survey study of 18 change projects	Found the importance of top management involvement and commitment. Furthermore, identified a shared power approach to successfully manage change
1982 Nurick	Study of 246 employees of an American utility company	Found a link between objective participation and psychological participation (increased perception of influence).
1990 Beer et al.	Study of large-scale corporate change programs	Found staff-driven improvement projects to yield performance
1998 Kempis, RD, Ringbeck, J.	Quantitative and qualitative research study of 70 international industry companies	Found that participation leads to an obviously high acceptance and efficiency level compared to employees who were not involved
1999 Coyle-Shapiro	Study of organisational change interventions as part of a total quality project with 600 participants of a multinational UK based company	Found that manager behaviour is positively related to employee participation in change while employee involvement in change is positively related to assessment of change benefits
2000 Waddell, Cummings & Worley	Pointed out several studies	Found a consistent relationship between employee involvement and productivity measures such as fin. Performance, customer satisfaction, etc.
2000 Eby, Russel, Adams & Gaby	Study of 2 division of a national sales organisation	Found that participation is positively related to readiness for change.
2001 Harper & Utley	Three year study of 18 organisations with regard to IT implementation and organisational culture.	Found a strong link between success of IT systems employed and the concern for human attributes. Positively related manager and employee-oriented attributes are e.g. autonomy, team work and information sharing.
2002 Huy	Study of 500 employees during a 3 years relocation change project in a large IT company	Found that the greater the support demonstrated by senior managers, the greater the commitment of middle managers.
2002 Cunningham et al.	Survey of 880 employees of a large Canadian teaching hospital	Found that active involvement in the change process is positively related to change self-efficacy, which positively influences commitment to change and reduces perceived stress of change.
2003 Schuster-Cotterell	Study of 21 international managers at a large pharmaceutical company by means of a survey and structured interviews	Found a significant link between reward and empowerment, which could mean that managers use empowerment as a reward.
2003 Flanders	Study of 264 employees of a public department undergoing a restructuring process	Found a) a positive relationship between participation and readiness for change and b) that participation could play no role with regard to the perception of management support for change.
2003 Abdinnour-	Study of >900 employees of a U.S aircraft manufacturer during an	Contrary to the expectation, no improvement of attitudes towards the new system could be measured even though employees were intensively trained and involved in

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Helm, Lengnick- Hall & Lengnick Hall	SAP implementation	the implementation.
2004 Lines	Study of 241 employees of a Norwegian telecommunication company	Found a strong relationship between participation and goal achievement and reducing resistance. A medium effect was found on commitment.
2004 Drahtschmied	Survey of 80 German Mutual Saving Banks	Found that while 2/3 of the analysed banks saw scepticism and fear about change as a serious reason for change resistance, a lack of participation was not seen at all as being a major problem.
2005 Claßen, Arnold & Papritz	Study of 114 German, Austrian and Swiss companies with regard to change management practices	Found a) an increasing management focus on employee involvement and a decreasing focus on the degree of suffering as a change driver and b) that 40 percent of all managers share the view that change can be forced by increasing the individual "pain"/affect level of employees
2005 Inversini	Study of 4 business cases, a survey of 78 and semi-structured interviews with 39 change consultants and managers.	Found a significant link between participation level and self-reflexion, and that the degree of participation should be adapted to the local leadership culture in order to manage change successfully.
2005 Higgs & Rowland	Case study of 7 English organisations incl. 40 informants and 70 change stories	Found that directive approaches were the least effective in most cases
2006 Rafferty & Restubog	Study of 311 employees of administrative, finance and HR departments of 5 Australian Organisations	Found that participation is positively related to readiness for change but only in fine-tuning change projects. For transformation change projects the influence could not be identified.
2006 Ratterty & Griffith	Case study of a large Australian public sector organisation	Found that supportive leadership had a significantly positive influence on employee uncertainty, work satisfaction and turnover intention
2006 Schraeder, Swamidas & Morrison	Study of 135 employees of a health care company	Found that high involvement in the change process leads to a high support for change.
2007 Böhm, Vanden Eynde & Pirker	Researched 45 organisations with regard to change management	Found early involvement of employees and transparency as central factors for success
2007 Szabla	Survey of 281 employees of a US county government	Found that power-coercive implementation strategies were the least positively judged
2007 Albion & Gagliardi	Study of 2,549 government employees undergoing major structural and procedural changes	Found that a supportive leadership style such as transformational leadership is related to job satisfaction during change through the building of a change specific efficacy
2007 Machin & Albion	Two step study with 2,600 state government employees testing a prediction model for change success	Found that supportive change management activities and a positive organisational climate contribute to an affective commitment to change and to change success.
2007 Houben & Frigge	Survey of German medium and large sized companies	Found that support and commitment of senior and middle managers as important success factor
2008	Survey of 337 MBA & OD	Found four significant leadership talents to effectively drive change:

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Gilley, Dixon & Gilley	Master students with regard to leadership with respect to change and innovation	communication, motivation, involving others, coaching
2008 Parish, Cadwallader, Busch	Study of 191 employees with regard to the role of employee commitment in the success of organisational change	Found that employees who have a quality relationship with their manager feel more desire and duty to support organisational change
2008 Jimmieson, Peach & White	Survey of 149 employees of a local government council	Found a strong correlation between participation and communication. Furthermore both aspects were found to be positively related to employees reaction to organisational change
2008 Sverek et al.	Study of 716 nurses of a Swedish Hospital	Found a positive influence of participation on change commitment and for the reduction of negative effects of change such as role ambiguity etc.
2008 Meaney & Pung	McKinsey Survey of 3200 global executives	Found engagement and involvement as the top approach used by successfully realised change and transformation projects.
2009 Wiesner & Poole	Study of 340 SME managers in Queensland/Australia	Found that managers favour/limit topics for participation, which do not challenge manager decision power such as health & safety, job design & work operations, customer service etc. Only ¼ of the studied managers used an intensive participative style.
2009 Liu, Liu, Man	Study of 173 employees in Macau with regard to the relation of personal change schemas, change behaviour and participation	Found a supportive effect through employee participation and the good and close working relationships between managers and employees on the individual perception of change.
2009 Ikonen & Kurhila	Study of 40 students during 8 software projects	Found user involvement to be a top factor for project success.
2009 Bouckennooge	Study of 1358 participants of 42 Belgian organisations	Found that involvement in a change process correlated with readiness for change and the ability of managers to lead change

Source: Hetkamp 2011; developed for this study

Direct contradictions to Waldersee & Griffiths' findings are found in publications, which point out the limited effectiveness of a directive change style (Higgs & Rowland 2005 p; Porter, Lorsch & Nohria 2004). It is argued that a directive style prevents useful critical feedback, makes the handling of conflicts more complex and reduces the ability of the system to handle complex challenges in the long run (Meier 2007; Mueller-Stewens & Lechner 2001). Employee involvement in contrast is regarded as being of central importance to the successful realisation of change as it builds commitment and support for organisational changes (*Leading Change* 1988; Daft 2002; Laudon & Laudon 2000; Lines 2004; Litzcke & Nolte 2008; Whelan-Berry & Somerville 2010).

A shared implementation style can also be seen to reduce change resistance, to produce alternative ways and more realistic plans to make the change happen. It is reasoned that

resistance is not directly be related to the change goals but to the change itself. A shared implementation would enable management to reduce fears while employees could work out alternative ways of achieving the change goals. It is said that employees would want to know and understand goals, reasons and consequences and would want have personal influence especially in areas where they are directly affected (Doppler 2011; Klewes & Langen 2008; Lohmer 2000). It can be considered a logical style of behaviour for managers who try to minimize participation as they expect the worst while employees would try to extend participation while also expecting the worst. In this case, resistance should be positively judged as a forced participation to break this deadlock and enable managers, while constructively dealing with resistance, to turn back to more realistic change plans and timelines (Lohmer 2000). While Caldwell (2003) sees the role of change managers as being the creation of the context, in which new ideas for changes emerge, some authors even go a step further by promoting self-organised change realisation guided by a managerial vision of what should be achieved (McMillan 2006).

The preference for a participative and shared style nowadays can also be explained by the evolution of working conditions and work focus (see Table 2.7). While in the past the work environment was dominated by less educated workers performing physical routine work with fewer skills, the modern work environment has developed towards information centric jobs with a need for a highly-educated and skilled workforce. The importance of using the intellectual capacity of employees has grown. The focus of leadership has shifted more onto the quality and strength of relationships and in guiding employees using their intellectual capacity effectively for the good of the company (Daft 2002). This paradigm change can also be found back in the study results with regard to change leadership in different decades. While Dunford et al. (1990) found that a directive or coercive leadership style was adequate for managing rapid and radical change, 10 years later Buchanan et al. (2000) found the exact opposite, that a participative change style was preferable (James 2005).

However not all authors clearly favour one style or another. As a means to overcome resistance for example to change, both ways are regarded as possible, either in the form of a more shared approach including training, communication and participation or as a more unilateral approach with a more directive or coercive focus (Daft 2002). A shared implementation style can also be said to have the drawback of a possible conflicting message being sent to employees. While on the one hand a participative leadership style targets

employee needs at the highest levels of Maslow's motivation pyramid, basic needs such as safety and job security are often ignored due to increasing competition, downsizing and changed customer preferences (Duck 1993).

A slightly different literary view results from study results that a shared and participative change approach would require situational judgement and can not always be regarded as the best option to overcome resistance (Nielsen 2008). This view is strongly influenced by the contingency theory (Litzcke & Nolte 2008) and relates to the usability and usefulness of participation and involvement with situational influence factors such as time pressure, organisational culture for participation and the intellectual readiness and willingness of employees (Daft 2002; Inversini 2005; Kotter & Schlesinger 2008).

In addition to the situational factor a cultural, national background might play an important role with regard to leadership style and participation (see Table 2.7). It was shown that northern European business cultures would favour a more coaching oriented change style while southern European business cultures would favour a more directive change style (Schuster-Cotterell 2003). Moreover, German business culture is deemed as being more participative and co-operatively oriented than the more directive and unilateral U.S. business culture, which is characterised by a high security focus, leading to slower change progress and a more negative perception of change (Nehls & Kautzsch 2000; Wever 1995).

It could also be argued that the managerial view of a given organisational situation is a divisive factor for the selection of an implementation style. A shared approach could either be seen as a means to facilitate deep change commitment and to implement new ideas and understanding in an organisation in order to facilitate resistance reduction and to increase change efficiency (Nehls & Kautzsch 2000) or as a given necessity to feed employee needs for managerial support in change realisation (Mueller-Stewens & Lechner 2001). Inversini (2003) supports this idea on the managerial view with findings that a shared implementation style is most effective when its level still fits to the local leadership culture (see table 2.7).

In addition to the debate on management views, we find the debate on underlying schools of thoughts (see Table 2.7). It is argued that managers either follow a social-technique or a deterministic view. A deterministic view in the case of technology driven changes is understood to be regard to technology as being the determinant for change where employees, managers and organisations have to adapt. It is argued that empirical organisational

psychology research proved that this view would not hold true as it would lead to an efficient use of technology and inhuman work places (Bungard 2005a; Ulich 2005). This view is still widely shared in management and is based on the deterministic characteristic of natural, engineering, legal and IT science and their training programmes (Mütter & Feldmüller 2008a).

For the management of more fundamental organisational changes such as targeting change management actions on reframing, it is recommended to stimulate the cognitive structures of a social system and related individuals (Mueller-Stewens & Lechner 2001). Furthermore, speed and a direct holistic approach to change are generally considered more advantageous using the initial organisational awareness and dynamics (Mueller-Stewens & Lechner 2001; Nehls & Kautzsch 2000). This argumentation is supported by Says law, which dictates that an offer creates its own demand (Hammer & Champy 1994). It could therefore be argued that a unilateral implementation style and its view that mental change is a function of a new work environment or process, could at least in the early phases of a project be beneficial to organisations and their members who are managing the conceptual part of a fundamental change within a short time frame.

Participation is also always related to a certain, voluntary loss of managerial power and control. It is therefore recommended to find a balance of supervision and control on the one hand and the advantages of empowering employees on the other (Leban & Stone 2008). Researchers draw attention to potentially different perceptions of managers and employees dependent on the implementation style used. Managers might perceive the implementation style they use differently to employees (Szabla 2007). Managers would seldom be able to establish a common understanding of change goals and to realise change in a way that would also be satisfactory to the employees (Al-Ani & Kaßner 2000).

Lines (2004) argues that participation does not constitute a fixed way of acting but a wide range of more or less intensive involvement between consultative participation up to the right to veto decisions. The question is therefore not only if participation helps to realise change implementation more successfully, but also just how much participation is needed to be most successful (Lines 2004).

As formulated in the research question five and six, the research will use Waldersee and Griffith's questionnaire to evaluate whether a relationship between change style and change realisations resulting from IT projects exist and whether comparable results can be found. The research will use the following hypothesis:

Hypothesis 3: The use of a participative implementation style is positively related to the change success in IT projects.

2.6.4 Change success

Several studies indicate that many change management initiatives and their results have fallen short of managerial expectations and set goals (Beer & Nohria 2000; Dobiéy & Wargin 2001; Jorgensen, Albrecht & Neus 2007; Siegal 1996; Taskinen & Smeds 1999; Waldersee & Griffiths 2004). It is argued in literature that these problems cannot be seen as resulting from the strategies themselves, but rather from the implementation of many change approaches (Janssen, Linnhoff & Baumgart 2002; Waldersee & Griffiths 2004). A significant number of managers see unsatisfactory change management as a reason for a disappointing project outcome. Moreover, a low awareness level of challenges arising during a change process, a managerial discomfort with the unpredictable and dynamic nature of change and a lack of readiness for change were identified as potential reasons leading to such results (Jones, Jimmieson & Griffiths 2005; Jorgensen, Albrecht & Neus 2007; Neumann, R. 2007).

Definition of change success

Dvir and Lechler (2004) analysed 448 projects together with the German Project Management Association (GPM). Dvir and Lechler define project success as a combined factor of project management and outcome. Project efficiency is understood as being the perception of "in time" and "in budget" realisation while customer satisfaction is a combined measure of perceived customer satisfaction with the process and the project result (Dvir & Lechler 2004). A comparable definition for project success was also to be seen in a study of 100 change projects by KPMG and the University of Gießen/Germany in 2009 (Reinmann, Dinges & Krüger 2009).

Parish, Cadwallader and Busch (2008) researched 191 employees from a non-profit making organisation with regard to the influence of employee commitment on the success of organisational change. Parish, Cadwallader and Busch defined the success as a combined

factor of individual learning, perceived implementation success and perceived performance improvement. Perceived implementation success is understood as “*the extent to which an implementation effort is considered successful by the organisation*“ while perceived performance improvement is understood as the perception of financial and non-financial effects on improving organisational performance (Parish, Cadwallader & Busch 2008 p.38).

Waldersee and Griffiths (2004) researched 408 Australian change programmes with regard to change types and outcomes. Change success was defined as the perception that initial organisational goals were achieved (Waldersee & Griffiths 2004).

Finally, commitment to change is understood as the level of psychological attachment to the implementation of new work rules, technologies and policies. It describes the individual internalisation process of a change programme and reflects the extent an individual identifies with and works for an organisational change programme (Jaros 2010; Lines 2004; Parish, Cadwallader & Busch 2008; Spalink 1999). Meyer et al. subdivide commitment to change into a normative, continuance and effective dimension. While affective commitment describes the personal identification and emotional attachment to a change project, continuance commitment describes the personal perception of costs associated and normative commitment the personal obligation to support a change project (Herscovitch & Meyer 2002; Machin, Fogarty & Bannon 2006; Parish, Cadwallader & Busch 2008). In several recent studies, Meyer et al. found indications for a positive relationship between affective commitment and change supportive behaviour. The positive influence of change commitment in general and affective commitment in particular is supported by comparable findings in studies of Ford (2003), Machin (2006), Parish (2008) and Neves (2009) (Jaros 2010; Machin, Fogarty & Bannon 2006).

Critical discussion

Success is a widely defined and interpreted factor (see table 2.8). The complexity of measuring success, especially change success, is based on the difficulty to define and prove reliable measurement criteria, to collect adequate data and the lack of interest of many departments and organisations to objectively research project success or failure details (Bungard 2005a; Mütter & Feldmüller 2008a; Shang & Seddon 2002). No single dominant definition of project success could be identified in literature, but a trend towards a combined business and behavioural orientation can be found. This trend can be explained from the

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business research side by the fact that organisations understand that efficiency and business targets are necessary but not sufficient for achieving a sustainable change result (Carnall 1990; Mueller-Stewens & Lechner 2001). Judge by the IT research side, it is argued that measuring the use and satisfaction of a new IT system would not be enough to determine the success of a system. Instead the benefits provided by a new IT system are recommended as a measure for success (DeLone & McLean 2003; Seddon 1997). As noted in the table 2.8, the measures for success can be grouped into categories such as manager and employee focussed success measures, economic success measures, project management success measures, and combined measures while the large number of identified proposals for combined success measure underlines the common trend to a wider and multifaceted view of project success. Some authors even go a step further arguing that not a specific but a wide variety of success criteria is needed as projects, evaluation perspectives and purposes differ in each project. Success criteria could only be defined based on a specific such a reference frame (DeLone & McLean 2003; Seddon 1997; Seddon et al. 1998; Shang & Seddon 2002). In addition it is proposed that project success needs to be measured over time while not each success criteria is realised at the some time and that a success or failure in one project phase would not enable any conclusion about the success or failure of the overall projects (Markus et al. 2000; Shang & Seddon 2002).

Table 2.8 – Literature overview with regard to (change-) project success

Year	Elements specifying (change-) project success	Issues for this research
1965 Leavitt	Project success through simultaneous change: tasks, technology, structures, managers and employees	Combined success measures
1967 Greiner	Survey study of 18 change projects found that successful change projects a) affect many managers and employees; b) result in staff perception changing positively; c) increase effective problem solving and d) improve organisational performance	
1991 Beer	Notes that change often fails as it is too often focused on only one or two dimensions. Promoting the multi-dimensional 7S framework of Peters & Athos instead including focus on design, strategy, structure, system, style, staff, skills and shared values	
1998 Seddon et al.	Not proposed a fixed set of IT success measurement criteria but proposed a two dimensional matrix (type of stakeholder and type of system) to frame discussions about IT effectiveness measurement. From an analysis of 186 quantitative IT studies, it was concluded that a huge range of measure for IT effectiveness is needed.	
1999 Dutta/ Manzoni	Successful performance improvement through changing and rethinking of a) culture; b) processes and c) structure and systems technology	

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<p>1999</p> <p>Taskinen & Smeds</p>	<p>Case study research of 3 companies in Finland. Change project measures used a combination of effectiveness/ efficiency measures of employees, processes and technologies.</p> <p>Effectiveness & efficiency of human measures used were sponsorship, innovative climate, communication of strategy, desire of owners, willingness to change, understanding of objectives, time invested by managers, employee productivity, perseverance in change, social skills, educational skills, sense of coherence, capability, motivation and resistance to change.</p> <p>Effectiveness & efficiency of process measures used were strategy alignment, identification of critical success factors, generic management methods, creativity techniques and quality of planning.</p> <p>Effectiveness & efficiency of technology measures used were identification of strategic technologies and tools, cost efficient use of technology and need for training.</p>	
<p>2000</p> <p>Waddle, Cummings & Worley</p>	<p>Defined three major criteria for an effective intervention: a) Fit with organisational needs; b) Intended outcome based on causal knowledge and c) Competence transfer to handle new situation</p>	
<p>2000</p> <p>Markus et al.</p>	<p>Demonstrated in 16 case studies that to measure the success of a new IT solution</p> <p>a) a measure in several project phases and b) a use of different measure criteria per phase would be appropriate.</p> <p>Dimension of success could be a) Success in technical terms; b) Success in economic/ business terms; c) Success in terms of smooth running operations; d) Success in terms of IT adoption by managers and employees and e) Success viewed by customers, suppliers and investors</p>	
<p>2001</p> <p>Robbins et al.</p>	<p>Success of change programs as the sum of four outcome levels a) reactions (e.g. job satisfaction, communication); b) learning (e.g. vision, reasons for change); c) behaviour (e.g. job performance, behaviour) and d) results (achievement of organisational goals)</p>	
<p>2002</p> <p>Shang & Seddon</p>	<p>Developed an enterprise system benefit framework based on research of 233 case studies and applied it in analysing 4 case studies. Dimensions of success are a) Operational benefits; b) Managerial benefits; c) Strategic benefits; d) IT infrastructure benefits e) Organisational benefits. In addition, the perceived net benefit flow was proposed to identify and report the benefit on a year-by-year basis.</p>	
<p>2003</p> <p>DeLone & McLean</p>	<p>Enhanced their model for measuring IT success. Net benefit from the use of a new IT solution is defined as final IT success criteria. Whereby the definition what qualifies net benefits, for whom and at which level has to be defined per project as it could not be defined without first defining the context and frame of reference.</p>	
<p>2005</p> <p>Kohnke, Bungard & Mkadukanya</p>	<p>Defined 5 criteria for a successful SAP implementation: a) business results; b) quick wins; c) user acceptance; d) user behaviour and e) learning organisation</p>	
<p>2005</p> <p>Jones, Jimmieson & Griffiths</p>	<p>Measures for change implementation success of IT systems in a study of 157 employees were user satisfaction and system usage</p>	
<p>2005</p> <p>Puettgen & Roe</p>	<p>Defined a short term success of IT implementation as a combination of staying in time and staying in budget</p> <p>Defined a long term success of IT implementation as a combination of a) performance improvement; b) process knowledge; c) satisfaction with the system and d) system acceptance</p>	
<p>2007</p> <p>Machin & Albion</p>	<p>Success as a sum of perceived multiple aspects of change: a) Co-location of staff; b) Internal restructuring; c) Changes in job roles; d) Changes in service delivery; e) Changes in organisational management; f) Changes in work procedures and g) Changes in technology systems</p>	

Chapter two - Literature review: change management

2008 Litzcke & Nolte	Success rate of change processes by evaluating the rate of pre-defined target achievement and by implementation of a second-loop learning process	
2008 Leban & Stone	Defined success as a multi factor measure of satisfaction with change, project management success, operational performance improvement and improved enterprise performance	
2009 Krueger	Defined investments in change as investments in future company revenues. A success measurement is a combination of achieving an organisational value add, improving organisational performance and the acceptance and support of employees	
1993 Duck	Change of individual thinking, feeling and behaviour/working habits as a basis of organisational change and the achievement of business results.	Managers and employees focused success measures
2000 Lohmer	Indicators of successful change processes were defined as positive mobilisation; a shared vision and a cultural change	
2007 Holt	A five step study with > 900 managers with regard to the key factors for determining change readiness. Criteria used to measure change successes were a) job satisfaction; b) affective commitment and c) fluctuation rate	
2011 McDaniel	Study of 288 employees of a US State university used "User's motivation to use IT" as success criteria	
1993 Hall, Rosentahl and Wade	Study of 120 reengineering projects found that performance improvements across the entire business (EBIT) can only be achieved when defining changes in terms of overall cost or customer value	Pure economic success measures
1995 Grover	Defined success of reengineering as a combination of perceived success level and goal fulfilment in a longitudinal study of business process reengineering projects	
1996 Kotter	The main goals of over 100 projects were to increase competitiveness.	
1998 Scheer	IT projects are investments. As such they have to be prioritised and selected based on their verifiable value contribution to the organisation, e.g. in the form of additional cash flow or savings. 5 studies show that this value contribution is not yet the case.	
2000 Cope	The value added is the final measure for change processes. Managers would otherwise have problems with the high amount of invested time and resources.	
2000 Al-Ani & Kaßner	Added value and increasing efficiency and effectiveness are the drivers behind restructuring and changes of systems, structures and processes.	
2002 Watson Wyatt	Survey of 12,750 U.S. workers found that companies who managed organisational changes well increase shareholder value by 29 percent over three years while companies who managed change poorly lost 5 percent of their shareholder value in the some timeframe.	
2005 Ford & Greer	Study of 80 managers from 22 organisations with regard to usage of control systems and change outcome. Defined success as the extent, to which change projects produced meaningful business results. Found a positive relationship between the use of control systems and achieving business results	
2008 Leban	Success of change understood as achieving level of expected outcome in relation to the costs invested in economic and human resources	
1993	Success factors measuring business improvements such as improved profitability or productivity can only be realised for a limited time and are therefore not a sustainable	

Chapter two - Literature review: change management

Goss, Pascale & Athos	factor for driving and judging change	of projects
2000 Keil, Mann & Rai	Survey of 580 IT projects with regard to reasons for escalation. Measured project performance by successful completion of the project; successful implementation & use and implementation in time & in budget	Project Management related success measures
2003 Zoellner	Ask for no specific success measurement but for a comparison of original project goals & budgets real goals achieved and budgets required determining project success.	
2007 Meier	Project success by meeting time and cost goals	
2007 Brinkhoff & Thonemann	Study of 87 SCM projects with regard to success driving factors. Success was understood as projects ,which were finished as planned and achieved as expected	

Source: Hetkamp 2011; developed for this study

Change projects and especially IT projects are mainly a mixture of technical and behavioural/ cultural changes (Jones, Jimmieson & Griffiths 2005; Shang & Seddon 2002; Turner 1998). The measurement of the successful realisation of IT projects is therefore a combination of two parallel influencing factors, one resulting from the new IT system and one from the management of organisational and behavioural changes. It is therefore necessary to measure both effects separately before measuring the overall success of the IT project.

A German study of SAP implementation projects supports this assumed relationship by identifying strong and medium correlations between system satisfaction, on time and on budget project delivery and overall acceptance of the new system and new work processes with performance improvements. Furthermore, the study found that change management activities focusing on the human side of change explained nearly 50 percent of the perceived overall project success level (Püttgen & Roe 2005 p.153-157). The view that an overall success of an IT project is a combination of IT and organisational change success is also shared by several other authors (Boos, Heitger & Hummer 2004).

All three success measurement schemes of Dvir and Lechler (2004), Meyer et al. (2002) and Parish, Cadwallader and Busch (2008) have been proven in previous research. Due to its project focus, Dvir and Lechler's success definition based on Pinto and Prescott (1990) was used to identify the success perception of the new IT solution. Parish, Cadwallader and Bush's and Meyer's definition of affective commitment to organisational change was used to measure the success of organisational change resulting from an IT project. Finally, the

combined success definition of Parish, Cadwallader and Busch (2008) and of Waldersse and Griffith (2004) contributed to the multi-faceted characteristics of success resulting from IT projects in line with the dominant view in literature that project success is to be regarded as a combination of different success factors (see table 2.5). Hard success factors with regard to the goal achievement and organisational improvement of a project are thereby combined with soft factors such as organisational learning and satisfaction with the realisation process as projects, should also generate perceivable and measurable economical improvements for companies (Krueger 2009; Mueller-Stewens & Lechner 2001; Neumann, R. 2007).

2.6.5 Summary of conceptual framework

The conceptual framework was formulated based on the critical analysis and discussion of knowledge of change management (see Table 2.4); Readiness for Change (see Table 2.6) and implementation style (see Table 2.7) and change success (see Table 2.8). The three hypotheses are

Hypothesis 1: Knowledge of change management is positively related to the change success in IT projects

Hypothesis 2: Readiness and agreement to change is positively related to the change success in IT projects

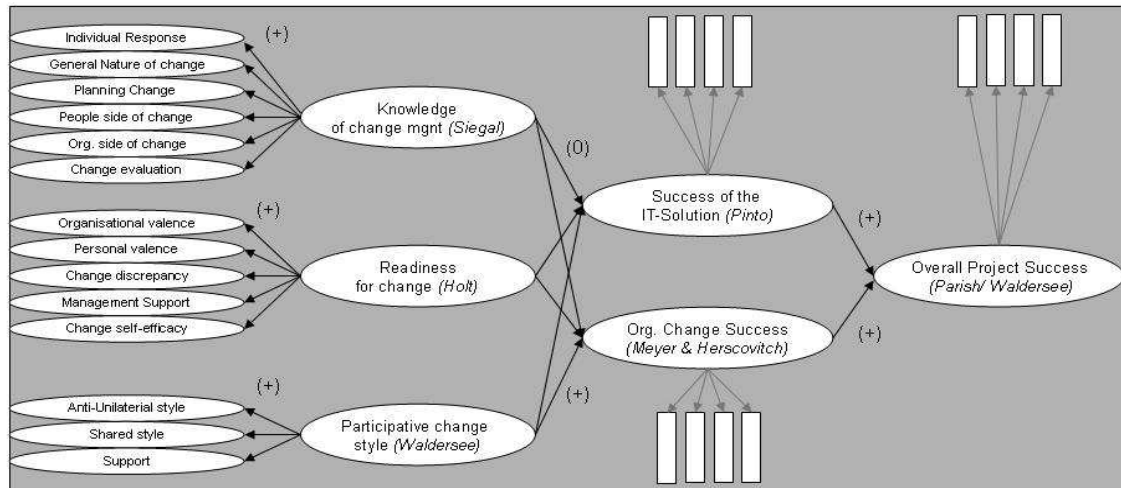
Hypothesis 3: A participative change implementation style is positively related to the change success in IT projects

Figure 2.8 illustrates the structural equation model with the assumed relationships between the three constructs knowledge of change management, readiness for change and a participative change style with success of the IT-solution and the organisational change success. The overall project success is deemed to be positively influenced by both success constructs.

A better empirical understanding and support of the impact of the human factors of change are assumed to address the identified research gap and to offer managers faced with IT projects and related organisational change processes an empirically supported guideline to realise IT projects and related organisational change more successfully. The findings of the research will only give evidence and guidelines for more successful managerial actions as

there are no simple recipes for change success in general (Ashurst & Hodges 2010; Barret, Grant & Wailes 2006; Dawson 2001; Machin, Fogarty & Bannon 2006; Safar et al. 2006; Whelan-Berry & Somerville 2010).

Figure 2.7 – Structural equation model of the study



Source: Hetkamp 2011; developed for this study

2.7 Summary

The chapter reviewed organisational change theory and its implications for organisations and individuals. The need for contemporary research in the field of organisational change was identified in order to address the lack of empirical analysis about managing the human side of organisational change related to IT projects and business results.

The effects and processes dealing with organisational change were discussed on an organisational and an individual level supplemented by a review of the status quo of organisational change resulting from European IT projects. The first section of the chapter closes with a discussion on selected theoretical change models and their coverage of aspects to manage the human side of change. A conclusion of discussion of change management models that more empirical research was needed, to better understand the effect and relationship of aspects to manage the human side of change on the change itself, on IT and on the business outcome of IT-projects.

The second part of the chapter introduced and discussed three organisational change approaches (manager knowledge of change management, employee readiness for change and a unilateral change management change approach), which are regarded by major studies in

Chapter two - Literature review: change management

literature as leading to a positive change attitude at an early project phase to exert a positive influence on the success of change realisation. The chapter closes with a discussion and research definition of change success and the presentation of the proposed research model.

The next chapter provides the research objectives, the related research questions, sub questions and hypotheses required in the research process. A complete description of the quantitative methodology used for the data gathering phase of the research has also been included.

CHAPTER THREE – RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter (Chapter 2) examined the theoretical background on organisational change and identified the lack of quantitative research on human change management factors for the successful realisation of organisational change and the overall success of IT projects. This chapter outlines the research methodology used to meet the research objective.

3.2 Research questions and hypotheses

Based on the importance of the successful realisation of IT projects to European Steel producers, which was discussed in Chapter 1 and the importance, to successfully manage human factors of related organisational changes for the survival and competitiveness of the European steel industry, which was discussed in Chapter 2, the following Research Objective is formulated:

To examine the extent, to which aspects of change management such as knowledge of change management, readiness for change and participative change implementation style have an influence on the success of IT projects and the realisation of resulting organisational changes.

In addition, the following research questions were formulated to address the research objective:

- **RQ 1 – Is there a relationship between knowledge of change management and the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 2 – What is the impact of knowledge of change management on the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 3 – Is there a relationship between readiness for change and the successful realisation of IT solutions and resulting organisational changes?**

- **RQ 4 – What is the impact of readiness for change on the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 5 – Is there a relationship between a participative change implementation style and the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 6 – What is the impact of a participative change implementation style on the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 7 – Is there an influence of project and personal characteristics on the potential relationships of knowledge of change management, readiness for change and a participative change style with the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 8 – What is the impact of project and personal characteristics on the potential relationships of knowledge of change management, readiness for change and a participative change style with the successful realisation of IT solutions and resulting organisational changes?**
- **RQ 9 – Is there an influence of successful IT solutions and a successful management of related organisational changes on the overall successful realisation of IT projects?**
- **RQ10 – What is the impact of successful IT solutions and a successful management of related organisational changes on the overall successful realisation of IT projects?**

After reviewing the relevant studies and theoretical models (Armenakis, A. et al. 2007; Church, Allan H., Waclawski & Burke 1996; Dvir & Lechler 2004; Holt et al. 2007; Meyer et al. 2002; Parish, Cadwallader & Busch 2008; Pinto & Prescott 1990; Siegal 1996; Waldersee & Griffiths 2004; Warner Burke Associates 1995) and based on the research model developed for this research (see figure 2.7), research hypotheses were formulated (Kerlinger & Lee 2000; Leedy & Ormrod 2005; Neumann, W. 2003). The research model of

this study is based on the assumption that change success, successful IT solutions and the overall success of the IT project represents the dependent variables. Change success is expected to be positively influenced by the three independent variables: knowledge of change management, readiness for change, change implementation style while the overall success of the IT project is expected to be positively influenced by change success.

Knowledge of change management

H1a: Knowledge of change management is positively related to change success in IT projects.

H1b: Knowledge of change management is not related to successful IT solutions.

Readiness for change

H2a: Readiness for change is positively related to change success in IT projects.

H2b: Readiness for change is not related to successful IT solutions.

Participative change implementation style

H3a: The use of a participative change implementation style is positively related to the change success in IT projects.

H3b: The use of a participative change implementation style is not related to successful IT solutions.

Project success

H4a: Change success is positively related to the overall success of IT projects.

H4b: A successful IT solution is positively related to the overall success of IT projects.

3.3 Research design and methodology

The original overall research objective of the study was to examine the influence of the three specified factors on the realisation of organisational change and IT solutions in IT projects and to examine the influence of the successful management of organisational change on the overall success of IT projects in the German steel industry. However, due to the crisis on the global steel market and its serious economic consequences for the German steel industry, the focus of many companies and national federations was on managing this situation and

fighting for survival. As a consequence insufficient support and commitment for the study to ensure a suitable data basis for the quantitative and representative statistic analysis was experienced during 2009. The offer at the beginning of 2010, based on personal business contacts, to alternatively conduct the study on a multi-lingual and pan-European level focusing on the European steel industry was therefore welcomed and agreed to in order to keep the study from failing at an early stage of research.

This section details the critical realism research paradigm and its applicability to the overall research objective and the research design.

3.3.1 Research paradigm

The research paradigm is understood to define the belief system that guides researchers. The research paradigm underlying this research study is critical realism, which is also known as post positivism. Critical realism is regarded as an appropriate research paradigm for business and commercial research. It follows the view that reality exists but is so complex that it can only be observed imperfectly. Critical realism can therefore be adequate for the analysis of complex situations in workplaces. Furthermore, the paradigm of critical realism is characterised by noting the aims and assumptions of the research whereby both quantitative and qualitative research techniques are considered appropriate (University of Southern Queensland 2008).

The critical realism paradigm was chosen for a number of reasons. Firstly the reality of organisational change processes in IT projects can be described as complex but observable. Secondly it was not possible, to completely exclude a mutual influence of investigator and participants on each other in the European steel market. Thirdly, the aim of the study to provide explanations and predictions to improve the management of organisational change related to IT projects. Critical realism was therefore adopted as the research paradigm for this research.

3.3.2 Research design

A research design is understood as the research planning, which identifies the resources necessary and provides a structure of procedures for the researcher to collect and analyse data (Leedy & Ormrod 2005). A research design is meant to help the researcher to work effectively and efficiently by precisely specifying how the research is to proceed. A

research design is defined as having two main functions. The first is the development of the procedure required to undertake the research project. The second ensures the quality of the research procedures planned (Kumar 1996).

This study used a cross-sectional ex post facto design and collected data from IT projects undertaken in a period of 5 year between 2005 and 2010 (Vahs 2003 p.4). An ex post facto design is regarded as a viable research alternative when it is not possible to manipulate certain variables in order to investigate their potential influence on other variables (Leedy & Ormrod 2005). The research focuses on IT projects in a real business environment, which made the control, isolation and manipulation of single variables impossible. The ex-post facto design was therefore selected as the research design for this study rather than an experimental design.

A cross-sectional design of the research (Leedy & Ormrod 2005) was chosen instead of a longitudinal design due to the limited time planned for the execution of the research. The cooperation of companies and unions was given on the condition of proper timing and a minimal disruption of normal business practice. It was therefore decided that the data concerning change management activities was to be collected at only a single time and from particular projects. Descriptive elements were investigated with the aid of a multi-lingual online survey.

An online survey was used as it is fast and accurate. It could be distributed more quickly to the final target groups of the participating companies and be answered compared to a postal survey. The less time consuming characteristics and the ease of replying to an online survey should help to motivate participants to take part in the study. Furthermore, an online survey reduced the need to re-type data and the potential errors with regard to re-typing and answering. In this way, the online survey helps to improve the integrity of the data set and the efficiency in analysing the data.

3.3.3 Research method

The research methodology to investigate the large amount of IT projects of European steel producers and distributors was a quantitative, online and multi-lingual survey approach to effectively and efficiently gather and structure the large amount of relevant data. The survey

Chapter Three – Research Methodology

was offered in the English, German, French, Spanish and Italian languages and only included previously used and validated research questions.

Figure 3.1 – Welcome - public study website



contact imprint

Change in Steel

Home
About me
Background and goals of the survey
Information about the questionnaire
German literature recommendations

+++ Study extended till 31st of July 2010 +++ Study extended till 31st of July 2010 +++

Welcome to the study

"Success Factors for Change Management in IT-Projects using the example of the European steel industry"

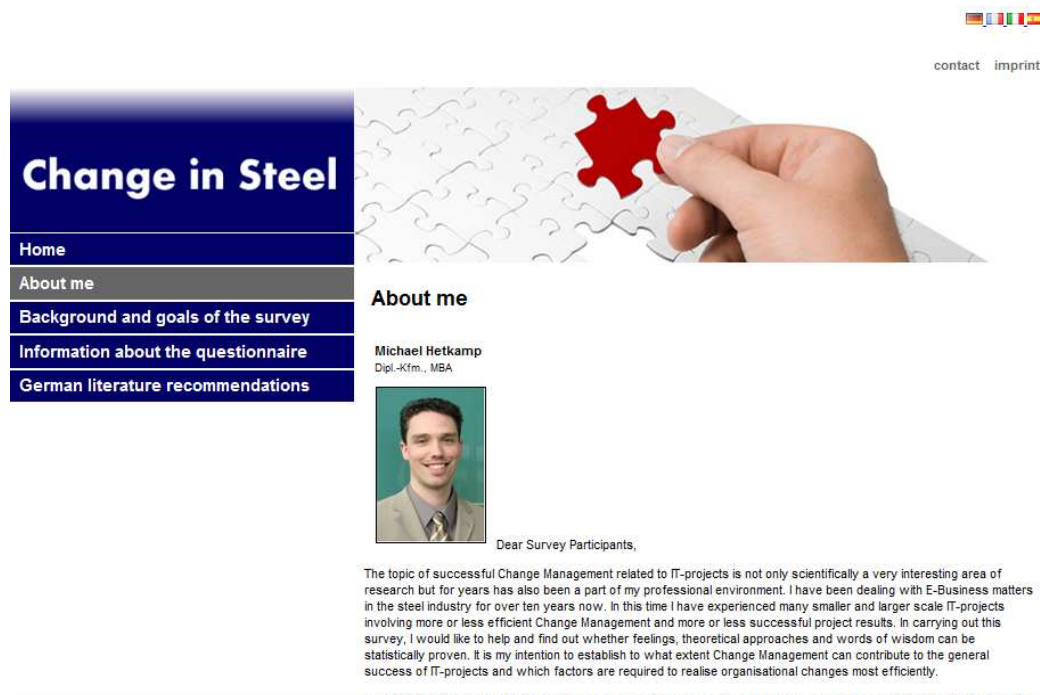
A project under the scientific supervision of the University of Southern Queensland (Australia) and kindly supported by the confederation of European Iron and Steel Industries – EUROFER.

Stahl
EUROFER
European Confederation of Iron and Steel Industries

USO

Source: Hetkamp 2011; developed for this study

Figure 3.2 – About the researcher - public study website




contact imprint

Change in Steel

Home
About me
Background and goals of the survey
Information about the questionnaire
German literature recommendations

About me

Michael Hetkamp
Dipl.-Kfm., MBA



Dear Survey Participants,

The topic of successful Change Management related to IT-projects is not only scientifically a very interesting area of research but for years has also been a part of my professional environment. I have been dealing with E-Business matters in the steel industry for over ten years now. In this time I have experienced many smaller and larger scale IT-projects involving more or less efficient Change Management and more or less successful project results. In carrying out this survey, I would like to help and find out whether feelings, theoretical approaches and words of wisdom can be statistically proven. It is my intention to establish to what extent Change Management can contribute to the general success of IT-projects and which factors are required to realise organisational changes most efficiently.

Source: Hetkamp 2011; developed for this study

Figure 3.3 – Background and goals of the study - public study website



Change in Steel

- Home
- About me
- Background and goals of the survey**
- Information about the questionnaire
- German literature recommendations

Background and goals of the study

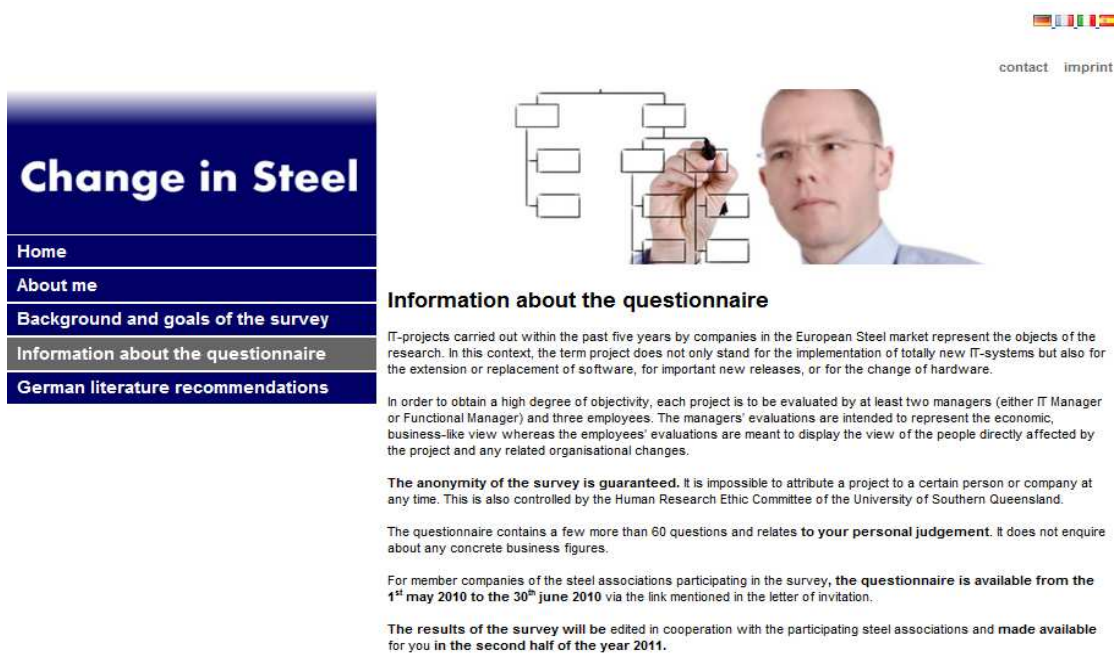
Information technology (IT) has become a crucial basis of every company in worldwide economy today. Although IT is hardly recognisable from outside, IT can be a major factor in company productivity. On the other hand, malfunctions and failures of IT can severely disrupt operational procedures or stop them completely. Thus, IT does not only illustrate operational procedures but actively shapes company competitiveness. In so doing, IT-projects, i.e. both the implementation of new IT-based solutions and the upgrade or change of IT-applications, often cause changes in process sequences, working methods and responsibilities or lead to adaptations in organisational structures.

In science as well as in practice, more and more people support the view that most of the **economical success and benefit of an IT-project does not solely depend on its technical realisation but on its implementation and the way the resulting changes are applied** to usual working processes of the departments and services concerned. With this in mind, it could be possible that a technically moderate project provides visible economical advantages for the company because of an efficient implementation in everyday work. In contrast, a technically demanding project could turn out as a value destroyer when its implementation in usual procedures fails and the IT-solution receives no acceptance amongst the staff. This would also mean that new working methods can only be introduced over a longer period of time through cost-intensive trainings and supportive measures.

This is exactly the point where the study is finds to start, using the European steel market as an example and previously selected influencing factors as a research basis. The survey represents the statistical analysis the relation between the realisation of changes and the economic success of an IT-project. **The primary goal of the study is to find out just how far people-oriented change approaches influence the overall success of an IT-project and if this relationship can be proven statistically.**

Source: Hetkamp 2011; developed for this study

Figure 3.4 – About the study questionnaire - public study website



Change in Steel

- Home
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- German literature recommendations

Information about the questionnaire

IT-projects carried out within the past five years by companies in the European Steel market represent the objects of the research. In this context, the term project does not only stand for the implementation of totally new IT-systems but also for the extension or replacement of software, for important new releases, or for the change of hardware.

In order to obtain a high degree of objectivity, each project is to be evaluated by at least two managers (either IT Manager or Functional Manager) and three employees. The managers' evaluations are intended to represent the economic, business-like view whereas the employees' evaluations are meant to display the view of the people directly affected by the project and any related organisational changes.

The anonymity of the survey is guaranteed. It is impossible to attribute a project to a certain person or company at any time. This is also controlled by the Human Research Ethic Committee of the University of Southern Queensland.

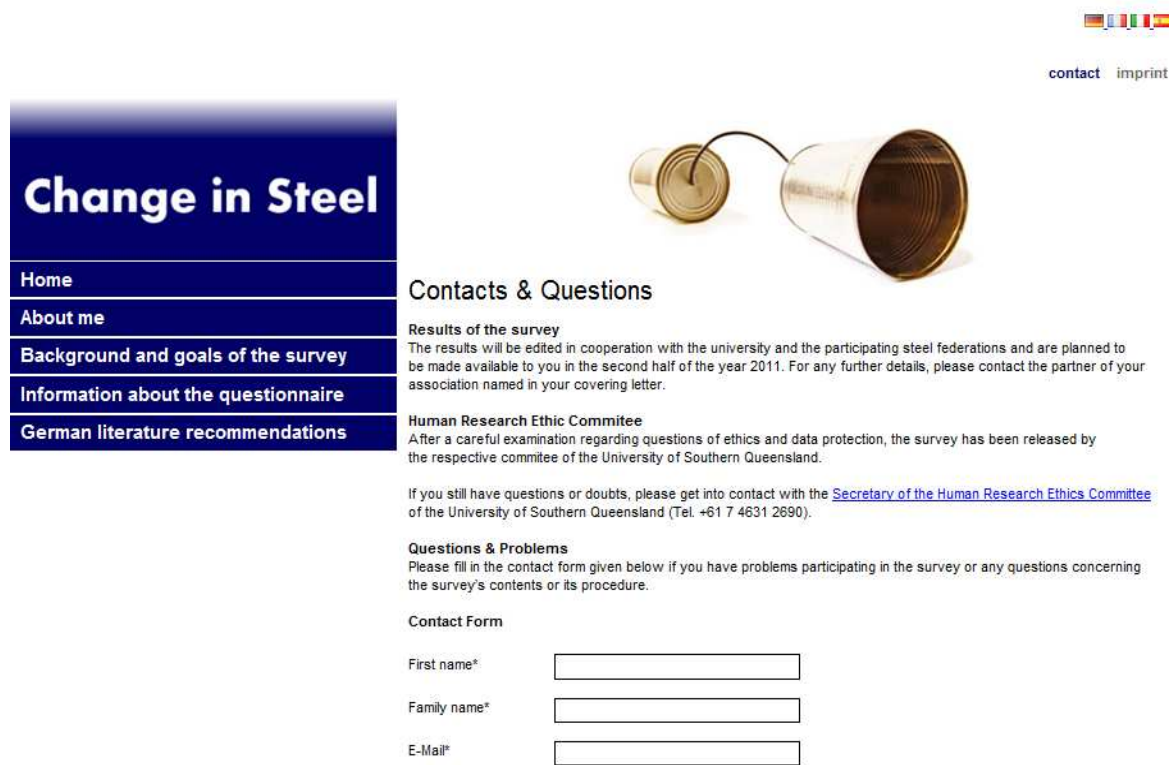
The questionnaire contains a few more than 60 questions and relates to **your personal judgement**. It does not enquire about any concrete business figures.

For member companies of the steel associations participating in the survey, **the questionnaire is available from the 1st may 2010 to the 30th June 2010** via the link mentioned in the letter of invitation.

The results of the survey will be edited in cooperation with the participating steel associations and **made available for you in the second half of the year 2011.**

Source: Hetkamp 2011; developed for this study

Figure 3.5 – Contact details - public study website



The screenshot shows a website with a dark blue header and navigation menu. The main content area is white and features a large image of a pair of glasses. The text on the page includes a title, a navigation menu, a section for 'Contacts & Questions', and a contact form.

Change in Steel

- Home
- About me
- Background and goals of the survey
- Information about the questionnaire
- German literature recommendations

Contacts & Questions

Results of the survey
The results will be edited in cooperation with the university and the participating steel federations and are planned to be made available to you in the second half of the year 2011. For any further details, please contact the partner of your association named in your covering letter.

Human Research Ethic Committee
After a careful examination regarding questions of ethics and data protection, the survey has been released by the respective committee of the University of Southern Queensland.

If you still have questions or doubts, please get into contact with the [Secretary of the Human Research Ethics Committee](#) of the University of Southern Queensland (Tel. +61 7 4631 2690).

Questions & Problems
Please fill in the contact form given below if you have problems participating in the survey or any questions concerning the survey's contents or its procedure.

Contact Form

First name*

Family name*

E-Mail*

Source: Hetkamp 2011; developed for this study

Questions were only translated and adapted without loss or adulteration of their original meaning in order to fit the specific scenario of IT projects. The questionnaire only included pre-coded questions, no open ended questions and required written responses and was pre-tested with three IT projects from the largest German steel producer. The pre-test ensured a clear formulation of questions and explanations of the survey for the data collection process. Participant feedback of the pre-test was qualitatively collected. The feedback collected was used to refine the questionnaire and instructions (see Chapter 4 and Appendix 2). The invitation letter for the European steel producers and a letter of recommendation from Eurofer – the Association of European Steel Producers - to its members and the invitation letter for the study questionnaire in the English language can be seen in Appendix 3.1 – 3.3.

The individual research questions are set out in table 3.1 respective to the methodological component developed to address each component of the research objective.

Chapter Three – Research Methodology

Table 3.1 – Research questions to survey questions

<p>RQ 1: Is there a relationship between knowledge of change management and the successful realisation of IT solutions and resulting organisational changes?</p>	<p>Questions 55 -80 of the questionnaire for the knowledge of change management</p> <p>Questions 52-55 of the questionnaire for the successful realisation of change</p> <p>Questions 44-47 of the questionnaire for the successful IT solution</p>
<p>RQ 2: What is the impact of knowledge of change management on and the successful realisation of IT solutions and resulting organisational changes?</p>	<p>Questions 55 -80 of the questionnaire for the knowledge of change management</p> <p>Questions 52-55 of the questionnaire for the successful realisation of change</p> <p>Questions 44-47 of the questionnaire for the successful IT solution</p>
<p>RQ 3: Is there a relationship between readiness for change and the successful realisation of IT solutions and resulting organisational changes?</p>	<p>Questions 19-43 of the questionnaire for the readiness for change</p> <p>Questions 52-55 of the questionnaire for the successful realisation of change</p> <p>Questions 44-47 of the questionnaire for the successful IT solution</p>
<p>RQ 4: What is the impact of readiness for change on the successful realisation of IT solutions and resulting organisational changes?</p>	<p>Questions 19-43 of the questionnaire for the readiness for change</p> <p>Questions 52-55 of the questionnaire for the successful realisation of change</p> <p>Questions 44-47 of the questionnaire for the successful IT solution</p>
<p>RQ 5: Is there a relationship between a participative change implementation style and the successful realisation of IT solutions and resulting organisational changes?</p>	<p>Questions 8-18 of the questionnaire for the change style</p> <p>Questions 52-55 of the questionnaire for the successful realisation of change</p> <p>Questions 44-47 of the questionnaire for the successful IT solution</p>
<p>RQ 6: What is the impact of a participative change implementation style on the successful realisation of IT solutions and resulting organisational changes?</p>	<p>Questions 8-18 of the questionnaire for the change style</p> <p>Questions 52-55 of the questionnaire for the successful realisation of change</p> <p>Questions 44-47 of the questionnaire for the successful IT solution</p>
<p>RQ 7: Is there an influence from project- and personal characteristics on the potential relationships of knowledge of change management, readiness for change and a participative change style with the successful realisation of IT solutions and resulting organisational changes?</p>	<p>Questions 1 – 12 project specification web form and Questions 1-7 personal data section of the questionnaire</p> <p>and</p> <p>all remaining questions</p>
<p>RQ 8: What is the impact of project- and personal characteristics on the potential relationships of knowledge of change management, readiness for change and a participative change style with the successful realisation of IT solutions and resulting organisational changes?</p>	<p>Questions 1 – 12 project specification web form and Questions 1-7 personal data section of the questionnaire</p> <p>and</p> <p>all remaining questions</p>
<p>RQ 9: Is there an influence of successful IT solutions and a successful managing of organisational change resulting from IT projects on the overall successful realisation of IT projects?</p>	<p>Questions 52-55 of the questionnaire for the successful realisation of change</p> <p>Questions 44-47 of the questionnaire for the successful IT solution</p> <p>Questions 48-51 of the questionnaire for the overall success of the IT project</p>
<p>RQ 10: What is the impact of successful IT solutions and a successful managing of organisational change resulting from IT projects on the overall successful realisation of IT projects?</p>	<p>Questions 52-55 of the questionnaire for the successful realisation of change</p> <p>Questions 44-47 of the questionnaire for the successful IT solution</p> <p>Questions 48-51 of the questionnaire for the overall success of the IT project</p>

Source: Hetkamp 2011; developed for this study

The Economic Structure of the European steel industry is represented by the confederation of European Iron and Steel Industries – EUROFER (Eurofer 2010b). EUROFER was contacted to enquire about participation in the study. LimeSurvey software (LimeSurvey 2009) was applied to distribute the online survey to all member companies of EUROFER and their related national federations for online completion. The online project specification and the English version of the questionnaire can be seen in Appendix 3.4. The project specification asked IT-managers to describe the project regarding 11 selected criteria. The study questionnaire consisted of 4 parts. The first part included a limited number of questions about personal characteristics of each participant followed by three sections representing the questions of each of the above described, independent constructs. The first section of questions represented the construct “*Participative Change Style*” and included 10 questions, followed by a section of 25 question representing “*Readiness for Change*”. The final section combined “Knowledge of Change Management” with “Change Success”, “IT Success” and Overall Project Success” and comprised 37 questions.

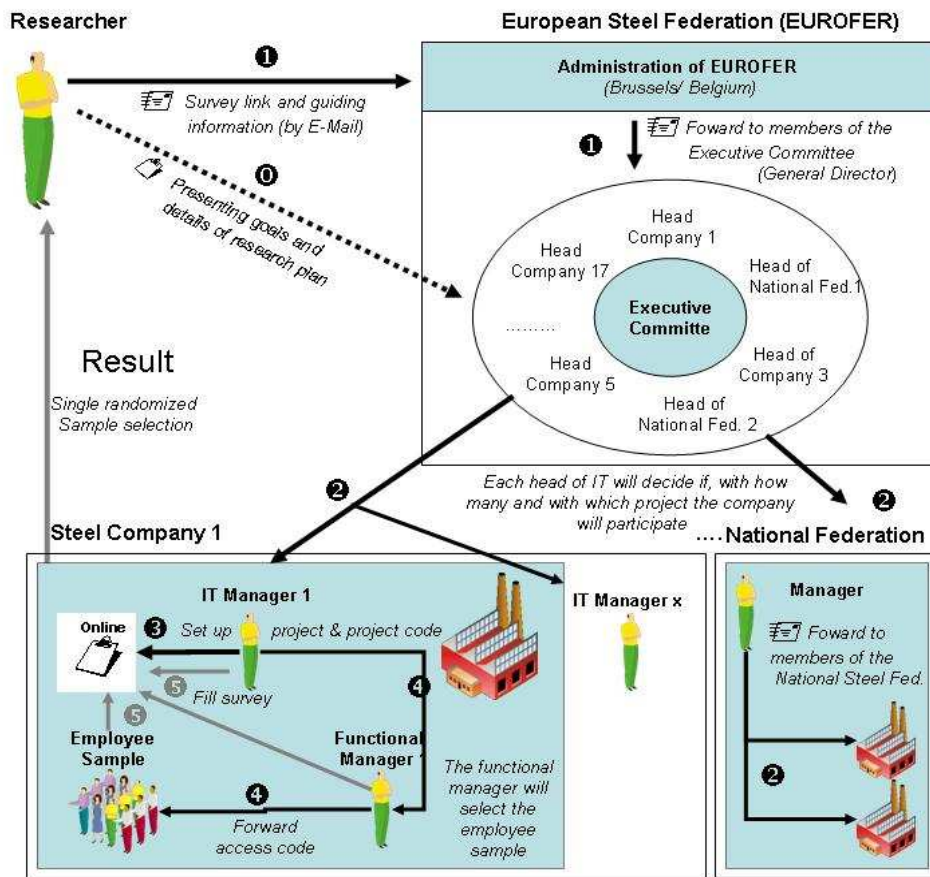
3.3.4 Participant selection

The target group for this study was European steel producers that had implemented IT projects between 2005 and 2010. The study was not specific to companies or projects of a certain size as almost all companies had implemented IT projects with related organizational change issues. Due to a lack of a branch register of IT projects on the European steel industry, the sample frame for this study was all European steel producers organised in the European federations Eurofer (Eurofer 2010b) and their participating national federations. In total, 21 pan-European steel producers and 5 national federations with about 250 national members were invited to participate in the study.

The single access points via EUROFER facilitated the use of a simple randomised sampling method surveying all steel producers invited for the purposes of this study. The sampling unit for this study was IT projects, which had been undertaken by the steel companies contacted between 2005 and 2010. In practice, a letter of invitation was shared with the general director of EUROFER. He sent this letter of invitation and a recommendation on behalf of EUROFER to the members of the EUROFER Executive Board who forwarded it internally to the local heads of IT. Access to the online survey was only possible via the link provided in the invitation. All companies of the sample frame had an equal opportunity to participate in the study and to decide on the number and type of IT projects, with which they

wished to participate (Leedy & Ormrod 2005). Figure 3.6 offers a detailed process description of the sampling and data collection process.

Figure 3.6– Sampling and data collection process



Source: Hetkamp 2011; developed for this study

The respondents targeted were a) project and change managers who had initiated and guided the changes resulting from a certain IT project and b) employees and managers who had been directly affected by the change taking place (Inversini 2005; Kohnke, Bungard & Madukanya 2005; Kurupparachchi, Mandal & Smith 2002; Scheer 1998). All participants were surveyed individually. In order to reduce the reliance on single respondents, a minimum of 4 employee and management respondents were set as a minimum participation quota to be included in each project. Finally, 137 of 148 questionnaires were filled out completely. Twenty-five of 37 projects entered fulfil the minimum number of participants.

There were several strategies employed to maximise the participation and response rate. The researcher personally presented the goals and details of the study in order to provide

detailed information about the study, the survey and its value for the member companies and the steel federations. Participant anonymity was emphasised and guaranteed to gain their trust and cooperation. Any questions or problems arising could be asked at any time via a web based contact form or via telephone. Questions and answers forming a guideline were provided online to assist managers with the selection of IT projects and with the forwarding of the questionnaire invitations (see Appendix 3.5 and 3.6). Finally an offer was made to share the final study results and findings with both federations on the completion of the study (Leedy & Ormrod 2005).

3.3.5 Validity and reliability

The validity and reliability of the quantitative questionnaire were considered. The reliability of the research was ensured by using a five point Likert scale to measure all constructs. A five point Likert scale was found to have the highest coefficient alpha reliability of all types of Likert scales (Hinkin 1995).

Reliability was also considered by developing, reviewing and pre-testing the questionnaire to ascertain that the questions and instructions were clear and unambiguous before the questionnaire was finalised (Leedy & Ormrod 2005). The exclusion of projects that participated in the pre-test and those, which did not fulfil the minimum number of affected employees, served to further ensure the quality of the analysis.

In addition, statistical first and second generation criteria were used to statistically estimate the reliability of the collected data. An exploratory factor analysis (EFA) was used to check the uni-dimensionality of each construct and sub-construct. A Kaiser-Meyer-Olkin-criteria (KMO) of < 0.6 ; a measure of sampling adequacy (MSA) and a communality < 0.5 as well as a significant Barlett test were considered as indicators for insufficient indicator reliability (Weiber & Mühlhaus 2010 p.107). As first generation criteria for reliability, the standardised Cronbach alpha reliability coefficient, the inter-item correlation and the corrected inter-item correlation were used to investigate the reliability of the scale and to ensure dependability and consistency of the indicators used to measure the constructs and variables. Indicators with a standardised Cronbach alpha value of < 0.7 ; inter-item correlation < 0.3 and corrected item-to-total correlation < 0.5 were considered as having insufficient reliability (Hair et al. 2006 p.102+137; Hinkin 1995 p.982; Weiber & Mühlhaus 2010 p.115). Finally based on a confirmatory factor analysis (CFA) the reliability of the measured

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constructs and sub-constructs was verified using second generation criteria such as the indicator reliability, the factor reliability and the average variance extracted (Bouckennooghe, Devos & Van den Broeck). A factor loading and a factor reliability < 0.6 ; an indicator reliability < 0.4 and an AVE < 0.5 were considered as being insufficient (Parish, Cadwallader & Busch 2008 p.42; Weiber & Mühlhaus 2010 p.127).

In addition to reliability, several types of validity were established to ensure that the meaning of the constructs were correctly captured in the study (*Web Center for Social Research Methods* 2009). To ensure construct validity, the study was built on research constructs of previous research projects (Armenakis, A. et al. 2007; Herscovitch & Meyer 2002; Holt et al. 2007; Parish, Cadwallader & Busch 2008; Pinto & Prescott 1990; Siegal 1996; Waldersee & Griffiths 2004; Warner Burke Associates 1995). Statistically, construct validity was analysed by comparing the Maximum likelihood estimates with the Bayesian estimates and by using the Chi^2 test of difference and the Fornell-Larcker criteria. While a Chi^2 difference values < 3.84 for a confidence interval of 95 percent is regarded as insufficient, squared sub-construct correlations smaller than the related AVEs of the compared sub-constructs indicate an insufficient Fornell-Larcker criteria (Blunch 2008; Weiber & Mühlhaus 2010). To avoid an overlapping influence of IT solutions, concurrent organisational changes and the overall project outcome, the study measured all three success rates of IT projects separately. Negatively worded questions were not added in order to avoid a potential systematic error (Hinkin 1995). Questions, which had originally been formulated in a negative manner, were used in their original way but were coded as the inverse to avoid systematic error during the data analysis process (Weiber & Mühlhaus 2010). External validity of the study was supported by the single randomised sample selection, which enabled the researcher to assume that the characteristics of the analysed sample approximately represent the sample population, namely the European steel producers (Leedy & Ormrod 2005).

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Table 3.2 – Overview about research measurements

Dimension	Measure	Scale
Knowledge of change management (Siegal 1996) (Warner Burke Associates 1995)	Individual response to change General nature of change Planning change Managing the people side of change Managing the organisational side of change Evaluation the change effort	Five point Likert scale
Readiness for change management (Armenakis, A. et al. 2007; Holt et al. 2007)	Belief that change is necessary/ organisationally beneficial Belief that change could be implemented Belief that organisational leaders are committed to the change Belief that the change is personally beneficial	Five point Likert scale
Participative change implementation style (Waldersee & Griffiths 2004)	Importance of directives and memos Importance of redeployment of key staff Importance of job redesign Importance of pilot programmes Importance of training Importance of meetings Importance of problem solving groups Importance of rewards and incentives Supportiveness of the workforce of the change Supportiveness of the management of the change	Five point Likert scale
Change success - Affective commitment to change (Parish, Cadwallader, Busch 2008) (Meyer et. al 2002)	Belief in the value of organisational changes Belief in the usefulness of the organisational changes. Belief that the organisational changes serves an important purpose. Belief that things improve due to the undergone organisational changes	Five point Likert scale
Successful realisation of the IT solution (Dvir & Lechler 2004) (Pinto & Prescott 1990)	Perceived on time realisation of the IT solution Perceived on budget realisation of the IT solution Satisfaction with implementation process of the IT solution Satisfaction with the resulting IT solution	Five point Likert scale
Overall success of the IT project (Parish, Cadwallader, Busch 2008; Waldersee & Griffith 2004)	Perceived satisfaction with training for new work processes (learning) Perceived satisfaction with the way the project was realised in total. Perceived business success of project in total. Perceived performance improvement resulting from the project in total	Five point Likert scale

Source: Hetkamp 2011; developed for this study

A potential response bias was analysed by comparing the first thirty questionnaires completed and received with the 30 last questionnaires with respect to significant differences among any model variables (Keil, Mann & Rai 2000; Parish, Cadwallader & Busch 2008).

While the person related moderator variables and their measurements were mainly adapted from previous research by Siegal (1996), no single adequate source for the IT-project related moderator variables could be identified. The variables and measurements used in the survey were therefore mainly adapted from several previous researches (Kohnke, Bungard & Madukanya 2005; Laudon & Laudon 2000; Lorenz 2008; Siegal 1996) and combined specifically for this research.

In order to achieve uni-directional outcomes for a measured construct, all negatively worded questions or those negatively intended questions posed by the previous researcher compared to the research construct, were coded with the inverse five point Likert scale. A high disagreement with a negatively worded question for example resulted in a high score on the Likert scale.

3.3.6 Data analysis techniques

Quantitative analysis of the collected survey data was undertaken using the Statistical Package for Social Science (SPSS) including the extra analysis package Analysis of Moment Structures - AMOS.

Univariate outliers were checked using box plots of every indicator while multi-tivariate outliers were analysed by calculating and comparing the Mahalanobis distance of each indicator with regard to distinctively different values (Bryne 2010; Weiber & Mühlhaus 2010). Univariate normality of the data was verified by using graphical methods such as normality plots or histograms and by using statistical tests of skewness and kurtosis values. Multivariate normality was analysed calculating the Mardia's measurement (Blunch 2008; Hair et al. 2006; Weiber & Mühlhaus 2010).

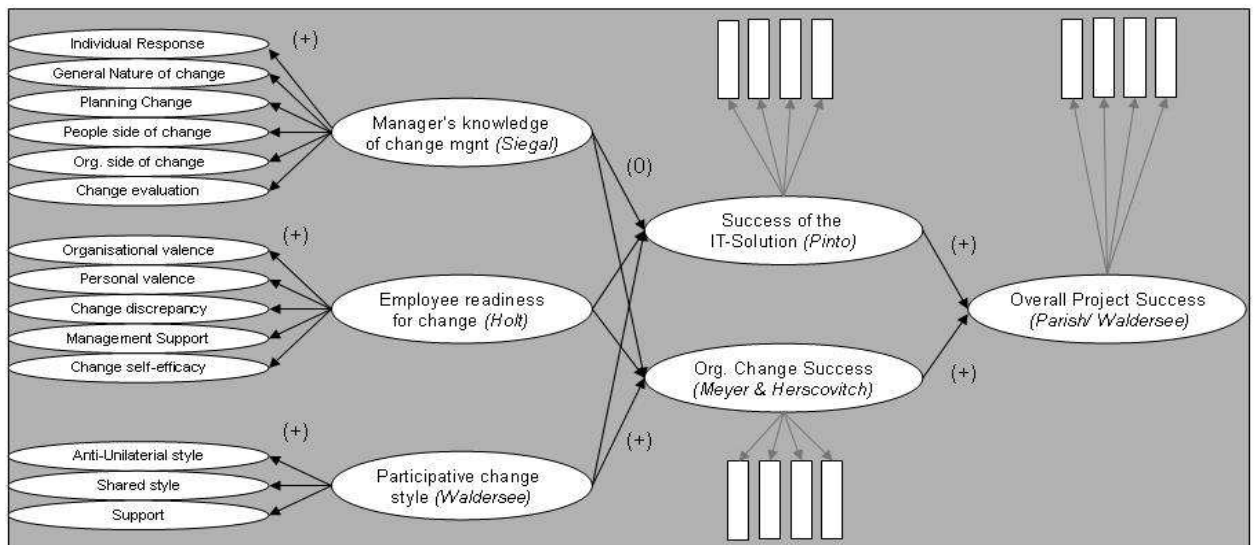
Descriptive analysis was used to gain a better understanding of the data collected (Leedy & Ormrod 2005). For each indicator, construct and variable the mean standard deviation and variance was calculated. Frequency distributions were used to separately uncover the

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distribution of personal and project specific characteristics of the data collected both in total and of the single variables. Furthermore frequency distributions were used to illustrate the distribution of data between the different constructs of each variable. In addition the correlation between the different constructs and variables was calculated using a correlation coefficient matrix (Backhaus et al. 2003; Leedy & Ormrod 2005; Levine & Krehbiel 2002).

Inferential statistics were used to deduct estimates about characteristics of the sample population based on the data sample (Leedy & Ormrod 2005). A structural equation modelling (SEM) was used, to simultaneously analyse the hypothesized multiple relationship paths of the research model (Backhaus et al. 2003; Hair et al. 2009; Weiber & Mühlhaus 2010). Measures used to validate the wellness of fit of the empirical data and the hypothetical path model were: $\chi^2 / Cmin$, Root Mean Square Residual – RMSEA, PClose, Akaike Information Criterion – AIC, Goodness of Fit Index - GFI, Adjusted Goodness of Fit Index – AGFI, Comparative Fit Index -CFI, Hoelter’s Critical N (Blunch 2008; Bryne 2010; Weiber & Mühlhaus 2010).

Figure 3.7 – Hypothesized relations between variables and constructs of the research model



Source: Hetkamp 2011; developed for this study

3.4 Limitations

3.4.1 Geographic limitations

As the study involved steel producers and distributors in the specified European region, the results only reflect what is happening in that region and cannot be generalized for application in a larger context.

3.4.2 Limitations of the survey

The methodology itself has some inherent limitations. A questionnaire does not give respondents the ability to explain or clarify their answers. Qualitative context information about given answers are therefore lost and could lead to wrong conclusions (Di Pofi 2002). The descriptive, quantitative focus of the survey approach was chosen to collect respondent attitudes and to analyse the existence of relationships (Leedy & Ormrod 2005; Neumann, W. 2003). The methodological shortcomings of a rating scale to quantify individual attitudes were implicitly accepted in the study design (Leedy & Ormrod 2005). Furthermore the cross-sectional character of the survey only provided a view of a specific population at the particular moment in time when the data was collected (Leedy & Ormrod 2005).

Other limitations of the survey approach are rooted in the behaviour and mental state of the survey participants. As such participants could have been able to answer using what they believed that researcher would like to hear instead of stating their true attitudes. Furthermore memories that respondents had about the IT projects could be distorted. Answers could therefore be different to reality or what was really thought at that time. Finally descriptions of past events could be coloured by recent events or by the current context (Leedy & Ormrod 2005). A questionnaire approach in the study has the limitations that a low return rate could lead to a lack of representativeness and, as the questionnaire is completed by one single person online, the researcher runs the risk that respondents may misinterpret questions (Leedy & Ormrod 2005).

3.5 Ethical considerations

The protocol for this research was approved by the Research Ethics Committee at the University of Southern Queensland where the researcher is a doctoral student. The forms

required were completed and careful consideration given to the items contained therein before being approved.

3.5.1 Informed cConsent

The study questionnaire provides for informed consent of participants (Leedy & Ormrod 2005).

3.5.2 Plain language for consent mechanism

The consent was provided in plain language.

3.5.3 Participants free to withdraw at any stage

Participants were able to withdraw from the questionnaire at any time simply by not continuing with it.

3.5.4 Preservation of confidentiality

Confidentiality has been preserved by the researcher in accordance with the ethical guidelines to researchers by the University of Southern Queensland. The resultant data will be reported in total and summary. Furthermore any identification of participating individuals and companies was made impossible by the questionnaire design (Leedy & Ormrod 2005).

3.5.5 Research findings reported to participants

A summary of the findings of the study were made available to all participating steel federations.

3.5.6 Data security and storage

The data collected from the survey has been stored in a locked filing cabinet at the researcher's home office and will be kept for a period of five years as required by the High Research Ethics Committee of the Southern University of Queensland.

3.5.7 Contact details

Contact details of the researcher are provided at the public website where access to the survey is located and on all pages of the questionnaire.

3.5.8 Participant access to research ethics board

Participants in the questionnaire were provided with contact details for the Research Ethics Committee of the Southern University of Queensland on the public website and in the introductions of the questionnaire.

3.5.9 Privacy regulations

No intrusive enquiry was undertaken as part of the survey. The questionnaire was submitted, reviewed and approved by the Research Ethics Committee of the University of Southern Queensland.

3.5.10 Psychological and other risks

There are no known psychological, physical or other potential risks to the participants in the project.

3.6. Summary

This chapter specified the overall research objectives, the related research questions and research hypotheses.

Critical realism was selected as the research paradigm due to its appropriate match with the research objectives and the research environment. The selected methodology to address the research objective was a multi-lingual quantitative survey. The selected research design is an ex post facto cross-sectional design. The research questions were related to the various components of the research design. The process for the sampling and selection of participants for the primary research has been described.

The tools and approaches for the data analysis and for ensuring the validity and reliability of the study has been presented. Potential limitations of the research have been identified and issues relating to research ethics considered. The appropriate approvals for conducting the study in the described manner were received. The economic importance of IT projects for European steel producers and the importance of successful change management for the success of IT projects provided the justification for the research.

CHAPTER FOUR – PILOT STUDY

4.1 Study design and process

The pilot study of the research project was carried out using a voluntary sample of employees and managers from headquarter of the largest German steel producer ThyssenKrupp Steel Europe AG, during February 2010. The rationale behind the Pilot Study was to review and validate the complete study process with regard to usability and comprehensibility.

Sixteen employees from various levels of hierarchy from Sales and IT departments were asked to qualitatively test the full German survey process. Three IT projects from the years 2001-2004 were chosen, for which at least 5 potential participants could be identified who had personally experienced the implementation of the selected IT-project.

The participants were only given a small introduction with regard to their role as a test participant. Each participant was only confronted with the invitation letter for companies and with the reference letter of the federations. Participants had to manage the survey process without any external help. The researcher only interacted when a participant was completely stuck.

Besides testing the full scope of the survey, the participants were asked to name all kinds of misleading or incomprehensible survey details. All remarks returned such as typing errors, complicated sentences or expressions or unclear questions and process steps were collected. Details and questions about the study in general or about the intention of certain questions were answered and discussed after completion of the pilot test. The collected qualitative remarks were later summarised and categorised in a table for a structured follow up.

4.2 Qualitative outcome of pilot study

About 270 remarks were collected in total. Most of them were valid and named more than once. Only a small number of remarks had to be rejected due to technical or methodological reasons. If remarks had to be rejected the reasons were included in the remark table (see Appendix 6.1).

Another important finding of the pilot test was that completion of the online questionnaire took between 15 to 30 minutes. This measured average answering duration is long but still reasonable taking into account the credibility of the study with respect to its being supported by the main European steel federations and by at least one executive manager in the company.

4.3 Outcome of the pilot study

The distribution by gender (75 percent male, 25 percent female) can be regarded as representative of the German Steel industry, which is traditionally dominated by males. Also the distribution of the nationality of participants (99 percent German) can be regarded as representative. The distribution of organisational status (69 percent employees, 25 percent sales managers, 6 percent IT managers) is in line with the study methodology and was determined by the selection of pilot study participants. The distribution by age (37 percent < 30 years, 37 percent in the category 30-39 years, 12.5 percent in the category 40-50 years, 12.5 percent >50 years), education (mainly bachelor or commercial training) and company affiliation (mainly <20 years) can not be regarded as representative for ThyssenKrupp Steel Europe in general although it does represent major trends in employee development. The distribution of perceived frequency of change in the industry (19 percent low, 19 percent medium, 37 percent high, 25 quite high) can also be regarded as typical for the German steel industry in general and ThyssenKrupp Steel Europe in particular. Since 2003, the industry, and especially ThyssenKrupp Steel Europe, has faced dramatic market changes. While the very profitable developments until 2008 had never been experienced before also the downturn of the global economic situation had dramatic consequences for ThyssenKrupp Steel Europe, which had not been seen since World War II.

Three projects were identified for the pilot study (see table 4.1). Project S454 was an implementation of SAP-SD in the company sales departments between 2000 and 2002. Project S455 was a new, central web-based management information system combining all commercial and production related data from the first order booking till invoices and claims. The final project S456 was the introduction of a European steel marketplace for e-sales between 2001 and 2003, as a joint venture project of the main European steel producers. The main focus of the applications offered was providing customers with web-based order progress and applications for auctioning stock and non-prime material.

Chapter Four – Pilot Study

Table 4.1 – Overview pilot study projects

Project ID	S454	S455	S455
Project name	TOPAS	TOMIS	STEEL24-7
Description (not part of project specification)	Implementation of SAP-SD	Implementation of an internal Order Information System	Implementation of an eMarketplace
Company size	> 10,000 employees	> 10,000 employees	> 10,000 employees
Project focus	Sales	Sales	Sales
Kind of project	New system	System replacement	New system
Functional focus	Transaction system	Information system	Information system
Project budget	0.5 - 2.5 Mio.€	0.5 - 2.5 Mio.€	6 - 20 Mio. €
Project duration	24 months	12 months	36 months
No of employees affected	501 - 1000 employees	501 - 1000 employees	251 - 500 employees
Standard software	Yes	No	No
Number of affected locations	6-10	6-10	6-10
Kind of roll-out	Big bang	Stepwise	Stepwise
Amount of organisational change resulting	Large	Medium	Medium

Source: Hetkamp 2011; developed for this study

As a structural equation model requires normally distributed data, the future study data was analysed with regard to its normality. For the univariate analysis three methods were set up in SPSS namely a) Box-Plots for visually checking each indicator, b) Histograms for visually checking each indicator and c) Mardia's coefficient as a statistical indicator.

For the multivariate normality it was planned to use the function range of AMOS and to calculate the multivariate Mardia coefficient. Unfortunately, AMOS had some problems processing the pilot study data, which made it impossible to report a multivariate normality value for the pilot study. Both visual checks and the statistically calculated Mardia normality values lead to the conclusion that the pilot study data is not normally distributed. Nevertheless ordinal data is known not to be perfect normally distributed (Blunch 2008). As a measure for reliability the following values were built and calculated in SPSS namely a) Cornbach's Alpha (standardised and without item), b) Inter-Item Correlation and c) Corrected Item Scale correlation. It became obvious that a large number of Cronbach's alphas (standardised and without item) and of the Corrected Item Scale correlation had a very negative value, which, based on literature, could pose a reason to eliminate the item from the study.

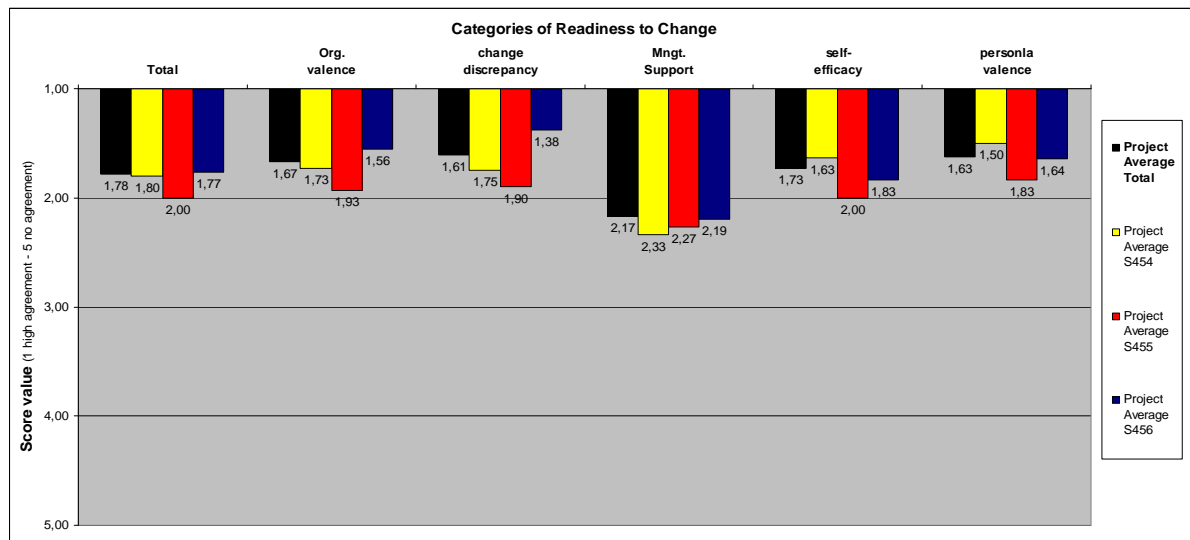
4.4 Trends in results

4.4.1 Readiness for change

The comparison of average project answer values for change readiness showed that all projects are significantly related and close together. The deviations from the overall average curve are minor or not given in many questions. This tendency can also be found in the total average agreement values for change readiness. The average readiness value of 2.7 represents that participants only experienced a medium level of mental readiness for the IT projects in question (see figure 4.2).

Analysed by the five categories of Armenakis' change readiness model (see figure 4.1), it was found that organisational valence and self-efficacy interestingly received the highest agreement score while personal valence and change discrepancy received the lowest average agreement scores.

Figure 4.1 – Average scores for all categories of the readiness for change



Source: Hetkamp 2011; developed for this study

4.4.2 Style of change implementation

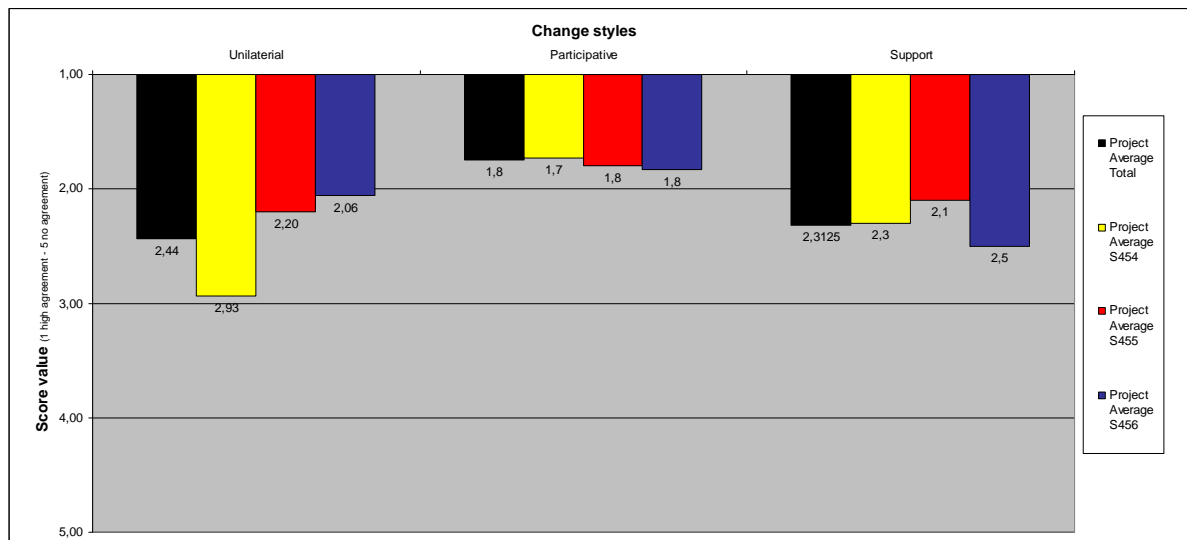
The 11 questions represent the 11 single change options from Waldersse/Griffith with regard to change style. The answer scale was a 5 point Likert scale from total agreement to total disagreement. The greater the answering value the greater the disagreement with the statement presented. Interestingly the participants only used 4 of the 5 answer options. The average answering value of all three pilot projects are very closely related and only deviate minimally from the overall average curve such as it was seen in the case of change readiness

above. When analysed by change style, a preference of a unilateral change style and change support was found while a participative style received clearly lower answering values (see figure 4.2).

4.4.3 Knowledge of change management

The 25 questions represent Burke’s 25 single change questions with regard to change management knowledge. The answer scale was true and false presenting agreement or disagreement to the statements provided. The greater the answering value the greater the disagreement with the presented statement. A distribution of the single participant answers has been left out as a limitation to a two answer option led to an unspecific graph.

Figure 4.2 – Average answering values of the three pilot projects by change style



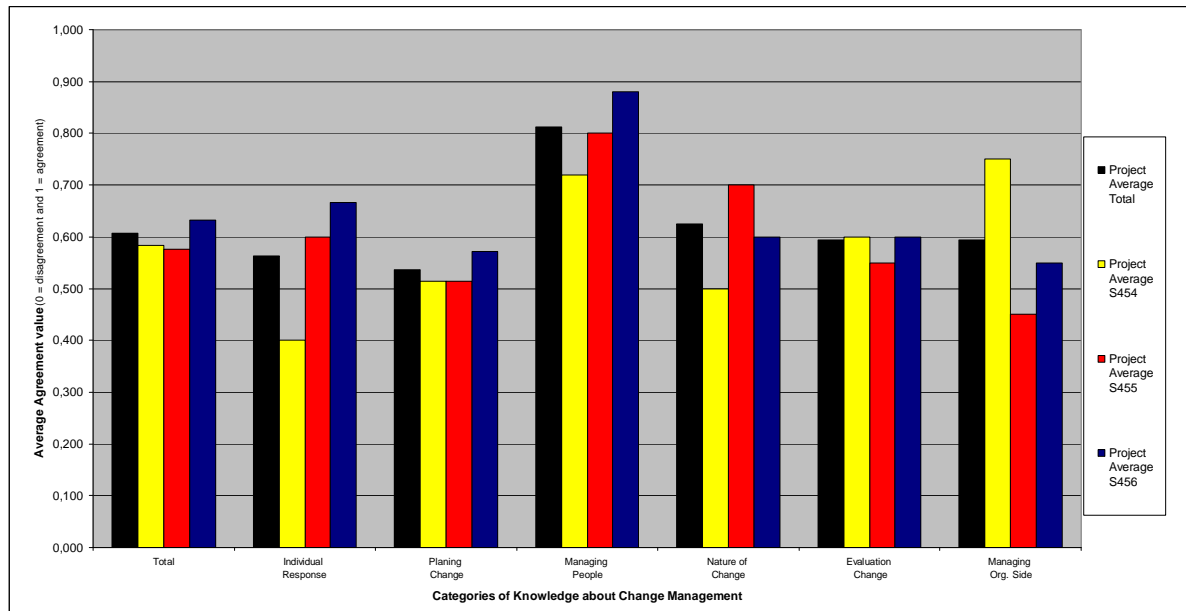
Source: Hetkamp 2011; developed for this study

As in the above analysed cases, the close relation of all three projects and the minor deviate from the average curve can be traced back to change management knowledge. When measured related to Burke’s managing change model we find that for all pilot projects only a medium score of Burke’s managing change model was to be found. With an agreement score of 60.8 percent on average and a range between 58.4 percent and 63.2 percent, all pilot projects show quite a low agreement score to Burke’s model.

When analysing the pilot study results in detail with regard to the 5 categories of Burke’s managing change model we find that surprisingly *Managing people* received the highest average score while *Individual response* and *Planning change* received the lowest. With

regard to the individual projects it is interesting to see that project S454 received a significantly low score in *Individual response* while project S455 received a very low score for the *Managing the organizational side of change*.

Figure 4.3 – Average scores for all categories of the knowledge of change management



Source: Hetkamp 2011; developed for this study

4.4.4 General descriptive statistics

In addition to descriptive statistics such as mean, standard deviation and variance, a correlation matrix for all categories was calculated (see table 4.2 and 4.3). In addition, planned statistical analysis such as an Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) or Structural Equation Modelling (SEM) could not be successfully calculated as three questions from *Knowledge of change* (S14, S20, S24) were answered in all cases with the same answering value.

Chapter Four – Pilot Study

Table 4.2 – Descriptive statistics of dependent and independent variables

	Min	Max	Mean		SD	Var
				Standard error		
Change knowledge	0.52	0.80	0.6324	0.00883	0.08655	0.007
Change readiness	2.27	2.99	2.5923	0.02198	0.21538	0.046
Participative style	1.61	2.56	2.2083	0.02561	0.25092	0.063
IT success	1.00	4.25	2.2969	0.08802	0.86246	0.744
Org change success	1.00	2.75	1.9531	0.05458	0.53473	0.286

Source: Hetkamp 2011; developed for this study

The Kaiser-Meyer-Olkin (KMO) measurement was used to test fit the indicators in each of the construct categories. As a result only 7 of 14 categories were found to have an acceptable or nearly acceptable KMO value. Seven categories had a negative value and 2 could not even be identified. In addition, the correlation matrix of all construct categories identified that nearly every second relation between the construct categories used were negatively correlated (see table 4.3).

Table 4.3 – Correlation matrix of categories

	Knowledge of Change Management	Readiness for Change	Participative Style	IT Success	Org Change Success
Knowledge of Change Management	1.000				
Readiness for Change	0.356	1.000			
Participative Style	0.131	0.227	1.000		
IT Success	0.130	0.228	0.086	1.000	
Org Change Success	-0.127	0.387	0.087	0.835	10.000

Source: Hetkamp 2011; developed for this study

4.5 Key Learning's from pilot study and modifications concluded

Qualitative key learning's from the pilot study were typing errors, phrases and words classified as misleading and too complicated, which were reworked. In particular with those questions adapted from previous research, care was taken so as not to change the meaning of the English original during the translation and adaptation process. Smaller technical features were added to the questionnaire and to the website of the study to increase the ease of handling. Major changes resulting from the pilot study were the restructuring of the invitation letter for companies, the addition of question and answer sections for the project specification and the invitation letter for employees, a change of order, in which the single question sections of the independent variable were sorted in the questionnaire. All those changes and rework was meant to present a questionnaire and study information free of typing errors and easy to understand for each participant.

A quantitative key learning from the pilot study was the standardisation of the measurement scale. Due to serious statistical analysis problems regarding the knowledge of change management construct and the there used managing change questionnaire, it was decided to use a 5 point likert scale instead of a true-false measurement scale, which was used in the former studies. A minimum of a 5 point likert scale was used for all variables to conduct these statistical analyses (Blunch 2008). Also some issues of data coding could be identified and fixed. A planed quantitative analysis of the pilot data was only possible in a very limited form due to the small amount of test data and the complexity of the study model. Possible reasons for the identified not-normal data distribution and the disappointing outcome of the correlation matrix and Kaiser-Meyer-Olkin measure could be the very limited number of pilot data. There was an expectation that due to the size of the European steel industry and the support of the EUROFER executive committee that the final study data set would be large enough to conduct all planed statistical analysis and that this much larger data set would also be more normally distributed compare to the small set of pilot data. A completely normally distributed data set was not expected as studies using a rating scale are frequently found to moderately violate normality (Bryne 2010; Weiber & Mühlhaus 2010).

Sub-Constructs	Knowledge of Change Management						Readiness for Change					Participative Style		
	Individual Response	General Nature	Planning Change	Managing People Side	Managing Org Side	Evaluating Change	Organisational Valence	Personal Valence	Change Discrepancy	Management Support	Change Self Efficacy	Anti Unilateral Style	Shared Style	Support
Knowledge of Change Management	1,000													
Individual Response	,088	1,000												
General Nature	,465	-,397	1,000											
Planning Change	,305	-,166	,860	1,000										
Managing People Side	,365	-,036	-,126	,390	1,000									
Managing Org Side	-,135	,247	-,180	-,510	-,339	1,000								
Evaluating Change	-,350	-,449	,136	,053	,154	-,147	1,000							
Readiness for Change	,049	-,154	,203	,236	,000	,082	,031	1,000						
Organisational Valence	-,184	-,418	,180	,165	,056	,397	,521	,187	1,000					
Personal Valence	-,284	-,052	-,187	,104	,182	-,505	,361	-,049	,666	1,000				
Change Discrepancy	-,024	,215	-,133	-,331	,084	-,056	,163	-,331	-,293	-,266	1,000			
Management Support	-,088	-,290	,083	,230	,309	-,160	,087	,222	,257	,003	-,030	1,000		
Change Self Efficacy	-,221	-,400	-,229	,089	-,043	-,124	,070	,175	,462	,313	-,436	-,188	1,000	
Anti Unilateral Style	,047	,174	-,243	,038	,165	,236	-,179	,289	-,050	-,199	-,187	-,099	-,100	1,000
Shared Style														
Support														

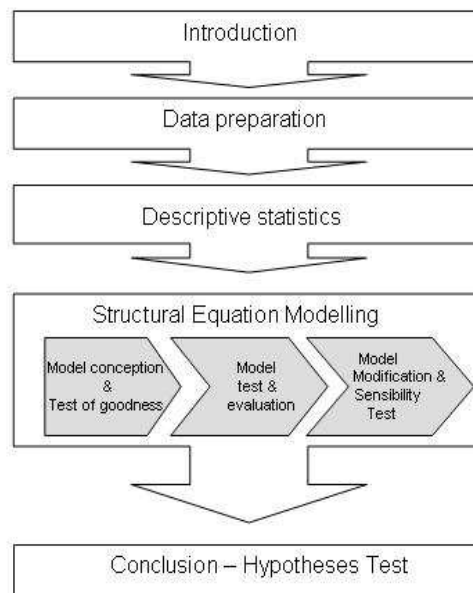
Source: Hetkamp 2011; developed for this study

CHAPTER FIVE - DATA ANALYSIS

5.1 Introduction

Based on the research design already described, data collection strategy, adopted statistical data analysis techniques and their justifications in chapter 3, this chapter describes how the data collected was prepared and analysed in order to address the research questions and hypotheses in this study. The outcome of the statistical description and analysis in this chapter is then discussed in relation to the research problem and related literature in Chapter 6. The structure of the chapter is outlined in figure 5.1.

Figure 5.1 – Structure of data analysis and interpretation



Source: Hetkamp 2011; developed for this study

5.2 Data preparation

The data collected in the online survey required processing and editing in order to convert the data into a suitable format for answering the research questions. This process ensured that the primary data was suitable for statistical and especially a multivariate analysis in terms of accurate coding, downloading into a local computer database, cleaning and screening. Data preparation therefore reduces the risk of violating statistical properties or of running inappropriate interference and interpretations of the results and of applying an appropriate remedy (Hair et al. 2006).

5.2.1 Response rate

Due to the unknown survey population of IT-projects in the European steel industry, the survey was distributed according to the method described and discussed in Chapter 3. Neither the number of potential IT projects nor the respondents could therefore be determined. However, the email invitation targeting IT- and functional managers of the European steel industry who conducted IT-projects in the past 5 years included a hyperlink and a password to the secured online survey questionnaire and yielded 148 respondents who started to complete the questionnaire. One hundred and thirty-seven of these (92.6 percent) finished the questionnaire completely. The balance of 11 (7.4 percent) were unfinished and therefore incomplete questionnaires. This data was deemed unsuitable for inclusion in the primary data set. Of the 37 IT projects entered only 25 (67.6 percent) fulfilled the minimum data quality criteria of at least 4 related and completed questionnaires. The balance of 12 (32.4 percent) projects and their related and completed questionnaires were deemed unsuitable for inclusion in project based calculations and analysis.

Due to the design of the questionnaire, it was impossible to complete the questionnaire without answering all questions. No missing data therefore occurred in the data set. In cases of incomplete questionnaires it was assumed that respondents had either lost interest or restarted the questionnaire at a later time. The completion time of the questionnaire ranged from 7 to 79 minutes with an average completion time of 15 minutes. It was assumed that the wide spread of the questionnaire completion time resulted from a largely different individual experience level with online surveys and also from the assumption that respondents had answered the questionnaire in their work breaks. Longer completion times could result from temporary disturbances such as phone calls during the answering process.

5.2.2 Data coding

Coding was fulfilled by assigning a code based on a five point Likert scale to each response as aligned to each question in the survey. The survey consisted only of pre-coded questions without any open end questions or requirements on the respondent to write individual responses (see Chapter 3, Section 3.3.3). Responses were automatically coded by the online survey software (see Chapter 3, Section 3.3.4) and each questionnaire was issued with a unique response ID. The variable coding used in the SPSS- and AMOS program corresponded to the nature of the data and the pre-coded responses.

The raw data was first manually examined after the responses were collected. The examination functioned as a quality screen ensuring that all data was complete, accurate and free of inconsistencies.

5.2.3 Data examination

The purpose of the data examining process was to ensure that the data was screened and prepared correctly by identifying outliers, inconsistent responses and violations of the assumptions underlying multivariate techniques. The objective is to portray the actual data and to uncover potential hidden effects (Hair et al. 2006).

The use of an online survey questionnaire and the automatic recording and coding of answers helped to largely avoid data input and data handling errors. The data was downloaded from the database of the online survey tool, into a MS Excel file format as a basis for further statistical analysis in the specialised statistics programs SPSS and AMOS.

Potential data problems were considered to either result from case-related problems such as outliers or from problems related to the distribution of the data such as outliers, normality/multivariate normality, response bias and multi-collinearity (Blunch 2008; Bryne 2010; Hair et al. 2006).

5.2.4 Normality

Many simultaneous equation modelling methods such as the maximum likelihood estimation or the generalised least square algorithms require an assumption of multivariate normality of the data (Bryne 2010; Kline 1998; Weiber & Mühlhaus 2010). Violation of normality could affect mean calculations and variance and co-variance estimations (Blunch 2008). As univariate normality can mostly be enough to assume multivariate normality (Blunch 2008), skewness and kurtosis were calculated for each single question. The criteria for univariate normality utilised in this study were a skewness value between -2.0 and 2.0 and a kurtosis value between 7.0 and -7.0 (Weiber & Mühlhaus 2010). According to this standard criteria, 13 of 73 questions showed a skewness of slightly >-2 while 2 of 73 questions were found to have a kurtosis of slightly >7.0 (see Appendix 4.1). In addition, the critical ratios of skewness and kurtosis were included in the analysis for univariate normality. The criteria for univariate normality utilised in this study was a maximum critical ratio of 2.57 representing

$\alpha = 1$ percent (Weiber & Mühlhaus 2010). According to this standard criteria several cases were identified, which showed higher skewness and kurtosis values (see Appendix 4.1).

Multivariate normality was analysed using the Mardia coefficient. Any significant deviation from zero indicates that the data set is not distributed normally (Blunch 2008; Kline 1998; Weiber & Mühlhaus 2010). A Mardia coefficient of 230 and a critical ratio of the Mardia coefficient of 13 support the findings from the univariate normality analysis that most of the variables used in the model were abnormal. In line with these findings of the univariate and multivariate assessment of normality, the box plots of the individual questions show that the answers of most questions are concentrated in the upper area of the five point Likert scale (see Appendix 4.1).

Another test conducted to estimate normality was the comparison of the standard error estimated in the standard model and the standard error of a bootstrap with 500 samples (see Appendix 4.1). The large number of identified cases, in which the bootstrapped standard error was found to be significantly larger compared to the estimated one, could be interpreted as a strong indicator for a kurtotic nature of the study data (Bryne 2010).

A moderate violation of normality in studies using rating scales is not uncommon and can frequently be found in many studies due to the robustness of the maximum likelihood estimation method (Bryne 2010; Weiber & Mühlhaus 2010). To decide whether the above identified violations of normality is critical or only moderate the p-value of the study model was compared to the Bootstrap Bollen-Stine p-value. It was found the study model had a low p-value of $p = .000$ compared to the Bollen-Stine p-value of $p = 0.02$. It was therefore concluded that the violation of normality had no negative influence on the probability of the study estimates (Bühner 2011). As a transformation of data could lead to interpretation problems, using a simultaneous equation modelling method, which does not depend on normality such as an asymptotically distribution-free (ADF) test, was identified as an alternative modelling method (Weiber & Mühlhaus 2010). Due to poor analysis results of the asymptotically distribution-free (ADF) estimation with samples smaller than one thousand and due to the robustness in the case of normality violation, some authors recommend continuing with simultaneous equation modelling using the maximum likelihood estimation (Bryne 2010). Violating the assumption of multivariate normality would probably have a negative effect on X^2 –

values and standard residuals and lead to much higher values. Parameter estimations in contrast would probably not be effected (Reinecke 2005).

5.2.5 Outliers

Outliers are defined as observations that are obviously different from all other observations in the data set. The impact of outliers can be positive or negative. Their information might be either beneficial or could possibly distort the statistical analysis. If detected a detailed analysis of each identified case is therefore recommended (Hair et al. 2006; Kline 1998).

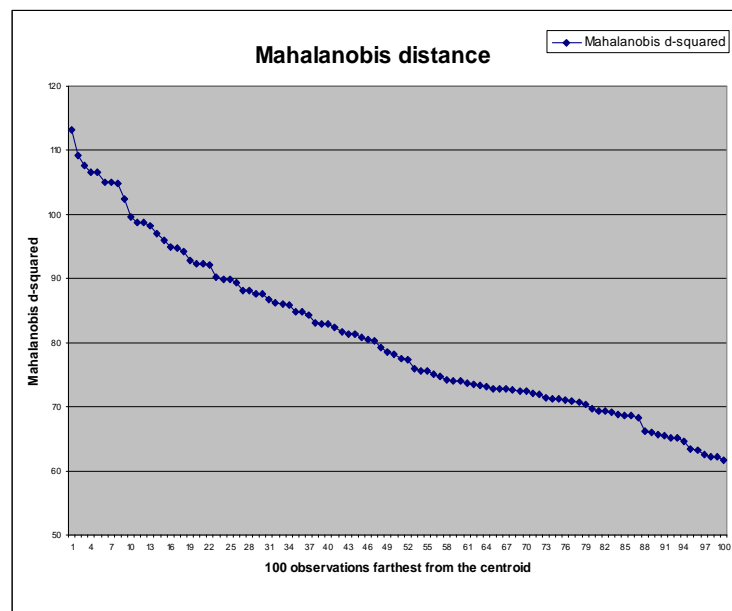
The analysis of outliers was conducted on both a univariate and on a multivariate level. On a univariate level Box-Plots were created using SPSS and were manually screened (Weiber & Mühlhaus 2010). The outcome of the analysis identified that 52 out of 73 single questions had potential outliers. The number of outliers per variable ranged from 2 to 11. No frequent pattern of outranging answers could be identified (details are available from the author). One argument, which speaks against all these cases being real outliers, was that a five point Likert scale was used to illustrate the personal perception of the respondents for each of the 73 questions. While the scale and the questionnaire avoided any outranging value entry, the nature of the questions had a focus on personal perceptions. In addition, of the 73 individual questions all standard deviations were found to lie between 0.5 and 1.6 from their average (see Appendix 4.3). The conclusion was therefore reached that such identified data points were not outliers, which negatively influenced the result of the analysis but that there were logical and personal reasons for these answers. Such identified data points were therefore not eliminated from the data set (Weiber & Mühlhaus 2010).

On a multivariate level the squared Mahalanobis distance D^2 was calculated and interpreted using AMOS (Kline 1998; Weiber & Mühlhaus 2010). The visual analysis for multivariate outliers identified three distinct data points, which obviously disturb the smooth shape of the downward directed D^2 curve. These clear breaks are regarded as indications of possible outliers (Weiber & Mühlhaus 2010) (see figure 5.2).

However, with regard to the abnormal distribution of the data set in general and the lack of clear identification criteria for multivariate outliers using the squared Mahalanobis distance and also compared to the validation of other data sets, this identified data point could not clearly be identified as being outliers (Bryne 2010; Hair et al. 2006; Weiber & Mühlhaus

2010). A calculation based method for identifying multivariate outliers was therefore additionally used. The value of the Mahalanobis distance divided by the degree of freedom was calculated for each question (see Appendix A.4.2) and compared. A value of 2.5 was taken as an indication for outliers facing some 100 observations (Hair et al. 2006 p.77). The results of this calculation-based method were uncritical results for all observed cases. The outcome of the calculative approach therefore underlined the assumption that no question was eliminated from the data set.

Figure 5.2 – Curve of downward sorted D^2 -values



Source: Hetkamp 2011; developed for this study

Another test conducted to estimate the presence of outliers was the comparison of the standard error estimated in the standard model and the standard error of a bootstrap with 500 samples (see Appendix 4.1). The large number of identified cases, in which the bootstrapped standard error was found to be significant larger compared to the estimated one, could be interpreted as a strong indicator for outliers in the study data (Bryne 2010).

5.2.6 Autocorrelation

A basic assumption of a regression model is the independence of errors, which are also called residuals. Autocorrelation is said to exist if the residuals of differently collected data sets correlate. A substantial autocorrelation could have a negative effect on the validity of a regression model (Hill, E. & Lim 2008; Levine & Krehbiel 2002). One calculative method to detect autocorrelation is the Durbin-Watson formula. While a result around 2 indicates an

independence of the residuals, a value significantly smaller than 2 is said to indicate positive autocorrelation and a value significantly larger than 2 a negative autocorrelation (Backhaus et al. 2003 p.87; Hill, E. & Lim 2008 p.239; Levine & Krehbiel 2002 p.537).

Using the Durbin-Watson formula to check for the autocorrelation of and between the single study model constructs showed that for all constructs neutral values were found, which indicates the independence of their residuals. Only for the construct “*Participative Change Style*” was a value found, which indicated a positive autocorrelation of the residuals inside this construct (see figure 5.3).

Figure 5.3 – Durbin-Watson test for autocorrelation

	Indicators	Durbin Watson (per construct)	Durbin Watson
Chance success	Readiness for change	2.04	1.96
	Knowledge of CM	1.78	
	Participative style	0.86	
IT success	Readiness for change	2.04	2
	Knowledge of CM	1.78	
	Participative style	0.86	
Project success	Change success	1.9	2.1
	IT success	1.95	

Source: Hetkamp 2011; developed for this study

5.2.7 Multicollinearity

Multicollinearity in structural equation modelling (SEM) is said to exist, if two or more indicators are so highly correlated that they measure the same underlying construct (Hair et al. 2006; Kline 1998; Mueller 1996). Based on the results of the confirmatory factor analysis (CFA), two statistical methods were used to identify and localize a possible multi-collinearity: the calculation and comparison of tolerance and variance inflation factor (VIF) and the comparison of standardized regressions (Bryne 2010; Hair et al. 2006).

The tolerance is defined as the variation of an independent variable, which is not explained by other independent variables. The VIF is the inverse of the tolerance while the root of the VIF show the factor, by which the standard error of a variable was increased due to colinearity (Hair et al. 2006; Kline 1998). A tolerance of < 0.2 and a VIF > 5 were regarded as being insufficient (O'Brien 2007). The analysis of all study indicators, sub-constructs and constructs identified the sub-construct “change discrepancy” and 4 indicators of the construct “Readiness for change” for potential colinearity (see Appendix 4.3 for details).

Another indication for an existing multicollinearity is regarded in a standardized correlation factor > 1 between two variables (Bryne 2010). The multicollinearity analysis therefore also took place as part of the confirmatory factor analysis (CFA). The results of the analysis indicated two possible variables with a potential colinearity. In both cases these were relationships between a sub-construct and a related construct. The sub-construct “Managing People Side” was found to have a standard regression of just sharply above the critical mark with 1.02 on “Knowledge of Change Management”. More obvious and critical was “Participative Change Style”, which was found to have a standard regression of > 6 on “Shared Change Style” (see Appendix 4.3 for details).

5.2.8 Response bias

A response bias is understood as being a negative influence on representativeness of study results for the sample population due to non-respondents. A potential response bias was analysed by comparing the first thirty questionnaires completed and received with the thirty last questionnaires with respect to significant differences among any model constructs and sub-constructs (Keil, Mann & Rai 2000; Parish, Cadwallader & Busch 2008). A non-parametric Mann-Whitney-U test was used to analyse whether answers from both groups significantly differed. The assumption for applying this test is that the answers of the last respondents were very close to the potential answers of non-respondents and would differ to those answers from early respondents. A significant difference between both groups could be seen as an indicator that the study results are not representative of the sample population (Zinnbauer & Erbl 2004 p.3). As a result of the tests it was found that only for the construct “IT success” and the two sub-constructs could a significant difference be identified (see table 5.1). Based on these test results, no indication for a response bias could be identified.

5.3 Descriptive statistics

5.3.1 Mean, standard error, standard deviations, variance and correlation matrix

Evaluation of the descriptive statistics of the data collected familiarises the research with the data set before proceeding with bi-variate and multivariate analyses (Levine & Krehbiel 2002). Descriptive statistics such as means, standard errors, standard deviations and variances of the variables for each construct are reported in Appendix 4.4.1. It can be observed that while the constructs “Readiness to Change”, Success of Org. Change” and “Overall Project Success” received the highest average scores, the constructs “Knowledge of Change Management” and Participative Change Style” show the lowest standard errors, standard deviations and variances.

Table 5.1 – Respondent bias using the non-parametrical Mann-Whitney-U test

Test of independence between First and Last 30 Respondents	Sig. Mann-Whitney Test	Result
Knowledge of Change Management	0.498	equal distribution
Individual Response	0.959	equal distribution
General Nature	0.734	equal distribution
Planning Change	0.261	equal distribution
Managing People Side	0.794	equal distribution
Managing Org Side	0.794	equal distribution
Evaluating Change	0.049	unequal distribution
Readiness for Change	0.988	equal distribution
Organisational Valence	0.516	equal distribution
Personal Valence	0.135	equal distribution
Change Discrepancy	0.141	equal distribution
Management Support	0.874	equal distribution
Change Self Efficacy	0.601	equal distribution
Participative Style	0.098	equal distribution
Anti Unilateral Style	0.038	unequal distribution
Shared Style	0.954	equal distribution
Support	0.802	equal distribution
IT Success	0.02	unequal distribution
Org Change Success	0.889	equal distribution
Project Success	0.487	equal distribution

Source: Hetkamp 2011; developed for this study

Very divergent results can be found for the three constructs when measuring the success. All three constructs show high standard errors, standard deviations and variances.

The analysis of the correlation matrix showed that less than half the correlations of the sub-constructs measured were significant. Furthermore, only the constructs “Readiness for

Change” and the success constructs were found to be strongly correlated internally (Blunch 2008) and with each other. The opposite was found for the constructs “Knowledge of Change Management” and “Participative Change Style”. In both, only weak or at maximum medium or sometimes even negative correlations were found internally and with the other constructs (see table 5.2).

5.3.2 Respondent profiles

The survey questionnaire also gathered information about respondents’ demographic characteristics. Information related to gender included, age, nationality, organisational status, level of education and their corporate affiliation. This section also collected information related to the respondents’ perception of the frequency of organisational change in their working environment.

Gender, age and nationality: The sampling unit of the analysis comprised IT and functional project managers and employees affected by IT projects in the European Steel Industry. In sum, the sample consisted of 137 respondents. Seventy-eight percent of the respondents were male and only 28 percent were female. The study did not purposefully target gender and was random. The observation supports the gender inequality amongst managers and employees in the European Steel Industry. The study was dominated by German respondents accounting for 61 percent followed by neighboring nationalities such as French, Belgian, Dutch and Austrian each with 6 percent - 8 percent.

Forty-two percent of the respondents were between the 40-49 years old. Those aged between 30-39 years accounted for a further 33 percent. The sample was therefore predominately in the middle to the advanced stage of careers and level of work experience. Exactly 50 percent of the respondents were in employee status followed by functional managers at 29 percent and IT managers at 21 percent. Due to the different local definitions and translations of managerial positions in the different European countries, a manager was defined as a person being directly in charge of more than 1 person. Those experts being in a purely functional responsibility but without personnel responsibility were included in the employee group. Due to significant differences in hierarchical levels and responsibilities in medium sized companies and larger enterprises, the management levels were not further broken down into senior, vice-president or executive level (see table 5.3).

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Table 5.2 – Mean, standard deviation and correlation matrix of all measured constructs and sub-constructs

Constructs/ Sub-Constructs	Mean	Standard Deviation	Knowledge of Change Management			Readiness for Change				Participative Style			IT Success	Org Change Success	Project Success	
			Individual Response	General Nature	Planning Change	Managing People Side	Managing Org Side	Evaluating Change	Organisational Valence	Personal Valence	Change Discrepancy	Management Support				Change Self Efficacy
Knowledge of Change Management																
Individual Response	3.957	0.860	1.000													
General Nature	3.3226	0.809	0.102	1.000												
Planning Change	3.129	0.435	0.278	0.102	1.000											
Managing People Side	3.7419	0.752	0.680**	-0.040	0.392*	1.000										
Managing Org Side	3.9319	0.597	0.340	0.120	0.530**	0.100	1.000									
Evaluating Change	2.8387	0.485	0.229	0.159	0.113	0.293	-0.033	1.000								
Organisational Valence	4.0215	1.282	0.041	0.427*	0.037	0.180	0.069	0.407*	1.000							
Personal Valence	4.2323	1.056	0.151	0.433*	0.146	0.232	0.067	0.349	0.912**	1.000						
Change Discrepancy	4.1774	1.350	0.081	0.370*	0.114	0.212	0.074	0.424*	0.956**	0.950**	1.000					
Management Support	3.7742	0.785	0.164	0.176	0.079	0.369*	0.473**	0.165	0.393*	0.351	0.329	1.000				
Change Self Efficacy	4.1613	0.877	0.291	0.385*	0.062	0.266*	0.101	0.249	0.683**	0.682**	0.682**	0.682**	1.000			
Anti Unilateral Style	3.2796	0.861	-0.003	-0.311	0.019	-0.032	0.075	-0.247	-0.448	-0.396*	-0.472**	0.410*	0.959**	1.000		
Shared Style	3.7366	0.772	0.448*	0.084	0.195	0.461	0.357	0.276	0.462**	0.332*	0.410*	0.959**	0.444*	0.444*	1.000	
Support	3.3226	0.881	0.488**	-0.114	-0.109	0.074**	0.203*	-0.030	-0.144	-0.083	-0.134	0.406*	-0.073	-0.189	0.284	1.000
IT Success																
IT Success	3.2258	1.087	0.129	0.177	-0.169	0.010	-0.212	0.253	0.614**	0.596**	0.604**	0.996	0.676**	-0.331	0.265	-0.148
Org Change Success																
Org Change Success	3.8597	1.387	0.096	0.375*	0.026	0.258	0.147	0.322	0.892**	0.891**	0.840**	0.478**	0.843**	-0.464**	0.545**	-0.30
Project Success																
Project Success	3.9184	1.279	0.174	0.282	0.111	0.234	0.040	0.348	0.909**	0.884**	0.890**	0.327	0.899**	-0.425	0.542**	-0.076

N = 107. *p < .05. **p < .001.

Source: Hetkamp 2011; developed for this study

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Table 5.3– Frequencies of respondent profiles: gender, age, nationality and org. status

Gender	Frequency (n = 137)
Male	78 percent
Female	22 percent

Age	Frequency (n = 137)
20-29 years	9 percent
30-39 years	33 percent
40-49 years	42 percent
>50 years	16 percent

Nationality of Participants	Frequency (n = 137)
Austrian	7 percent
Belgian	8 percent
Brasilian	1 percent
French	7 percent
German	61 percent
Indian	1 percent
Italian	2 percent
Luxemburgers	1 percent
Dutch	6 percent
Polish	1 percent
Spanish	1 percent
Swiss	2 percent
Turkish	2 percent

Org. Status	Frequency (n = 137)
IT Manager	21 percent
Employee	50 percent
Functional Manager	29 percent

Source: Hetkamp 2011; developed for this study

Education, company affiliation and perceived frequency of organisational change: Respondents with a professional or specialised training qualification accounted for the majority at in sum >75 percent. Graduates or post graduates only accounted for 33 percent. Respondent employment with their current employer was quite equally distributed between < 10 year at 36 percent, 11-20 year at 28 percent and 21-30 years at 27 percent. The majority of respondents at 90 percent perceived the current frequency of organisational change in their work environment as being medium to high (see table 5.4).

Table 5.4 –Respondent profile frequencies: education, company affiliation and frequency of org. change

Education	Frequency (n = 137)
None	0 percent
Professional training	25 percent
Specialised training	52 percent
Bachelor/ Master	12 percent
Doctorate	11 percent

Corporate affiliation	Frequency (n = 137)
< 10 years	36 percent
11- 20 years	28 percent
20- 30 years	27 percent
31- 40 years	9 percent

Perceived frequency of Org. Change	Frequency (n = 137)
Very Low	0 percent
Low	5 percent
Medium	43 percent
High	47 percent
Very High	5 percent

Source: Hetkamp 2011; developed for this study

The average score of each respondent profile characteristic and each construct can be found in Appendix 4.4.2.

5.3.3 Project profiles

The survey questionnaire also gathered information about IT-project characteristics. Information included size of the company running the project, department mainly affected by the project, the focus of the project, the functional IT focus of the system, project budget, project duration, number of employees affected, number of locations affected by the project, whether standard software was used for the project, which roll out approach was use in the project and the amount of organisational change the project caused.

Company size, departments, number of employees and number of locations affected: The sampling unit of the analysis was IT and functional project managers and employees affected by IT projects in the European Steel Industry. In sum, the sample consisted of 25 IT

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projects, which fulfilled the minimum requirement of 4 fully completed and returned questionnaires. Of companies, which specified IT projects for the survey, 59 percent had > 5000 employees, followed by companies between 2500 – 5000 employees, which accounted for 30 percent. The IT projects mainly affected up to 250 employees and made up a share of 44 percent while 250 – 500 employees were affected by a further 31 percent of the IT projects. At 43 percent, 2 – 5 company locations were affected by the IT project in focus while another 28 percent were limited to a single location. Departments mainly affected by such IT projects were logistics, production and sales & marketing (see table 5.5).

Table 5.5 – Frequencies of IT project profiles: company size, number of affected employees, locations and departments

Company size (No of Employees)	Frequency (n = 25)
<50	0 percent
50 - 250	0 percent
251 - 500	0 percent
501 - 1000	0 percent
1001 - 2500	11 percent
2500 - 5000	30 percent
>5000	59 percent

Department mainly affected by the project (Multiple selection were possible)	Frequency (n = 25)
Marketing/ sales	30 percent
Human resources	0 percent
Research / technology	8 percent
Production	34 percent
Administration / maintenance	8 percent
Accounting / finance	12 percent
Customer relations department	4 percent
Purchasing	4 percent
IT	4 percent
Logistics	38 percent

No of employees affected	Frequency (n = 25)
<50	22 percent
- 250	44 percent
- 500	31 percent
- 1000	0 percent
- 2500	0 percent
- 5000	0 percent
>5000	3 percent

No of locations affected	Frequency (n = 25)
1	28 percent
2 -5	43 percent
6 -10	11 percent
11 -20	13 percent
>20	6 percent

Source: Hetkamp 2010; developed for this study

Project focus, functional focus, project budget and duration: The clear majority of 57 percent of all IT projects were focused on the implementation of a new IT system, followed but 24 percent focused on replacements and 19 percent on extensions of existing systems. While 76 percent of all IT projects focused on transaction oriented IT systems only 24 percent related to knowledge oriented IT systems. While the major IT project budget of 55 percent of all projects was between € 100,000 – € 30,000, the project duration showed a split between medium term projects of 18 months with a 40 percent share and short term projects with a 24 percent share (see table 5.6).

Table 5.6 – Frequencies of IT project profiles: project focus, functional focus, project budget and duration

Project Focus	Frequency (n = 25)
New IT-system	57 percent
System update	0 percent
System extension	19 percent

Functional IT focus	Frequency (n = 25)
Transaction system	76 percent
Knowledge system	24 percent
Decision support system	0 percent
Executive support system	0 percent

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Project budget (in €)	Frequency (n = 25)
> 10,000	0 percent
- 99,999	7 percent
- 250,000	55 percent
- 500,000	9 percent
- 2.5 Mio.	17 percent
- 5 Mio.	4 percent
- 20 Mio.	8 percent

Project duration (in months)	Frequency (n = 25)
3	3 percent
6	34 percent
9	9 percent
10	3 percent
12	8 percent
17	11 percent
18	19 percent
22	4 percent
24	4 percent
36	4 percent

Source: Hetkamp 2011; developed for this study

Standard software and roll out approach: While 60 percent of the IT projects used a standard software, the roll out approach was nearly equally shared with 51 percent using a step-wise roll out approach and 49 percent using a big bang approach. The size of organisational change caused amounted to 61 percent of all IT projects for medium change, while 21 percent caused large organisational changes (see table 5.7).

Table 5.7 – Frequencies of IT project profiles: standard software and roll out approach

Standard software used	Frequency (n = 25)
Yes	60 percent
No	40 percent

Roll-out approach	Frequency (n = 25)
Big-Bang	49 percent
Step-wise Roll-Out	51 percent

Size of org. change caused	Frequency (n = 25)
Very small	0 percent
Small	10 percent
Medium	61 percent
Large	21 percent
Very large	8 percent

Source: Hetkamp 2011; developed for this study

The average score of each project profile characteristic and each construct can be found in Appendix 3.3. The respondent and IT project profiles provide meaningful insights into the participants and projects represented by this sample. The next stage of the research was to validate the measures that were used to put the constructs in the conceptual framework into operation and to develop the structural model to test the study hypotheses.

5.4 Conceptualisation of model and test for statistical goodness

Structural equation modelling (SEM) is a group of statistic models, which explain the relationships between multiple constructs and variables. This is done by examining the structure of interrelationships of independent and dependent variables in a series of equations. The special characteristic of an SEM is that it combines the multivariate techniques of a factor analysis and a multiple regression analysis (Hair et al. 2006). For the researcher, the SEM has become a standard instrument for the validation of hypotheses systems and relationships between latent constructs (Weiber & Mühlhaus 2010). A three step approach is recommended to undertake a SEM. First the research has to formulate a measurement model with indicator variables. Secondly, the parameters have to be estimated. This can either happen in two sub-steps or in one step. In case of a two step process, the confirmatory factor analysis (CFA) of the exogenous and the endogenous variables is done first before the regression analysis estimates the relationships in the structural model. Alternatively, single step estimation is offered by the statistic software AMOS (Analysis of Moment Structure), which simultaneously estimates all model parameters based on a factor analytical approach. The final validation of the reliability and validity of the SEM results can be done based on statistical goodness of fit tests (Backhaus et al. 2003).

5.4.1 Model conceptualisation

Measurement models can be either formative or reflective. The difference between formative and reflective models can be found in the direction of the assumed relationships and causality of latent variables and the indicator variables measured. In a formative model the indicator variables are seen to influence the latent variable. Indicator variables are therefore regarded as different dimensions of the latent variable. Reflective models follow a reverse relationship. Changes in the latent variable are regarded as leading to changes of the indicator variables. The indicator variables are therefore exchangeable. A precondition for CFA and SEM analysis is that the structural model is reflective (Backhaus et al. 2003). For the study model described in Chapter 3 it is therefore assumed that the latent constructs and sub-constructs cause changes in the individual items measured.

Latent variables are theoretical constructs, which can not directly be observed. In order to measure latent variables, a set of reliable and valid indicators has to be set in operation and justified to sufficiently describe the causality of the theoretical construct (Bryne 2010). In the case of this study, the measurement model is conceptualised to include 17 first order and 3 second order latent variables. The 17 first order variables are set in operation by 73 indicators.

For an SEM to be identifiable, the pieces of information have to be at least as large as or rather larger than the number of parameters to be estimated. The number of surplus information is called “degrees of freedom” and the greater degrees of freedom an SEM has, the more precise the estimation (Blunch 2008). With >2,400 degrees of freedom, the study model is said to be able to estimate.

The optimal sample size for an SEM has been a matter of discussion. Even though a large sample size is generally said to produce a more stable estimation, maximising the sample size is no longer regarded as being appropriate. Instead, it is recommended that the optimal sample size varies between 100 and < 500 depending on the model complexity, the characteristics of the communalities and the amount of constructs with fewer than three indicators. With a complex structural model, 15 communalities < 0.45 and 2 constructs with fewer than three indicators (see Appendix 3.5.1), an optimal sample size of 300 – 500 or even a factor of 10:1 to 20:1 of model parameters and samples are regarded as being sufficient (Hair et al. 2006 p.742; Kline 1998 p.211). The existing sample size of 137 could

either be too small to produce a stable estimation or especially for the constructs “*Knowledge of change management*” and “*Participative change style*” insufficient for an SEM.

5.4.2 Reliability and validity analysis

As already stated above, an SEM includes the analysis of hypothetical, latent constructs, which can not be directly measured. The goodness of the structural model is therefore heavily dependent on the goodness of the indicators measured. The validation of the measurement model with regard to reliability and validity is therefore of significant importance for an SEM. Reliability evaluates the goodness of the measurement instrument while validity verifies to what extent the measurement was taken (Kline 1998; Leedy & Ormrod 2005; Weiber & Mühlhaus 2010). As described in Chapter 3, four assessments were conducted to determine the reliability and the validity of the indicators and constructs used in this study. At first the dimension of each construct and sub-construct was tested using an explorative factor analysis (EFA), secondly the reliability of the indicators for each construct and sub-construct was tested, and thirdly a confirmatory factor analysis (CFA) to verify the reliability of the constructs and sub-constructs were tested. Finally the validity of the measurement model itself was verified.

In the special case of a sequential equation model, the exploratory factor analysis (EFA) is used to explore whether the correlations of indicators measured relates to the operational, hypothetical latent constructs. Such goodness criteria for reliability, which base on an EFA, are also called first generation goodness criteria. In the special case of a sequential equation model (SEM), the confirmatory factor analysis (CFA) lays the basis for the validation of model reliability and validity. The CFA analyses whether the theoretical relationships can be confirmed based on a given and theoretically justified model. In this role, the CFA analyses the goodness of the measurement of the hypothetical constructs. Such goodness criteria for reliability and validity, which base on a CFA, are also called second generation goodness criteria and are based on the standardised estimates. While the first generation goodness criteria are used foremost with pre-test data to refine a study model, the second generation goodness criteria are used to validate the reliability and validity of the measured data set (Backhaus et al. 2003; Weiber & Mühlhaus 2010).

Outcome assessment of uniform dimensionality using an explorative factor analysis (EFA): Uniform-dimensionality means that a set of indicators only measure one underlying construct (Hair et al. 2006). The Kaiser-Meyer-Olkin (KMO) criteria and the Barlett test were calculated at sub-construct level. The KMO evaluates whether a construct explains more variance than a single standardised variable whereas the Barlett test examines the null hypothesis that the indicators originate from an uncorrelated sample population (Backhaus et al. 2003; Weiber & Mühlhaus 2010). Only for the constructs “*Readiness for change*” and the three success constructs did both criteria deliver satisfactory results. At indicator level, the Measure of Sampling Adequacy (MSA) and the communalities were calculated. The MSA indicates the strengths of belonging of one indicator to the other indicator within a construct, while communality informs about the percentage share of a construct spread, which can be explained by the extracted indicator (Blunch 2008; Hair et al. 2006; Weiber & Mühlhaus 2010). For both criteria only the three success constructs delivered satisfactory results. While the constructs “*Readiness for change*” and “*Participative style*” only had one indicator each thus not meeting the MSA minimum, all three constructs failed the communality test. A summary of findings can be found in table 5.8. For analysis details see Appendix 4.5.1.

Table 5.8 – Summary of uniform-dimensionality assesment

	KMO ($\geq 0,6$)	Barlett test (not significant)	MSA (> 0.5)	Communality (> 0.5)
	On sub-construct level		On indicator level	
Readiness for change	OK	Not significant	1/25	5/25
Knowledge of change Management	5/6 (btw. 0.5 -0.6)	4/6 significant	10/25	10/25
Participative Style	2/3 (btw. 0.5 -0.6)	1/3 significant	1/11	3/11
IT Success	OK	Not significant	OK	OK
Org Change Success	OK	Not significant	OK	OK
Project Success	OK	Not significant	OK	OK

Source: Hetkamp 2011; developed for this study

Outcome assessment reliability assessment using first generation goodness criteria

The standardised Cronbach Alpha and Inter-Item correlation were calculated on sub-construct level. The Cronbach Alpha measures the internal consistency of a construct while

the inter-item correlation shows the correlation between the indicators of a construct. At indicator level, the corrected item-to-total correlation was calculated. This indicates potential indicators for exclusion to improve the measurement model (Blunch 2008; Hair et al. 2006; Weiber & Mühlhaus 2010). Only construct “*Readiness for Change*” and success constructs showed satisfactory results with a few minor problems in the area of the corrected item-to-total correlation. The other two constructs delivered unsatisfactory results in all three criteria. It is worthy to note that the analysis indicated that an exclusion of question w1 could lead to satisfactory reliability results for the sub-construct “*AntiUnilateral Change style*” of the “*Participative Change Style*” construct and would have a positive effect on the uniform dimensionality results for this sub-construct leaving two of three sub-constructs of “*Participative Change Style*” with sufficiently reliability results. A summary of findings can be found in table 5.9. For analysis details see Appendix 4.5.2.

Table 5.9 – Summary of first generation reliability assesment

	Cronbach Alpha (standard.) (≥ 0.7)	Inter-Item Correlation (≥ 0.3)	Corrected Item-to-total correlation (≥ 0.5)
	On sub-construct level		On indicator level
Readiness for Change	OK	OK	2/25
Knowledge of Change Management	6/6	6/6	25/25
Participative Style	2/3	1/3	4/11 (1 close to 0.5)
IT Success	OK	OK	OK
Org Change Success	OK	OK	OK
Project Success	OK	OK	OK

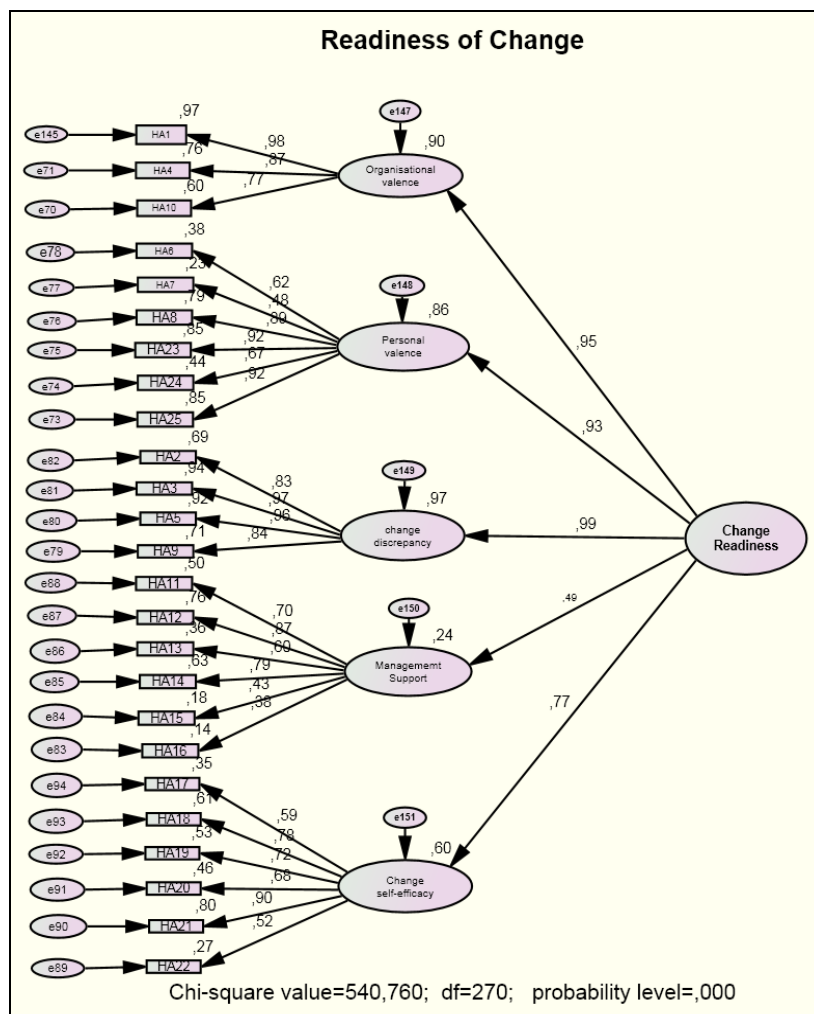
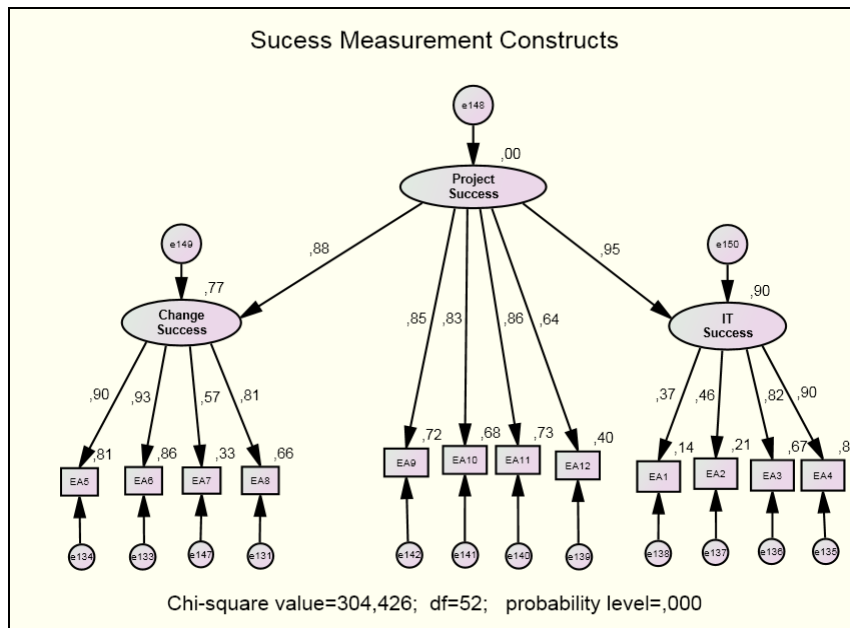
Source: Hetkamp 2011; developed for this study

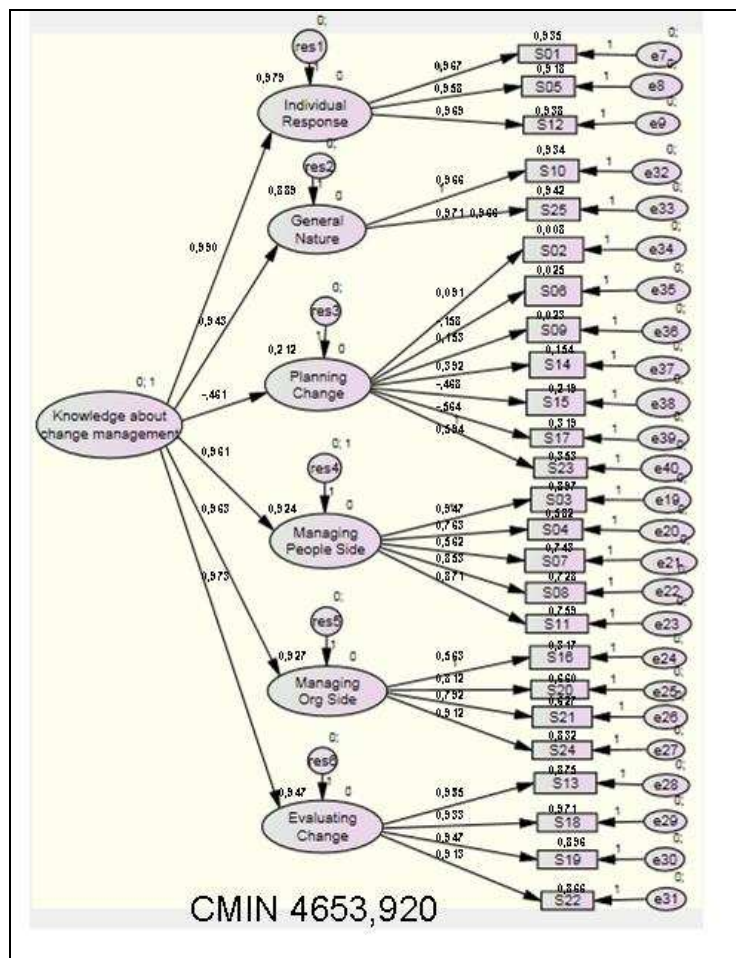
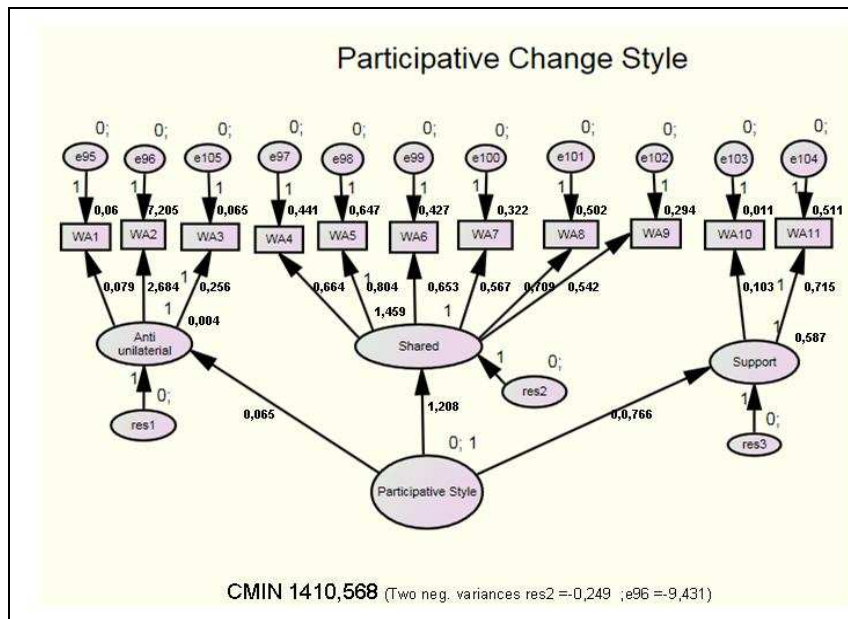
Outcome assessment reliability assesment using second generation goodness criteria

As the classical methods of judging the reliability of a measuring instrument such as a coefficient of determination regressing a measurement on a latent construct do not take latent variables into account as part of the measurement model, a confirmatory factor analysis (CFA) was conducted using the SEM model as a basis to also include the latent variables of the study model (*Structural Modeling Equation with AMOS - Training Material*

2008; Blunch 2008; Reinecke 2005). Detailed results of the confirmatory factor analysis can be found in figure 5.4 and appendix 3.5.3.

Figure 5.4 – Outcome of CFA per construct





Source: Hetkamp 2011; developed for this study

Chapter Five - Data Analysis

The factor reliability and the average variance extracted were calculated on sub-construct level. The factor loading reliability and indicator reliability were calculated at indicator level. The factor reliability shows the share of the sub-construct variance, which can be explained by the related construct. In addition, the average variance extracted indicated the average percentage of the variance, which can be explained by the related indicators. At indicator level, we find an indication of whether the loading on the sub-construct, which is also called standardised estimate of each indicator, is significantly different from zero. The guide level of significance to be different from zero was 0.1 percent. In addition, the indicator reliability shows the share of an indicator variance, which can be explained by the related sub-construct. The indicator reliability is also called squared multiple correlation (SMC) (Blunch 2008; Mueller 1996; Weiber & Mühlhaus 2010). A summary of findings can be found in table 5.10. For analysis details see Appendix 4.5.3.

In total, none of the 6 latent constructs fulfilled the minimum criteria in all four areas. The two success constructs "*Success of organisational change*" and "*Overall project success*" only showed weaknesses in the area of indicator reliability as one indicator in each construct had a reliability of not < 0.4 but < 0.3 . The third success construct "*IT success*" also showed weaknesses in the area of indicator reliability but also in the area of AVE. With two indicators significantly below a reliability level of 0.4, the average variance extracted at construct level dropped slightly below the minimum limit of 0.5. The construct "*Readiness for Change*" showed comparable weaknesses in the areas of indicator reliability and AVE. While the three sub-constructs were found to have 2 indicators slightly below and 4 indicators significantly below reliability at 0.4, the sub-construct "*Management support*" was also found to have an AVE slightly below 0.5.

More serious were the reliability problems detected for the two constructs "*Knowledge of Change Management*" and "*Participative Change Style*". Both failed in all criteria. The construct "*Participative Change Style*" was found to have one indicator not significantly different from zero and three indicators were found to have reliability issues. All three indicators were from the two sub-constructs "*Shared Style*" and "*Anti Unilateral Style*", of which two indicators only slightly fell short of the 0.4 minimum requirements while one failed it significantly. While all sub-constructs were found to have AVE values below the minimum limit, at least the sub-construct "*Shared Change Style*" only failed slightly. In addition, the reliability of the sub-construct "*Anti Unilateral Change Style*" was found to

lack the necessary reliability. The sub-construct “*Support*” met all reliability criteria. For the construct of “*Knowledge of Change Management*”, it can be said that even where a quarter of all indicators were found to have reliability problems, all such problematic indicators were a part of the sub-construct “*Planning Change*”. Also on sub-construct level, the only problematic sub-construct identified was the aforementioned “*Planning Change*”.

Table 5.10 – Summary of second generation reliability assesment

	Sub-Construct reliability (≥ 0.6)	Average variance Extracted (≥ 0.5)	Factor loading ($p=***$)	Indicator reliability (≥ 0.4)
	On sub-construct level		On indicator level	
Readiness for Change	OK	1/5	OK	4/25 (1 close to 0.4)
Knowledge of Change Management	1/6	1/6	4/25	7/25
Participative Style	OK	1/3 (1 close to 0.5)	3/11	3/11
IT Success	OK	1 (1 close to 0.5)	OK	2/4
Org Change Success	OK	OK	OK	1/4
Project Success	OK	OK	OK	1/4

Source: Hetkamp 2011; developed for this study

Outcome assessment validity assessment using second generation goodness criteria

The above validated reliability is a necessary and sufficient condition for the validity of the measuring instrument (Blunch 2008; Kline 1998; Mueller 1996). In addition, validity shows the conceptual correctness and goodness of the study model. Due to systematic and random errors, the validity of hypothetical constructs can only be concluded but not conclusively proven. The conclusion of validity is accepted in practice, if coupled with reliability content and construct validity, can also be demonstrated. Content validity was already provided in the early phase of creating the study model when only using model constructs, which had been used in research before. Construct validity in contrast was analysed as described in Chapter 3 by comparing the maximum likelihood estimates with estimates based on a Bayesian approach and by validating the discriminate validity of the study model (Bryne 2010; Hair et al. 2006; Weiber & Mühlhaus 2010). The above selected maximum likelihood estimation approach is based on the assumption that the true model parameters are fixed but unknown whereas their estimates are random but known. The Bayesian estimation in contrast is based on Bayes’ theorem and follows the assumption that every unknown

quantity is random. The Bayesian estimation therefore assigns each unknown quantity to a joint probability distribution. Based on this different methodological approach, the Bayesian estimation permits the comparison of AMOS maximum likelihood estimates. Very equal estimates could thereby be interpreted as an indication for validity of the hypothesized model structure (Bryne 2010). In addition, the Chi² test of difference and the Fornell-Larcker criteria were used to validate whether two sub-constructs might measure the same. A summary of findings can be found in table 5.11 (Weiber & Mühlhaus 2010). For analysis details see Appendix 4.5.4.

The comparison of ML and Bayesian estimates showed that the two success constructs “*Change Success*” and “*Project Success*” and the construct related to a participative change style were found to have exact equivalent estimation values. The construct “*Readiness for change*” was found to have 5 and the construct “*Knowledge of Change Management*” 8 indicators with a significant difference between both estimation outcomes. While all five indicators of “*Readiness for Change*” belonged to the sub-construct “*Management Support*”, the majority of cases of “*Knowledge of Change Management*” were found to be concentrated in the sub-construct “*Planning Change*”.

Table 5.11 – Summary of second generation validity assesment

	Test of Chi ² Difference*	Fornell-Larcker Criteria**	Comparison of Non-Standardised Indicator Loadings: ML vs. Bayesian
	Pair wise comparison on sub-construct level		On indicator level
Readiness for Change	2/10	5/10	5/25
Knowledge of Change Management	15/15	10/15	8/25
Participative Style	1/3	1/3	OK
IT Success	3/3	1/3	3/4
Org Change Success			OK
Project Success			OK

* Test of Chi difference= CFA with fixed pairwise covariance between sub-constructs – Chi² of the related construct > critical value 3.84 with alpha=0.05

** Fornell-Larcker criteria = Pairwise squared correlations of sub-constructs < AVEs of the compared sub-constructs

Source: Hetkamp 2011; developed for this study

With regard to both tests for discriminate validity, no construct passed one or both tests completely. While the test of χ^2 difference only prognosed 2 sub-construct combinations of the construct “*Readiness to Change*” to fail the test, 5 sub-construct combinations were found using the Fornell-Larcker criteria. The only common problematic sub-construct combination identified by both tests was “*Organisational Valence*” and “*Change Discrepancy*”. For the construct “*Participative Change Style*” one problematic sub-construct combination was identified in each test but a different one each time. As the Fornell-Larcker criteria is regarded as being a more demanding criteria compared to the χ^2 test of difference, and as the χ^2 is based on assumptions such as multi-normality and a sufficiently large sample size, which were already found above, to be questionable for this study, the main attention will be focused on the Fornell-Larcker test results and not the χ^2 test of difference (Weiber & Mühlhaus 2010).

Summary of model reliability and validity evaluation

As a result of the first and second generation test of reliability and the tests for validity, it can be concluded that none of the constructs or sub-constructs meet all quality criteria. The three success constructs and the construct “*Readiness for change*” showed sufficiently reliable results with only minor weaknesses, which could also result from the influence of lacking multi-normality and a possibly insufficient sample size. The good reliability results of these constructs are in line with findings in previous research, which found comparable results. The two constructs “*Knowledge of Change Management*” and “*Participative Change Style*” showed results with worse reliability. The main sources of problems were identified in the sub-constructs “*Planning Change*” and “*Anti Unilateral Style*”. The validity analysis indicated weaknesses for all constructs of the study model.

If these results had become obvious after a pre-test, there would have been a need to rework the study model significantly. In a later step of the SEM, those patterns for reliability and validity problems in the study model could be considered possible options for model modifications.

5.5 Model test and evaluation

Structural equation modelling (SEM) belongs to the family of confirmative multivariate analysis methods and is used to confirm a-priori formulated hypothesis systems and to explain relationships between multiple variables. The SEM includes statistical methods to quantitatively evaluate complex relationships between endogenous and exogenous variables and to estimate their interdependencies (Weiber & Mühlhaus 2010). SEM can be regarded as a combination of dependent and interdependent multivariate statistical techniques whose foundations can be found in t factor analyses and in multi regression analyses. The SEM procedure includes the aspects of a series of equations to express the structure of inter-relationships under study and of modelling these structural relationships to confirm the theory under study. The SEM is the only multivariate technique, which can simultaneously analyse all study model variables, to determine the extent, to which the study data is consistent with the hypothesised study model. The SEM has therefore become a popular methodology for non-experimental research for non-visible concepts, which can not directly be observed (Bryne 2010; Hair et al. 2006). An SEM therefore consists of a structural model including the relationship between all latent variables and a measurement model including all defined indicators and their relationships with the latent variables. To determine the significance of a hypothetical model and its interrelationships, the SEM statistically analyses co-variation and correlation between model constructs by comparing sample and theoretical co-variance matrices. The SEM is therefore also called the analysis of co-variant structures (Blunch 2008; Hair et al. 2006).

For a structural model to be identifiable, it needs at least to be saturated, which means that it has equal or more measurement indicators than estimation parameters thus enabling the estimation of the unknown parameter by the variance and covariance matrices of the indicators measured. An identifiable model is marked by a positive number of degrees of freedom. In practice it is recommended that the number of degrees of freedom equals at least the number of unknown parameters to be estimated and that the equations to be estimated are linearly independent and that correlation matrix of the data measured is positively defined. If the software used, AMOS, detects any problem with the identification of a model, a warning message is displayed (Reinecke 2005; Weiber & Mühlhaus 2010).

The three most widely-used estimation algorithms are the Maximum Likelihood Method, the Unweighted Least Square Method (ULS) and the Generalized Least Square Method

(GLS). The ML Method tries to minimize the difference of empirical and theoretical, model specific covariance matrices. The ML method is scale invariant, which means that scale transformations do not effect the estimation. The estimation calculation based on correlation matrices thus lead to the same model fit results. The ML method is based on the assumption of multi-normality and uses the Chi²-test to estimate the significance (p) level of the model estimation. The ULS method tries to minimize the squared sum of each element of a residual matrix. A residual matrix thereby includes the differences between the measures and theoretical model variances and co-variances. The ULS method needs no multi-normality but is dependent on scale and has limited capabilities in calculating the model fit as no Chi²-test is used. The ULS method is therefore recommended to test models based on correlation matrices. The GLS method bases on the same assumptions such as the ML method (multinormality, scale invariance and Chi²-test). The GLS is applied when the variances of the observations are unequal or when there is a certain degree of correlation between the observations (Reinecke 2005; Weiber & Mühlhaus 2010). The model evaluation of the study model is based on the Maximum Likelihood Method.

5.5.1 Model evaluation

The evaluation of the study model is the heart of any structural equation modelling. It is evaluated, if the theoretically and hypothetically defined relationships and hypotheses of the study model can be found and verified in the measured data set. Evaluation can either happen construct-wise as done in 5.4 or in the complete study model. The analysis and evaluation of the study thereby happened in two steps. At first, the analysis as to whether the model could be confirmed by the measured and collected data took place followed by a second step (see 5.6) where modifications were identified and analysed to improve the model.

Several goodness criteria of model fitness were used to support both analysis steps (see table 5.12). The first kind of goodness criteria evaluated the model by evaluation plausibility, inferential statistics, absolute fitness and descriptive goodness of fit criteria. Furthermore, the model was compared to a default and an independent model. Criteria for incremental model fitness and parsimony and also information criteria were additionally employed for the evaluation of possible model improvements,

Table 5.12 – Goodness of fit criteria used for this study

Criteria Name	Abbreviation	Type of test	Acceptance level
		Evaluation of plausibility	1. not neg. variances 2. Communality ≤ 1 3. Correlation ≤ 1 4. $-1 > \text{Error Var.} < 1$ 5. $-1 > \text{CoVar.} < 1$
Chi square with accompanying significance	χ^2 (df, p)	Evaluation by inferential statistic measures	$p > 0.05$
Normed Chi-square	χ^2 / df	Evaluation by inferential statistic measures	$\chi^2 / df < 3$ (values > 3 and < 5 may also indicate satisfactory fit)
Root mean-square error of approximation	RMSEA	Evaluation by inferential statistic measures	RMSEA < 0.05 (values < 0.08 may also indicate satisfactory fit)
Hoelter's critical N	Hoelter	Evaluation by inferential statistic measures	Hoelter $\leq N$ (study model)
Root mean square residual	RMR	Evaluation of descriptive fitness measures	RMR = 0 (perfect fit of model and measured covariance)
Goodness of fit index	GFI	Evaluation of descriptive fitness measures	GFI > 0.5
Adjusted goodness of fit index	AGFI	Evaluation of descriptive fitness measures	AGFI > 0.9
Comparative fit index	CFI	Model comparison (default, independent)	CFI > 0.9
Tucker Lewis index	TLI	Model comparison (default, independent)	TLI > 0.9
Parsimony standardised fit index	PNFI	Model comparison (incremental fitness & parsimony)	< 0.06 PNFI < 0.09 (substantial model difference)
Parsimony centrality fit index	PCFI	Model comparison (incremental fitness & parsimony)	the larger the better
Akaike Information criterion	AIC	Model comparison (information criteria)	the smaller the better
Expected Cross Validation index	ECVI	Model comparison (information criteria)	the smaller the better

Source: Developed from

(Structural Modeling Equation with AMOS - Training Material 2008; Blunch 2008; Bryne 2010; Hair et al. 2006; Kline 1998; Weiber & Mühlhaus 2010)

Estimations of study models with negative variances, communalities and correlations > 1 are defined as being implausible and are also called Heywood cases (Kline 1998 p.210). Each of these cases could lead to negatively defined parameter matrices and make it impossible to calculate certain goodness measures resulting in a break off the estimation calculation. Problems in estimating a study model could also result from error variances and covariances < -1 or > 1 . The study model and the single constructs were therefore first checked for plausibility. The four measures of inferential statistics used to evaluate the goodness of fit were the χ^2 -test including probability level, the χ^2 / df , the root-mean-square-error of approximation and Hoelter's critical N. The χ^2 -test is also called likelihood ratio test, and

analyses the hypothesis of the empirical and hypothetical covariance matrices being equal. The probability level indicates the probability of finding a discrepancy as large as χ^2 under the assumption that the model is correct. Less strict than the χ^2 -test is the root-mean-square-error of approximation (RMSEA), which evaluates whether a hypothetical model approximates well. As the χ^2 -test can be disturbed and be negatively influenced by complex models, a large sample size or a lack of multi-normality, the RMSEA and the χ^2/df are good alternative measurement criteria. The Hoelter's critical N calculates the necessary size a sample should have in order to accept a model based on a χ^2 -test with a probability level of at least 95 percent.

In addition, descriptive goodness measurements, which are independent of sample size and multi-normality, analyse an approximate model fit by evaluating whether a possible difference between the empirical and hypothetical covariance matrices can be ignored. Descriptive goodness measures used were the root-mean-square-residual RMSEA, the goodness of fit (GFI) and the adjusted goodness of fit (AGFI). The root-mean-square-residual sets the difference between the empirical and hypothetical co-variance matrices in relation to the number of indicators included in a model. A perfect fit is therefore given if the RMR equals zero. The goodness of fit (GFI) measure equals the R^2 of a regression analysis and is independent of the sample size. A GFI value indicated that all empirical covariances can be replicated by the hypothetical model. As the GFI can still be influenced and disturbed by model complexity, the adjusted goodness of fit (AGFI) was additionally used. By including the number of model parameters and degrees of freedom, the AGFI corrects the GFI. Finally, the Comparative Fit Index (CFI) and the Tucker Lewis Index (TLI) compare the study model with an independent model and a saturated model. The TLI not only compares the χ^2 -values of the three models but also includes the degrees of freedom. If a model is over-fitted, the TLI can also reach >1 . While the TLI is based on the assumption of central χ^2 -distribution, the CFI assumes a non-central χ^2 -distribution. The CFI is therefore limited between 0 and 1 (*Structural Modeling Equation with AMOS - Training Material* 2008; Hair et al. 2006; Reinecke 2005; Weiber & Mühlhaus 2010).

Before the study model was tested in total, the single constructs underwent tests with regard to their single goodness of fit based on the results of the confirmatory factor analysis (CFA) (see table 5.13). No Heywood cases were found for any construct. Apart from in the constructs “*Knowledge of Change Management*” and “*Participative Change Style*” no

goodness measures could be calculated. In line with the findings from the reliability and validity analyses, it was found that nearly all constructs failed error variance and covariance criteria for plausibility. This underlines the discovery mentioned above that all constructs in general and the constructs “*Knowledge of Change Management*” and “*Participative Change Style*” in particular are not specified with the necessary quality.

Table 5.13 – Goodness of fit results for single constructs based on CFA

	Readiness for Change	Knowledge of Change Management	Participative Change Style	IT Success	Change Success	Project Success
Evaluation of Plausibility	Var.: OK Com.: OK Cor.: OK EVar.: 4/31 CoVar: 57/496	Var.: OK Com.: OK Cor.: OK EVar.: 17/32 CoVar: 330/561	Var.: OK Com.: OK Cor.: OK EVar.: 5/15 CoVar: 8/66	Var.: OK Com.:OK Cor.: OK EVar.: : 2/4 CoVar: 7/10	Var.: OK Com.:OK Cor.: OK EVar: 1/3 CoVar: 7/10	Var.: OK Com.: OK Cor.: OK EVar.: OK CoVar: 6/10
Chi ² (df, p)	540,760 p=0.000	3921.680 p =	1274.564 p =	85.769 p=0.00	29.468 p= 0.00	2.619 p=0.27
Chi ² / df	2.003	14.578	31.086	42.885	14.734	1.309
RMSEA	0.086	0.995	0.468	0.555	0.318	0.048
Hoelter (0.05)	78			10	28	312
RMR	0.130	0.195	0.157	0.281	0.117	0.032
GFI	0.743	0.628	0.843	0.797	0.906	0.990
AGFI	0.690	1	1	-0.13	0.528	0.951
CFI	0.903			0.666	0.925	0.998
TLI	0.892			-0.02	0.774	0.993

Source: Hetkamp 2011; developed for this study

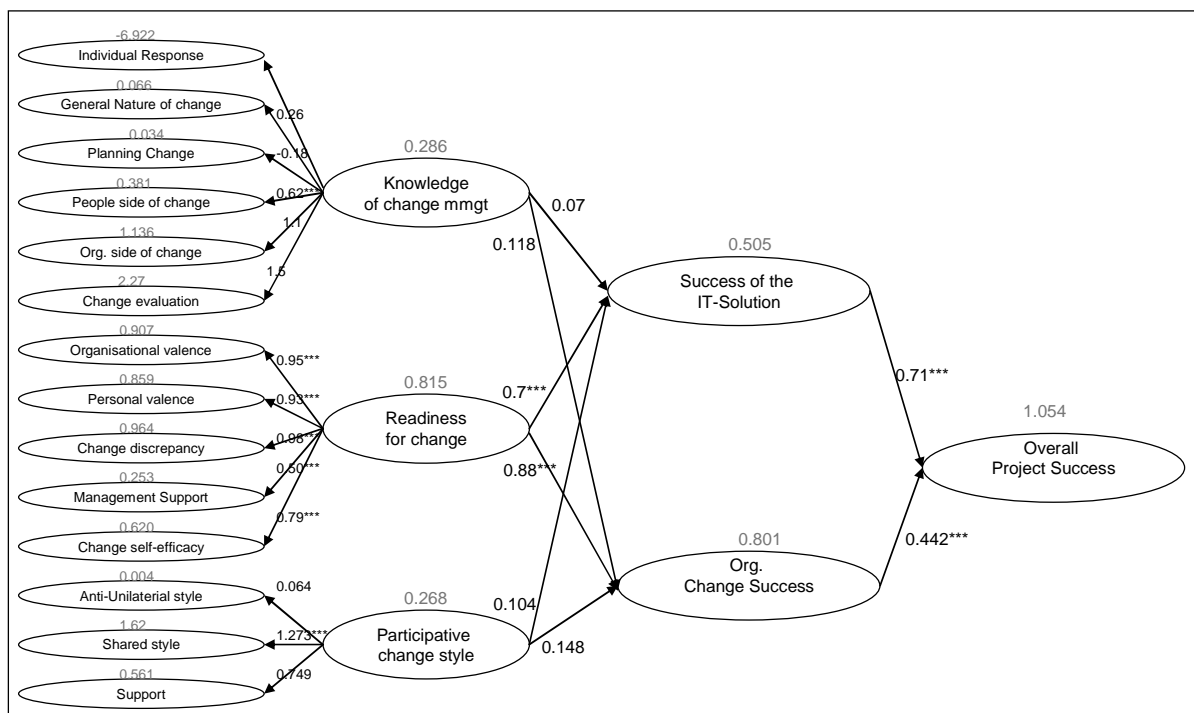
The inferential statistic measures for the goodness of fit found that alone “*Readiness for Change*” seems to have almost reached acceptance results. Only the RMSEA value was sharply above the limit. The three success constructs in contrast either failed the Chi²/df and the RMSEA test or were found to have an insufficient probability level for Chi². Even though the probability values could not be calculated for the constructs “*Knowledge of Change Management*” and “*Participative Change Style*”, all other goodness criteria were found to be far above any minimum requirements. The comparative fit analysis resulted in suitable results for the constructs “*Readiness for Change*”, “*Project Success*” and “*Change Success*”. Whereas for the constructs “*Knowledge of Change Management*” and “*Participative Change Style*” no results were calculated by AMOS, “*IT Success*” was found to have insufficient CFI and TLI values.

5.5.2 Analysis of the study model

The analysis of the study model as a whole found that in contrast to the single constructs, the model could be estimated and the goodness of fit be calculated using the maximum likelihood algorithm. The standardised regression weights and squared multiple correlations

(R²) for all constructs and sub-constructs of the study model can be found in figure 5.5. Based on the recommendation of Chin (1998) that a standardised regression of 0.2 or greater can be called meaningful (Weiber & Mühlhaus 2010 p.185), only 6 non-meaningful relationships were found whereby the non-meaningful relationships between “*Knowledge of Change Management*”/ “*Participative Change Style*” and “*IT Success*” were already assumed to fall under this category. (see Chapter 3). The empirical results of the analysis confirm most parts of the theoretical study model. A strong effect was not only found for all sub-constructs on “*Readiness for Change*” but also in “*IT Success*” and “*Change Success*”. Furthermore a strong effect originating from “*IT Success*” and “*Change Success*” was found on the overall “*Project Success*”. In contrast to the model assumptions, “*IT Success*” was found to have a significantly stronger effect on “*Project Success*” than “*Change Success*”. Also different to the model assumption were the weak effects on “*Knowledge of Change Management*”/ and “*Participative Change Style*” and of both on “*Change Success*”.

Figure 5.5 – Standardised outcome study model estimation using the ML algorithm



Source: Hetkamp 2011; developed for this study

Based on the recommendations of Chin (1998) a squared multiple correlation (R²) of 0.19 can be called weak, of 0.33 moderate and of 0.66 substantial (Weiber & Mühlhaus 2010 p.181). “*Project Success*”, “*Change Success*”, “*Readiness for Change*” and the related sub-constructs were found to be substantial. In contrast to the model assumptions, it was

surprising to find weak R^2 values for the sub-constructs “*Individual Response*”, “*General Nature of Change*”, “*Planning Change*” and “*Anti-Unilateral Change Style*”.

The results of the goodness of fit analysis based on the above defined criteria can be found in table 5.14. While the χ^2 was found to be significant, the χ^2/df was found to be on an acceptable level. The RMSEA was found to be at the lowest acceptable level. All three criteria indicate a reasonable model fit. The indication of a reasonable fit was also supported by the RMR, which showed that the empirical data could not be fitted perfectly but only reasonably to the theoretical study model. The Hoelter’s critical N result for $\alpha = 0.05$ confirmed that the sample size was large enough for the study model to reach a significant result. In contrast, the criteria GFI, AGFI, CFI and TLI were found to be significantly below acceptable level.

Table 5.14 – Goodness of fit Results of the study model

Model Variations	Study Model (Graziano & Raulin)
Chi ² (df, p)	4815.423 p=0.000
Chi ² /df	1.9
RMSEA	0.081
Hoelter (0.05)	75
RMR	0.226
GFI	0.510
AGFI	0.478
CFI	0.656
TLI	0.643

Source: Hetkamp 2011; developed for this study

Built on the results of the goodness of fit analysis, the reliability assessment of the study model as a whole based on 2nd generation criteria was calculated. Besides the single constructs and sub-constructs, which had already been tested in the confirmatory factor analysis (CFA), the relationships between the single constructs were also included. The results of the reliability assessment can be found as a summary in table 5.15 and in detail in appendix A.5.6. While the three success constructs and “*Readiness for Change*” showed comparable reliability values compared to the CFA, the constructs “*Knowledge of Change Management*” and “*Participative Change Style*” showed significantly weaker and mainly unacceptable reliability values. The analysis of the construct relationships assumed in the study model found that only the loading of “*Readiness of Change*” on “*IT Success*” and “*Change Success*” and the loading of “*IT Success*” and “*Change Success*” on “*Project success*” were of reasonable reliability.

Table 5.15 – Assessment of reliability of the study model based on 2nd generation criteria

	Sub-Construct Reliability (≥ 0.6)	Average Variance Extracted (≥ 0.5)	Factor Loading ($p=***$)	Indicator Reliability (≥ 0.4)
	On sub-Construct Level		On Indicator Level	
Readiness for Change	OK	1/5	OK	6/25 (2 close to 0.4)
Knowledge of Change Management	4/6	4/6	14/25	23/25 (2 close to 0.4)
Participative Style	1/3	2/3	3/11	5/11
IT Success	OK	1 (1 close to 0.5)	OK	2/4
Org Change Success	OK	OK	OK	1/4
Project Success	OK	OK	OK	1/4 (1 close to 0.4)
Relationship- Knowledge of CM, Readiness for C and Participative on Change Success	1/1	1/1	2/3	2/3
Relationship- Knowledge of CM, Readiness for C and Participative on IT Success	1/1	1/1	2/3	2/3
Relationship – Change and IT Success on Project Success	1/1	1/1	OK	1/2

Source: Hetkamp 2011; developed for this study

In line with the interpretation of the standardised effects, the R^2 and the internal reliability of the constructs, both constructs “*Knowledge of Change Management*” and “*Participative Change Style*” were found to have no reliable loading on “*IT Success*” and “*Change Success*”.

5.6 Model modifications and sensitivity testing

After estimating the full model, two further tests were undertaken, to potentially identify more detailed insights from the study model. At first, possible model modifications were identified and analysed. In a second step, a sensitivity analysis was undertaken to compare the influence of personal and project characteristics on the estimation and to assess the direct loading of all sub-constructs on the three latent success variables.

5.6.1 Model modification

The aim of the model modification was further to improve the model and assess the contribution of the analysis to science and in practice. The study model was based on the approach that all constructs and relationships should be included in the model as determined by theory in Chapter 3. In addition to this model, modified models were developed that could be tested as alternatives ensuring that the model with the best explanatory power was accepted.

Based on theory and the results of the reliability analysis, both of the unreliable and weak constructs “*Knowledge of Change Management*” and “*Participative Change Style*” were deleted for the first modified model. Only the moderately reliable sub-constructs “*Shared Change Style*” and “*Managing People*” were kept. In the absence of the above mentioned constructs, it was validated whether direct influence of sub-constructs on Change and IT Success could be identified. Results of the first modified model can be found in table 5.15 and figure 5.5.

In line with the assumptions of the study model, the loading of both isolated sub-constructs “*Shared Change Style*” and “*Managing People Side*” on “*Change Success*” was found to be significant while the loading and the standardised effect on “*IT Success*” was found to be insignificant and non-meaningful. However, even though the effect of both constructs on “*Change Success*” was significant, the standardised effect in both cases was found not to be meaningful.

While goodness of fit criteria indicated a criteria-wide improvement of the first modified model when compared to the original study model, the general goodness of fit level remained unchanged. The idea of improving the explanatory power of the model by also reducing both unreliable constructs, meant that reliable components had to be rejected. Where the first model modification was firmly based on theory, the second modified model was based purely on the 2nd generation reliability analysis. With the exclusion of the theoretical background, all unreliable model elements were eliminated. The motivation of the second modified model was to find the best possible statistical outcome of the study model and in so-doing, find a benchmark for the original study model showing the best possible level of outcome for the model (see figure 5.6, figure 5.7, table 5.16, table 5.17 and appendix 4.7.1 for details).

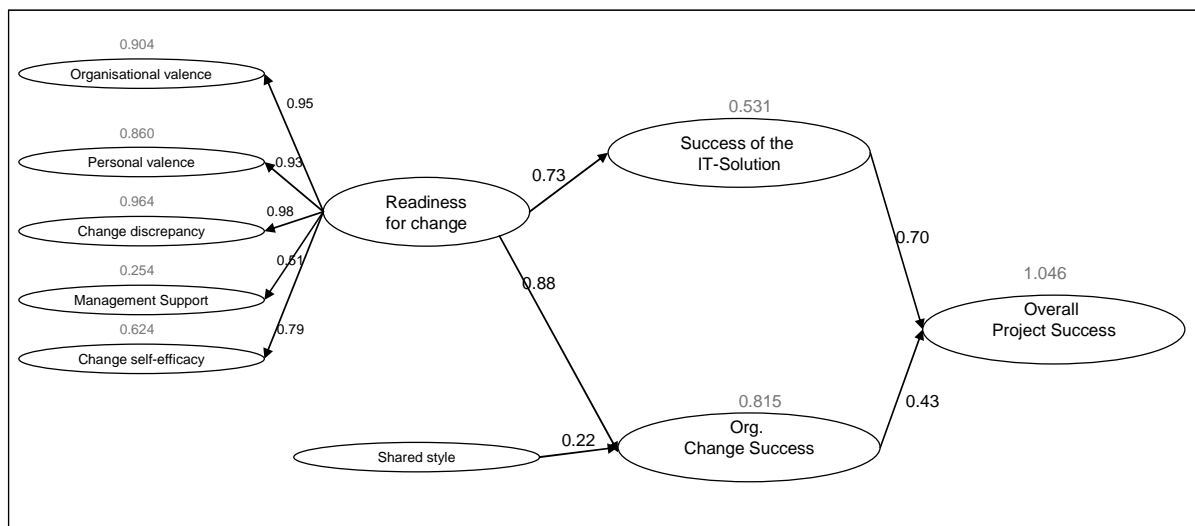
Chapter Five - Data Analysis

Table 5.16 – Goodness of fit results from the modified study models

Model Variations	Study Model	Modified Model 1 - Reduced on “Shared Change Style” and “Managing People Side”-	Modified Model 2 - Only Reliable Indicators-	Modified Model 3 - Reduced on “Readiness for Change” and “Shared Change Style”
Chi ² (df, p)	4815.423 p=0.000	2127.360 p=0.000	1066.476 p=0.000	1816.365 p= 0.000
Chi ² / df	1.9	1.99 (+0.09)	1.95 (+0.05)	2.137 (+0.237)
RMSEA	0.081	0.085 (+0.04)	0.084 (+0.03)	0.091 (+0.01)
Hoelter (0.05)	75	75	77	69
RMR	0.226	0.198 (-0.028)	0.183 (-0.043)	0.195 (-0.031)
GFI	0.510	0.599 (+0.089)	0.691 (+0.181)	0.613 (+103)
AGFI	0.478	0.544 (+0.066)	0.644 (+0.166)	0.570 (+0.092)
CFI	0.656	0.781 (+0.125)	0.875 (+0.219)	0.806 (+0.150)
TLI	0.643	0.793 (+0.150)	0.864 (+0.221)	0.794 (+151)
PNFI	0.462	0.624 (+0.162)	0.713 (+0.251)	0.651 (+0.189)
PCFI	0.632	0.751 (+0.119)	0.804 (+0.172)	0.759 (+0.127)
AIC	5149.423	2343.360 (-2806.063)	1232.476 (-3916.947)	2008.365 (-3141.058)
ECVI	37.863	17.231 (-20.632)	9.062 (-28.801)	14.767 (-23.096)

Source: Hetkamp 2011; developed for this study

Figure 5.6 – Standardised outcome of the first modified study model



Source: Hetkamp 2011; developed for this study

Even though the majority of loads left in the model were found to be meaningful and the reliability criteria and goodness of fit improved significantly, the effect and reliability of the relationships between the constructs in particular remained nearly unchanged and unimproved. The fact that the elimination of all unreliable indicators did not lead to perfect

model reliability and to significantly high loads, underlines that the above identified lack of reliability was not caused by single weak indicators or model components but rather by a general reliability weakness, especially in the constructs “*Knowledge of Change Management*” and “*Participative Change Style*” and their effects on “*Change Success*”.

Figure 5.7 – Standardised outcome of the second modified study model

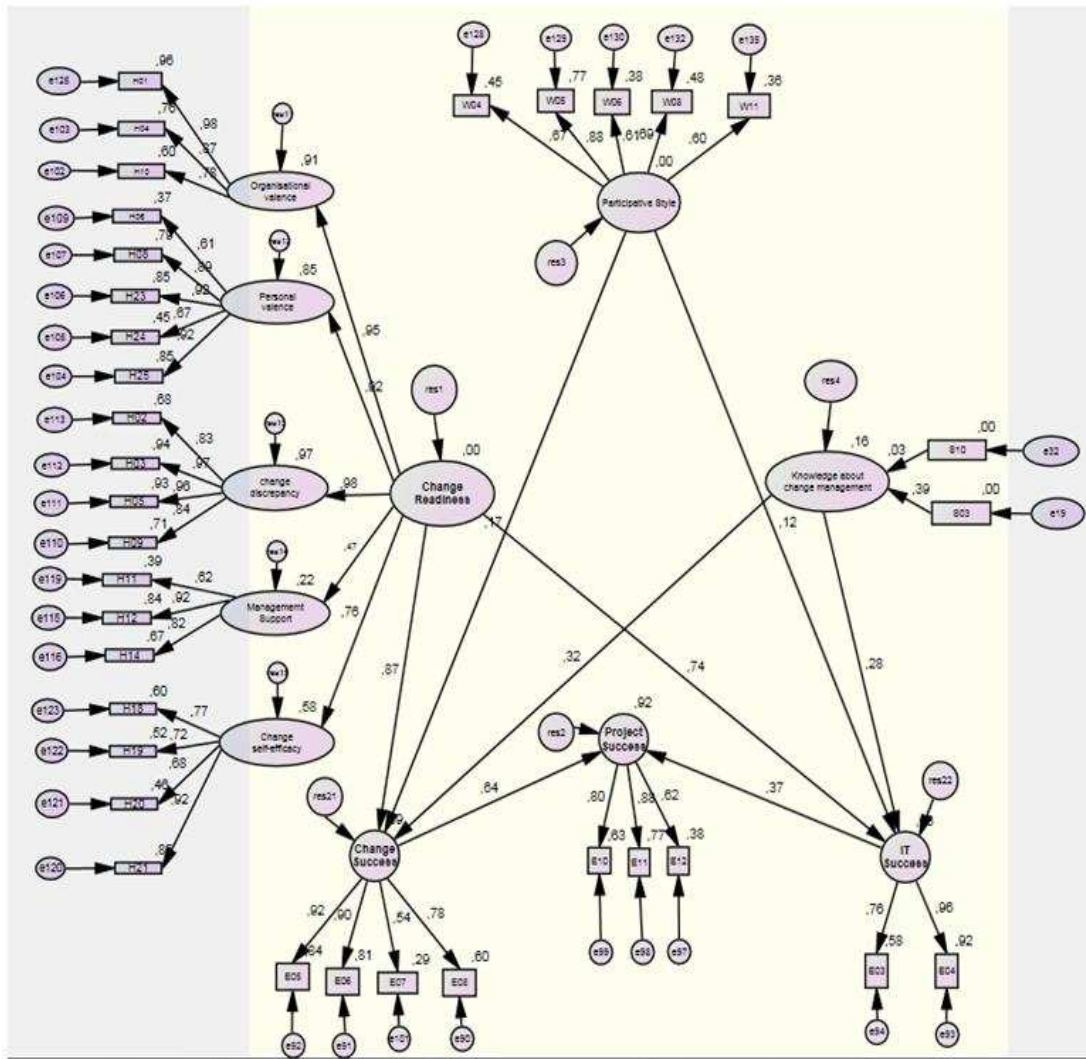


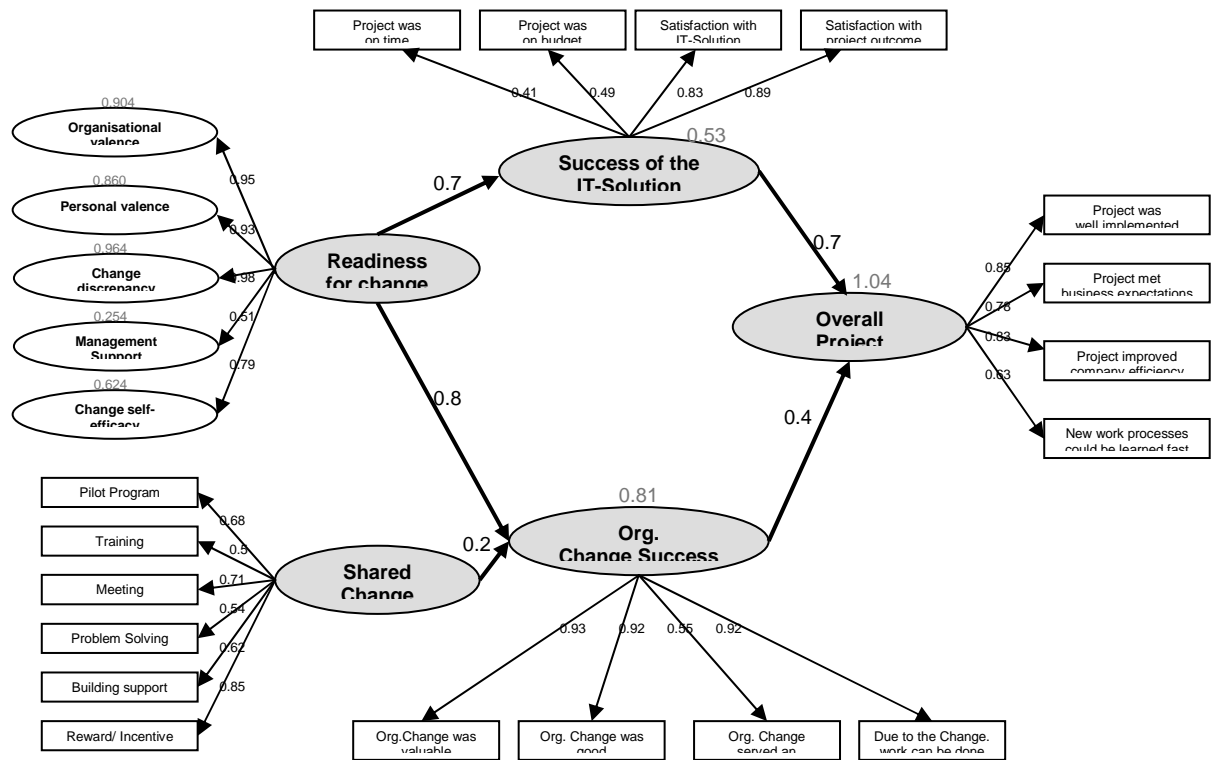
Table 5.17 – Assessment of reliability of the 2nd modified study model based on 2nd generation criteria

	Sub-Construct reliability (≥ 0.6)	Average variance Extracted (≥ 0.5)	Factor loading ($p=***$)	Indicator reliability (≥ 0.4)
	On Sub-Construct Level		On Indicator Level	
Readiness for Change	OK	OK	OK	1/25 (1 close to 0.4)
Knowledge of Change Management	1/1	OK	1/2	1/2
Participative Style	OK	OK	OK	2/5
IT Success	OK	OK	OK	OK
Org Change Success	OK	OK	OK	1/4
Project Success	OK	OK	OK	1/4 (1 close to 0.4)
Relationship- Knowledge of CM, Readiness for C and Participation in Change Success	1/1	1/1	1/3	2/3
Relationship- Knowledge of CM, Readiness for C and Participation in IT Success	1/1	1/1	2/3	2/3
Relationship – Change and IT Success in Project Success	1/1	1/1	OK	1/2

Source: Hetkamp 2011; developed for this study

In a third modified model, the two unreliable constructs “*Knowledge of Change Management*” and “*Participative Change Style*” were eliminated. Only the promising sub-construct “*Shared Change Style*” was kept. With regard to theory and previous studies, the idea behind this third modification was to validate whether the hypotheses with regard to the loading of readiness for change and a participative change style on change success could be found to be of a significant and meaningful explanatory nature (see table 5.16, figure 5.8 and appendix 4.7.2 for details). In contrast to both previous model modifications, all model loadings were found to be significant and meaningful. The goodness of fit criteria were significantly better than the original study model and the first modified model and only slightly worse than the second modification model.

Figure 5.8 – Standardised outcome of the third modified study model



Source: Hetkamp 2011; developed for this study

In addition, the software AMOS also proposed possible model modifications. The AMOS modification indices suggested several additional new relationships for the model to improve the explanatory outcome of the model. However, these proposed modifications were limited to error terms, which were not consistent with the theoretical assumptions of the underlying model. These proposals were thus not being followed.

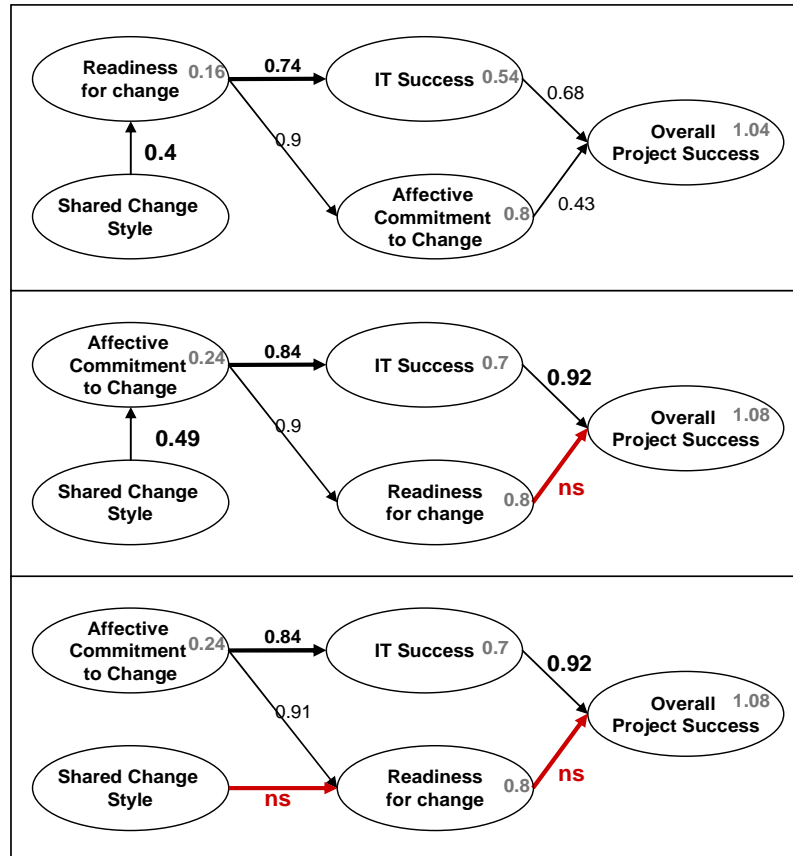
In sum, it can be said that the third modified model can be regarded as a worthwhile alternative to the original study model.

5.6.2 Further alternative model paths

Due to different study models and path relations of other researchers, three further modifications were tested (Cunningham, C. E. et al. 2002; Eby et al. 2000; Flanders 2003; Kwahk & Kim 2008; Rafferty, A. & Simons 2006). Taking the third modified model as the basis, the relationship of “Shared Change Style” to “Readiness for Change” instead of an influence on “Change Success” was analysed. In a second step “Readiness for Change” and “Change Success” were interchanged. Finally, this last interchanged model was modified

again by redirecting the relationship of “Shared Change Style” back on “Readiness for Change”. A summary of findings from all three modifications can be found in figure 5.9.

Figure 5.9 – Standardised outcome of the further study model modifications



Source: Hetkamp 2011; developed for this study

Even though none of these modifications showed better goodness criteria than the third modified model, interesting observation could be found. With respect to “*Shared Change Style*” a difference could be observed when a relationship to constructs was analysed with direct loading on the overall project success. While the analysis of the relationship between “*Shared Change Style*” and “*Readiness for Change*” with direct loading on the overall project success delivered no statistically significant results, the relationship to affective commitment to change, or “*Change Success*” in the third modified model, delivered only a moderate influence. The opposite was found for the relationship to the same constructs when both were placed in the second row of the model. In this case, “*Shared Change Style*” was found to have a significant and much stronger influence on both constructs.

Regarding the two constructs “*Change Success*” measured as effective to change and “*Readiness for Change*” it was found that both constructs had an equally strong loading on

each other. In addition, affective commitment to change was found to potentially have a slightly stronger influence on “*IT Success*” than on “*Readiness for Change*”. Finally, the influence of “*IT Success*” on the overall project success was found to significantly increase concurrently with the non-significant relationship between “*Readiness to Change*” and the overall project success.

5.6.3 Sensitivity analysis

In a first step, the direct loads of all sub-constructs on the three success measures were analysed. While only two sub-constructs were found to have a significant load on “*IT Success*”, four were already found on “*Change Success*” and “*Project Success*”. While all loads on “*IT Success*” and “*Change Success*” were also meaningful, only one sub-construct load on “*Project Success*” was seen to be meaningful. See table 5.18 for details.

Table 5.18 – Overview of significant direct loads of sub-constructs on success variables

Sub-Constructs on " IT Success"	
Change self-efficacy	0.502
Change discrepancy	0.379
Sub-Constructs on "Change Success"	
Change self-efficacy	0.22
Change discrepancy	0.524
Organisational valence	0.472
Shared change style	0.267
Sub-Constructs on "Project Success"	
Change self-efficacy	0.226
Change discrepancy	0.145
Organisational valence	0.191
Personal valence	-0.145

Source: Hetkamp 2011; developed for this study

In a second step, the influence of personal and project characteristics on the model estimation was analysed. The group comparison function of AMOS was used for this analysis. With regard to the small overall sample size and the minimum group size required to identify constructs, the following limitations had to be incorporated in order to achieve

results. At first the study model could not be analysed in total. The analysis was therefore split up into the single constructs. Furthermore the analyses were limited to those criteria, which could be consolidated into two groups, each of which having at least 50 answers. However, even with these limitations, the constructs “*Knowledge of Change Management*” lead to no useful result whatsoever..

Findings of personal characteristics:

- With regard to the nationality of study participants, German and other European origins were compared. A significantly high and meaningful loading of both groups for “*Readiness for Change*” on “*Change Discrepancy*”, “*Personal Valence*”, “*Organisational Valence*” and on “*Change Success*” were found. Only for “*Readiness for Change*” on “*Personal Valence*” (0.97 vs. 0.84) and on “*Change Success*” (0.89 vs. 0.81) were significant differences found for other European participants.
- With regard to age, the participants were divided into two groups, younger than 40 and older than 40. For “*Shared Change Style*” significant loadings of 0.22 were found on “*Change Success*” for older participants. A significantly high and meaningful loading for “*Readiness for Change*” on “*Change Discrepancy*”, “*Personal Valence*”, “*Organisational Valence*” and on “*Change Success*” was found for both age groups. Significant differences were found for young participants for “*Readiness for Change*” on “*Change Success*” (0.94 vs. 0.84) and “*Change Success*” on “*Project Success*” (0.66 vs. 0.34). For older participants, in contrast, significantly higher loadings of “*Readiness for Change*” on “*Organisational Valence*”(0.97 vs. 0.89) and of “*IT Success*” on “*Project Success*” (0.8 vs. 0.46) were found. For “*IT Success*”, all four items were found to have a meaningful and significant loading but only for older participants.
- With regard to company position, the participants were divided into employees and managers. For “*Shared Change Style*” significant loadings were found on “*Change Success*” at 0.54 for managers. A significantly high and meaningful loading was found for both groups in “*Readiness for Change*” on “*Change Discrepancy*” and for “*Change Success*” on “*Project Success*”. Significant differences were found for employee participants for “*Readiness for Change*” on “*Change Success*” (0.95 vs.

0.4), “*Readiness for Change*” on “*Organisational Valence*” (0.94 vs. 0.79), “*Readiness for Change*” on “*Personal Valence*” (0.98 vs. ns) and “*Readiness for Change*” on “*Management Support*” (0.66 vs. ns). For managers, in contrast, a higher loading was only found for “*IT Success*” on “*Project Success*” (0.72 vs. ns). For “*IT Success*” only for managers were all four items were found to have a meaningful and significant loading. In contrast, all items loading on “*Project Success*” were found to be stronger for employees.

- With regard to the educational background of the participants, they were divided into skilled workers and academically qualified employees. For “*Shared Change Style*” significant loadings were found on “*Change Success*” at 0.3 for skilled workers A significantly high and meaningful loading of both groups was found for “*Readiness for Change*” on “*Change Discrepancy*”, “*Organisational Valence*” and on “*Personal Valence*” and for “*Change Success*” on “*Project Success*”. Significant differences were found for skilled workers for “*Readiness for Change*” on “*Change Success*” (0.92 vs. 0.73), on “*Personal Valence*” (0.99 vs. 0.58) and on “*Management Support*” (0.73 vs. 0.25) and for “*Change Success*” on “*Project Success*”(0.61 vs. 0.48). For those participants with an academic background in contrast, a higher loading was only found to be significant for “*IT Success*” on “*Project Success*”(0.71 vs. 0.44). For “*IT Success*” only for academically qualified employees were all four items found to have a meaningful and significant loading. In contrast, however, all items loading on “*Change Success*” were found to be stronger for skilled workers.
- With regard to company affiliation, the groups were divided into groups smaller than 10 years experience in the company and greater than 10 years. For “*Shared change style*” significant loadings were found on “*Change Success*” at 0.3 for participants with a longer company affiliation. A significantly high and meaningful loading was found for both the groups “*Readiness for Change on Change Success*” and on “*Change Success*” on “*Project Success*”. The only significant difference was found in “*IT Success*” on “*Project Success*” (0.71 vs. 0.58) for those participants with a company affiliation longer than 10 years.
- With regard to perceived frequency of organisational change, the groups were divided into a low to medium frequency perception and a high frequency perception.

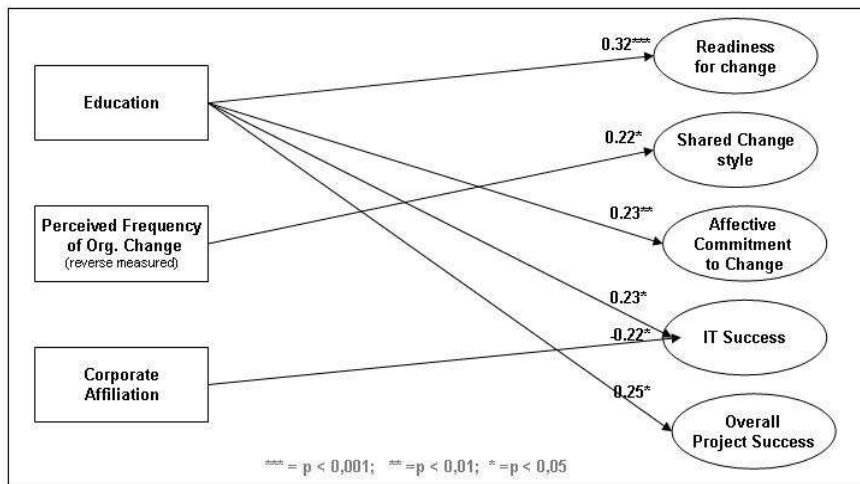
A significantly high and meaningful loading was found for both the groups “*Readiness for Change*” on “*Change Discrepancy*”, “*Personal Valence*”, “*Organisational Valence*” and on “*Change Success*” as well as “*Change Success*” and “*IT Success*” on “*Project Success*”. Significant differences were found for participants with a perception of a high change frequency for “*Readiness for Change*” on “*Personal Valence*” (0.96 vs. 0.84), on “*Organisational Valence*” (0.99 vs. 0.89) and on “*Change Success*” (0.93 vs. 0.81). Participants with a perception of low to medium change frequency were only found to have a significantly higher loading for “*Change Success*” on “*Project Success*” (0.56 vs. 0.42). In contrast, the loading of all items on “*Project Success*” and especially regarding perceived satisfaction with system solution and project outcome were stronger for participants with a perception of a high change frequency.

Measuring the influence of personal characteristics showed that only for three characteristics significant and meaningful results could be identified (see figure 5.10). A low perceived change frequency in the organisation/ work environment was found to have a medium positive influence on the positive perception of “*Shared Change Style*”. In contrast, a long corporate affiliation was found to have a medium but negative influence on the perception of “*IT-Success*”. The widest and strongest positive influence could be identified for education. A high education level has medium, positive influence on “*Readiness for Change*”, “*Affective Commitment to Change*”, “*IT-Success*” and “*Overall Project Success*”.

Findings of project characteristics:

- With regard to company size, the groups were divided into companies with less and more than 5000 employees. For “*Shared Change Style*” significant loadings were found on “*Change Success*” at 0.31 for the larger companies. A significantly high and meaningful loading for both groups for “*Readiness for Change*” on “*Change Discrepancy*”, “*Personal Valence*”, “*Organisational Valence*” and on “*Change Success*” was found. A significant difference was found for the smaller companies in a significantly higher loading of “*Readiness for Change*” on “*Personal Valence*” (0.99 vs. 0.89) while the larger companies were found to have a significantly higher loading of “*Change Success*” on “*Project Success*” (0.81 vs. 0.195).

Figure 5.10 – Regression of personal characteristics on success variables



Source: Hetkamp 2011; developed for this study

- With regard to project focus, the groups were divided into new systems and system replacements and enhancements. For “*Shared Change Style*” significant loadings of 0.34 were found on “*Change Success*” for the system replacement and enhancement projects. A significantly high and meaningful loading for “*Readiness for Change*” on “*Change Discrepancy*”, “*Personal Valence*”, “*Organisational Valence*” and on “*Change Success*” was found. A significant difference was only found for system replacements of “*Change Success*” on “*Project Success*” (0.87 vs. 0.15).
- With regard to the project budget, the groups were divided into project budgets smaller and larger than €250,000. For “*Shared Change Style*” significant loadings of 0.43 on “*Change Success*” were only found for higher budgeted projects. A significantly high and meaningful loading of both groups was only found for “*Change Success*” on “*Project Success*”, for “*Change Readiness*” on “*Change Success*” and for the “*Readiness for Change*”, the “*Change Success*” and the “*Overall Project Success*” constructs. While the higher budgeted projects were found to have a significantly higher loading of “*Change Success*” on “*Project Success*” (0.83 vs. 0.41) and of “*Shared Change Style*” on “*Change Success*” (0.43 vs. ns), the lower budgeted projects were found to have a significantly higher loading on “*Readiness for Change*” on “*Personal Valence*” (0.98 vs. 0.86), on “*Organisational Valence*” (0.97 vs. 0.89) and on “*Change Success*” (0.93 vs. 0.76). Only for higher budgeted projects all four items of the “*IT Success*” construct were found to be meaningful.

- With regard to the project duration, the groups were divided into those lasting up to 12 months and those longer than 12 months. For “*Shared Change Style*” significant loadings of 0.42 were found on “*Change Success*” for the longer scheduled projects. A significantly high and meaningful loading of both groups was only found for “*Change Success*” on “*Project Success*”. The shorter projects were found to have a significantly higher loading for “*Readiness for Change*” on “*Personal Valence*” (0.97 vs. 0.85) and on “*Change Success*” (0.93 vs. 0.83).
- With regard to the number of people affected by a project, the groups were divided fewer than and greater than 250 people. A significantly high and meaningful loading of both groups was only found for “*Change Success*” on “*Project Success*”. Whereby the projects, which affected a smaller number of people were found to have a significantly higher loading of “*Readiness for Change*” on “*Personal Valence*” (0.97 vs. 0.80), the projects, which affected a larger amount of people were found to have significantly high loading of “*Change Success*” on “*Project Success*” (0.78 vs. 0.49).
- With regard to project introduction strategy, the groups were divided into a big bang strategy and a stepwise introduction. For “*Shared Change Style*” significant loadings of 0.27 were found on “*Change Success*” for those projects, which were implemented stepwise. A significantly high and meaningful loading of both groups was found in “*Readiness for Change*” on “*Change Discrepancy*”, on “*Personal Valence*”, on “*Organisational Valence*” and on “*Change Success*” as well as for “*Change Success*” on “*Project Success*”. A significantly higher loading was found for projects, which were implemented using a big bang strategy such as “*Readiness for Change*” on “*Personal Valence*” (0.97 vs. 0.87) and on “*Management Support*” (0.71 vs. 0.48).
- With regard to organisational change caused by the project, the groups were divided into low to medium and high organisational change. For the projects, which caused a greater organisational change, no significant loading were identified. A significantly higher loading for those projects, which only caused a low or medium organisational change, was found in contrast for “*Readiness for Change*” on “*Change Self-Efficacy*” (0.95 vs. 0.28), on “*Personal Valence*” (0.96 vs. 0.8), on “*Management Support*”

(0.61 vs. 0.48), on “*Change Success*” (0.92 vs. 0.81) and on “*IT Success*” (0.81 vs. 0.64).

5.7 Summary and hypotheses testing

This chapter describes the data analysis undertaken in this research study. The process includes data preparation, generating descriptive statistics, SEM model conceptualisation and test of goodness, SEM model test and evaluation, SEM model modification and sensitivity analysis.

The data preparation stage analyses the data under consideration for normality, outliers, autocorrelation, collinearity, multicollinearity and response bias. In addition, descriptive statistics of the data are assessed, which includes frequency distributions and average results for all demographic and project-related characteristics. Structural Equation Modelling (SEM) using the maximum likelihood (ML) method of estimation was used to test the hypothesised single constructs and the study model in accordance with the conceptual framework developed in Chapter 3. This included evaluating the reliability and validity of the single parts of the measurement model and also conducting a confirmatory factor analysis (CFA). In a final step, after the study model had been calculated, the model was evaluated by comparing it with three modified models, by measuring the direct loading of the sub-constructs on the success measures and by conducting a sensitivity analysis of all demographic and project-related characteristics.

While no outliers were identified, it was found that the study data did not fulfil the assumption of multi-normality. Furthermore, it became obvious that the reliability and validity of the study model was below the recommended limits, which were chiefly but not solely caused by the two constructs “*Knowledge of Change Management*” and “*Participative Change Style*”. In contrast, the third modified model indicated that the data fits the model parts concerning “*Readiness for Change*” and “*Shared Change Style*” and the three successes measures well and reproduces their parts of the conceptual framework. The third modified model was aligned with theoretical knowledge and was identified as an improved alternative for the original study model.

The analysis conducted in this chapter showed that the following hypotheses were supported by the model:

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- H2a: Readiness for change is positively related to the change success in IT projects.
- H3a: The use of a participative change implementation style is positively related to the change success in IT projects.
- H3b: The use of a participative change implementation style is not related to successful IT solutions.
- H4a: Change success is positively related to the overall success of IT projects.
- H4b: A successful IT solution is positively related to the overall success of IT projects.

The analysis conducted in this chapter showed that the following hypotheses were not supported by the model:

- H1a: Knowledge of change management is positively related to change success in IT projects.
- H1b: Knowledge of change management is not related to successful IT solutions.
- H2b: Readiness for change is not related to successful IT solutions.

The interpretations and implications of the results of the analysis conducted in this chapter are discussed in the next chapter.

CHAPTER SIX – DISCUSSION, CONCLUSION AND RECOMMENDATION

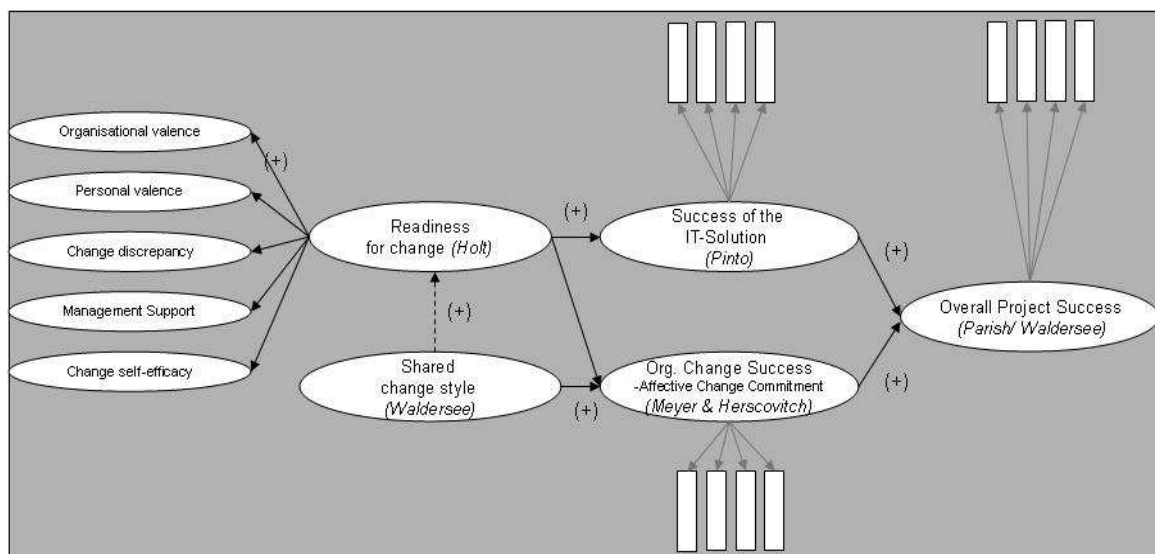
6.1 Introduction

This final chapter concludes and discusses the results of the research findings of the study. Firstly, discussion and interpretation of the results of the statistical analyses of the data and of the research hypotheses reported in Chapter 5 are undertaken with relevant literature. The research objective of this study is - **To examine the extent, to which aspects of change management such as knowledge of change management, readiness for change and participative change implementation style have an influence on the success of IT projects and the realisation of resulting organisational changes.** There are eight research hypotheses addressing this research objective. The discussion in this chapter is structured around these research hypotheses. The chapter finalizes by reporting the limitations of the research, followed by implications for research and practice and by offering recommendations for future research.

6.2 Discussion and interpretations of results

This section will discuss and interpret the results of the hypothesis testing by using a newly revised conceptual framework based on the analyses in the previous chapter to link the discussion.

Figure 6.1 – New conceptual framework as result of study results



Source: Hetkamp 2011; developed for this study

6.2.1 Relationship between knowledge of change management and change success and successful IT solutions in IT projects

The hypotheses H1a and H1b were concerned with the influence of knowledge of change management on change success and on a successful IT solution. Based on several empirical investigations, a lack of change management knowledge and experience in numerous managers facing organizational changes was identified. (Claßen & von Kyaw 2010; Houben & Frigge 2007; Paré & Jutras 2004; ProCedera 2010; Reinmann, Dinges & Krüger 2009; Siegal 1996; Szabla 2007). Hypothesis H1a therefore proposed a positive relationship between knowledge of change management, measured by Burke's Managing Change Questionnaire (Siegal 1996) and change success, measured as an affective commitment to change (Meyer et al. 2002; Parish, Cadwallader & Busch 2008). Hypothesis H1b in contrast, proposed that there is no relationship between knowledge of change management and a successful IT solution, measured by project success (Dvir & Lechler 2004; Pinto & Prescott 1990) as the outcome of an IT project.

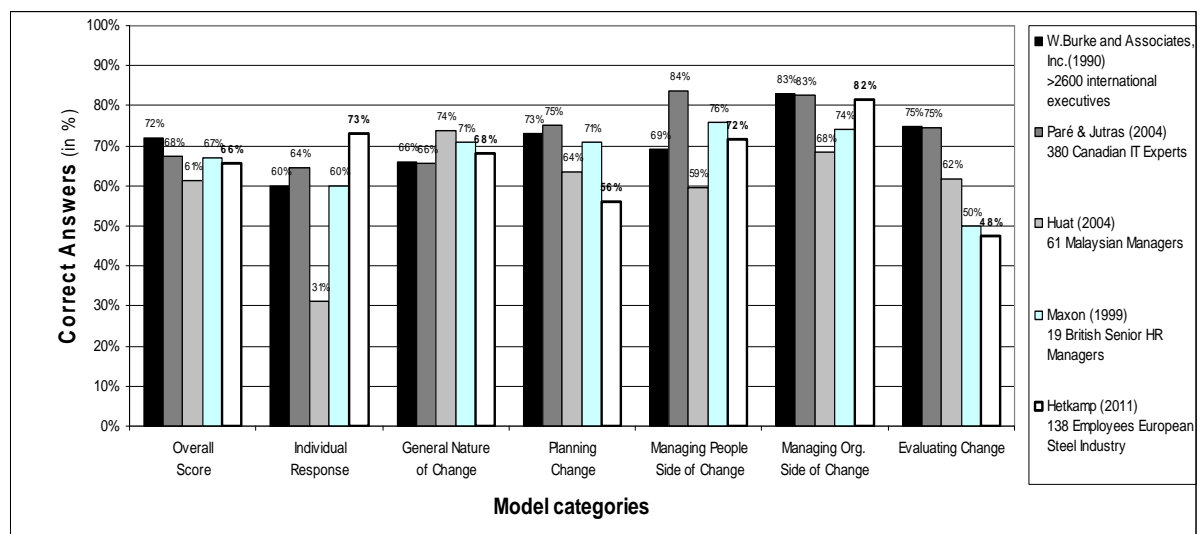
While the study results supported the H1b hypothesis, i.e. that there seems to be no influence of knowledge of change management on a successful IT outcome, the study results also found no proof of a positive influence of knowledge of change management on change success (H1a).

When comparing the results of the Managing Change Questionnaire –MCQ of the European steel industry collected in this study with the results of previous studies (Huat 2004; Maxon 1999; Paré & Jutras 2004; Siegal 1996; Warner Burke Associates 1995), it was found that the study respondents obtained similar scores to previous studies. The overall MCQ result for the European steel industry was similar to all other identified studies. In contrast to most other studies, no significantly higher score for managers when compared with employees, could be found (Paré & Jutras 2004; Siegal 1996). One possible reason for this phenomenon might lie in the fact that the previous studies differentiated between management levels while this study only differentiated between managers in general and employees. As previous studies showed the significantly higher scores for middle and senior management and not for first or second line managers (Siegal 1996 p.69), it could also be concluded that most European steel managers who participated might hold lower managerial positions, which in turn may have resulted in fewer clearly different MCQ scores.

Chapter Six – Discussion, Conclusion and Recommendation

The comparison of the scores of the single categories of Burke’s Managing Change Model (see figure 6.2) found surprising results for the two categories “Planning Change”, which is intended to deal with preparation activities before a change is implemented, and the category “Evaluating Change”, which is intended to deal with indicators of change effectiveness. The scores of the European steel industry in both categories were significantly below the average of previous studies whereas again there were no great differences between management and employee scores. In contrast, the scores in the categories “General Nature of Change”, “Managing People Side of Change” and “Managing Organisational Side of Change” were similar to the scores in previous studies. While “Managing Organisational Side of Change” had a high score of 82 percent, the other two categories were found to have relatively lower total scores of each only about 70 percent. Only for “General Nature of Change” could a significant discrepancy be identified between the scores of managers and employees. While employees had a low score of 59 percent, managers were found to have a relatively high score of 77 percent. Previous studies had identified neither such a high score in this category for managers nor such a low score for employees. Finally, also in the category “Individual Response to Change”, which is intended to deal with handling and managing personal reasons for change resistance, the score was significantly higher than in previous studies (73 percent). Furthermore, employees were found to have a slightly higher average score (75 percent) than managers (71 percent).

Figure 6.2 – Comparison of Managing Change Questionnaire results



Source: Hetkamp 2011; developed for this study

The MCQ results of the European steel industry did not support the conclusion of previous studies, which indicated that hard factors of managing a change process, such as planning

and evaluating, are skills, which managers had already learned in their education and training while there is a managerial lack of education and skill regarding fundamental and human aspects of change (Church, Alan H. et al. 1996; Paré & Jutras 2004; Reinmann, Dinges & Krüger 2009; Siegal 1996). Following Burke's Managing Change Model, the scores of this study in contrast indicates a lack of managerial planning and evaluating skills dealing with organisational change as a part of IT projects in the European steel industry. In addition, the mainly similar or even improved scores on employee level compared with the scores of managers, indicated no superiority or mastership of managing organisational change at management level.

In the next step, the study attempted to find supportive indication for the hypothesis of Burke's Managing Change Model and its measurement instrument suggesting that a high agreement score would lead to more success in managing organisational change. While the reliability of the MCQ as a measuring tool could be proven in two independent studies (Church, Allan H., Waclawski & Burke 1996; Paré & Jutras 2004), first evidence of a correlation between a high MCQ score and project success was found by Huat (2004). The current study could not find comparably good reliability values in the Managing Change Questionnaire. With a Cronbach Alpha value of 0.21 and an inter-item correlation of 0.086 in total, the *reliability of the MCQ* was clearly below the recommended minimum levels. In addition, the correlations between the single model categories were found to be weak. Only "Managing People Side of Change" was found to have a significant loading on the total construct.

Regarding the influence of a high MCQ score and project success, Huat (2004) found a correlation between both values at 0.56. The study found supportive evidence for Huat's findings with correlations of a high MCQ score and Change Readiness at 0.43; with change success – affective commitment to change at 0.37 and with Project Success at 0.35. In contrast, the analysis of the positive influence of a high MCQ score on change and project success could find no supportive evidence for these relationships. Neither were the loading of MCQ on change success nor on project success found to be meaningful and/or significant. Only the category "Managing People Side of Change" was found to have a meaningful influence on Change Success, and this only with a weak level of significance ($p=0.008$).

In sum it can be said that many of the MCQ scores of this study were similar to previous studies and that supportive evidence for a correlation of a high MCQ score and change and project success was found. However, only little supportive evidence was found to show positive influence of a high model score on change success and project success. The same applies for the model reliability and the conclusion of previous studies as to a lack of managerial knowledge about the fundamental and human aspects of change.

When comparing the MCQ scores achieved in this study, only in the category “General Nature of Change” could a significantly higher score be found for managers than for employees. It could therefore be concluded that even though European steel managers might be skilled in identifying and interpreting the nature of change, their knowledge and skills as to how to deal with organisational change successfully, seem not to be significantly better than that of the normal employees. This supports findings from other European change management studies, which point to a lack of change management training and experience in managers (Claßen, Arnold & Papritz 2005; Claßen & von Kyaw 2010; Coverdale 2004; Houben & Frigge 2007; Jorgensen, Albrecht & Neus 2007). It can be concluded that the European steel industry needs to improve change management training, particularly for middle management who play a central role in a change process, and to enable practical experiences and reflections in order to improve and build up superior and sustainable managerial change management competencies (Andrews, Cameron & Harris 2008; Herzig & Jimmieson 2006; Kolb 1996; Paré & Jutras 2004). The positive influence of “Managing People Side of Change” on Change Success underlines the emphasised importance of the human factor in implementing organisational change successfully (McNish 2001; Safar et al. 2006; Self, Armenakis & Schraedder 2007; Spalink 1999).

Originally developed as a management reflexion instrument, the MCQ questionnaire was neither initially intended for complex statistic analysis nor could many studies be identified, which tested and used it in different environments. Model enhancements and more studies are necessary, to better judge the goodness and cross-cultural validity as a measurement tool for knowledge about change management.

6.2.2 Relationship between readiness for change and change success and successful IT solutions in IT projects

Hypotheses H2a and H2b were concerned with the influence of readiness for change management on change success and on a successful IT solution. Based on several empirical investigations readiness for change was identified as being one major facilitator for successful management of organisational change (Bernerth 2004; Claßen & von Kyaw 2010; Holt et al. 2007; Jones, Jimmieson & Griffiths 2005; Kwahk & Kim 2008; Weeks et al. 2004). Hypothesis H2a therefore assumed a positive influence of readiness for change, measured by Armenakis' instrument, on change success, measured as effective affective commitment to change (Meyer et al. 2002; Parish, Cadwallader & Busch 2008). Hypothesis H2b in contrast, assumed that there is no relationship between readiness for change and a successful IT solution measured by project success (Dvir & Lechler 2004; Pinto & Prescott 1990) as an outcome of an IT project.

The high Cronbach alpha reliability value of readiness for change and the positive influence on commitment to change, which was identified, was found to be in line with findings in previous studies (Armenakis, A. et al. 2007; Gresch 2011; Holt et al. 2007; Kwahk & Kim 2008; Machin & Albion 2007; Orth 2002; Todnem 2007). However, not only could the study find supportive evidence for the positive relationship between readiness for change and an affective commitment to change, but it was also able to support research findings showing a significant and very strong inverse relationship between affective commitment and readiness for change (Kwahk & Kim 2008). These findings support the closeness and relatedness of both concepts (Orth 2002). However, contrary to expectations, the study found no significant influence of readiness for change on the overall project success when readiness for change was placed between commitment to change and project success in the study model. This supports the argument that readiness for change is not a predictor for change success but a facilitator to build commitment to change (Armenakis & Harris 2009; Bernerth 2004; Klarner, Todnem & Diefenbach 2011; Orth 2002; Todnem 2007; Weeks et al. 2004). A failure to establish readiness for change in an early phase of a project is argued to contribute to a later change and project failure (Jones, Jimmieson & Griffiths 2005). The positive effect of an early change readiness is further supported by socio-cultural developments of real time information availability and the growing importance of knowledge and knowledge workers. Research showed that employees expect more and earlier information about project direction and goals than in earlier decades (Claßen & von Kyaw 2010; Conner 1992). The positive

relationship between readiness for change and commitment to change is supported also on an emotional level. While readiness to change was found to lead to an emotionally pleasant reaction to change, it is argued that an emotional adaptation to change increases personal commitment and engagement for organisational change (Gresch 2011; Klarner, Todnem & Diefenbach 2011; Walinga 2008).

While the study results supported the hypothesis H2a, i.e. that there seems to be a significant positive relationship between readiness for change and change success defined as affective commitment to change, the study results also found a positive relationship between readiness for change and a successful IT outcome (H2b) (see figure 6.1). Readiness for change thereby was found not only to influence a successful outcome of change, but also showed that an early positive project attitude can have a positive influence on the later IT system and project satisfaction (Abdinnour-Helm, Lengnick-Hall & Lengnick-Hall 2003; Harper & Utley 2001; Jones, Jimmieson & Griffiths 2005; Klarner, Todnem & Diefenbach 2011; Meaney & Pung 2008; Schraedder, Swamidass & Morrison 2006). The study therefore supports the argument of motivation and user acceptance as a major objective for IT implementation (Joshi 1991; McDaniel 2011). This influence of change readiness on a later IT system and project perception could be a possible explanation for the significant relationship between readiness for change and IT success.

The management of expectations early in a project was not only found, to positively influence attitudinal and behavioural change during system implementation but could also help to avoid expectations being too high (Conner 1992; Ginzberg 1981; Inversini 2005). The importance of preparing employees and managers emotionally for organisational change was furthermore underlined by findings, which showed a significant correlation between emotional stability and adaptive performance of change and the positive influence of expressive suppression on the change adaptation of employees (Schraub, Stegmaier & Sonntag 2001).

Even though readiness for change seems to be a suitable predictor for employee change support and commitment as well as for system acceptance, research findings warn that influencing factors for establishing readiness for change differ between small and large scale changes, whereby employees who feel capable of supporting small scale change were found to also support larger scale changes (Rafferty, A. & Simons 2006). Building readiness and

support for smaller organisational and IT driven change could therefore form the basis for larger potential organisational and IT change in the future. Regarding the readiness for change model of Armenakis (1999) used in this study, it is critically argued that it appears only to be based on cognitive terms found in a large scale Belgian study and to be less effective than intentional and emotional terms of readiness for change (Bouckenooghe, Devos & Van den Broeck 2009; Piderit 2000). Cunningham (2002) pointed toward a different aspect of readiness for change by defining readiness of change for a given change project as the sum of individual and organisational readiness for change, whereby individual readiness was found to be one of two significant influencing factors for organisational readiness for change. Finally, it is argued that readiness is not only an individual and subjective attitude, but is also influenced by the social environment. Influencing factors such as organisational change history, organisational culture, beliefs, intentions, structures, management behaviour, management communication and management reaction to bottom-up proposals make readiness for change and the choice of potential methods to establish it a very situational and individual challenge for project managers. (Armenakis, Harris & Mossholder 1993; Fairhurst, Green & Courtright 1995).

Some main contributors for establishing readiness for change identified in earlier research are trust in leadership, system support, organisational support, perceived personal competences, communication, personal reshaping capabilities and an active job i.e. a high decision latitude combined with a high demand (Cunningham, C. E. et al. 2002; Jones, Jimmieson & Griffiths 2005; Kwahk & Kim 2008; Rafferty, A. & Simons 2006). Involvement and participation is one contributor to readiness for change, the significant influence, of which could also be shown in this study (Eby et al. 2000; Flanders 2003; Jones, Jimmieson & Griffiths 2005; Rafferty, A. & Simons 2006) and which is reflected in the new conceptual framework in Figure 6.1.

6.2.3 Relationship between a participative change style to change success and successful IT solutions in IT projects

Hypotheses H3a and H3b were concerned with the influence of a participative change style on change success and on a successful IT solution. Based on several empirical investigations, participation was identified as one major facilitator for successful management of organisational change (Baronas & Louis 1988; Böhm, Vanden Eynde & Pirker 2007; Ikonen & Kurhila 2009; James 2005; Jorgensen, Albrecht & Neus 2007; Litzcke & Nolte 2008;

Swanberg O'Connor 1995). Hypothesis H3a therefore proposed a positive influence of a participative change style based on Waldersee and Griffith's study (2004), on change success, measured as affective commitment to change (Meyer et al. 2002; Parish, Cadwallader & Busch 2008). Hypothesis H3b in contrast, proposed that there is no relationship between a participative change style and a successful IT solution as an outcome of an IT project measured against project success (Dvir & Lechler 2004; Pinto & Prescott 1990). The study results supported the hypothesis H3a that there seems to be a significant positive relationship between a participative change style on change success defined as affective commitment to change and also hypothesis H3b that there is no significant relationship between a participative change style and a successful IT outcome. These findings contrast with findings that well informed staff have a positive influence on the on-time delivery and goal achievement of projects and that participation is related to successful implementation (Lines 2004; Poepl & Kraus 2005).

The reliability value of a participative change style identified and the positive influence on commitment to change and were found to be in line with findings in previous studies (Lines 2004; Rafferty, A. & Simons 2006; Schraedder, Swamidass & Morrison 2006; Sverke et al. 2008; Vahs 2003; Wanberg & Banas 2000).

The findings that all six measured shared methods (such as pilot programs) were loaded significantly and meaningfully onto the shared change style sub-construct, supported Waldersee and Griffith's (2004) choice of these shared practices for their research. The significant influence of user training for a successful shared change style supported previous research findings and underlines the relationship between involvement and learning and the importance of learning for personal change (Inversini 2005; Pagon, Bamutai & Bizjak 2008; Reinmann, Dinges & Krüger 2009; Reiß, von Rosenstiel & Lanz 1997; Woodward & Hendry 2004). The significant influence of meetings for a successful and shared change style supports arguments that meetings and workshops are the most often employed methods of change management (Claßen & von Kyaw 2010; Drahtschmied 2004). Most surprising was the fact that rewards and incentives were found to be the most strongly related method of all those analysed, which lead to a successful, shared change style. This finding supports earlier indications that even if not often used, incentives and rewards can be a powerful instrument for driving participation and support for change (Meaney & Pung 2008; Reinmann, Dinges & Krüger 2009).

However, not only could the study find supportive evidence for the positive relationship between a participative change style and affective commitment to change, but also for the positive relationship between a participative change style and readiness to change (Eby et al. 2000; Flanders 2003; Rafferty, A. & Simons 2006) and which are both included in the new conceptual framework in Figure 6.1. Both findings confirm the supportive effect of participation and involvement in helping employees and managers to understand, accept and support organisational change initiatives (Bouckenooghe, Devos & Van den Broeck 2009; Lines 2004; Meaney & Pung 2008). Research indicated that objective participation and involvement lead to an increased personal perception of a change project and of a personal influence on change, which in a later step positively influences the personal perception of a project and change outcome (Coyle-Shapiro 1999; Inversini 2005; Nurick 1982).

Bearing in mind the fact that in contrast to other studies, no meaningful and significant influence of a shared change style on the overall project success could be identified (Lines 2004; ProCedera 2010), the limited influence of a shared change style on readiness for change and on affective commitment to change as shown in section 5.6.2, supported arguments that traditional participation approaches in a change and IT project could be useful but is neither necessary nor sufficient. It is therefore proposed to regard and use participation not as a central approach anymore but is a more flexible, supporting and enabling way. (Markus & Mao 2004; Rafferty, A. & Simons 2006). On the other hand the study did provide supportive indications that even a simple and limited form of involvement and participation such as user training or problem solving groups could increase project and change acceptance (Inversini 2005; Nurick 1982). Some authors point to fact that the effect of new behavioural approaches, such as participative approaches in this study, was found to be largely influenced by the behaviour and communication of top managers (Fairhurst, Green & Courtright 1995). The limitation of the involvement influence could therefore also result of a contrary managerial behaviour.

In contrast to Rafferty and Simons (2006) findings of a limited effect of participation only in projects with smaller scale changes, the study found only for larger projects a significant and meaningful influence of a shared change style on change success and of change success on the overall project success. For smaller projects, a larger relevance of IT success and readiness for change for the perception of the overall project success.

The study could neither validate indications that the positive influence of participation might increase with the intensity and depth of the involvement as the study only analysed those 6 shared methods used in Waldersee and Griffith's (2004) research, nor could it validate indications of an increased influence of participation and involvement, if change were perceived to drive organisational efficiency (Cunningham, C. E. et al. 2002; Inversini 2005; Lines 2004; Schraedder, Swamidass & Morrison 2006; Wanberg & Banas 2000).

6.2.4 Relationship between change success and a successful IT solution and overall success of IT projects

The final two hypotheses H4a and H4b were concerned with the influence of change success and a successful IT solution on the overall success of IT projects. Based on several empirical investigations successful management of change was identified as one major facilitator for an overall successful outcome of projects (Claßen & von Kyaw 2010; Holt et al. 2007; Houben & Frigge 2007; Jorgensen, Albrecht & Neus 2007; Machin & Albion 2007; Parish, Cadwallader & Busch 2008; ProCedera 2010; Vahs 2003). Hypothesis H4a therefore assumed a positive influence of change success, measured as effective commitment to change (Parish, Cadwallader & Busch 2008), on the overall success of IT projects based on study approaches by Parish, Cadwallader & Busch (2008) and Waldersse & Griffith (2004). In order to separate the influence of change management from the technical IT delivery on the final project result, the final hypothesis H4b assumed a positive relationship between a successful IT solution, measured by project success (Dvir & Lechler 2004; Pinto & Prescott 1990) and the overall success of IT projects. The study results found supportive evidence for both hypotheses and is reflected in the new conceptual framework in Figure 6.1.

6.2.5 Overall project success

The high reliability identified and the validity value of overall Project Success and the highly significant influence of the single measurement items on the construct are in line with previous research (Parish, Cadwallader & Busch 2008; Pinto & Prescott 1990). The study results support previous studies regarding the positive influence of commitment to change on the perception of goal achievement of a change project, on the perception of a successful change implementation, of improved organisational performance due to a change project and especially on the significant and meaningful influence of learning for the overall project success (Ikonen & Kurhila 2009; Karp 2005; McNish 2001; Noble & Mokwa 1999; Paton & McCalmann 2000; Sin-Jin Lin et al. 2010; Vahs 2003). Finally, the statistical significance

and meaningfulness of this newly created “Overall project success” construct, including 4 aspects of project success, supports the argument that the overall success of IT projects can only be measured with a number of different success criteria identifying the different aspects of change (Shang & Seddon 2002). It was therefore included in the new conceptual framework in Figure 6.1.

6.2.6 IT success

The high Cronbach alpha reliability value of IT Success identified (0.8) and the influence of a perceived project implementation success on the overall perception project success is also in line with previous research (Dvir & Lechler 2004; Parish, Cadwallader & Busch 2008). More surprising was the finding that traditional measures of project management efficiency such as on-time and in-budget project delivery were found to have only a medium influence on IT success of an IT project while the perceived satisfaction of employees and managers with the IT solution itself and the IT implementation process were found to have a significantly higher influence. These results are surprising as previous research and publications indicated the importance of project management efficiency for the overall success of a project. Turner (1998) for example pointed to a study of Morris and Hough, which identified on time and in budget delivery as one of four project success criteria. Keil, Mann and Rail (2000) in addition found that successful IT-projects were mainly on time and in budget. In contrast, other studies identified equal correlations of acceptance and satisfaction with a project on time and in budget delivery and the overall success of a project (Papke-Shields, Beise & Quan 2009; Pinto & Prescott 1990). Results comparable to those in this study could only be found in research about SAP-projects, which identified that system satisfaction and acceptance had a more significant and twice as intensive correlation with an organisational performance increase than an on time and in budget delivery (Püttgen & Roe 2005 p.153-155).

A possible explanation for the greater influence of perceived satisfaction could be located in the construct itself (see Figure 6.1). The study combined the aspects of project efficiency and project satisfaction in the joint construct of IT Success while Dvir and Lechner (2004), based on research findings by Pinto (1990), separated both aspects in their analysis. Furthermore they identified a strong positive influence of project efficiency on project satisfaction. It could therefore be argued that both aspects of the construct might be of equal importance as indicated by Pinto (1990) and Papke-Shields (2009) but that as project efficiency positively

influenced project satisfaction, the two values of project satisfaction were found to have a significantly stronger influence.

Another explanation might be seen in the subjective nature of the project satisfaction part of the construct. Turner (1998) emphasised that projects have objectively measurable and subjective success criteria, which could work satisfactorily together, but where achievement and judgement could also be separated by time or by stakeholder group. Pinto (90) believed that while a successful implementation perception is based on criteria such as on time or in budget delivery, client satisfaction resulted from completely different variables such as workability of the deliverable, acceptability and benefit and project success on criteria such as operational improvement. It could therefore be argued that the subjective satisfaction criteria were more directly experienced and recognised by the study participants in their daily work environment than the question as to whether the a projects met budget or time goals, which are normally only the challenges of IT project managers. Due to this operational closeness, the majority of the participants perceived project satisfaction to be of higher relevance. Zoellner (2003) supports this interpretation stating that manager judgment of project success and satisfaction is based on criteria measuring the business benefit realised by a project, while project customers –users- would base their judgement more on the usability and usefulness of the solution delivered. Froehlich (2002) regards the whole measurement of perceived project success critically by arguing that too often projects goals are realigned to keep the people motivated when it becomes obvious that the project is running out of hand. Only furthermore, the perception of project success is largely influenced by psychological and political factors. Also, project failures do not lead to serious consequences for the managers responsible and the employees. Taken together, this leads to the situation that the perception of success of an IT-project can be regarded as being mainly independent of possible time line and budget overruns.

A third possible explanation for these findings could be argued to result from a personal positive project attitude in an early project phase. Studies indicated that a positive attitude toward an IT project in an early project stage leads to positive perception and satisfaction with the system (Abdinnour-Helm, Lengnick-Hall & Lengnick-Hall 2003; Ikonen & Kurhila 2009; Issabella 1990; Jones, Jimmieson & Griffiths 2005; Lee, Kim & Lee 1995). This explanation is also in line with findings that IT system acceptance and individually perceived usefulness and usage intention are strongly effected by social influence processes and not only by objective system characteristics (Venkatesh & Davis 2000). Research findings for

example indicated a positive relationship of readiness to change and an emotional pleasant reaction to change (Armenakis & Harris 2009; Gresch 2011).

The identified difference influence strengths of project management success criteria and satisfaction success criteria and the differences in influence significance and strength of IT success between managers and employee underline the argument that a multifaceted range of measurement criteria is needed to measure IT success and that there is no perfect measurement criteria. It is therefore recommended that the choice of measurement criteria has to be based on the project specifics, measurement purpose, evaluation perspective and project stakeholders to get a useful (DeLone & McLean 2003; Markus et al. 2000; Seddon 1997; Seddon et al. 1998; Shang & Seddon 2002). IT success is therefore also included in the new conceptual framework in Figure 6.1.

6.2.7 Change success

The high reliability identified and validity value of change success, defined as affective commitment to change, the highly significant influence on the overall perception project success (see Figure 6.1) and its statistically significant single measurement items were also in line with previous research (Machin & Albion 2007; Meyer & Allen 1991; Meyer et al. 2002; Orth 2002; Parish, Cadwallader & Busch 2008). Several studies already indicated that commitment to change could stimulate individual support for change (Baraldi et al. 2010; Michaelis, Stegmaier & Sonntag 2009; Neves 2009; Orth 2002). However, even more important for project managers are in the findings that commitment and motivation also seem to have a positive influence on project impact and outcome (Andersen et al. 2006; Jaros 2010; McNish 2001; ProCedera 2010; Vahs 2003). In the special case of organisational change as part of IT-projects, the study indicated that affective commitment to change is positively related to all four measured items of overall project success: the perception that the project was well implemented, the perception the project improved the organisational efficiency and met business expectations and the perception that all new work aspects were learned and could be handled. The study therefore delivers evidence that affective commitment to change has a positive influence on the perception of an overall project outcome (see Figure 6.1). This findings stand in line with research results that a medium level of commitment is needed to achieve the desired outcome (Sinclair et al. 2005).

Michel et al. (2010) found that a high level of affective change commitment in an early project phase was strongly related to a high level of effective change commitment after the

project end. As behavioural and attitudinal changes are said to take time and often lag behind changes of organisational processes and IT systems, Michael et al.'s findings underline the importance of stimulating personal change and commitment to change as early as possible in order to reduce the time gap between process- and behaviour change outcome (Grant 2010; Meyer et al. 2007; Nurick 1982). As this study was limited to finished projects, this time lag in behavioural change could neither be identified nor could it be shown just how much time this change in behaviour requires and what effect a high level of change commitment could have on this development. Another important finding in this study is the strong relationship between readiness for change and affective commitment to change and their strong influence on the IT success. The close relationship is considered to result from common theoretical roots and influences (Jaros 2010). That fact that only affective commitment to change was found to have a significant loading on overall project success, contradicts the argument that commitment to change is the prerequisite of creating readiness for change. Instead, the study findings seem to support the hypothesis of Armenakis and colleagues that the successful creation of change readiness leads to a commitment to change (Jaros 2010).

The strong relationship between change success, measured as an affective commitment to change, and the overall project success perception also supports research findings that a high commitment level to change can positively influence the way employees and managers deal with change. Negative attitudes and behaviour towards change are said not to result from a resistance to change in general but from individual and situation specific perceptions of change and change outcome such as uncertainties, fear or role ambiguity (Conner 1992; Haiss 2001; Hosking & Anderson 1992; Klarner, Todnem & Diefenbach 2011; Liu, Y. & L. 2005; Robbins et al. 2001). Commitment to change was found to positively influence the personal ability to cope with change, to reduce the negative emotions generated by change and to reduce resistance and blockage in a change process (Baraldi et al. 2010; Cunningham, G. B. 2006; Inversini 2005; Sverke et al. 2008). Although the study did not measure this influencing criteria in detail, the strong relationship to overall project success underlines these arguments indicating that a high level of change commitment has a positive influence on the way individuals deal with and adopt change and thus, in turn, also on the project outcome. However, some researchers also caution viewing the adaptation and acceptance process to change too simplistically as being a sequential but multifaceted process. Inconsistent behaviour and different reactions in the work and private environment could be possible resulting outcomes, which managers then have to face (Fedor, Caldwell & Herold

2006; Piderit 2000). The establishment and capture of a high commitment to change is therefore a situational and very individual challenge for a manager, which is reflected in the new conceptual framework in Figure 6.1.

Contributors to establishing commitment to change identified in earlier research are many and include active change management in general, personal favourableness, appropriateness, incentives and rewards, information and communication, trust in top management, good relations to managers, congruence of project and organisational goals, role autonomy, motivation, organisational commitment, fit of organisational culture and change, positive work climate, organisational identification, vision and story for change and personal experiences with former change (Fedor, Caldwell & Herold 2006; Jaros 2010; Macaulay, Yue & Thurlow 2010; Machin & Albion 2007; Michaelis, Stegmaier & Sonntag 2009; Michel, Stegmaier & Sonntag 2010; Middleton & Harper 2004; Parish, Cadwallader & Busch 2008).

6.2.8 Influence of personal and project characteristics

Personal characteristics

An important influence of a shared change style for a commitment to change was only found for older participants, skilled workers, participants longer affiliated with the company and (surprisingly) managers. Also surprising was that simultaneously these specific participants (except for skilled workers), was found to exhibit a preference for IT success and an important influence of IT Success on the overall perceived project success. Participation not only appears to have a limited influence but was only relevant to certain groups of people. Younger organisational members, members with an academic education and recently recruited members are often characterised with attributes such as being dynamic, having a higher confidence to deal with new things, flexibility and high motivation, which might be a reason why participation was rated as being of high importance (Cunningham, C. E. et al. 2002). In contrast, participation and involvement were found to be important with people who were longer accustomed to work in organisational routines. The fact that existing IT solutions have represented the basis for routine work of these people for years might be an explanation for the parallel importance of IT success and its importance for the overall project success. The importance of a perceived participation and involvement for these groups might result from the fear of losing control of their stable and accustomed working environment, fear of potential role ambiguity and fear of possible

role conflicts during a change process. Proactive participation and involvement could help to reduce and prevent these negative effects in a change process (Nurick 1982; Schraedder, Swamidass & Morrison 2006; Sverke et al. 2008). That managers are also numbered amongst these groups of organisational members is surprising but also in line with the latest research indications, that more and more managers feel overwhelmed by and tired of constant changes (Claßen & von Kyaw 2009, 2010).

For employees, participants with academic backgrounds, participants with a high frequency of change perception and partially also younger participants, in contrast, the importance of organisational and personal valence and management support for readiness for change and of readiness for change for a commitment to change was better established. Unlike the group of people described in the previous paragraph, these organisational members apparently do not see participation and influence as being of importance but rather regard the necessity and usefulness of change for their work environment and themselves as being important in order to feel committed and to support change (Armenakis, A. et al. 2007; Bernerth 2004; Orth 2002; Weeks et al. 2004). The fact that IT success was not found to be significant, but that commitment to change was found to be of high relevance for project success leads to the assumption that this influence is not limited to organisational changes linked to IT projects in particular, but to organisational changes in general. The importance of commitment and a positive perception of a change project can especially be found for participants who perceived the current frequency of change as high. For those participants who already implicitly feel stressed by the frequency of change, IT success is dominated by personal satisfaction with the IT solution and the project outcome while good IT project management only seems to be of minor importance. The findings and differences of influence factors based on personal characteristics underline that change management related to IT projects need to be a joined task of IT specialists and functional business leaders (Markus & Benjamin 1996).

Project characteristics

For IT projects with larger budgets, with short term project durations and which affect only a limited number of employees the following relationships were found to be significant and significantly stronger: Readiness for change on change success as well as personal and organisational valence, change self-efficacy and change discrepancy on readiness for change (see Figure 6.1). On the other hand, IT projects characterised as system replacements or

enhancements, with smaller budgets affecting a larger amount of employees were found with significant and significantly stronger relationship to a shared change style on change success, IT success itself and of IT success and change success on the overall project success. One possible explanation for this difference could be that the steel industry is a very traditional industry characterised by high fixed costs and large steel mills. The necessary IT systems supporting the production and administration processes are therefore also larger and have generally already been in place for years. Smaller changes to those systems, therefore, might not really change work process and behavioural aspects drastically. Therefore the establishment of a positive attitude of the IT solution supplied and a commitment to those limited changes achieved by involving people, seem to be enough to achieve a positive project perception even though a larger number of people might be effected (Jimmieson, Peach & White 2008; Lines 2004; Madsen, Miller & John 2005). Supportive research results for these findings are also found in the fact that employees and managers seem to differentiate between work place changes and personal adaptation needs. Change initiatives, which only ask for a change in work processes but demand little personal or behavioural change, were found to receive a significantly higher commitment level compared to changes with more personal adaptation necessity (Fedor, Caldwell & Herold 2006; Sverke et al. 2008). This is in contrast to more expensive IT projects. As only a small number of employees are affected on average, those projects are more likely focused on very local and specialised work and production processes. As these projects seem to demand larger changes in work processes and work behaviour, convincing employees of their necessity and benefit and establishing a change readiness seem to be of higher importance in order to achieve a project and change commitment than in the case of smaller projects (Kwahk & Kim 2008; Neves 2009). These findings are also in line with the research which found that participation and involvement can be useful but are neither necessary nor sufficient for IT projects acceptance and success (Abdinnour-Helm, Lengnick-Hall & Lengnick-Hall 2003; Markus & Mao 2004).

Even though the influence of personal and project characteristics analysis on the study change model was limited by the small number of data sets returned, it supported the argument that there is no single silver bullet for successful change management. Individual influencing factors based on situation are of high relevance in identifying the most appropriate change practices (Al-Ani & Gattermeyer 2001a; Dawson 2001). This conclusion was further underlined by supportive findings about different influencing factors for

successful change management with respect to low and large scale changes (Rafferty, A. & Simons 2006).

6.3 Conclusions about theory

The study provided a comprehensive review of change management literature, models of organisational change and an overview of current change management practices in Europe. An empirical research study was carried out to explore influencing and success factors for change management in IT projects using the example of the European steel industry. Enablers, barriers and interconnections of influencing factors to effectively manage organisational change were discussed and identified. In addition, the change management knowledge level of managers and employees affected by IT projects were surveyed and compared with previous research results. Although facing and reacting to a changing environment is not a new phenomenon, the difference is found in the speed and frequency of change, which is constantly escalating (Rohe 1999; Spalink 1999). Change is no longer to be regarded as a phenomenon limited by time but as a constantly increasing dynamic drive. (Boos, Heitger & Hummer 2004). The ability to prepare organisations for and to manage organisational change has thus become an essential managerial skill and a success factor for organisations (Ashurst & Hodges 2010; Jordan; Whelan-Berry & Somerville 2010).

Information technology and telecommunication (IT) has been one of these constant drivers for change and has become an important factor in the competitiveness of companies (Housel & Skopec 2001; Neumann, R. 2007; Schwarz 2000). The effect of IT projects on organisations can range from process acceleration and automation up to business process transformation. IT projects can therefore be regarded as being linked to process redesign, organisational structures and individual skills and behaviour. Efficiently and effectively implementing and using IT in an organisational environment has with many managers proven to be a greater challenge than expected. Since the 1980s, several studies indicated the high failure rates of IT projects (Doujak, Endres & Schubert 2004; Froehlich 2002; Keil, Mann & Rai 2000; Peters 2005). The failure of IT projects was found to be strongly linked to a lack of attention to human aspects of change during these projects (Cicmil 1999; Dutta & Manzoni 1999; Kohnke, Bungard & Madukanya 2005; Neumann, R. 2007). It is argued that poor or no change management tends to lead to high follow-up costs, lost investment and a loss in organisational productivity. Even best managed IT projects thereby not only

create costs directly related to IT, implementation and training but also create costs resulting from the organisational and individual learning and adaptation process. Organisations face such costs mainly as a temporary loss in productivity. Results of failed IT projects such as exceeded budgets, sunk costs, missed business opportunities and a loss in productivity over a longer time period can therefore have significant financial consequences for organisations. In times of increasing global competition and an uncertain global economy, it is of the highest importance for organisations not only to use IT as an opportunity to face changes, but also to realise and use such IT solutions efficiently and effectively in order to survive and to ensure future competitiveness.

The manner, in which new IT solutions and systems are implemented and the way in which individuals adopt new processes and behaviour, is therefore regarded as representing the key to successful change management (Armenakis & Bedeian 1999; Paré & Jutras 2004; Spalink 1999; Whelan-Berry & Somerville 2010). However, this adaptation and learning process was found to neither be simplistic nor predictable. In contrast, the process was found to consist of several steps, to be strongly linked to emotions and to be very individual in its duration and intensity. It is argued that managers and employees do not resist change per se, but do resist being changed. Individual acceptance and support for change was found to be based on personal perception of necessity and benefits, which outweighed potential costs and losses (Krueger 2009; Mütter & Feldmüller 2008b). Successful IT projects therefore require the combined management of hard and soft factors of change. It is furthermore argued that the significant influence of these social and political processes on the success or failure of IT projects creates the need for a more complex and successful change model (Kuruppuarachchi, Mandal & Smith 2002; Nielsen 2008).

This analysis of the current situation of change management in Europe found that even though the success rate of change projects seems to have increased, there is still a significant percentage of projects which fail. Even more worrying was the finding that the general support for change projects constantly decreases. This trend was found not to be limited to the employee level but also already emerging in senior management levels. The constantly growing external and internal pressure to change and the increasing parallelism of change projects seem to tire more and more people. Furthermore, the analysis indicated comparable shortcomings and problems to other studies such as a lack in managerial change management

competences and a lack of understanding of human aspects of change. A positive factor seems to be the tendency to a more participative change management style.

Analysis and comparison of change management knowledge identified a comparably low knowledge level of managers and employees as indicated in previous studies. Significantly different and surprising were the facts that there is no difference between the knowledge of managers and employees in terms of change management, and that the participants of the European steel industry showed comparably good results with regard to the soft aspects of change and knowledge gaps as well as the hard aspects of change such as planning and evaluation. These findings were in line with conclusions about the current situation of change management in Europe and support the argument that successful management of change needs a combination of hard and soft factors of change and also that management levels still seem to lack the experience and knowledge of just how to successfully manage organisational change.

This analysis of influencing factors illustrated that commitment to change has a significant influence on the perception of the business success of IT projects. Furthermore, readiness for change was found to be a strong driver not only for establishing commitment to change but also for a success perception of an IT solution. These results support earlier research that an early positive perception of the necessity of a project and goals help not only to accept and support organisational change but also to judge the IT solution and the project outcome more positively. Furthermore building readiness for change and a commitment to change could prepare employees and managers for a change, reduce uncertainty and fear, and in this manner help them to find a way through the stressful and emotional change and personal change process better and faster. Participation and involvement in contrast were found to have a significant but only limited influence in establishing a commitment to change. Surprisingly, no significant influence of change management knowledge on the commitment to change or project success could be found. In particular, this finding should be interpreted with caution as it could also be the result of the unsatisfactory statistical validity and reliability of the measurement model employed. Finally, the study found supporting evidence that no one approach fits all methods of managing change. The analysis of personal and project characteristics indicated a variety of influencing factors, their significance and strength. The findings of this study should therefore be regarded as an indication and orientation for managers, which need to be validated in each specific project situation.

In conclusion, drawn from the study results it can be said that while participation seems to have only a limited effect on building project and change support, an early establishment of readiness to change seems to be a way to build IT acceptance and an affective project and change commitment, both of which in turn seem to be significant drivers for the success of IT projects. More managerial competence, experience and focus on building early readiness and commitment to change and more involvement could help, to better manage the human side of IT projects, improve the efficiency and effectiveness of IT projects and possibly also reduce the widespread tiredness and frustration caused by change.

This research study made a contribution to close the existing gap in sufficient research and provides future researchers and managers with quantitative data regarding the influence of change management practices on achieving the change and business success of IT projects. The research study answered the call for an holistic research view involving employees, IT and functional managers in order to analyse the effect of change management practices from alternative perspectives (Claßen & von Kyaw 2009; Herzig & Jimmieson 2006; Kohnke, Bungard & Madukanya 2005). The study supports previous research about the importance of change commitment and readiness for change not only, to successfully achieve organisational change, but also to achieve overall project success. The study also supported the importance of participation in this process and the fact that readiness for change and participation should be regarded as prerequisites for a commitment to change.

6.4 Implications for practice

Even though the representativeness on European level is limited due to the limited number of mainly German participants, the results of this study have the potential to provide a better understanding of how managers of steel Producers could use change management practices to drive efficiency and effectiveness of IT-project (Bungard 2005a; Fernis 2006; Kohnke, Bungard & Madukanya 2005; Legris & Collette 2006; Paré & Jutras 2004). Two major areas were identified as to how managers could improve the current level of change management, change acceptance and change success. Firstly, managers can improve change management practices by improving the planning of change, improving the synchronisation of projects and intensifying evaluation and also by learning from change evaluation and experience. Secondly, more personnel related activities, mechanism and orientation are required by managers to establish an early readiness for change and a commitment to change.

Managers need to inform, prepare and guide organisational members better in order to smoothen the way through the change process thus preventing change resistance, fear and uncertainty, thereby achieving a higher level of change support and acceptance (Bernerth 2004; Orth 2002; Todnem 2007; Weeks et al. 2004). Involving and participating organisational members can be one way to achieve this (Lines 2004; Rafferty, A. & Simons 2006; Schraedder, Swamidass & Morrison 2006; Sverke et al. 2008; Vahs 2003). However, even more important than involving the people is planning, conceptualisation and communication in a manner that organisational members share the necessity of the project, the benefits to the organisation and not unimportantly for their own work environment. The acceptance of the necessity of a change is an important first step toward change commitment (Conner 1992). The study shows that the five elements – change discrepancy, personal valence, organisational valence, management support and self-efficacy - of a change message for creating readiness for change proposed by Armenakis et al. (1999) can explain why a certain change is necessary and appropriate and can enhance the employee's feeling of self-efficacy. This compels individuals to work toward change and reduces their fear and resistance, which ultimately contributes to the success of change. In order to increase efficiency and effectiveness of IT projects, managers therefore need to pay more attention to the planning, synchronising and gaining of the acceptance and support of organisational members at an early project stage.

Using mechanisms of involvement and rewards could be two ways, in which managers could encourage organisational members, to support and keep supporting a project. Even simple and limited forms of involvement such as user trainings or problem solving groups can thereby positively influence the individual attitudes towards a project (Inversini 2005; Nurick 1982). Rewards and incentives can be an effective way for managers to maintain organisational member support for a project by rewarding such support and it can additionally have a motivating effect in continued change of individual behaviour and work processes (Reinmann, Dinges & Krüger 2009). A change process is a component part of an IT project and is mostly not short term but a process lasting several months. Managers who wish to achieve successful change, therefore, have to maintain, stimulate and ensure the readiness and commitment level continuously during this process (Self & Schraedder 2008).

For IT managers the study results recommend that IT project management is necessary but not alone sufficient for project success. The study showed that the personal satisfaction in

the way a new IT solution is implemented and the satisfaction with the new solution itself has a stronger influence on the perception of project success and fulfilling project management goals. As project management and project time/budget constraints are mainly not topics for employees and functional managers effected by new IT solution, these people focus more on the operational issues such as the implementation process and the final solution they have to work with. In order to achieve a perception of project success in this stakeholder group and to ensure the sustainability of the process changes realised, managers need to pay more attention to the management of expectations and to deliver IT solutions to meet these expectations. IT managers therefore face the challenge of meeting project goals and at the same time satisfying users and project sponsors in order to reach not only successful functional IT solutions and meeting budget/time constraints but also achieving a perceived project success for all project stakeholders. Close cooperation with functional managers to establish organisational readiness and commitment to a project could be a promising step to realise this.

6.5 Limitations of this research and directions for future research

As with all research, the results of the present study may have been affected by a number of factors, thus potentially leading to some bias in the conclusions drawn. One obvious limitation of a cross-sectional design is that it makes it impossible to draw conclusions in terms of the direction of causality. However, even a cross-sectional study provides an indication of differences between groups and relationships between variables (Spector 1994), and this study constitutes an important step towards increased knowledge about change management in the context of IT projects. A methodological concern of this study results is the low response rate, which made the planned project-based analysis impossible, limited the influence analysis of personal and project characteristics and may affect the ability to generalise results. The low response rate may be due to the fact that it is uncommon for the European association of steel producers to support such business studies as this. The tense economic situation may also be a possible distraction to force the attention of many local managers more onto the challenges of daily operations. Related is the issue of the dominant number of German study participants, which limits the ability to generalise the results on European level. Another concern could result from the sampling of local IT projects for study participation by local IT managers who may not have contributed a representative choice of projects but only those, which were successful (Leedy & Ormrod 2005). Reservations may also be placed on the reliance on self-reported results. The study

results could therefore be biased by common method variance (Spector 2006). Also the timing of this study could constitute a limitation (Baraldi et al. 2010). While all participants had to answer the questions on already implemented IT projects, no difference was made in the study as to how long a project had already been finished. A long time between an event and an evaluation could lead to a blurred view of the past by the participants in a study. Additionally, the ex post design did not allow to draw any conclusions at which part of a project and with how many delay one of identified influences variables led to measurable results. Another limitation is that the data was collected in one particular region and among employees in a specific industry at a time when the global steel market was highly affected by the economic crisis 2009/2010. Hence, the present results would benefit from future research using a larger amount of longitudinal data collected in a variety of industrial sectors and in different countries. The results of this study would also benefit from the application of the same measurement concepts employed for readiness for change (Armenakis, A. et al. 2007; Armenakis, Achilles et al. 2007; Holt et al. 2007), IT success (Dvir & Lechler 2004; Pinto & Prescott 1990) and overall project success (Parish, Cadwallader & Busch 2008; Waldersee & Griffiths 2004) as their scales showed satisfactory reliabilities. As the theoretical relevance and influence discussed is sound, future research needs to find alternative, more reliable and valid measurement constructs for knowledge of change management and participation in a change process than those used in this study. For the measurement of commitment to change (Meyer et al. 2002; Parish, Cadwallader & Busch 2008) it is recommended for future researchers to include all three components of the commitment to change model as also normative and continuance commitment could be important influencing factors in a change process (Jaros 2010). More future research is also needed on the differences in human behaviour and change management success drivers between larger, one time IT projects and from smaller, regularly happening IT improvisations as a success recipe of is argued not to be suitable for the other and as a large number of IT and related organisational changes is argued to happen on a small step, regular basis (Keen 1981; Orlikowski 1996). Finally, a more detailed construct of readiness for change such as indicated in the research of Cunningham (2002) and Bouckenooge (2009) and a more detailed analysis of personal and project characteristics regarding their influence as well as an identification of possible approaches and methods as to how future project managers can improve the success rate of change management in IT projects, would be beneficial for researchers and for putting into practise.

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Appendix 1 – Overview about selected organisational change models

Name/ Author	Description
<p><i>Organisational Development</i></p>	<p>The organisational development approach is a long-term, organisation-wide, planned development and change process of incremental steps. The process is managed from the top and is based on individual learning and behavioural science through participation and experiences. The approaches seeks to improve organisational efficiency and employee well-being.</p> <p>(Boos, Heitger & Hummer 2004; Inversini 2005; Robbins et al. 2001; Waddell, Cummings & Worley 2000)</p>
<p>Lewin's Change Model 1951</p>	<p>The model consists of 3 planned, sequential phases.</p> <ol style="list-style-type: none"> 1. unfreeze (Create a need for change and minimise change resistance) 2. move (Changing of people, tasks, structure and encouraging change support) 3. re-freeze (Reinforce change results and make modifications) <p>(Dawson 2001; Inversini 2005; Leban & Stone 2008)</p>
<p>Greiner's A successful change process 1967</p>	<p>The model consists of 6 phases each of which consists of stimulus for change and an organisational reaction.</p> <ol style="list-style-type: none"> 1. pressure on top management -> Willingness to change 2. intervention of consultants -> Reorientation to internal problems 3. diagnosis of internal problems -> Recognition of specific problems 4. development of new solutions -> Commitment to new courses of action 5. experimenting with new solutions -> Search for results 6. enhance change with positive results of the experiments -> acceptance of the new approaches <p>(Greiner 1967; Mueller-Stewens & Lechner 2001)</p>
<p>Beckhard & Harris <i>Managing the Transition Model</i> 1977</p>	<p>General framework for change which was adapted from Lewin. Managing the transition model consists of 3 phases and describes how an organisation moves from a current to a future state.</p> <ol style="list-style-type: none"> 1. current state 2. transition state 3. desired future state <p>Three major activities to facilitate organisational change:</p> <ol style="list-style-type: none"> 1. activity planning (a road map for change) 2. commitment planning (identification of key groups and persons whose commitment is needed) 3. management structure <p>(Mohr et al. 2010; Mueller-Stewens & Lechner 2001; Waddell, Cummings & Worley 2000)</p>
<p>McKinsey's 7-S Modell 1981</p>	<p>Seven specific interrelated dimensions need to be balanced in order to manage organisational change dynamics and achieve performance improvement.</p> <ol style="list-style-type: none"> 1. strategy (set of action to gain a competitive advantage and to allocate resources) 2. skills (distinctive organisational capabilities) 3. shared values (fundamental principles and concepts about right and desired behaviour) 4. structure (organisational structure) 5. systems (sum of organisational processes and procedures) 6. staff (people, within an organisation, their skills and their abilities) 7. style (collective behaviour of managers) <p>(Dutta & Manzoni 1999)</p>
<p>Kotter's Eight Stage Process for Successful Organisational Transformation 1986</p>	<p>General framework for change, adapted from Lewin.</p> <ul style="list-style-type: none"> - establish a sense of urgency - create a coalition - develop a vision - communicate a change vision - empower broad-based action - generate quick wins - consolidate gains - anchor new approaches in the organisational culture <p>(Krueger 2009; Leban & Stone 2008; Todnem 2005)</p>
<p>Tushman et al. 's Model 1988</p>	<p>Organisational life is regarded as consisting of periods of converging change, interrupted by discontinuous change. While converging change supports the organisational fit between strategy, structure, processes and systems, it can be subdivided into 2 types of change: fine-tuning and incremental change. Radical change is argued to be necessary in times of major environmental changes to align the organisational system and core values.</p> <p>(James 2005)</p>

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<p>Burke's <i>Managing change model</i></p> <p>1988</p>	<p>The model consists of dimensions, illustrating the principles of managing change and is represented as a pyramid. The basic level represents the knowledge of fundamental aspects of change</p> <ul style="list-style-type: none"> - individual response to change - general nature of change <p>The basic level is built upon using the knowledge from the change process consisting of:</p> <ul style="list-style-type: none"> - planning change - managing the "people" side of change - managing the "organisational" side of change - evaluating change <p>(Paré & Jutras 2004; Siegal 1996).</p>
<p>Nadler's <i>Congruence model</i></p> <p>1988</p>	<p>Change input is generated e.g. by the organisational environment. As a reaction, a strategic redefinition of work takes place. Organisational subsystems such as work, people, the informal organisation and the formal organisation interact with each other to find a new fit for the whole system, the single units and for each individual.</p> <p>(Leban & Stone 2008; Mueller-Stewens & Lechner 2001)</p>
<p>Carnall <i>Managing major changes</i></p> <p>1990</p>	<p>Managing change is regarded as a process initiated by an internal or external pressure for change. From this pressure to change three main areas for action arise:</p> <ul style="list-style-type: none"> - managing transitions effectively - dealing with organisational cultures and - managing organisational politics <p>These three areas then lead to the need to support creativity, learning and risk-taking on the one hand and to rebuilding self-esteem and performance on the other. If both areas can be realised successfully, organisational learning and change is achieved.</p> <p>(Carnall 1990)</p>
<p>Kanter et al.'s <i>Ten Commandments for Executing Change</i></p> <p>1992</p>	<ul style="list-style-type: none"> - analyse the organisation and its need for change - create a vision - separate from the past - create a sense of urgency - support a strong leader role - line up political sponsorship - craft an implementation plan - develop enabling structures - communicate honestly and involve people - reinforce and institutionalise change <p>(Todnem 2005)</p>
<p>Burke-Litwin <i>Model</i></p> <p>1992</p>	<p>The model is a diagnostic model and deals with organisational causes and effects of change, predicts individual and organisational performance and identifies transformational and transactional dynamics for change success. The model and the accompanying questionnaire provide assistance to change agents and managers and help them understand which factors need attention and when.</p> <p>(Armenakis & Bedeian 1999)</p>
<p>Tichy & Shermann <i>Transformation-model</i></p> <p>1993</p>	<p>General framework for change which was adapted from Lewin.</p> <p>Consists of three phases:</p> <ul style="list-style-type: none"> - awakening - envisioning - rearchitecturing <p>(Mohr et al. 2010)</p>
<p>Dunphy & Stace's <i>Contingency Model</i></p> <p>1993</p>	<p>The contingency model is a situational approach which follows the idea that the most appropriate change is the one which fits best possibly to the organisational environment. The two dimensions "scale of change" and "leadership style" result in 4 types of organisational change:</p> <ul style="list-style-type: none"> - fine turning - incremental adjustments - modular transformation - corporate transformation <p>(James 2005; Todnem 2005)</p>
<p>Vollman's <i>Model of the transformation imperative</i></p> <p>1996</p>	<p>The model consists of an 8x6 factor matrix to assess the viability of a change effort. Each row and line has to be analysed for a specific organisational case. The 8 rows are:</p> <ul style="list-style-type: none"> - strategic intention (which issues to address) - competencies (needed for a desired change) - processes (measuring efficiency and effectiveness) - resources (systematic use of HR) - outputs (customer expectations) - strategic response (planning action)

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	<ul style="list-style-type: none"> - challenges (anticipated barriers for change) - learning capacity (new knowledge, skills and abilities needed) <p>The 6 columns consist of 3 organisational dimensions and 3 organisational resources:</p> <ul style="list-style-type: none"> - culture - configuration - coordination - people - information - technology <p>(Armenakis & Bedeian 1999; Safar et al. 2006)</p>
<p>Janes et al. <i>Transformations-Management</i></p> <p>2001</p>	<p>The transformation management approach targets the combination of the advantages of Organisational Development (OD) and Business Process Reengineering (BPR). The process consists of 4 steps:</p> <ul style="list-style-type: none"> - naming the need to transform (problem identification and localisation of the transformation energy) - goal setting (goal definition, create commitment for the transformation context and process) - concept & realisation (creation and implementation of the transformation concept) - evaluation (review of the transformation and initiation of correction processes) <p>The approach differentiates between three aspects of a change design: the team design, the process design and the organisational design.</p> <p>(Inversini 2005)</p>
<p>Luecke's <i>Seven Steps</i></p> <p>2003</p>	<p>Luecke's 7 Step model represents a packet of 7 steps to manage continuous and emergent change.</p> <ol style="list-style-type: none"> 1. mobilise energy and commitment for change through a joint identification of business problems 2. develop a shared vision 3. identify leadership 4. focus on results 5. start change at the periphery and let it spread without pushing it from the top 6. institutionalise change success through structures and policies 7. monitor and adjust in order to respond to problems in the change process <p>(Todnem 2005)</p>
<p>Woodward and Henry's <i>Leading and Coping with Change Model</i></p> <p>2004</p>	<p>The leading of and coping with a change model consists of 4 phases and of 4 categories:</p> <ul style="list-style-type: none"> - learning interventions - leading and resourcing change - employee adaptation - individual and organisational failure <p>The model is built as a process model starting with the creation of a new situation/direction.</p> <p>(Woodward & Hendry 2004)</p>
<p>Balogun/ Hope Hailey's <i>Change Kaleidoscope</i></p> <p>2004</p>	<p>The change kaleidoscope regards change as specific to an organisational context and offers a dynamic diagnostic framework to analyse and configure the features of change needed. The design choice of organisational change consists of decisions regarding change path, start and end point of change, change style, targets of change, change levers and change roles. These change design choices are influenced by contextual change features regarding power, time, scope, readiness and capacity for change and organisational diversity as well as preservation tendency. The outer rim of the change kaleidoscope represents the organisational strategic change context determining the reason for change and what to change into.</p> <p>(Balogun & Hope Hailey 2004)</p>
<p>Brettel, Reißig-Thust & Plag's <i>Dice of Change Management</i></p> <p>2005</p>	<p>The dice of change management includes 27 fields of activities and is based on the three dimensions</p> <ul style="list-style-type: none"> - actor level (individual, group and organisational level) - change phase (unfreeze, move, refreeze) and - determinants of change action (skills, willingness and ability). <p>(Brettel, Reißig-Thust & Plag 2005)</p>
<p>Doppler's <i>Charta of Change Management</i></p> <p>2005</p>	<p>The Charta of change management combines 8 interrelated principles which are regarded as leading to a successful change if all is managed and achieved.</p> <ul style="list-style-type: none"> - goal oriented management - no activity without prior diagnosis - think and act holistically - involve those who are effected - help to establish self-help - process-oriented steering - vitalising communication - careful selection of key persons <p>(Doppler & Lauterburg 2005)</p>

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<p>Krüger's <i>Orientation model for strategic renewal (3W-Model)</i></p> <p>2009</p>	<p>The need for change is the starting point for any organisational change. Together with change willingness and change ability/skills, these three aspects form the interrelated framework for a change process which in turn leads to a strategic renewal. During this change process a new strategy is needed to initiate and drive a change process. Management drives change while project management coordinates the change process. Communications and HR supports change while financial accounting observes change progress. The change process should after all lead to a change in individual attitude and behaviour which helps to realise and follow the new strategy. Many of these components of a change process are interrelated and influence each other.</p> <p>(Krueger 2009)</p>
<p>Capgemini Consulting <i>Transformation-Architecture Model</i></p> <p>2010</p>	<p>Successful transformation is regarded as consisting of 10 interrelated action points.</p> <ul style="list-style-type: none"> - success (identifying and anchoring) - situation & environment (analyse and understand) - orientation & alignment (have to be accelerated) - structure & monitoring (to be developed and built up) - mobilisation & commitment (to be ensured) - organisation & process (collect and design) - conflicts & resistance (to be reduced and avoided) - leadership (to be supported) - organisational culture (to be enhanced) - qualification & development (to take place group specifically) <p>(Claßen & von Kyaw 2010)</p>
<p>Accenture's <i>Wheel of Change</i></p> <p>2010</p>	<p>The wheel of change consists of 4 fields:</p> <ul style="list-style-type: none"> - steering (models & methods, coordination and steering and activity planning) - leadership (shared vision, sponsorship, team building, realisation of business value add) - identification (local implementation teams, realisation of local benefits, support readiness for change, communication) - ability (training, HR structures, organisational design, communication design) <p>(Mohr et al. 2010)</p>

Source: Hetkamp 2011; developed for this study

Appendix 2 – Qualitative results of the pilot study – List of named remarks

Category	Location	Kind of	Description	Frequency of Complain	Status	Comments
Overall		Formulation	Don't use abbreviations such as "bzgl."	2	resolved	
Overall		Formulation	Better "ab dem 3. Quartal" instead of "in der zweiten Jahreshälfte 2011"	1	denied	2nd half of 2011 gives more time flexibility instead of narrowing the deliverable onto the third quarter
Overall		Typing mistake	"cher"	12	resolved	
Letter of invitation to member companies	Overall	Formulation	Too much redundant context in the invitation letter and the reference letter. Better to write the invitation letter for executives as target group (high level overview & advantages for them and what do they have to do) and be more personal.	3	resolved	
Letter of invitation to member companies	Overall	Lack of understanding/ too complex	Study focus in invitation letter not consistent with reference letter of steel federation	1	resolved	
Letter of invitation to member companies	Overall	Lack of understanding/ too complex	Not clear what should be done now. Project specification and employee answering	6	resolved	
Letter of invitation to member companies	1st paragraph	Typing mistake	"zurzeit"	1	resolved	
Letter of invitation to member companies	1st paragraph	Typing mistake	"solcher Projekte Unternehmen statistisch"	3	resolved	
Letter of invitation to member companies	1st paragraph	Lack of understanding/ too complex	Which steel federation supports this study?	1	resolved	
Letter of invitation to member companies	1st paragraph	Lack of understanding/ too complex	1st sentence too long and too complex	1	resolved	
Letter of invitation to member companies	1st paragraph	Lack of understanding/ too complex	2nd sentence too long and too complex	2	resolved	
Letter of invitation to member companies	1st paragraph	Formulation	3rd sentence should be turned. From on "herauszufinden"	1	resolved	Also turned Website-Background of the study
Letter of invitation for member companies	1st paragraph	Formulation	Instead of "Studie zum Umgang mit organisatorischen Veränderungen bei der Einführung.." better "Studien zu Change Management Maßnahmen bei der Einführung.."	1	resolved	Also turned Website-Background of the study
Letter of invitation for member companies	1st paragraph	Lack of understanding/ too complex	What means emperical?	1	resolved	
Letter of invitation for member companies	1st paragraph	Lack of understanding/ too complex	Last two sentences (from "Die Studie...IT-Projekte haben.") too long and to difficult to understand.	2	resolved	
Letter of invitation for member companies	2nd paragraph	Typing mistake	"dieses Wissen Unternehmen, "	1	resolved	
Letter of invitation for member companies	2nd paragraph	Formulation	"wirtschaftlich angespannte Lage" too colloquial	1	resolved	Also turned Website-Background of the study

Letter of invitation for member companies	2nd paragraph	Formulation	Better "Unternehmen wie Ihres" instead of "Unternehmen wie Ihnen"	3	resolved	Sentence is formulated more generally
Letter of invitation for member companies	2nd paragraph	Typing mistake	"von wachsendem, globalem"	1	resolved	
Letter of invitation for member companies	2nd paragraph	Formulation	There is no comparison of efficient	1	resolved	Also in Letter to participants
Letter of invitation for member companies	3rd paragraph	Typing mistake	"werden, bevor"	3	resolved	
Letter of invitation for member companies	3rd paragraph	Typing mistake	"Sie sind eingeladen, mit"	1	resolved	
Letter of invitation for member companies	3rd paragraph	Typing mistake	"von Projekten würde"	4	resolved	
Letter of invitation for member companies	3rd paragraph	Formulation	Better "IT-Projekte" instead of only "Projekte"	1	resolved	Also changed on Website and in Letter to participants.
Letter of invitation for member companies	3rd paragraph	Lack of understanding/ too complex	Unclear why a larger number of participating projects would be positive for the study	1	resolved	
Letter of invitation for member companies	4th paragraph	Typing mistake	"Alle Antworten"	9	resolved	
Letter of invitation for member companies	4th paragraph	Formulation	Better "können sich neben der Einführung... beschäftigt haben"	1	resolved	Also changes in Website - Background of the Questionnaire
Letter of invitation for member companies	4th paragraph	Formulation	better "anhand des Fragebogen"	1	resolved	Also changes in Website - Background of the Questionnaire
Letter of invitation for member companies	4th paragraph	Formulation	better "zur Erfassung der Projekte"	1	resolved	
Letter of invitation for member companies	5th paragraph	Typing mistake	"Bedenken zum Thema Ethik"	1	resolved	
Letter of invitation for member companies	4th paragraph	Typing mistake	"zudem in der wissenschaftlichen Fachpresse"	1	resolved	
Letter of invitation for member companies	4th paragraph	Formulation	Better "im Rahmen des Fragebogens"	1	resolved	
Letter of invitation for member companies	4th paragraph	Typing mistake	"Weitere Informationen zum Studienverlauf"	1	resolved	
Letter of invitation for member companies	4th paragraph	Formulation	1st sentence should be adopted from Letter to participants. Much better formulated there	1	denied	Sentence is reformulated which resolved this issue.
Letter of invitation for member companies	4th paragraph	Lack of understanding/ too complex	Not clear who and what has to be done regarding the specification of projects	1	resolved	
Letter of invitation for member companies	5th paragraph	Typing mistake	"Abschließende"	4	resolved	
Letter of invitation for member companies	5th paragraph	Formulation	Better "Zu den Themen Ethik und Datenschutz"	2	resolved	Also in Website - Contact
Letter of invitation for member companies	6th paragraph	Typing mistake	"2. Hälfte"	2	resolved	
Letter of invitation for member companies	6th paragraph	Formulation	Add which year	2	resolved	
Letter of invitation for member companies	6th paragraph	Formulation	Avoid "noch" too negative. Better "Sie haben bis zu 30.06.2010 die Möglichkeit ..."	1	denied	
Letter of invitation for member companies	6th paragraph	Lack of understanding/ too complex	Not clear who would present which results where. Formulate sentence in an easier way.	1	resolved	
Letter of invitation for member companies	7th paragraph	Formulation	Rework formulation of last sentence	1	resolved	

Letter of invitation for member companies	7th paragraph	Formulation	Leave "freiwillig" out. Better only "Ihre Mithilfe"	2	resolved	
Letter of invitation for member companies	Finish	Typing mistake	Leave a line between the end of the letter and "With kind Regards"	1	resolved	
Federation reference letter	1st paragraph	Typing mistake	"bei der ThyssenKrupp Steel AG"	3	resolved	
Federation reference letter	1st paragraph	Formulation	Does everybody know what a dissertations is?	1	resolved	
Federation reference letter	2nd paragraph	Typing mistake	"als Solches, sondern"	1	resolved	
Federation reference letter	2nd paragraph	Formulation	2nd Sentence. Better "wie diese Lösung durch ein IT-Projekt umgesetzt wurde"	1	resolved	
Federation reference letter	3rd paragraph	Typing mistake	"Stahlindustrie haben ihre "	1	denied	Gramatically correct
Federation reference letter	3rd paragraph	Lack of understanding/ too complex	What is meant? ("wenn aus dem Kreis ebenfalls Daten..") Better "wenn Sie sich an der Studie beteiligen würden"	6	resolved	
Federation reference letter	4th paragraph	Typing mistake	" beteiligten Verbänden"	3	resolved	
Federation reference letter	4th paragraph	Formulation	"finden Sie weitere Informationen zu dieser Studie"	1	resolved	
Federation reference letter	4th paragraph	Formulation	"Die Beantwortung nimmt nur wenig Zeit in Anspruch"	1	resolved	
Federation reference letter	5th paragraph	Formulation	Leave "ebenfalls" out	1	denied	
Federation reference letter	5th paragraph	Formulation	Last sentence of letter to participants should be adapted	1	denied	The reference will be send together with the invitation letter for companies which already includes this sentence
Website	Overall	IT-Function	Key words and key aspects of the study should written in bold in all categories to better meat the readers eyes	2	resolved	
Website	Home page	IT-Function	Welcome text should be larger	1	resolved	
Website	About me	IT-Function	Small font not easy to read.	1	resolved	
Website	About me	Formulation	Add an empty line below the headline of the CV	1	resolved	
Website	About me	Formulation	Formulate less long sentences	1	resolved	
Website	About me	Typing mistake	"beitragen"	3	resolved	
Website	About me	Formulation	Avoid formulations such as "mehr oder weniger"	1	resolved	
Website	About me	Typing mistake	"Veränderungen"	1	resolved	
Website	About me	Typing mistake	A blank too much in front of "in wie weit"	1	resolved	
Website	About me	Formulation	Avoid "Bauchgefühle". Find a more appropriate formulation.	1	resolved	
Website	About me	Formulation	Better write "Teilnehmer/-innen"	1	resolved	
Website	About me	Typing mistake	"organisatorischen Veränderungen"	2	resolved	
Website	About me	Formulation	Better split CV in professional and study part	1	denied	Common format how other doctoral candidates in a comparable situation have formatted their C.V.
Website	About me	IT-Function	Formating of the personal message broken. Might be a reason that IE7 is still used.	1	resolved	Design adapted to suit all browser settings
Website	Background of the study - Overall	Formulation	Reduce content redundancy and highlight key words such in the "About the Questionnaire" section	1	resolved	

Website	Background of the study - 1st paragraph	Formulation	Two equal words in one sentence ("Störung + stören")	1	resolved	
Website	Background of the study - 1st paragraph	Typing mistake	"nicht mehr nur Betriebsprozesse sondern"	2	resolved	
Website	Background of the study - 2nd paragraph	Lack of understanding/ too complex	More shorter sentences. First and last sentence too long and too complex	1	resolved	
Website	Background of the study - 2nd paragraph	Formulation	Two equal words in one sentence ("wird + wird")	4	resolved	
Website	Background of the study - 3rd paragraph	Lack of understanding/ too complex	Split first sentence. Too complex	1	resolved	
Website	Background of the study - 3rd paragraph	Typing mistake	First line - leave comma out	1	resolved	
Website	Background of the study - 3rd paragraph	Formulation	"ist es, herauszufinden"	2	resolved	
Website	About the Questionnaire - 2nd paragraph	Formulation	Avoid abbreviations better "organisatorische" instead of "org."	1	resolved	
Website	Background of the study - 3rd paragraph	Typing mistake	"ausgewähltern"	1	resolved	
Website	About the Questionnaire - 3rd paragraph	Typing mistake	Twice "möglich"	1	resolved	
Website	About the Questionnaire - 3rd paragraph	Typing mistake	"globalem Wettbewerbsdruck"	1	resolved	
Website	Background of the study - 2nd paragraph	Typing mistake	2nd sentence, no comma	1	denied	Comma is gramatically correct
Website	About the Questionnaire - 3rd paragraph	Formulation	"möglich" is used twice in one sentence. Avoid this	2	resolved	
Website	About the Questionnaire - 6th paragraph	Typing mistake	"über diese"	2	resolved	
Website	About the Questionnaire - 6th paragraph	Formulation	"über diese" who is meant? Formulate more clearly	1	resolved	Also changed in the letter to participants + Website - Contact
Website	Additional literature	IT-Function	No equal design. Different fonts, different spaces between literatures.	1	resolved	
Website	Additional literature	IT-Function	List the literature references with comments first and those without comments at the end	1	resolved	
Website	Additional literature	Formulation	First letter of "Management Consulting" is grey. Why?	1	resolved	
Website	Additional literature	IT-Function	Text Management Consulting to much left and different than other literature	1	resolved	
Website	Additional literature	IT-Function	Sort references downwards by actuality	1	denied	Contradicting request to sort link to studies at the bottom
Website	Contact	IT-Function	Subject is missing	1	resolved	
Website	Contact	IT-Function	Hint regarding mandatory fields are missing.	2	resolved	
Website	Contact	Lack of understanding/ too complex	Change the order of the paragrahs. Otherwise one could think that the formular refers to the USQ ethic commission.	1	resolved	

Website	Contact	Typing mistake	"Fragen und Probleme"	2	resolved	
Website	Contact	Typing mistake	"zum Inhalte"	2	resolved	
Website	Contact	Formulation	Better write "bei Problemen im Rahmen der Studienteilnahme/ des Fragebogens".	2	resolved	
Website	Contact	Typing mistake	"zum Studienverlaufs"	1	resolved	
Website	Contact	Formulation	Leave out "diesbzgl."	1	resolved	
Website	Contact	Lack of understanding/ too complex	Who is meant? "überdiese"? The uni or the steel federations?	1	resolved	
Website	Contact	Typing mistake	"im Anschreiben"	1	resolved	
Website	Contact	Typing mistake	"bitte"	1	resolved	
Website	Data security	Typing mistake	"speichert"	3	resolved	
Website	Data security	Formulation	Should be rewored	1	resolved	
Website	Data security	Formulation	Better "Server-Log-Files"	1	resolved	
Website	Impressum	Formulation	Should be rewored	1	denied	No error was found
Letter to participants		Lack of understanding/ too complex	Unclear what managers have to do. Small supports sentences are too easily overviewed. Better start online with a clear introduction before offering copy text and PDF.	3	resolved	
Letter to participants		Formulation	Double meaning. Better to leave one word out ("knapp über)	1	denied	A rhetorical instrument. The higher the figure named the less motivated people will be to answer the questionnaire but stating that the questionarie has only 60 questions would also be wrong.
Letter to participants		Lack of understanding/ too complex	Level of information about the study is ok but it not 100 percent clear what people will have to do now. 5 people one questionnaire?	2	resolved	
Letter to participants		Lack of understanding/ too complex	Link to questionnaire and project code not well positioned. An introductory text should be followed by the link/ the code. Keep the subjects blocks close together.	1	resolved	
Letter to participants		Formulation	Better add how much time will be needed to fill the survey. The number of questions says nothing.	1	resolved	
Letter to participants		Lack of understanding/ too complex	Not understandable what is to do and why the text does not speak to the project creator. Small intro text below the page title is easily overlooked.	3	resolved	
Letter to participants		Lack of understanding/ too complex	Own questionnaire answering of project creator neither clear nor really named.	1	resolved	
Letter to participants		Lack of understanding/ too complex	Use and relevance of project code not clear enough.	2	resolved	
Letter to participants		Formulation	Language should be easier, more straight and the whole letter should be shorter to make it easier for employees to keep interest and motivation to answer the survey	1	denied	Letter was reworked from language aspect to formulate it as easy as possible but as the letter as to be self-explaining many information have to be given which makes it impossible to significantly

						shorten it.
Letter to participants		Formulation	Write "Wie es weiter geht" in bold	1	resolved	
Letter to participants	1st paragraph	Formulation	1st sentence better "für organisatorische Veränderungen"	1	resolved	
Letter to participants	1st paragraph	Typing mistake	"Sie"	2	resolved	
Letter to participants	1st paragraph	Lack of understanding/ too complex	Split first sentence. Too complex	1	resolved	
Letter to participants	1st paragraph	Typing mistake	The study title is "Erfolgsfaktoren für organisatorische Veränderungen im Rahmen von IT-Projekten in der europäischen Stahlindustrie"	1	resolved	
Letter to participants	2nd paragraph	Formulation	1st sentence leave "vermuteten" out	1	resolved	
Letter to participants	2nd paragraph	Formulation	No comparison of efficient possible	1	resolved	
Letter to participants	2nd paragraph	Typing mistake	"Studien"	1	resolved	
Letter to participants	2nd paragraph	Typing mistake	"Projektes"	1	resolved	
Letter to participants	2nd paragraph	Formulation	Better "läuft noch bis"	1	resolved	
Letter to participants	2nd paragraph	Formulation	1st sentence too unspecific. Better "Ziel der Studie ist es"	1	resolved	
Letter to participants	2nd paragraph	Formulation	What is the aim of the study? "Untersuchung" oder "Extraktion"?	1	resolved	
Letter to participants	3rd paragraph	Typing mistake	"und"	2	resolved	
Letter to participants	3rd paragraph	Typing mistake	"Kommission"	1	denied	"Kommission" with 2 m
Letter to participants	3rd paragraph	Typing mistake	"Dies wird u.a. von"	2	resolved	
Letter to participants	3rd paragraph	Typing mistake	"Studien"	1	resolved	
Letter to participants	4th paragraph	Formulation	Rework the 2nd sentence (with the reference to the personal appraisal)	1	resolved	
Letter to participants	4th paragraph	Typing mistake	"Fragenbogen"	1	resolved	
Letter to participants	4th paragraph	Typing mistake	"Übern" or "über den"	4	resolved	
Letter to participants	5th paragraph	Typing mistake	"Fragenbogen"	2	resolved	
Letter to participants	5th paragraph	Typing mistake	"30.06.2010" not "30.07.2010"	1	resolved	
Letter to participants	5th paragraph	Formulation	No consistent way fo writing "2. Hälfte 2011"	1	resolved	
Letter to participants	Download	IT-Function	PDF download function is available	1	resolved	
Survey - Project specification	Overall	IT-Function	Text not nicely formatted/ broken between lines.	5	resolved	
Survey - Project specification	Overall	Lack of understanding/ too complex	Not 100 percent clear what has to be done. Support text is easily overviewed. Better open with a side such as the homepage, provide more explanation and link than to the project specification	1	resolved	
Survey - Project specification	Support Text	Formulation	Following to "zum einen" "zum anderen" is missing	2	resolved	
Survey - Project specification	Support Text	Formulation	Besser "fließen in die Studie ein"	2	resolved	

Survey - Project specification	Support Text	Lack of understanding/ too complex	not clear	1	resolved	
Survey - Project specification	Project name	IT-Function	The symbol for more information does not provide any text with IE 7. With Firefox and IE 8 Support text works as supposed.	5	resolved	Support texts will be added below the question.
Survey - Project specification	Company size	Formulation	Too much focused on large ERP-projects and large enterprises. Where are the SMEs belows 100 employees which are the majority of european traders and service centers? Smaller steps with smaller numbers needed	2	resolved	
Survey - Project specification	Project costs	Formulation	Too much focused on large ERP-projects and large enterprises. SMEs have less than 1 Mio. IT budget per year. Smaller steps with smaller numbers needed	2	resolved	
Survey - Project specification	Project costs	Formulation	Better "Höhe des vormalis geplanten Projektbudgets"	1	resolved	
Survey - Project specification	Project duration	Lack of understanding/ too complex	Unclear on what the duration is focused on. Provide additional information	2	resolved	
Survey - Project specification	Company belonging	Formulation	Also offer selection options >20 years. E.g. 21-30, 31-40 years etc.	1	resolved	
Survey - Project specification	Effectted departments	Lack of understanding/ too complex	Selection not understandable and not representing company reality	1	resolved	
Survey - Project specification	Effectted departments	Lack of understanding/ too complex	Not clear if those departments are meant which do the project or which have to use the new application afterwards	3	resolved	
Survey - Project specification	Effectted departments	Formulation	Better write "Sonstige" instead of "Sonstiges Management"	1	resolved	
Survey - Project specification	Effectted departments	Lack of understanding/ too complex	Add example of what is meant (purchasing, IT tec.)	1	resolved	
Survey - Project specification	Effectted departments	Lack of understanding/ too complex	What means Maintenance & Administration? General Adiminstration and Facility management? More information needed.	2	resolved	
Survey - Project specification	Number of effected employees	Lack of understanding/ too complex	What means "betroffen"? Part of the project team or had to work with the new system?	2	resolved	
Survey - Project specification	Number of effected locations	Lack of understanding/ too complex	What is meant with "Standort"? Production location? More information necessary or better understandable wording.	1	denied	Standort or location are commonly used expressions and were understood by nearly all participants
Survey - Project specification	Focus of the IT-system behind the project	Lack of understanding/ too complex	What is a transaction system, a decision support system and an expert system? More information necessary or better understandable wording.	8	resolved	
Survey - Project specification	Focus of the IT-system behind the project	IT-Function	Multiple selection necessary as most new application are no greenfield projects but are a combination a replacing an old, narrowed application and providing a new and wide process coverage	7	denied	To confusing for statistical analysis. Support text has been added to make question more precise
Survey - Project specification	Focus of the IT-system behind the project	Lack of understanding/ too complex	What's about Reporting and Operation Systems? Where to they belong to?	1	resolved	
Survey - Project specification	Focus of the IT-system	Typing mistake	"Entscheidungs-unterstützungssystem"	3	resolved	

	behind the project					
Survey - Project specification	Kind of project	Formulation	Better "Einführung IT-System" "Ablösung eines vorhandenen Systems" "Update eines Systems (z.B. Release/ Patch) "Funktionale Systemerweiterung"	1	resolved	
Survey - Project specification	Kind of project	Lack of understanding/ too complex	Selection option not self explanatory. Provide more information what is meant	1	resolved	
Survey - Project specification	Kind of project	Typing mistake	"Simmulation"	1	resolved	
Survey - Project specification	Kind of project	Typing mistake	Better "Systemneueinführung"	1	resolved	
Survey - Project specification	Standard Software	Lack of understanding/ too complex	What means standard software? Is an open source programming framework also standard?	3	resolved	
Survey - Project specification	Kind of project	IT-Function	Multiple selection necessary as modern IT-system often have more than one function.	3	denied	To confusing for statistical analysis. Support text has been added to make question more precise
Survey - Project specification	Way of roll-out	Typing mistake	Better "wie wurde"	2	resolved	
Survey - Project specification	Way of roll-out	Typing mistake	"komplette"	2	resolved	
Survey - Project specification	Way of roll-out	Lack of understanding/ too complex	Additional, explanatory text in brackets should easier formulated. Not self-explanatory	1	resolved	
Survey - Project specification	Way of roll-out	Typing mistake	"Big Bang"	8	resolved	
Survey - Project specification	Way of roll-out	Lack of understanding/ too complex	Selection of answers too simplistic. How should a project be classified which is completely introduced for one sales area and all necessary departments and locations but not in all sales areas? And how should the question be answered if two system are run in parallel for a certain time?	1	denied	In both cases it would not be a big-bang but a stepwise approach
Survey - Project specification	Intensity of organisational change resulting	Formulation	Better write "mäßig" instead of "teils/teils"	1	resolved	
Survey - Project specification	Intensity of organisational change resulting	Lack of understanding/ too complex	Question not self-explanatory. Better refere to the company in total instead of the effected company areas. One might not think about the departments which had to work with a new software but only about the department who run the project.	2	resolved	
Survey	Overall	Formulation	Short questions such as regarding the project success are much easier and fast to answer than the more complicating psychological questions before	1	denied	Questions have been reworked and shorted as much as possible but questions still have to be translations of the English orginal. A different message or meaning has to be avoided.
Survey	Overall	IT-Function	Survey answering progress should also be shown in percentage value	1	denied	Not possible with the used freeware software

Survey	Overall	IT-Function	E-Mail Contact should be added (comparable to common website)	1	resolved	
Survey	Overall	IT-Function	A BACK-Button would be needed to review and correct finished questions	5	resolved	
Survey - Opening		Lack of understanding/ too complex	Rework Introtxt. Intention is good, formulation sometimes weak and leave too much room for misunderstandings	3	denied	Standard text of the freeware software. Can't be changed without programming knowhow.
Survey - Opening		Formulation	Better use color contrasts, no writing in italics and a larger size.	3	resolved	
Survey - Project code		Typing mistake	"können"	1	resolved	
Survey - Project code		Formulation	Description where project code can be found should be added for those who overread the letter of invitation. Without finding the project code back, the survey could not be answered.	1	resolved	
Survey - Project code		IT-Function	Support text is easy overlooked. Make support text more viewable.	1	resolved	
Survey - Project code		IT-Function	Support text "Please select one answer" too far left	1	resolved	
Survey - Project code		Formulation	Formate of support text should be overworked	1	resolved	
Survey - Project code		IT-Function	Text "16 questions" is irritating as >60 questions were named before. Better leave it out or call it differently.	2	denied	Standard setting of the freeware software as 16 separate question blocks are used. Can't be changed
Survey - Personal data	Highest degree	Formulation	Better write "Ausbildung" instead of "Lehre"	1	resolved	
Survey - Personal data	Organisationa l Status	Formulation	Better "Ihre aktuelle Stellung" instead of "Ihre Stellung"	1	resolved	
Survey - Personal data	Organisationa l Status	Lack of understanding/ too complex	Add information how a manager status is understood. Very company specific and therefore easily misunderstood	1	resolved	
Survey - Siegal	Overall	IT-Function	Column width of answer option not of equal size	5	resolved	
Survey - Siegal	Overall	Formulation	Headline with Question block numbers should be larger and bold plus a more visible free space between the headline and the support text.	3	resolved	
Survey - Siegal	Overall	Lack of understanding/ too complex	Answers mainly relativ to project. Genereal answers are complex. No easy black or white	3	denied	1. The answer options are taken from Siegal's original questionnaire 2. The questionnaire target on a general personal mind set.
Survey - Siegal	Overall	Lack of understanding/ too complex	Answers option should be shorter and with this more obvious such as "Yes" "No"	2	resolved	Answer options are reduced
Survey - Siegal	Overall	Lack of understanding/ too complex	All question in general too long and too complex. Should overworked	1	denied	The question was reworked as short as possible without leaving aspects from Siegal's original.
Survey - Siegal	Overall	Formulation	It is too obvious that the same topic is asked to frequently after each other. Order of questions should better be mixed.	1	denied	The order of questions was taken form Siegal's original questionnaire

Survey - Siegal	1st page, 1st Question	Lack of understanding/ too complex	Should be formulated less complex	1	denied	The question is quite short
Survey - Siegal	1st page, 2nd Question	Typing mistake	Without comma	1	resolved	
Survey - Siegal	1st page, 2nd Question	Typing mistake	"Weges"	2	resolved	
Survey - Siegal	1st page, 2nd Question	IT-Function	Line break not nice	1	resolved	
Survey - Siegal	1st page, 2nd Question	Lack of understanding/ too complex	Which visions and perspectives are meant? For the employee or the company/department in general?	1	denied	Both aspects belong together.
Survey - Siegal	1st page, 2nd Question	Typing mistake	"Führungskräften"	1	denied	Gramatically correct
Survey - Siegal	1st page, 2nd Question	Lack of understanding/ too complex	Too long	1	denied	The question was reworked as short as possible without leaving aspects from Siegal's original.
Survey - Siegal	1st page, 3rd Question	Lack of understanding/ too complex	Too complex. Can only be understood after 3x reading.	2	resolved	
Survey - Siegal	1st page, 5th Question	Lack of understanding/ too complex	Too complex. Can only be understood after 3x reading.	1	resolved	
Survey - Siegal	1st page, 5th Question	Typing mistake	"erster Schritt"; "ist es, eine allgemeine"	4	resolved	
Survey - Siegal	1st page, 7th Question	Lack of understanding/ too complex	too complex	1	resolved	
Survey - Siegal	1st page, 7th Question	Typing mistake	"mit Veränderungen ist es, mehr Informationen"	1	resolved	
Survey - Siegal	1st page, 8th Question	Typing mistake	"von gewohnten Arbeitsweisen"	3	resolved	
Survey - Siegal	2nd page, 1st Question	Lack of understanding/ too complex	What is meant with "Abschluss". Not clear.	1	resolved	
Survey - Siegal	2nd page, 2nd Question	Typing mistake	Better "Muster"	4	resolved	
Survey - Siegal	2nd page, 2nd Question	Typing mistake	" gewisse Mustern"	1	resolved	
Survey - Siegal	2nd page, 3rd Question	Formulation	Formulation should be overworked and be easier formulated	2	resolved	
Survey - Siegal	2nd page, 3rd Question	Formulation	"in kleine Gruppen zu kommunizieren"	2	resolved	
Survey - Siegal	2nd page, 3rd Question	Formulation	"Informationen an Mitarbeiter" or "Informieren von Mitarbeitern"	4	resolved	
Survey - Siegal	2nd page, 4th Question	Typing mistake	"Teilnahmslosigkeit"	1	denied	No error was found
Survey - Siegal	2nd page, 4th Question	Lack of understanding/ too complex	Question too complex and has to be read three times before answering	1	resolved	
Survey - Siegal	2nd page, 5th Question	Typing mistake	" Fortschritts "	8	resolved	
Survey - Siegal	2nd page, 5th Question	Formulation	Either don't use the abbreviation "bzgl." and write the full word or use the word "über"	1	resolved	
Survey - Siegal	2nd page, 6th Question	Lack of understanding/ too complex	What means "Besitzstandswahrung"?	1	denied	There is no better suited word in German
Survey - Siegal	2nd page, 5th Question	Formulation	"Besitzstandswahrung ist"	1	resolved	
Survey - Siegal	2nd page, 8th Question	Lack of understanding/ too complex	What is meant with "Symbolische Dinge und Handlungen"? More information necessary or better understandable wording.	10	resolved	

Survey - Siegal	2nd page, 6th Question	Formulation	Better "Symbole & symbolische Handlungen"	1	resolved	
Survey - Siegal	2nd page, 7th Question	Lack of understanding/ too complex	Which visions and perspectives are meant? For the employee or the company/department in general?	2	denied	1. Also unclear in Siegal's original question. 2. Both options belong together.
Survey - Siegal	3rd page, 2nd Question	Typing mistake	"montären Anreiz"	5	resolved	
Survey - Siegal	3rd page, 2nd Question	Lack of understanding/ too complex	not clear	1	resolved	
Survey - Siegal	3rd page, 2nd Question	Lack of understanding/ too complex	What are means "Monetär"? I have not studied. Better write "geldliche Anreize"	2	resolved	
Survey - Siegal	3rd page, 5th Question	Typing mistake	"-feldern "	8	resolved	
Survey - Siegal	3rd page, 6th Question	Lack of understanding/ too complex	"kompliziert"	1	resolved	
Survey - Siegal	3rd page, 7th Question	Formulation	Either write "entweder eher" or "immer"	1	resolved	
Survey - Siegal	3rd page, 7th Question	Lack of understanding/ too complex	Too complex	2	resolved	
Survey - Siegal	3rd page, 8th Question	Lack of understanding/ too complex	Not clear what is meant	1	resolved	
Survey - Waldersee	Overall	Lack of understanding/ too complex	Introduction text too complex	1	resolved	
Survey - Waldersee	Overall	Lack of understanding/ too complex	Compulsory answer for every option does not make sense. What if this option was not used? Better insert the option "Was not used" or something comparable.	3	denied	For a more qualitative analysis of projects this point would be valid. But participants can rate an option as "neutral" or "not helpful". For the quantitative analysis it won't make a difference why options were not regarded as helpful.
Survey - Waldersee	Overall	Lack of understanding/ too complex	Change of survey focus project focus in invitation letter to general personal opinion (Siegal) to project-focus answers (Waldersee) is easily overlooked and confusion. Should be more obvious or change order of question blocks (Siegal at the end)	2	resolved	Siegal's general part was moved at the end and the work introductions were reworked and formulated more clearly
Survey - Waldersee	Headline	Typing mistake	"Handlungsmöglichkeiten, "	1	resolved	
Survey - Waldersee		Typing mistake	"Arbeitnehmersvertreter"	3	resolved	
Survey - Waldersee	Incentives	Lack of understanding/ too complex	What means "monetary"? Better use "geldlich"	3	resolved	
Survey - Waldersee	Change Support	Formulation	Better "Maßnahmen um... zu fördern"	1	resolved	
Survey - Holt	Overall	Formulation	Better sort answering option from absolute against to absolute agree	1	denied	The whole questionnaire has been sorted starting with the most positive answer on the left and ending

						with the most negative answer on the right.
Survey - Holt	1st page	Lack of understanding/ too complex	Too complex	1	resolved	
Survey - Holt	1st page, 3rd Question	Typing mistake	"legitim "	11	resolved	
Survey - Holt	1st page, 4th Question	Typing mistake	"würden"	1	resolved	
Survey - Holt	1st page, 6th Question	Typing mistake	"Veränderungen,"	1	resolved	
Survey - Holt	1st page, 6th Question	Lack of understanding/ too complex	Too complex.	1	resolved	
Survey - Holt	1st page, 6th Question	Typing mistake	"langfristig"	2	resolved	
Survey - Holt	1st page, 7th Question	Typing mistake	"zugehörig"	1	resolved	
Survey - Holt	1st page, 7th Question	Typing mistake	" , daß das Projekt"	1	resolved	
Survey - Holt	2nd page, 3rd Question	Typing mistake	Plural? "zugehörigen Veränderungen"	1	resolved	
Survey - Holt	1st page, 6th Question	Typing mistake	"mit sich brachten, "	1	denied	Gramatically correct
Survey - Holt	2nd page, 7th Question	Typing mistake	"dieses"	2	resolved	
Survey - Holt	2nd page, 7th Question	Typing mistake	"Führungskräften dieses Projekte"	1	resolved	
Survey - Holt	2nd page, 8th Question	Formulation	Should be reworked. Seperate sentences or make 2 questions out of it.	3	resolved	
Survey - Holt	2nd page	Formulation	Better change sequence of questions: 1st all question relating on managers 2nd all questions relating on higher management	1	denied	Order of questions was taken from the Holt's original order of management support questions
Survey - Holt	2nd page	Formulation	Better "betrafen" instead of "angingen"	1	resolved	
Survey - Holt	2nd page	Lack of understanding/ too complex	Difference between higher management levels. A SME only has one generel manager and not 5 or 6 hierarchie level sich as an international enterprise.	1	resolved	
Survey - Holt	2nd page	Formulation	Better "der Fachbereich muß sich ändern"	1	resolved	
Survey - Holt	2nd page, 8th Question	Typing mistake	""Mich weniger Perspektiven"	1	resolved	
Survey - Holt	2nd page, 8th Question	Typing mistake	"sich verändern müsse"	1	resolved	
Survey - Holt	3rd page, 1st Question	Formulation	Better "die das Projekt mit sich brachte anzupassen"	1	resolved	
Survey - Holt	3rd page, 3rd Question	Lack of understanding/ too complex	Too complex. Formulate easier	1	resolved	
Survey - Holt	3rd page, 1st Question	Typing mistake	"Veränderungen"	4	resolved	
Survey - Holt	3rd page, 4th Question	Formulation	This question will only be answered absolute agreement (as employees would not blame themselves) or absolute disagreement (in case of frustated employees)	1	denied	The question is original part of Holt's questionnaire and should therefore not been removed.

						The questions are original part of Holt's questionnaire and should therefore not be removed.
Survey - Holt	3rd page, 2nd+4th Question	Formulation	Both question sound quite equal	1	denied	
Survey - Holt	3rd page, 1st Question	Typing mistake	"es gab keine Probleme,"	1	denied	No error was found
Survey - Holt	3rd page, 4th Question	Typing mistake	"umsetzen"	1	resolved	
Survey - Holt	3rd page, 6th Question	Typing mistake	"machen leisten wurden"	1	resolved	
Survey - Holt	3rd page, 6th Question	Lack of understanding/ too complex	What kind of personal experiences is meant? No clear	1	resolved	
Survey - Holt	3rd page, 6th Question	Typing mistake	"stimmten"	1	resolved	
Survey - Holt	3rd page, 6th Question	Typing mistake	"persönlichen Erfahrungen"	2	resolved	
Survey - Holt	3rd page, 7th Question	Typing mistake	"Veränderungen"	2	resolved	
Survey - Holt	4th page, 6th Question	Typing mistake	"Veränderungen"	1	denied	No error was found
Survey - Holt	4th page, 6th Question	Typing mistake	"zugehörigen"	1	resolved	
Survey - Holt	4th page, 2nd Question	Typing mistake	"wurde" instead of "würde"	1	denied	Gramatically correct
Survey - Holt	Answer options	Formulation	Inconsistened naming. On the 1st page the first answer is called "neutral", on page 2 + 3 "Bin nicht sicher"	2	resolved	
Survey - Holt		Lack of understanding/ too complex	What means chang barriers?	1	resolved	
Survey - Finish		Formulation	Better write "Vielen Dank" as headline instead of "Ende"	2	resolved	
Survey - Finish		IT-Function	Link should be colored more visibily	1	resolved	
Survey - Finish		IT-Function	The authors name should better be centrally located.	4	resolved	

Source: Hetkamp 2011; developed for this study

Appendix 3 – Details of data collection process

A 3.1 Invitation letter European steel producers

Ladies and Gentlemen,

01st May, 2010

between 1st May – 30th June 2010 I shall be conducting a pan-European research study relating to Organisational Change in IT projects. The research is undertaken in cooperation with the European federation for steel producers (EUROFER) and under the scientific supervision of the University of Southern Queensland (Australia). Your support and contribution to this research effort will be highly appreciated.

Using the European steel industry as the object of research, the study aims to empirically analyse the relationship between people-oriented change management, the successful realisation of organisational changes resulting from IT projects and the business success of such projects. The results of the research should help you to realise IT projects and any related organisational changes more effectively and efficiently in the future. In order to help you benefit promptly from the study, the research findings will be made available to you via the participating federations in the second half of 2011.

For more detailed information about the study see the attached letter of reference from your industrial federation or go to: www.Change-in-Steel.de

If you are not the IT officer, please forward the invitation to participate in the study to the IT-manager responsible for your company as the study focuses specifically on the attributes and details of single IT projects.

The study sets high value on the realistic representation of IT projects in the European steel industry to ensure the representative character of the study findings also for your company. By participating you can actively contribute to the representativeness and usefulness of the study results. To enhance the representative character further, the focus of the study is not limited to large-scale implementation of new IT-systems but also and on less spectacular but the more frequently occurring extensions or replacements of IT-applications or important new releases. In order to combine study objectivity and project specific characteristics, data collection will take place in two steps. In a first step a participating project will have to be specified online while in a second step at least 2 managers and 3 employees directly involved in the project implementation should answer the online questionnaire respecting the IT-project concerned.

With regard to the specific knowledge of the individual IT projects, IT-project managers should specify the chosen projects and closely coordinate the selection of participants in the online questionnaire with the departments concerned by the project. For more detailed information about how to participate in this study and to specify your IT projects see: www.change-in-steel.de/umfragestart.php

Thank you in advance for any project contribution to this research effort. Your participation will be sincerely appreciated.

Yours faithfully

Michael Hetkamp (Dipl.Kfm., MeBus, Post Grad., MBA)
University of Southern Queensland

A 3.2 EUROFER letter of recommendation

To the EUROFER Board

Dear Sir,

Please forward this message to your IT department

Between 1st May and 30th June 2010, Mr Michael Hetkamp will be carrying out a pan-European empirical study for his doctoral thesis regarding Change-Management.

The name of this study is: "Success Factors for Organisational Change Management in IT-Projects using the example of the European steel market". The study aims to empirically research the influence of people-oriented change management approaches, the successful realisation of organisational change and business success of IT-projects. In fact, the study does not concentrate on the IT-outcome of a project itself but on the way it was implemented and put into practice. The findings of this research aim to help you realise IT-projects and any related organisational changes more effectively and efficiently in the future.

The research will be undertaken in cooperation with EUROFER and EUROMETAL using an anonymous online questionnaire. The questionnaire was tested for usability and comprehensibility and should take less than 15 minutes to complete. The access to the questionnaire is only possible using the link provided in the attached letter of invitation.

As a EUROFER member you are invited should you wish to do so to contribute to the representative character of the study by participating with an optional number of IT-projects. A summary of the research findings will be made available to all members via the participating Steel federations in the second half of 2011.

Numerous companies have already stated their interest in participating in the study. We should appreciate your supporting Mr Hetkamp in his research project.

Yours faithfully,

Gordon Moffat
Director General
EUROFER
Avenue Ariane, 5
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B-1200 Brussels
Tel. +32 2 738 79 26
Fax +32 2 738 79 61
G.Moffat@eurofer.be
[B.Vander Syp@eurofer.be](mailto:B.Vander_Syp@eurofer.be)

A 3.3 Personal invitation to fill out the questionnaire

Ladies and Gentlemen,

You have been selected as potential participants in the pan-European research study „Success factors for change management in the context of IT projects using the example of the European steel industry“. Thank you in advance for your participation and contribution to this study.

The research aims to empirically analyse and prove the relationship between people-oriented change management approaches, the successful realisation of organisational change and the business success of IT projects. The findings of the research should help your company to realise IT projects and related organisational changes more effectively and efficiently in the future.

The questionnaire you are invited to participate in contains a few more than 60 questions, can be filled out in less than 15 minutes and focuses only on your **personal perceptions and experiences**. For reasons of objectivity, the questionnaire should be answered by at least 2 managers (functional and or IT) and 3 employees who experienced the respective project during its implementation. The **anonymity of the study is guaranteed**. No link to specific participants or companies is possible. This is supervised by the Human Research Ethic Committee University of Southern Queensland, Toowoomba Australia 4350, Tel. +61(7) 4631 2956, e-Mail: Ethics@usq.edu.au. For further information about the study: www.Change-in-Steel.de

The link below will enable you to access the study questionnaire for the IT-project you select. Please answer the questions with respect to your personal perceptions and experiences. The following details relate to the project you specify:

[Project code /name/]; [Kind of Project];

<http://umfrage.change-in-steel.de/index.php?sid=55869&lang=de>

The project code for the related project is: [project code]

The project codes can be regarded as a password and need to be entered at the beginning of the questionnaire. The project code prevents any access and/or input to the data entered in the questionnaire by unauthorised persons. Furthermore, the project code is the only link between your answers and the project details. Without entering the correct project code your answer will be lost for the study analysis.

What will the next steps be?

The data collection will be continued until 30th July 2010. A summary of the research findings will then be prepared and later distributed via all participating Steel federations to all members in the second half of 2011.

Thank you very much for your participation and contribution.

Yours faithfully

Michael Hetkamp (Dipl.Kfm., MEdus, Post Grad., MBA)
University of Southern Queensland

A 3.4 English version of the questionnaire

IT-project name/ -code:
(Please enter a project name/ code which will enable other participants to recognise the project. Furthermore, is the project code the only link between the questionnaires collected and the here specified project details)

Company size
 where the IT-project was implemented (in number of employees)

Department(s)/ Company area(s) affected at most by the project

Marketing/Sales
 Human Resources
 Research/ Technique
 Production
 Administration/Maintenance
 Accounting/ Finance
 Others

Reason for the IT-Project
(if more than one please only specify the primary reason)

New IT-system
(Implementation of a completely new IT system or replacement of an existing IT system with significantly more functionality/ data)

IT system replacement
(Replacement of an existing IT system with a new IT system of comparable functionality)

IT system update
(e.g. a major new release)

IT system extension
(Functional or data extension of an existing IT system).

Functional focus of the IT-System related to the IT-Project?
(if more than one, please only specify the primary function)

Transaction System
(a system which is mainly used for entering, processing and following up transactions such as bookings, orders, offers, invoices or requests)

Knowledge System
(all kinds of systems collecting, aggregating and presenting company internal data. The goals of these systems are the acquisition, processing, exchange and distribution of data and information for decision making. e.g. reporting systems, applications for office communication, online order tracking tools for customers)

Decision Support System
(all kinds of systems supporting middle management in administering, controlling and monitoring their projects and goals. This could also include smaller "What if" scenarios, analyses and business simulations)

Executive Support System
(a system supporting the higher management of a company with e.g. key performance indicators, developments of corporate figures, market trends and strategic figures)

Originally planned project budget (in Euros)

Originally planned project duration (in months)

Number of people affected by the IT-project in total

Was a standard software used?
(a software which can be bought/licensed and which is max. customised before it is implemented)
 yes no

Number of company locations affected by the IT-Project?

Roll-Out approach chosen?

Big-Bang *(a single Go-Live time for all affected employees and locations)*
 Roll-Out *(Step-wise Go-Live e.g. of separate functional moduls or in separate organisations units/locations)*

Degree of process / organisational change caused to the department(s)/company area(s) affected by the IT-project
 Very small Small Medium Large Very large

Appendix 3 – Details of data collection process

1.) Gender

Male	
Female	

2.) Age

>30 years	
30-39 years	
40-49 years	
<49 years	

3.) Country of your Nationality

(Country selection)

4.) Highest education degree

None	
Professional training	
Specialised training (e.g. master craftman's diploma, Certified Specialist etc.)	
Bachelor degree	
Master degree	
Doctoral degree	

5.) Functional role

IT Manager	
Functional Manager	
Employee	

6.) Corporate affiliation

>10 years	
11-20 years	
<20 years	

7.) Personal perception of organisational and process-related changes frequency in the organisation

Very small	
Small	
Half/half	
Large	
Very large	

Appendix 3 – Details of data collection process

Personal Judgements with regard to the specified IT Projects and its related Organisational Changes

Please rank the following alternative methods with regard to their usefulness for the realisation of the project specified in your invitation mail and the related organisational changes.

No.	Perception	Not supportive at all	Not supportive	Neutral	Supportive	Very supportive
8.)	Directives & memos					
9.)	Redeployment of staff					
10.)	Job redesign					
11.)	Pilot programs					
12.)	Trainings					
13.)	Meetings					
14.)	Problem solving groups					
15.)	Development of general approval among staff					
16.)	Rewards & incentives					
17.)	Involvement of workforce /union representatives					
18.)	Management support					

Please rank the following statements with regard to how you experienced them during the project specified in your invitation mail.

No.	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
19.)	I was convinced that the company would benefit from the project and the related organisational changes.					
20.)	It seemed to me that it did not make sense for us to initiate this project.					
21.)	I felt that there were legitimate reasons for us to undertake this project and the related organisational changes.					
22.)	I was sure that the project and the related organisational changes would improve our organisation's overall efficiency.					
23.)	I was sure that there were a number of rational reasons for this project to be undertaken.					
24.)	In the long run, I felt that it would be worthwhile for me that the company undertook the project and the related					

Appendix 3 – Details of data collection process

	organisational changes.					
25.)	I thought that the project and the related organisational changes would make my job easier.					
26.)	When this project and the related organisational changes were going to be implemented, I believed that there would not be anything left for me to gain.					
27.)	I had the feeling that the time spent on the project and the related organisational changes should have been spent on something else.					
28.)	I felt that this project and the related organisational changes would match the priorities of our company.					
29.)	Our leaders encouraged all of us to embrace this project and the related organisational changes.					
30.)	Our company's top decision makers put all their support behind this project.					
31.)	Every leader stressed the importance of this project.					
32.)	I had the impression that the organisation's top decision makers were committed to this change					
33.)	I thought that a lot of time was spent on this project and the related organisational changes whereas the leaders did not even want it to be implemented.					
34.)	Management sent a clear signal that this company was going to be changed.					
35.)	I had no problems adjusting my work when this project and the related organisational changes were implemented.					
36.)	There were same tasks, that were required when the project and the related organisational changes were implemented, about which I thought I could not carry them out very well.					
37.)	I was able to deal with the changes brought about by this project without any difficulties.					
38.)	I had the skills required to make this project and the related organisational changes work.					

Appendix 3 – Details of data collection process

39.)	I was able to learn everything new that this project brought about.					
40.)	My past experiences made me confident that I would be able to perform successfully after this project was implemented.					
41.)	I was afraid to lose my job in the company when the project and the related organisational changes would be implemented.					
42.)	I was afraid that this project would disrupt many of the personal relationships I had developed					
43.)	I thought that the future of my job / career was limited because of this project and the related organisational changes					
44.)	I think that the IT solution was realised within in the planned schedule.					
45.)	I think that the IT solution was realised in the planned budget.					
46.)	I am satisfied with the way in which the IT solution was implemented.					
47.)	I am satisfied with the IT outcome of the project.					
48.)	I think that project in total was well introduced and implemented in our company.					
49.)	I think that the project in total met our company's internal business expectations.					
50.)	I think that the project in total improved our company's overall efficiency/performance.					
51.)	It only took me a brief period of time to learn the new aspects the project brought about.					
52.)	I believe in the value of the related organisational changes (e.g. changed work processes).					
53.)	The related organisational changes were good for our department.					
54.)	The related organisational changes served an important purpose for the daily work of our department.					

Appendix 3 – Details of data collection process

55.)	Due to the related organisational changes our work can be done in a better way now.					
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Personal Perception of Organisational Changes in General

Please specify whether you agree or disagree with the following general statements with regard to the organisational changes below.

No.	Statement	I agree	I disagree
56.)	People invariably resist change.		
57.)	The articulation of the company's future state by its leaders is one of the most important aspects of a successful change effort.		
58.)	The most difficult aspect of any change effort is the determination of the vision for the future state.		
59.)	In any change effort, communicating what will remain the same is as important as communicating what will be different.		
60.)	Lacking freedom of choice about change usually provokes more resistance than change itself.		
61.)	A highly effective, early step in managing change is to recognise dissatisfaction with the current state.		
62.)	A common error in managing change is providing more information about the process than is necessary.		
63.)	As movement toward a new future begins, members of a company need both time and opportunities to disengage from the loss of the present state.		
64.)	The planning of change should be done by a small, knowledgeable group that communicates its plans on completion of this task.		
65.)	Despite differences in company structures, certain parts of change efforts always follow similar patterns.		
66.)	In any change effort, communicating information one-on-one is more effective than to small groups.		
67.)	Managing resistance to change is more difficult than managing apathy about change.		
68.)	Complaints about the change effort are often a sign of progress.		
69.)	"Turf issues", both individual and group, are usually the greatest obstacle to systemic change.		
70.)	The first question asked by most people about organisational change concerns the general nature of the future state.		
71.)	Symbols, slogans, or acronyms that represent organisational change typically reduce the effectiveness of the effort rather than add to it.		
72.)	Leaders find it more difficult to change organisational goals of the change		

	than to change the ways to reach those goals.		
73.)	Successful change efforts typically require changing the reward systems to support the change.		
74.)	With little information about the progress of a change effort, people will typically think positively.		
75.)	A change effort routinely should begin with modifications of the organisation's structure.		
76.)	The more members of an organisation are involved in planning the change, the more they will be committed to the change effort.		
77.)	A reduction in the company's problems represent clear-cut evidence of progress in the change effort.		
78.)	Organisational change is typically a response to external environmental pressures rather than internal management initiatives.		
79.)	In managing change, the reduction of restraints or barriers to the achievement of the end state is more effective than increased pressure toward that end state.		
80.)	Effective organisational change requires certain significant and dramatic steps or "leaps" rather than moderate incremental ones.		

The End

Thanks a lot for your participation.

You reached the end of the questionnaire and I would like to thank you for your participation in this study.

Next steps?

The questionnaire is open til 30th July 2010. The results of the study will be summarized and be made available for you in close cooperation with participating Steel Federations in the second half of 2011. Do not hesitate to contact the specified contact person of your responsible Steel Federation for any questions.

With kind regards
Michael Hetkamp

www.Change-in-Steel.de

A 3.5 Questions and answers for the selection and specification of IT projects

Thank you for your interest in participating in this research study.

As specified in your letter of invitation, the study is divided into two steps:

1. **Specification of the project** (see the form below). A small number of project characteristics guarantee project recognition by the employees and managers selected to answer the online questionnaire. Furthermore such characteristics will be used to analyse their influence on successful project realisation.
2. **Answering the online questionnaire** related to the specified project by 2 managers and 3 employees in the department(s)/ company area(s) affected. You are invited to complete one of the five questionnaires to be answered yourself. Further details about the online questionnaire will follow after the project specification has been completed.

What kinds of IT projects are under focus in the study?

The study focuses on all kinds of IT projects your company may have carried out in the last 5 years. The focus is not limited only to large-scale implementation of new IT-systems but also on extensions or replacements of IT-applications or important new releases. The study aims to achieve a realistic representation of IT projects in the European steel market. The focus is thus not limited to large-scale projects but rather includes smaller and less spectacular application extension or enhancements as such projects also result in new or changed work process for employees. Each project which is representative of the IT-project world in your company is therefore highly welcome.

What will the next steps be?

After completion of the project specification, you will automatically be offered a standard invitation letter including the respective project code for inviting the online questionnaire candidates. Further information will be provided regarding how to invite questionnaire candidates and includes hints for completing the questionnaire.

How could further IT-project be specified for our company?

There are two options for specifying further company IT projects.

1. Below the gray-marked invitation letter for questionnaire candidates on the next page, you will find a link which will bring you back to the empty project specification form.
2. Use the link provided in your study invitation letter.

Please take care. If you have not saved the project code of your current project, this data will be lost when returning to the project specification form.

Why participate with more than one project?

The representativeness and usefulness of the study results for the European steel producers and -distributors mainly depend on the realistic representation of IT projects in the European steel industry. The participation of small and medium sized companies and smaller and less spectacular IT projects is thus as important as the participation of larger companies and large-scale IT projects. By participating with more than one project you can actively contribute to a realistic representation of IT projects and the usefulness the study's findings, also for your own company.

A 3.6 Questions and answers for the selection and specification of IT projects

Thank you for specifying a project for your study participation.

Who should answer the online questionnaire for the specified project?

In addition to yourself, there should be at least one more manager and three employees from the department(s)/ company area(s) affected by the specified IT-project.

How can candidates for the online questionnaire be invited?

A prepared standard letter of invitation including the project reference of the project just specified is offered in the grey box below. It can either be copied or comfortably downloaded as a PDF for emailing to the questionnaire candidates selected for this IT-project.

How can you complete the questionnaire?

If you wish to complete the questionnaire for the project you have just specified yourself, please use the same link and project code presented in the invitation letter below.

Must the candidates for the questionnaire be nominated now or my questionnaire be completed immediately or can this be done at a later date?

You do not need to nominate candidates or answer the questionnaire directly. However, as this page and the project code below are specific to your specified project, you are welcome to save this page as a favourite site in your internet browser in order to continue working with it at a later time. This page will be available for you until the end of the study (End June 2010). If you close this page without having saved it, this page will be lost. (You might be lucky to use the RETURN-button of your internet browser).

How could further IT-project be specified by our company?

You have two options to specify further company IT projects.

1. Below the gray-marked invitation letter for questionnaire candidates you will find a link which will bring you back to the empty project specification form.
2. Use the link provided in your study invitation letter.

Please take care. If you have not saved the project code of your actual project, this data will be lost when returning to the project specification form

Appendix 4 – Details of the statistical analysis

A 4.1 Normality

Question	Assessment of normality			
	Skew	c.r.	Kurtosis	c.r.
H1	-1.96	-9.34	2.95	7.05
H2	-2.39	-11.42	3.85	9.20
H3	-2.18	-10.42	4.11	9.81
H4	-1.58	-7.53	1.61	3.84
H5	-2.09	-9.98	3.45	8.24
H6	-1.17	-5.58	0.87	2.08
H7	-0.61	-2.93	-1.04	-2.49
H8	-2.34	-11.19	3.96	9.47
H9	-1.70	-8.14	1.33	3.17
H10	-1.28	-6.13	0.80	1.90
H11	-1.62	-7.76	2.09	4.99
H12	-0.79	-3.75	0.48	1.14
H13	-1.38	-6.59	1.37	3.27
H14	-0.95	-4.55	1.15	2.75
H15	-1.86	-8.88	2.04	4.87
H16	-1.08	-5.15	-0.05	-0.12
H17	-1.17	-5.57	0.06	0.14
H18	-1.72	-8.22	1.40	3.35
H19	-1.62	-7.73	1.92	4.60
H20	-2.24	-10.69	7.48	17.86
H21	-2.11	-10.09	4.61	11.02
H22	-2.30	-10.98	5.25	12.55
H23	-2.41	-11.50	4.26	10.18
H24	-2.47	-11.78	4.39	10.50
H25	-2.63	-12.58	5.50	13.13
S1	-0.76	-3.64	-1.21	-2.88
S2	-2.04	-9.77	5.59	13.37
S3	0.68	3.24	-1.00	-2.38
S 4	-2.27	-10.84	7.94	18.98
S 5	-1.80	-8.61	3.06	7.30
S 6	-1.65	-7.89	2.62	6.26
S 7	-0.97	-4.61	-0.76	-1.81
S 8	-1.56	-7.45	3.41	8.15
S 9	0.77	3.68	-0.77	-1.84
S 10	-1.25	-5.96	0.33	0.80
S 11	-0.62	-2.97	-1.29	-3.07
S 12	-0.42	-1.98	-1.46	-3.48
S 13				
S 14	-1.72	-8.23	2.92	6.97
S 15	1.34	6.42	0.91	2.18
S 16	-0.68	-3.27	-1.11	-2.65
S 17	0.58	2.76	-1.04	-2.47
S 18	1.04	4.97	-0.54	-1.29
S 19	-1.91	-9.11	2.00	4.77
S 20	-2.13	-10.16	2.93	6.99
S 21	-0.84	-4.01	-0.03	-0.07
S 22	1.61	7.71	3.59	8.58

Appendix 4 – Details of the statistical analysis

S 23	0.49	2.33	-1.33	-3.17
S 24	-1.57	-7.50	3.20	7.63
S 25	-0.21	-1.02	-1.45	-3.47
W1	0.83	3.97	-0.21	-0.49
W2	-0.51	-2.42	-0.96	-2.29
W3	-0.21	-1.00	-1.39	-3.31
W4	-1.20	-5.75	0.75	1.79
W5	-1.70	-8.12	2.66	6.36
W6	-1.50	-7.14	2.39	5.72
W7	-1.83	-8.74	3.89	9.29
W8	-0.89	-4.26	0.50	1.20
W9	-0.38	-1.81	-0.86	-2.05
W10	-0.25	-1.22	-0.60	-1.44
W11	-1.35	-6.44	1.58	3.76
E1	-0.57	-2.74	-1.33	-3.17
E2	-0.52	-2.48	-1.24	-2.96
E3	-1.04	-4.97	-0.22	-0.53
E4	-1.48	-7.06	1.23	2.94
E5	-1.80	-8.60	2.36	5.63
E6	-1.58	-7.54	1.54	3.67
E7	-1.35	-6.45	0.81	1.95
E8	-1.19	-5.67	0.15	0.36
E9	-1.59	-7.61	1.16	2.76
E10	-1.52	-7.28	1.76	4.21
E11	-1.20	-5.73	0.48	1.16
E12	-1.73	-8.27	2.04	4.87
Multivariate			230.12	13.05

Regression Weights - ML Estimate				Bootstrap			
		Estimate	S.E.	SE	%-Difference (SE Bootstrap and SE ML Estimate)	SE-SE	Bias (Difference Bias Bootstrap and Bias Bootstrap ML)
Change Success	<--- Change Readiness	0,843	0,062	0,062	0%	0,002	0,003
IT Success	<--- Change Readiness	0,455	0,099	0,127	28%	0,004	-0,017
Change Success	<--- Shared	0,286	0,075	0,097	29%	0,003	-0,01
CSE	<--- Change Readiness	0,642	0,059	0,106	80%	0,003	0,002
change discrepancy	<--- Change Readiness	1		0		0	0
Managememt Support	<--- Change Readiness	0,237	0,064	0,103	61%	0,003	0
Personal valence	<--- Change Readiness	0,875	0,053	0,062	17%	0,002	-0,006
Organisational valence	<--- Change Readiness	0,937	0,061	0,044	-28%	0,001	0,001
Project Success	<--- Change Success	0,45	0,069	0,098	42%	0,003	0,004

Appendix 4 – Details of the statistical analysis

Project Success	<---	IT Success	1,14	0,269	0,722	168%	0,023	0,18
E09	<---	Project Success	1		0		0	0
E10	<---	Project Success	0,779	0,069	0,098	42%	0,003	0,001
E12	<---	Project Success	0,671	0,081	0,124	53%	0,004	-0,001
E11	<---	Project Success	0,929	0,074	0,069	-7%	0,002	0,001
E01	<---	IT Success	1		0		0	0
E02	<---	IT Success	1,159	0,287	0,559	95%	0,018	0,096
E03	<---	IT Success	1,736	0,368	1,204	227%	0,038	0,284
E04	<---	IT Success	1,655	0,356	1,238	248%	0,039	0,307
E05	<---	Change Success	1		0		0	0
E06	<---	Change Success	1,031	0,058	0,06	3%	0,002	-0,001
E08	<---	Change Success	0,997	0,081	0,092	14%	0,003	-0,002
E07	<---	Change Success	0,649	0,091	0,159	75%	0,005	-0,011
H10	<---	Organisational valence	0,898	0,077	0,035	-55%	0,001	-0,004
H04	<---	Organisational valence	1		0		0	0
H25	<---	Personal valence	0,941	0,051	0,054	6%	0,002	-0,002
H24	<---	Personal valence	0,561	0,059	0,114	93%	0,004	-0,003
H23	<---	Personal valence	1		0		0	0
H08	<---	Personal valence	0,988	0,059	0,041	-31%	0,001	0
H07	<---	Personal valence	0,714	0,119	0,124	4%	0,004	-0,002
H06	<---	Personal valence	0,709	0,084	0,094	12%	0,003	-0,007
H09	<---	change discrepancy	0,997	0,061	0,032	-48%	0,001	-0,003
H05	<---	change discrepancy	1		0		0	0
H03	<---	change discrepancy	0,961	0,032	0,024	-25%	0,001	0,001
H02	<---	change discrepancy	0,925	0,06	0,058	-3%	0,002	-0,005
H16	<---	Management Support	0,991	0,3	0,982	227%	0,031	0,189
H15	<---	Management Support	1		0		0	0
H14	<---	Management Support	1,568	0,344	1,383	302%	0,044	0,25
H13	<---	Management Support	1,37	0,313	0,843	169%	0,027	0,197
H12	<---	Management Support	1,87	0,407	1,613	296%	0,051	0,324
H11	<---	Management Support	1,587	0,341	0,995	192%	0,031	0,227
H22	<---	CSE	0,586	0,092	0,181	97%	0,006	0,007

Appendix 4 – Details of the statistical analysis

H21	<--- CSE	1		0	0%	0	0
H20	<--- CSE	0,547	0,06	0,127	112%	0,004	0,004
H19	<--- CSE	0,965	0,096	0,16	67%	0,005	0,009
H18	<--- CSE	1,1	0,099	0,137	38%	0,004	0,003
H17	<--- CSE	0,946	0,127	0,189	49%	0,006	0,005
H01	<--- Organisational valence	1,072	0,057	0,028	-51%	0,001	0,001
W04	<--- Shared	0,99	0,12	0,131	9%	0,004	0,012
W09	<--- Shared	0,77	0,138	0,146	6%	0,005	0,006
W08	<--- Shared	0,966	0,116	0,136	17%	0,004	0,014
W07	<--- Shared	0,628	0,105	0,193	84%	0,006	0,015
W06	<--- Shared	0,699	0,097	0,171	76%	0,005	0,012
W05	<--- Shared	1		0		0	0

A 4.2 Outliers– Mahalanobis distance

Observations farthest from the centroid
(Mahalanobis distance)

Observation number	Mahalanobis d-squared	p1	p2	D ² /df
29	113.148	0.002	0.22	0.045
88	109.248	0.004	0.099	0.043
42	107.639	0.005	0.035	0.042
92	106.594	0.006	0.011	0.042
78	106.58	0.006	0.002	0.042
26	105.067	0.008	0.001	0.041
56	105.001	0.008	0	0.041
46	104.925	0.009	0	0.041
41	102.33	0.013	0	0.040
12	99.676	0.021	0.001	0.039
59	98.809	0.024	0	0.039
65	98.723	0.024	0	0.039
101	98.309	0.026	0	0.039
44	96.955	0.032	0	0.038
4	95.943	0.037	0	0.038
18	94.955	0.043	0	0.037
75	94.794	0.044	0	0.037
82	94.143	0.049	0	0.037
48	92.813	0.059	0	0.037
70	92.354	0.063	0	0.036
111	92.312	0.063	0	0.036
106	92.165	0.064	0	0.036
128	90.196	0.084	0.001	0.036
66	89.916	0.087	0.001	0.035
131	89.836	0.088	0	0.035
69	89.284	0.095	0	0.035
102	88.197	0.109	0.002	0.035
30	88.07	0.11	0.001	0.035
103	87.676	0.116	0.001	0.035
45	87.672	0.116	0	0.035
108	86.75	0.13	0.001	0.034
133	86.206	0.138	0.002	0.034
132	86.117	0.14	0.001	0.034
84	85.929	0.143	0.001	0.034

Appendix 4 – Details of the statistical analysis

117	84.907	0.161	0.003	0.034
28	84.882	0.161	0.002	0.033
96	84.346	0.171	0.003	0.033
19	83.13	0.196	0.013	0.033
68	82.941	0.2	0.011	0.033
27	82.901	0.201	0.007	0.033
32	82.43	0.211	0.009	0.033
87	81.663	0.228	0.021	0.032
37	81.325	0.236	0.023	0.032
53	81.285	0.237	0.015	0.032
7	80.875	0.247	0.019	0.032
74	80.435	0.258	0.026	0.032
114	80.287	0.261	0.021	0.032
90	79.179	0.29	0.075	0.031
71	78.55	0.307	0.12	0.031
121	78.144	0.319	0.143	0.031
2	77.485	0.338	0.221	0.031
57	77.337	0.342	0.201	0.031
100	75.922	0.385	0.51	0.030
55	75.654	0.393	0.519	0.030
113	75.603	0.394	0.465	0.030
83	75.011	0.413	0.572	0.030
10	74.645	0.425	0.612	0.029
99	74.177	0.44	0.679	0.029
76	74.116	0.442	0.633	0.029
127	74.036	0.444	0.59	0.029
35	73.68	0.456	0.629	0.029
135	73.58	0.459	0.592	0.029
61	73.388	0.465	0.583	0.029
54	73.228	0.47	0.564	0.029
11	72.83	0.484	0.617	0.029
36	72.811	0.484	0.557	0.029
49	72.792	0.485	0.495	0.029
94	72.578	0.492	0.492	0.029
120	72.544	0.493	0.435	0.029
115	72.429	0.497	0.403	0.029
33	72.063	0.509	0.448	0.028
16	71.921	0.514	0.425	0.028
8	71.461	0.529	0.5	0.028
9	71.273	0.535	0.49	0.028
80	71.223	0.537	0.438	0.028
129	70.984	0.545	0.444	0.028
1	70.815	0.551	0.429	0.028
126	70.799	0.551	0.368	0.028
38	70.315	0.567	0.449	0.028
134	69.762	0.586	0.554	0.028
93	69.371	0.599	0.607	0.027
109	69.304	0.601	0.56	0.027
91	69.201	0.604	0.523	0.027
72	68.781	0.618	0.585	0.027
14	68.67	0.622	0.551	0.027
123	68.612	0.624	0.499	0.027
64	68.229	0.636	0.55	0.027

Appendix 4 – Details of the statistical analysis

119	66.23	0.699	0.938	0.026
81	66.038	0.705	0.935	0.026
107	65.728	0.715	0.942	0.026
43	65.564	0.72	0.936	0.026
6	65.232	0.73	0.946	0.026
118	65.188	0.731	0.927	0.026
110	64.629	0.747	0.957	0.026
62	63.467	0.779	0.993	0.025
15	63.16	0.788	0.994	0.025
23	62.614	0.802	0.997	0.025
34	62.178	0.813	0.998	0.025
63	62.147	0.814	0.997	0.025
31	61.663	0.825	0.998	0.024

Source: Hetkamp 2011; developed for this study

A 4.3 Multicollinearity

	Tolerance (> 0.2)	VIF (≤5)	Increase Standard Error (S.E.) due to multicollinearity by factor
IT Success	0.419	2.393	0.547
E01	0.430	2.326	0.525
E02	0.405	2.469	0.571
E03	0.390	2.562	0.601
E04	0.452	2.215	0.488
Org Change Success	0.47	2.232	0.494
E05	0.469	2.132	0.460
E06	0.366	2.730	0.652
E07	0.395	2.530	0.590
E08	0.651	1.537	0.240
Project Success	0.345	3.326	0.824
E09	0.283	3.531	0.879
E10	0.204	4.892	1.212
E11	0.572	1.748	0.322
E12	0.319	3.132	0.770
Readiness for Change	0.663	1.525	0.235
Organisational Valence	.214	4.678	1.163
Personal Valence	.230	4.341	1.083
Change Discrepancy	.175	5.712	1.390
Management Support	.767	1.304	.142
Change Self Efficacy	.514	1.946	.395
H01	.971	1.030	.015
H02	.234	4.282	1.069
H03	.069	14.455	2.802
H04	.207	4.833	1.198
H05	.087	11.502	2.391
H06	.410	2.442	.563
H07	.536	1.865	.366
H08	.206	4.863	1.205
H09	.245	4.079	1.020
H10	.334	2.995	.730

Appendix 4 – Details of the statistical analysis

H11	.336	2.978	.726
H12	.312	3.205	.790
H13	.346	2.894	.701
H14	.377	2.651	.628
H15	.548	1.825	.351
H16	.745	1.343	.159
H17	.510	1.961	.401
H18	.374	2.671	.634
H19	.383	2.610	.616
H20	.427	2.344	.531
H21	.264	3.789	.946
H22	.539	1.855	.362
H23	.144	6.956	1.637
H24	.456	2.193	.481
H25	.153	6.525	1.554
Knowledge of Change Management	0.333	4.3	1.074
Individual Response	.694	1.440	.200
General Nature	.920	1.087	.043
Planing Change	.916	1.091	.045
Managing People Side	.659	1.516	.231
Managing Org Side	.779	1.284	.133
Evaluating Change	.971	1.030	.015
S01	.553	1.807	.344
S02	.761	1.315	.147
S03	.637	1.569	.253
S04	.699	1.431	.196
S05	.709	1.411	.188
S06	.733	1.364	.168
S07	.620	1.614	.270
S08	.639	1.564	.251
S09	.569	1.759	.326
S10	.626	1.596	.263
S11	.752	1.330	.153
S12	.638	1.567	.252
S13	.663	1.509	.228
S14	.606	1.651	.285
S15	.746	1.341	.158
S16	.739	1.353	.163
S17	.745	1.343	.159
S18	.520	1.922	.386
S19	.661	1.513	.230
S20	.687	1.456	.207
S21	.600	1.666	.291
S22	.635	1.576	.255
S23	.657	1.523	.234
S24	.602	1.662	.289
S25	.780	1.282	.132
Participative Style	3.4462	0.07888	0.4392
Anti Unilateral Style	.970	1.031	.016
Shared Style	.806	1.241	.114
Support	.793	1.261	.123
W01	.563	1.776	.333
W02	.434	2.306	.518
W03	.466	2.147	.465

Appendix 4 – Details of the statistical analysis

W04	.541	1.850	.360
W05	.404	2.474	.573
W06	.516	1.937	.392
W07	.603	1.657	.287
W08	.499	2.005	.416
W09	.656	1.526	.235
W10	.837	1.195	.093
W11	.483	2.068	.438

Source: Hetkamp 2011; developed for this study

Standardized Regression Weights		Test for Multicollinearity (Estimate >1)
Change_self-efficacy	<--- Change_Readiness	0.774
change_discrepancy	<--- Change_Readiness	0.987
Management_Support	<--- Change_Readiness	0.49
Personal_valence	<--- Change_Readiness	0.927
Organisational_valence	<--- Change_Readiness	0.951
HA10	<--- Organisational_valence	0.773
HA4	<--- Organisational_valence	0.872
HA25	<--- Personal_valence	0.92
HA24	<--- Personal_valence	0.666
HA23	<--- Personal_valence	0.921
HA8	<--- Personal_valence	0.887
HA7	<--- Personal_valence	0.478
HA6	<--- Personal_valence	0.619
HA9	<--- change_discrepancy	0.84
HA5	<--- change_discrepancy	0.959
HA3	<--- change_discrepancy	0.971
HA2	<--- change_discrepancy	0.832
HA16	<--- Management_Support	0.379
HA15	<--- Management_Support	0.428
HA14	<--- Management_Support	0.794
HA13	<--- Management_Support	0.601
HA12	<--- Management_Support	0.87
HA11	<--- Management_Support	0.704
HA22	<--- Change_self-efficacy	0.523
HA21	<--- Change_self-efficacy	0.896
HA20	<--- Change_self-efficacy	0.68
HA19	<--- Change_self-efficacy	0.725
HA18	<--- Change_self-efficacy	0.781
HA17	<--- Change_self-efficacy	0.59
HA1	<--- Organisational_valence	0.984
Individual_Response	<--- Knowledge about_change management	0.985
General_Nature	<--- Knowledge about_change management	0.947
Planning_Change	<--- Knowledge about_change management	0.299
Managing_People Side	<--- Knowledge about_change management	1.002

Appendix 4 – Details of the statistical analysis

Managing_Org Side	<--- Knowledge about_change management	0.999
Evaluating_Change	<--- Knowledge about_change management	0.972
S01	<--- Individual_Response	0.967
S05	<--- Individual_Response	0.958
S12	<--- Individual_Response	0.969
S10	<--- General_Nature	0.966
S25	<--- General_Nature	0.971
S03	<--- Managing_People Side	0.92
S04	<--- Managing_People Side	0.924
S07	<--- Managing_People Side	0.942
S08	<--- Managing_People Side	0.969
S11	<--- Managing_People Side	0.938
S16	<--- Managing_Org Side	0.93
S20	<--- Managing_Org Side	0.847
S21	<--- Managing_Org Side	0.74
S24	<--- Managing_Org Side	0.913
S13	<--- Evaluating_Change	0.935
S18	<--- Evaluating_Change	0.933
S19	<--- Evaluating_Change	0.947
S22	<--- Evaluating_Change	0.931
S02	<--- Planning_Change	0.081
S06	<--- Planning_Change	-0.115
S09	<--- Planning_Change	0.186
S14	<--- Planning_Change	0.394
S15	<--- Planning_Change	-0.462
S17	<--- Planning_Change	-0.521
S23	<--- Planning_Change	0.545
Anti_unilateral	<--- Participative Style	0.001
Shared	<--- Participative Style	6.082
Support	<--- Participative Style	0.132
WA1	<--- Anti_unilateral	0.236
WA2	<--- Anti_unilateral	0.666
WA3	<--- Anti_unilateral	0.692
WA4	<--- Shared	0.719
WA9	<--- Shared	0.572
WA8	<--- Shared	0.745
WA7	<--- Shared	0.579
WA6	<--- Shared	0.674
WA5	<--- Shared	0.871
WA10	<--- Support	0.71
WA11	<--- Support	0.748
EA9	<--- Project_Success	0.763
EA10	<--- Project_Success	0.875
EA12	<--- Project_Success	0.613
EA11	<--- Project_Success	0.841
EA1	<--- IT_Success	0.694
EA2	<--- IT_Success	0.894
EA3	<--- IT_Success	0.534
EA4	<--- IT_Success	0.401
EA5	<--- Change_Success	0.859

Appendix 4 – Details of the statistical analysis

EA6	<---	Change_Success	0.971
EA8	<---	Change_Success	0.796
EA7	<---	Change_Success	0,551

Source: Hetkamp 2011; developed for this study

A 4.4 Descriptive statistics

A 4.4.1 Descriptive statistics on construct-, sub-construct- and indicator level

(Sub-) Constructs	Mean	Standard Error	Standard Deviation	Variance
Knowledge of Change Management	3.4969	.07128	.39686	.157
Individual Response	3.9570	.15438	.85955	.739
General Nature	3.3226	.16321	.90874	.826
Planning Change	3.1290	.07821	.43543	.190
Managing People Side	3.7419	.13510	.75223	.566
Managing Org Side	3.9919	.10719	.59681	.356
Evaluating Change	2.8387	.08718	.48541	.236
Readiness for Change	4.0733	.17040	.94873	.900
Organisational Valence	4.0215	.23028	1.28217	1.644
Personal Valence	4.2323	.18965	1.05590	1.115
Change Discrepancy	4.1774	.24241	1.34968	1.822
Management Support	3.7742	.14095	.78475	.616
Change Self Efficacy	4.1613	.15754	.87716	.769
Participative Style	3.4462	.07888	.43920	.193
Anti Unilateral Style	3.2796	.15465	.86108	.741
Shared Style	3.7366	.13864	.77193	.596
Support	3.3226	.15820	.88080	.776
IT Success	3.2258	.19515	1.08657	1.181
Org Change Success	3.9597	.25083	1.39657	1.950
Project Success	3.9194	.22965	1.27865	1.635

Variables per Construct	Mean	Standard Error	Standard Deviation	Variance
IT Success	3.2258	.19515	1.08657	1.181
E01	2.71	.294	1.637	2.680
E02	2.81	.238	1.327	1.761
E03	3.52	.266	1.480	2.191
E04	3.87	.231	1.284	1.649
Org Change Success	3.9597	.25083	1.39657	1.950

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E05	4.19	.243	1.352	1.828
E06	4.00	.262	1.461	2.133
E07	3.74	.266	1.483	2.198
E08	3.90	.276	1.535	2.357
Project Success	3.9194	.22965	1.27865	1.635
E09	3.87	.277	1.544	2.383
E10	3.97	.243	1.354	1.832
E11	3.84	.263	1.463	2.140
E12	4.00	.236	1.317	1.733
Readiness for Change	4.0733	.17040	.94873	.900
H01	4.16	.241	1.344	1.806
H02	4.39	.257	1.430	2.045
H03	4.19	.243	1.352	1.828
H04	4.06	.236	1.315	1.729
H05	4.16	.241	1.344	1.806
H06	3.90	.199	1.106	1.224
H07	3.90	.247	1.375	1.890
H08	4.39	.235	1.308	1.712
H09	3.97	.272	1.516	2.299
H10	3.84	.250	1.393	1.940
H11	3.94	.196	1.093	1.196
H12	3.42	.221	1.232	1.518
H13	4.00	.185	1.033	1.067
H14	3.68	.176	.979	.959
H15	4.42	.226	1.259	1.585
H16	3.19	.247	1.376	1.895
H17	3.55	.274	1.524	2.323
H18	4.23	.248	1.383	1.914
H19	4.03	.215	1.197	1.432
H20	4.58	.101	.564	.318
H21	4.16	.223	1.241	1.540
H22	4.42	.159	.886	.785
H23	4.45	.212	1.179	1.389
H24	4.65	.171	.950	.903
H25	4.52	.201	1.122	1.258
Knowledge of Change Management	3.4969	.07128	.39686	.157
S01	4.26	.232	1.290	1.665
S02	4.16	.105	.583	.340
S03	2.52	.231	1.288	1.658
S04	4.48	.146	.811	.658
S05	4.00	.213	1.183	1.400
S06	4.16	.154	.860	.740

Appendix 4 – Details of the statistical analysis

S07	3.77	.257	1.431	2.047
S08	4.32	.117	.653	.426
S09	2.42	.231	1.285	1.652
S10	4.10	.214	1.193	1.424
S11	3.61	.257	1.430	2.045
S12	3.61	.257	1.430	2.045
S13	3.35	.230	1.279	1.637
S14	4.10	.214	1.193	1.424
S15	2.42	.235	1.311	1.718
S16	3.71	.242	1.346	1.813
S17	2.55	.236	1.312	1.723
S18	1.61	.211	1.174	1.378
S19	4.48	.196	1.092	1.191
S20	4.74	.146	.815	.665
S21	3.16	.218	1.214	1.473
S22	1.90	.182	1.012	1.024
S23	2.10	.251	1.399	1.957
S24	4.35	.127	.709	.503
S25	2.55	.240	1.338	1.789
Participative Style	3.4462	.07888	.43920	.193
W01	2.68	.182	1.013	1.026
W02	3.71	.208	1.160	1.346
W03	3.45	.222	1.234	1.523
W04	3.84	.186	1.036	1.073
W05	4.16	.168	.934	.873
W06	4.10	.142	.790	.624
W07	4.13	.195	1.088	1.183
W08	3.32	.193	1.077	1.159
W09	2.87	.226	1.258	1.583
W10	2.94	.232	1.289	1.662
W11	3.71	.213	1.189	1.413

A 4.4.2 Average construct score per respondent profile

Gender	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
Male	78 percent	3.57	4.27	3.54	3.74	4.07	4.14
Female	22 percent	3.58	3.84	3.82	3.26	3.78	3.78

Age	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
20-29 years	9 percent	3.60	3.98	3.63	3.48	3.85	3.83

Appendix 4 – Details of the statistical analysis

30-39 years	33 percent	3.65	4.32	3.59	3.67	4.26	4.28
40-49 years	42 percent	3.52	4.12	3.59	3.72	3.86	4.03
>50 years	16 percent	3.53	4.12	3.63	3.42	3.99	3.81

Nationality of Participants	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
Austria	7 percent	3.55	3.99	3.56	3.73	4.03	4.03
Belgium	8 percent	3.39	3.58	3.42	3.02	3.27	3.14
Brazil	1 percent	3.15	4.40	3.33	4.25	4.50	4.50
France	7 percent	3.51	3.93	3.62	2.94	3.78	3.47
Germany	61 percent	3.58	4.30	3.57	3.79	4.13	4.26
India	1 percent	3.19	4.57	3.39	4.63	4.38	4.50
Italy	2 percent	3.74	3.12	3.94	3.08	3.50	3.25
Luxembourg	1 percent	3.31	1.94	3.33	1.00	1.00	1.00
Netherlands	6 percent	3.79	4.52	3.90	3.94	4.06	4.63
Poland	1 percent	3.75	3.81	3.72	4.25	3.25	2.25
Spain	1 percent	4.11	4.93	3.78	4.00	5.00	5.00
Switzerland	2 percent	4.23	4.46	3.78	2.75	4.25	3.38
Turkey	2 percent	3.55	4.47	4.04	3.42	4.42	4.42

Org. Status	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
IT Manager	21 percent	3.67	4.52	3.61	4.60	4.32	4.54
Employee	50 percent	3.53	3.90	3.63	3.41	3.82	3.92
Functional Manager	29 percent	3.57	4.40	3.54	3.31	4.12	3.96

Education	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
None	0 percent						
Professional training	25 percent	3.58	3.86	3.72	3.33	3.83	3.84
Specialized training	52 percent	3.56	4.42	3.53	3.88	4.23	4.28
Bachelor/ Master	12 percent	3.51	3.62	3.83	3.17	3.39	3.55
Doctoral degree	11 percent	3.67	4.31	3.41	3.63	4.00	4.07

Corporate affiliation	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
< 10 years	36 percent	3.61	4.16	3.58	3.59	3.95	4.06
11- 20 years	28 percent	3.56	4.29	3.63	3.86	4.10	4.28
20- 30 years	27 percent	3.56	4.25	3.64	3.78	4.21	4.18

Appendix 4 – Details of the statistical analysis

31- 40 years	9 percent	3.51	3.70	3.47	2.69	3.38	3.10
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Perceived frequency of Org. Change	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
Very Low	0 percent	0	0	0	0	0	0
Low	5 percent	3.97	4.41	3.70	3.96	4.32	4.36
Medium	43 percent	3.61	4.31	3.67	3.71	4.19	4.19
High	47 percent	3.49	4.01	3.56	3.46	3.78	3.89
Very High	5 percent	3.59	4.31	3.12	4.33	4.29	4.33

Appendix 4 – Details of the statistical analysis

Average construct score per project profile

Company Size (No of Employees)	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
<50	0 percent						
50 - 250	0 percent						
251 - 500	0 percent						
501 - 1000	0 percent						
1001 - 2500	11 percent	3.59	4.48	3.33	3.44	4.42	4.54
2500 - 5000	30 percent	3.62	3.98	4.04	3.66	3.85	3.99
>5000	59 percent	3.56	4.15	3.48	3.53	3.95	3.96

Department mainly effected by the project (Multiple selection were possible)	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
Marketing/ Sales	30 percent	3.64	4.33	3.47	3.40	4.18	4.00
Human Resources	0 percent						
Research/ Technique	8 percent	3.81	4.28	3.78	2.93	4.15	3.68
Production	34 percent	3.53	4.09	3.38	3.34	3.89	3.86
Administration/ Maintenance	8 percent	3.53	4.27	3.32	2.95	4.15	3.60
Accounting/ Finance	12 percent	3.59	4.25	3.39	2.86	4.09	3.70
Customer relation department	4 percent	3.19	2.97	3.58	2.45	2.60	2.50
Purchasing	4 percent	3.30	4.47	3.37	4.40	4.45	4.45
IT	4 percent	3.71	3.40	3.82	3.55	3.60	3.70
Logistics	38 percent	3.59	4.05	3.89	3.62	3.81	3.98

Project focus	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
New IT-system	57 percent	3.61	4.09	3.75	3.44	3.99	4.01
System replacement	24 percent	3.54	4.34	3.40	3.60	3.97	4.21
System update	0 percent						
System extension	19 percent	3.52	4.03	3.55	3.84	3.90	3.87

Functional IT focus	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success

Appendix 4 – Details of the statistical analysis

Transaction System	76 percent	3.55	4.05	3.67	3.54	3.88	3.91
Knowledge System	24 percent	3.66	4.44	3.51	3.60	4.26	4.41
Decision Support System	0 percent						
Executive Support System	0 percent						

Project Budget (in €)	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
> 10.000	0 percent						
- 99.999	7 percent	3.64	4.24	3.18	4.06	3.59	4.38
- 250.000	55 percent	3.59	4.09	3.81	3.64	4.00	4.11
- 500.000	9 percent	3.58	4.10	3.35	3.50	3.80	3.66
- 2,5 Mio.	17 percent	3.47	4.39	3.51	3.88	4.34	4.35
- 5 Mio.	4 percent	3.71	3.40	3.82	3.55	3.60	3.70
- 20 Mio.	8 percent	3.58	4.24	3.28	2.03	3.73	3.18

Project duration (in months)	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
3	3 percent	3.60	4.22	3.28	4.63	3.69	4.31
6	34 percent	3.62	4.01	3.95	3.64	3.82	4.04
9	9 percent	3.75	4.45	3.87	3.82	4.34	4.25
10	3 percent	3.55	4.02	3.63	4.50	4.13	4.44
12	8 percent	3.44	3.51	3.57	2.53	3.19	3.14
17	11 percent	3.59	4.48	3.33	3.44	4.42	4.54
18	19 percent	3.51	4.12	3.40	4.09	4.12	4.10
22	4 percent	3.77	4.08	3.28	1.50	3.85	2.75
24	5 percent	3.35	4.58	3.54	3.45	4.50	4.65
36	4 percent	3.40	4.41	3.28	2.55	3.60	3.60

No of effected employees	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
<50	22 percent	3.51	4.08	3.41	3.60	3.91	4.10
- 250	44 percent	3.61	4.15	3.93	3.79	4.08	4.21
- 500	31 percent	3.57	4.15	3.38	3.30	3.86	3.74
- 1000	0 percent						
- 2500	0 percent						
- 5000	0 percent						
>5000	3 percent	3.75	4.20	3.56	2.63	3.94	3.94

Standard Software used	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
Yes	60 percent	3.61	4.04	3.79	3.74	3.91	3.95

Appendix 4 – Details of the statistical analysis

No	40 percent	3.53	4.28	3.39	3.29	4.06	4.15
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No of effected locations	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
1	28 percent	3.48	4.22	3.43	3.59	4.18	4.29
2 -5	42 percent	3.63	4.00	3.90	3.69	3.86	3.99
6 -10	11 percent	3.59	4.30	3.30	2.87	3.67	3.96
11 -20	13 percent	3.64	4.34	3.64	3.42	4.25	3.93
>20	6 percent	3.49	4.05	3.23	4.00	3.71	3.50

Roll-Out approach	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
Big-Bang	49 percent	3.61	4.11	3.87	3.81	3.94	4.19
Step-wise Roll-Out	51 percent	3.54	4.16	3.40	3.31	4.00	3.89

Size of org. change caused	Deviation	Knowledge	Employee Readiness	Participative Style	IT Success	Change Success	Project Success
Very small	0 percent						
Small	10 percent	3.68	4.22	3.31	3.58	3.71	4.23
Medium	61 percent	3.57	4.10	3.81	3.61	3.96	4.04
Large	21 percent	3.58	4.15	3.40	3.62	4.06	4.08
Very large	8 percent	3.53	4.27	3.32	2.95	4.15	3.60

A 4.5 Reliability and validity

A 4.5.1 Assessment of uni-dimensionality of the measurement indicators using an EFA

Construct	Sub-Construct			
Readiness for Change	Organisational Valence	Kaiser-Meyer-Olkin. (≥ 0.6)		.739
		Bartlett-Test (not significant)	Chi-Square (approx.)	300.990
			df	3
			Significance of Bartlett	.000
		Indicators	MSA (> 0.5)	Communality (> 0.5)
		H01	.943	.889
		H04	.936	.876
		H10	.896	.803
		Sum of squared factor loadings		2.569
		Percentage of explained variance (percent)		85.640
	Personal Valence	Kaiser-Meyer-Olkin. (≥ 0.6)		.847
		Bartlett-Test (not significant)	Chi-Square (approx.)	545.019
			df	15
			Significance of Bartlett	.000
		Indicators	MSA (> 0.5)	Communality (> 0.5)
		H06	.712	.507
		H07	.591	.349
		H08	.898	.807
		H23	.915	.838
		H24	.736	.542
	H25	.902	.813	
	Sum of squared factor loadings		3.857	
	Percentage of explained variance (percent)		64.284	
	Change Discrepancy	Kaiser-Meyer-Olkin. (≥ 0.6)		.810
		Bartlett-Test (not significant)	Chi-Square (approx.)	585.123
			df	6
			Significance of Bartlett	.000
		Indicators	MSA (> 0.5)	Communality (> 0.5)
		H02	.890	.793
		H03	.955	.912
		H05	.955	.913
H09		.904	.817	
Sum of squared factor loadings		3.434		
Percentage of explained variance (percent)		85.856		
Management Support	Kaiser-Meyer-Olkin. (≥ 0.6)		.753	
	Bartlett-Test (not significant)	Chi-Square (approx.)	308.720	
		df	15	
		Significance of Bartlett	.000	
	Indicators	MSA (> 0.5)	Communality (> 0.5)	
	H11	.828	.686	
	H12	.843	.711	
	H13	.761	.580	
H14	.772	.596		

Appendix 4 – Details of the statistical analysis

		H15	.536	.287	
		H16	.465	.216	
	Sum of squared factor loadings			3.075	
	Percentage of explained variance (percent)			51.254	
	Change Self Efficacy	Kaiser-Meyer-Olkin. (>= 0.6)			.815
		Bartlett-Test (not significant)	Chi-Square (approx.)	353.406	
			df	15	
			Significance of Bartlett	.000	
		Indicators	MSA (> 0.5)	Communality (> 0.5)	
		H17	.672	.451	
		H18	.797	.635	
		H19	.796	.634	
		H20	.775	.601	
		H21	.872	.761	
	H22	.648	.420		
Sum of squared factor loadings			3.502		
Percentage of explained variance (percent)			58.367		

Construct	Sub-Construct				
Knowledge of Change Management	Individual Response	Kaiser-Meyer-Olkin. (>= 0.6)		.506	
		Bartlett-Test (not significant)	Chi-Square (approx.)	5.750	
			df	3	
			Significance of Bartlett	.124	
		Indicators	MSA (> 0.5)	Communality (> 0.5)	
		S01	.751	.564	
		S05	.764	.584	
		S12	.252	.063	
		Sum of squared factor loadings			1.211
		Percentage of explained variance (percent)			40.364
	General Nature	Kaiser-Meyer-Olkin. (>= 0.6)		.500	
		Bartlett-Test (not significant)	Chi-Square (approx.)	1.371	
			df	1	
			Significance of Bartlett	.242	
		Indicators	MSA (> 0.5)	Communality (> 0.5)	
		S10	.742	.550	
		S25	.742	.550	
		Sum of squared factor loadings			1.101
		Percentage of explained variance (percent)			55.036
		Planning Change	Kaiser-Meyer-Olkin. (>= 0.6)		.578
	Bartlett-Test (not significant)		Chi-Square (approx.)	51.994	
			df	21	
			Significance of Bartlett	.000	
	Indicators		MSA (> 0.5)	Communality (> 0.5)	
S02	.117		.654		
S06	-.185		.808		
S09	.254		.663		
S14	.552		.426		
S15	-.629		.463		
S17	-.657	.519			

Appendix 4 – Details of the statistical analysis

		S23	.679	.464	
		Sum of squared factor loadings		3.997	
	Percentage of explained variance (percent)		57.102		
	Managing People Side	Kaiser-Meyer-Olkin. (>= 0.6)			.762
		Bartlett-Test (not significant)	Chi-Square (approx.)		321.375
			df		10
			Significance of Bartlett		.000
		Indicators		MSA (> 0.5)	Communality (> 0.5)
		S03	.922	.849	
		S04	.864	.747	
		S07	.664	.441	
		S08	.863	.746	
		S11	.414	.171	
	Sum of squared factor loadings		2.954		
	Percentage of explained variance (percent)		59.075		
	Managing Org Side	Kaiser-Meyer-Olkin. (>= 0.6)			.574
		Bartlett-Test (not significant)	Chi-Square (approx.)		22.258
			df		6
			Significance of Bartlett		.001
		Indicators		MSA (> 0.5)	Communality (> 0.5)
		S16	.170	.930	
		S20	.610	.392	
		S21	.695	.563	
		S24	.766	.592	
		Sum of squared factor loadings		2.478	
	Percentage of explained variance (percent)		61.946		
	Evaluating Change	Kaiser-Meyer-Olkin. (>= 0.6)			.548
Bartlett-Test (not significant)		Chi-Square (approx.)		9.007	
		df		6	
		Significance of Bartlett		.173	
Indicators		MSA (> 0.5)	Communality (> 0.5)		
S13		.733	.538		
S18		-.569	.323		
S19		.614	.377		
S22		.247	.061		
Sum of squared factor loadings		1.300			
Percentage of explained variance (percent)		32.492			

Construct	Sub-Construct				
Participative Style	Anti Unilateral Style	Kaiser-Meyer-Olkin. (>= 0.6)			.520
		Bartlett-Test (not significant)	Chi-Square (approx.)		96.811
			df		3
			Significance of Bartlett		.000
		Indicators		MSA (> 0.5)	Communality (> 0.5)
		W01	.407	.166	
		W02	.910	.828	
W03	.886	.786			
Sum of squared factor loadings		1.779			

Appendix 4 – Details of the statistical analysis

		Percentage of explained variance (percent)	59.307
Shared Style	Kaiser-Meyer-Olkin. (>= 0.6)		.803
	Bartlett-Test (not significant)	Chi-Square (approx.)	262,698
		df	15
		Significance of Bartlett	,000
	Indicators	MSA (> 0,5)	Communality (> 0,5)
	W04	,725	,526
	W05	,838	,702
	W06	,716	,512
	W07	,666	,444
	W08	,771	,594
W09	,606	,367	
	Sum of squared factor loadings		3,145
	Percentage of explained variance (percent)		52,409
Support	Kaiser-Meyer-Olkin. (>= 0,6)		,500
	Bartlett-Test (not significant)	Chi-Square (approx.)	.725
		df	1
		Significance of Bartlett	,394
	Indicators	MSA (> 0.5)	Communality (> 0.5)
	W10	.733	.537
	W11	.733	.537
	Sum of squared factor loadings		1.073
	Percentage of explained variance (percent)		53.667

Construct	Sub-Construct			
Success of the IT Solution	Success of the IT Solution	Kaiser-Meyer-Olkin. (>= 0.6)		.624
		Bartlett-Test (not significant)	Chi-Square (approx.)	252.753
			df	6
			Significance of Bartlett	.000
		Indicators	MSA (> 0.5)	Communality (> 0.5)
		E01	.771	.883
		E02	.817	.868
		E03	.836	.865
		E04	.732	.896
			Sum of squared factor loadings	
	Percentage of explained variance (percent)		87.779	

Construct	Sub-Construct			
Change Success	Change Success	Kaiser-Meyer-Olkin. (>= 0.6)		.745
		Bartlett-Test (not significant)	Chi-Square (approx.)	364.148
			df	6
			Significance of Bartlett	.000
		Indicators	MSA (> 0.5)	Communality (> 0.5)
		E05	.864	.746
		E06	.926	.858
		E07	.733	.538
		E08	.903	.815
			Sum of squared factor loadings	

Appendix 4 – Details of the statistical analysis

		Percentage of explained variance (percent)	73.912	
Construct	Sub-Construct			
Project Success	Project Success	Kaiser-Meyer-Olkin. (≥ 0.6)		.806
		Bartlett-Test (not significant)	Chi-Square (approx.)	260.806
			df	6
			Significance of Bartlett	.000
		Indicators	MSA (> 0.5)	Communality (> 0.5)
		E09	.854	.729
		E10	.886	.786
		E11	.871	.758
		E12	.747	.558
		Sum of squared factor loadings		2.830
Percentage of explained variance (percent)		70.756		

Source: Hetkamp 2010; following (Weiber & Mühlhaus 2010)

A 4.5.2 Reliability assessment with first generation goodness criteria

Construct	Sub-Construct	Indicators	Cronbach Alpha (standard.) (≥ 0.7)	Inter-Item Correlation (≥ 0.3)	Corrected Item Scale Correlation (≥ 0.3)	Cronbach Alpha (with this item)
Readiness for Change	Organisational Valence	H01	0.916	0.784	.865	.850
		H04			.848	.861
		H10			.777	.921
	Personal Valence	H06	0.883	0.557	.636	.852
		H07			.494	.894
		H08			.800	.823
		H23			.814	.822
		H24			.590	.862
		H25			.803	.826
	Change Discrepancy	H02	0.945	0.81	.810	.940
		H03			.911	.911
		H05			.911	.909
		H09			.831	.936
	Management Support	H11	0.797	0.396	.683	.718
		H12			.698	.716
		H13			.604	.738
		H14			.611	.740
		H15			.382	.791
		H16			.324	.813
	Change Self Efficacy	H17	0.854	0.494	.556	.836
H18		.672			.803	
H19		.672			.802	
H20		.637			.821	
H21		.773			.787	
H22		.517			.832	

Appendix 4 – Details of the statistical analysis

Construct	Sub-Construct	Indicators	Cronbach Alpha (standard.) (>= 0.7)	Inter-Item Correlation (>= 0.3)	Corrected Item Scale Correlation (>= 0.3)	Cronbach Alpha (without this item)
Knowledge of Change Management	Individual Response	S01	0.228	0.09	.133	.083
		S05			.170	.048
		S12			.043	.319
	General Nature	S10	0.183	0.101	.101	a.
		S25			.101	a.
	Planning Change	S02	-0.128	-0.016	-.008	-.186
		S06			.100	-.307
		S09			-.053	-.148
		S14			-.037	-.163
		S15			-.122	-.068
		S17			-.113	-.065
	Managing People Side	S23	0.539	0.189	-.100	-.081
		S03			.310	.453
		S04			.239	.501
		S07			.307	.452
		S08			.310	.464
	Managing Org Side	S11	0.382	0.134	.334	.436
		S16			.049	.459
S20		.215			.258	
S21		.209			.246	
Evaluating Change	S24	0.008	0.002	.313	.156	
	S13			.001	-.082	
	S18			-.152	.233	
	S19			.095	-.195	
	S22			.037	-.110	

Construct	Sub-Construct	Indicators	Cronbach Alpha (standard.) (>= 0.7)	Inter-Item Correlation (>= 0.3)	Corrected Item Scale Correlation (>= 0.3)	Cronbach Alpha (without this item)
Participative Style	Anti Unilateral Style	W01	0.618	0.351	.190	.822
		W02			.635	.233
		W03			.552	.357
	Shared Style	W04	0.883	0.424	.580	.776
		W05			.716	.748
		W06			.561	.781
		W07			.508	.790
		W08			.626	.764
		W09			.464	.807
	Support	W10	0.137	0.073	.073	.a
		W11			.073	.a

Appendix 4 – Details of the statistical analysis

Construct	Sub-Construct	Indicators	Cronbach Alpha (standard.) (>= 0.7)	Inter-Item Correlation (>= 0.3)	Corrected Item Scale Correlation (>= 0.3)	Cronbach Alpha (with this item)
Success of the IT Solution	Success of the IT Solution	E01	0.798	0.497	.605	.750
		E02			.675	.709
		E03			.652	.724
		E04			.515	.788
Change Success	Change Success	E05	0.880	0.646	.732	.848
		E06			.839	.806
		E07			.586	.902
		E08			.815	.813
Project Success	Project Success	E09	0.861	0.607	.725	.813
		E10			.775	.795
		E11			.744	.804
		E12			.589	.866

Source: Hetkamp 2011; following (Weiber & Mülhhaus 2010)

A 4.5.3 Reliability assessment with second generation goodness criteria

Construct	Sub-Construct	Indicators	CFA Results			Reliability Analysis			
			Factor loading (p=***)	Squared Factor loading (SMC)	Error variance	Indicator reliability (>=0.4)	Sub-Construct reliability (>=0.6)	Average variance Extracted (>=0.5)	
Readiness for Change	Organisational Valence	H01	0.984	0.968	0.032	0.968	0.911	0.775	
		H04	0.872	0.760	0.240	0.760			
		H10	0.773	0.598	0.402	0.598			
		<i>Sum</i>	2.629			2.326	0.674		
		<i>Squared Sum</i>	6.912						
	Personal Valence	H06	0.619	0.383	0.617	0.383	0.891	0.589	
		H07	0.478	0.228	0.772	0.228			
		H08	0.887	0.787	0.213	0.787			
		H23	0.921	0.848	0.152	0.848			
		H24	0.666	0.444	0.556	0.444			
		H25	0.92	0.846	0.154	0.846			
		<i>Sum</i>	4.491			3.537	2.463		
	<i>Squared Sum</i>	20.169							
	Change Discrepancy	H02	0.832	0.692	0.308	0.692	0.946	0.815	
		H03	0.971	0.943	0.057	0.943			
		H05	0.959	0.920	0.080	0.920			
		H09	0.84	0.706	0.294	0.706			
		<i>Sum</i>	3.602			3.260	0.740		
	<i>Squared Sum</i>	12.974							
	Management Support	H11	0.704	0.496	0.504	0.496	0.806	0.428	
H12		0.87	0.757	0.243	0.757				
H13		0.601	0.361	0.639	0.361				
H14		0.794	0.630	0.370	0.630				

Appendix 4 – Details of the statistical analysis

Change Self Efficacy	H15	0.428	0.183	0.817	0.183			
	H16	0.379	0.144	0.856	0.144			
	<i>Sum Squared Sum</i>	3.776	2.571	3.429				
		14.258						
	H17	0.59	0.348	0.652	0.348	0.855	0.504	
	H18	0.781	0.610	0.390	0.610			
	H19	0.725	0.526	0.474	0.526			
	H20	0.68	0.462	0.538	0.462			
	H21	0.896	0.803	0.197	0.803			
	H22	0.523	0.274	0.726	0.274			
	<i>Sum Squared Sum</i>	4.195	3.022	2.978				
		17.598						

Construct	Sub-Construct	Indicators	CFA Results			Reliability Analysis		
			Factor loading (p=***)	Squared Factor loading (SMC)	Error variance	Indicator reliability (>=0.4)	Sub-Construct reliability (>=0.6)	Average variance Extracted (>=0.5)
Knowledge of Change Mngt.	Individual Response	S01	0.967	0.935	0.065	0.935	0.976	0.931
		S05	0.958	0.918	0.082	0.918		
		S12	0.969	0.939	0.061	0.939		
		<i>Sum Squared Sum</i>	2.894	2.792	0.208			
	General Nature	S10	0.966	0.933	0.067	0.933	0.968	0.938
		S25	0.971	0.943	0.057	0.943		
		<i>Sum Squared Sum</i>	1.937	1.876	0.124			
	Planning Change	S02	0.091	0.008	0.992	0.008	0.000	0.157
		S06	-0.158	0.025	0.975	0.025		
		S09	0.153	0.023	0.977	0.023		
		S14	0.392	0.154	0.846	0.154		
		S15	-0.468	0.219	0.781	0.219		
		S17	-0.564	0.318	0.682	0.318		
		S23	0.594	0.353	0.647	0.353		
	<i>Sum Squared Sum</i>	0.040	1.100	5.900				
	Managing People Side	S03	0.92	0.846	0.154	0.846	0.974	0.881
		S04	0.924	0.854	0.146	0.854		
		S07	0.942	0.887	0.113	0.887		
		S08	0.969	0.939	0.061	0.939		
		S11	0.938	0.880	0.120	0.880		
		<i>Sum Squared Sum</i>	4.693	4.406	0.594			
	Managing Org Side	S16	0.93	0.865	0.135	0.865	0.919	0.741
		S20	0.847	0.717	0.283	0.717		
		S21	0.74	0.548	0.452	0.548		
S24		0.913	0.834	0.166	0.834			

Appendix 4 – Details of the statistical analysis

		<i>Sum</i>	3.430	2.963	1.037			
		<i>Squared Sum</i>	11.765					
Evaluating Change		S13	0.935	0.874	0.126	0.874	0.966	0.877
		S18	0.933	0.870	0.130	0.870		
		S19	0.947	0.897	0.103	0.897		
		S22	0.931	0.867	0.133	0.867		
		<i>Sum</i>	3.746	3.508	0.492			
		<i>Squared Sum</i>	14.033					

Construct	Sub-Construct	Indicators	CFA Results			Reliability Analysis		
			Factor loading (p=***)	Squared Factor loading (SMC)	Error variance	Indicator reliability (>=0.4)	Sub-Construct reliability (>=0.6)	Average variance Extracted (>=0.5)
Participative Style	Anti Unilateral Style	W01	0.079	0.006	0.994	0.006	0.816	0.684
		W02	1.208	1.459	-0.459	1.459		
		W03	0.766	0.587	0.413	0.587		
		<i>Sum</i>	2.053	2.052	0.948			
		<i>Squared Sum</i>	4.215					
	Shared Style	W04	0.664	0.441	0.559	0.441	0.822	0.439
		W05	0.542	0.294	0.706	0.294		
		W06	0.709	0.503	0.497	0.503		
		W07	0.567	0.321	0.679	0.321		
		W08	0.653	0.426	0.574	0.426		
		W09	0.804	0.646	0.354	0.646		
	<i>Sum</i>	3.939	2.632	3.368				
		<i>Squared Sum</i>	15.516					
	Support	W10	0.103	0.011	0.989	0.011	0.312	0.877
		W11	0.715	0.511	0.489	0.511		
<i>Sum</i>		0.818	0.522	1.478				
	<i>Squared Sum</i>	0.669						

Construct	Sub-Construct	Indicators	CFA Results			Reliability Analysis		
			Factor loading (p=***)	Squared Factor loading (SMC)	Error variance	Indicator reliability (>=0.4)	Sub-Construct reliability (>=0.6)	Average variance Extracted (>=0.5)
Success of the IT Solution	Success of the IT Solution	E01	0.374	0.140	0.860	0.140	0.751	0.460
		E02	0.457	0.209	0.791	0.209		
		E03	0.820	0.672	0.328	0.672		
		E04	0.904	0.817	0.183	0.817		
		<i>Sum</i>	2.555	1.838	2.162			
	<i>Squared Sum</i>	6.528						
Change Success	Change Success	E05	0.898	0.806	0.194	0.806	0.884	0.662
		E06	0.926	0.857	0.143	0.857		
		E07	0.571	0.326	0.674	0.326		
		E08	0.812	0.659	0.341	0.659		
		<i>Sum</i>	3.177	2.618	1.382			
	<i>Squared Sum</i>	10.093						
Project	Project	E09	0.846	0.716	0.284	0.716	0.872	0.633

Appendix 4 – Details of the statistical analysis

Success	Success	E10	0.827	0.684	0.316	0.684		
		E11	0.855	0.731	0.269	0.731		
		E12	0.635	0.403	0.597	0.403		
		<i>Sum Squared</i>	<i>3.163</i>	<i>2.534</i>	<i>1.466</i>			
		<i>Sum</i>	<i>10.005</i>					

Source: Hetkamp 2011; following (Weiber & Mühlhaus 2010)

A 4.5.4 Validity assessment with second generation goodness criteria

Test of Chi² difference

Readiness for change (Chi ² = 540.76)	Change self-efficacy	Management Support	Change discrepancy	Personal valence	Organisational valence
Change self-efficacy	1				
Management Support	62.04	1			
Change discrepancy	14.64	23.34	1		
Personal valence	22.64	30.14	32.54	1	
Organisational valence	22.74	29.296	-3.538	-1.32	1

Knowledge of change management (Chi ² = 4623.946)	Evaluating Change	Managing Org Side	Managing People Side	Planning Change	General Nature	Individual Response
Evaluating Change	1					
Managing Org Side	not identifiable	1				
Managing People Side	-32.302	-46.431	1			
Planning Change	-50.27	-36.579	-44.852	1		
General Nature	not identifiable	-46.444	-31.783	-44.352	1	
Individual Response	not identifiable	-45.811	-26.913	-50.486	not identifiable	1

Participative change style (Chi ² = 247.924)	Support	Shared	Anti unilateral
Support	1		
Shared	46.369	1	

Appendix 4 – Details of the statistical analysis

Anti unilateral	82.245	-0.999	1
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Success (Chi ² = 373.633)	IT Success	Project Success	Change Success
IT Success	1		
Project Success	-80.595	1	
Change Success	-73.129	-88.103	1

Fornell-Larcker-criteria – Squared pair wise correlation compared to AVE

Readiness for Change	AVE	Change self-efficacy	Management Support	Change discrepancy	Personal valence	Organisational valence
AVE		0.502	0.428	0.815	0.859	0.775
Change self-efficacy	0.502	1.000				
Management Support	0.428	0.144	1.000			
Change discrepancy	0.815	0.585	0.234	1.000		
Personal valence	0.859	0.516	0.206	0.839	1.000	
Organisational valence	0.775	0.543	0.217	0.882	0.778	1.000

Knowledge about change management	AVE	Evaluating Change	Managing Org Side	Managing People Side	Planning Change	General Nature	Individual Response
AVE		0.877	0.741	0.881	0.142	0.938	0.931
Evaluating Change	0.877	1.000					
Managing Org Side	0.741	0.943	1.000				
Managing People Side	0.881	0.949	1.000	1.000			
Planning Change	0.142	0.084	0.089	0.089	1.000		
General Nature	0.938	0.848	0.895	0.899	0.080	1.000	
Individual Response	0.931	0.918	0.968	0.974	0.086	0.870	1.000

Participative change style	AVE	Support	Shared	Anti unilateral
AVE		0.877	0.491	0.326
Support	0.877	1		
Shared	0.491	0.650	1.000	

Appendix 4 – Details of the statistical analysis

Anti unilateral	0.326	0.000	0.000	1
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Success	AVE	IT Success	Project Success	Change Success
AVE		0,432	0,608	0,654
IT Success	0.432	1.000		
Project Success	0.608	0.964	1.000	
Change Success	0.654	0.526	0.850	1.000

A 4.6. 2nd Reliability assessment study model with second generation goodness criteria

		Indicators	Factor loading (p=***)	Squared Factor loading (SMC)	Error variance	Indicator reliability (>=0.4)	Sub-Construct reliability (>=0.6)	Average variance Extracted (>=0.5)
Study Model	Chance Success	Readiness for change	0.875	0.766	0.234	0.766	0.372	0.267
		Knowledge about CM	0.118	0.014	0.986	0.014		
		Participative Style	0.148	0.022	0.978	0.022		
		<i>Sum</i>	<i>1.141</i>	<i>0.801</i>	<i>2.199</i>			
		<i>Squared Sum</i>	<i>1.302</i>					
Study Model	IT Success	Readiness for change	0.700	0.490	0.510	0.490	0.234	0.169
		Knowledge about CM	0.070	0.005	0.995	0.005		
		Participative Style	0.104	0.011	0.989	0.011		
		<i>Sum</i>	<i>0.874</i>	<i>0.506</i>	<i>2.494</i>			
		<i>Squared Sum</i>	<i>0.764</i>					
Study Model	Project Success	Change Success	0.442	0.195	0.805	0.195	0.502	0.346
		IT Success	0.705	0.497	0.503	0.497		
		<i>Sum</i>	<i>1.147</i>	<i>0.692</i>	<i>1.308</i>			
		<i>Squared Sum</i>	<i>1.316</i>					

Readiness for Change	Organisational Valence	H01	0.981	0.962	0.038	0.962	0.912	0.776
		H04	0.874	0.764	0.236	0.764		
		H10	0.776	0.602	0.398	0.602		
		<i>Sum</i>	<i>2.631</i>	<i>2.328</i>	<i>0.672</i>			
	<i>Squared Sum</i>	<i>6.922</i>						
	Personal Valence	H06	0.623	0.388	0.612	0.388	0.891	0.590
		H07	0.480	0.230	0.770	0.230		
		H08	0.886	0.785	0.215	0.785		

Appendix 4 – Details of the statistical analysis

		H23	0.920	0.846	0.154	0.846		
		H24	0.665	0.442	0.558	0.442		
		H25	0.920	0.846	0.154	0.846		
		<i>Sum</i>	4.494	3.539	2.461			
		<i>Squared Sum</i>	20.196					
	Change Discrep ancy	H02	0.827	0.684	0.316	0.684	0.946	0.814
		H03	0.969	0.939	0.061	0.939		
		H05	0.962	0.925	0.075	0.925		
		H09	0.841	0.707	0.293	0.707		
		<i>Sum</i>	3.599	3.256	0.744			
	<i>Squared Sum</i>	12.953						
	Manage ment Support	H11	0.705	0.497	0.503	0.497	0.806	0.429
		H12	0.870	0.757	0.243	0.757		
		H13	0.601	0.361	0.639	0.361		
		H14	0.793	0.629	0.371	0.629		
		H15	0.430	0.185	0.815	0.185		
		H16	0.378	0.143	0.857	0.143		
		<i>Sum</i>	3.777	2.572	3.428			
	<i>Squared Sum</i>	14.266						
	Change Self Efficacy	H17	0.593	0.352	0.648	0.352	0.855	0.504
		H18	0.783	0.613	0.387	0.613		
H19		0.724	0.524	0.476	0.524			
H20		0.676	0.457	0.543	0.457			
H21		0.895	0.801	0.199	0.801			
H22		0.524	0.275	0.725	0.275			
<i>Sum</i>		4.195	3.021	2.979				
<i>Squared Sum</i>	17.598							

Appendix 4 – Details of the statistical analysis

		Indicators	CFA Results			Reliability Analysis		
			Factor loading (p=***)	Squared Factor loading (SMC)	Error variance	Indicator reliability (>=0.4)	Sub-Construct reliability (>=0.6)	Average variance Extracted (>=0.5)
Know- ledge of CM	Individual Response	S01	0.327	0.107	0.893	0.107	0.289	0.162
		S05	0.61	0.372	0.628	0.372		
		S12	0.075	0.006	0.994	0.006		
		<i>Sum</i>	<i>1.012</i>	<i>0.485</i>	<i>2.515</i>			
		<i>Squared Sum</i>	<i>1.024</i>					
	General Nature	S10	1.136	1.290	-0.290	1.290	0.681	0.649
		S25	0.089	0.008	0.992	0.008		
		<i>Sum</i>	<i>1.225</i>	<i>1.298</i>	<i>0.702</i>			
		<i>Squared Sum</i>	<i>1.501</i>					
	Planning Change	S02	0.100	0.010	0.990	0.010	0.001	0.132
		S06	-0.156	0.024	0.976	0.024		
		S09	0.117	0.014	0.986	0.014		
		S14	0.309	0.095	0.905	0.095		
		S15	-0.390	0.152	0.848	0.152		
		S17	-0.512	0.262	0.738	0.262		
		S23	0.606	0.367	0.633	0.367		
	<i>Sum</i>	<i>0.074</i>	<i>0.925</i>	<i>6.075</i>				
	<i>Squared Sum</i>	<i>0.005</i>						
	Managing People Side	S03	0.734	0.539	0.461	0.539	0.629	0.266
		S04	0.339	0.115	0.885	0.115		
S07		0.453	0.205	0.795	0.205			
S08		0.456	0.208	0.792	0.208			
S11		0.511	0.261	0.739	0.261			
<i>Sum</i>		<i>2.493</i>	<i>1.328</i>	<i>3.672</i>				
<i>Squared Sum</i>	<i>6.215</i>							
Managing Org Side	S16	0.371	0.138	0.862	0.138	0.190	0.075	
	S20	0.264	0.070	0.930	0.070			
	S21	-0.009	0.000	1.000	0.000			
	S24	0.306	0.094	0.906	0.094			
	<i>Sum</i>	<i>0.932</i>	<i>0.301</i>	<i>3.699</i>				
<i>Squared Sum</i>	<i>0.869</i>							
Evaluating Change	S13	0.305	0.093	0.907	0.093	0.001	0.086	
	S18	-0.433	0.187	0.813	0.187			
	S19	0.212	0.045	0.955	0.045			
	S22	-0.135	0.018	0.982	0.018			
	<i>Sum</i>	<i>-0.051</i>	<i>0.344</i>	<i>3.656</i>				
<i>Squared Sum</i>	<i>0.003</i>							

Appendix 4 – Details of the statistical analysis

		Indicators	CFA Results			Reliability Analysis		
			Factor loading (p=***)	Squared Factor loading (SMC)	Error variance	Indicator reliability (>=0.4)	Sub-Construct reliability (>=0.6)	Average variance Extracted (>=0.5)
Participative Style	Anti Unilateral Style	W01	0.081	0.007	0.993	0.007	1.766	2.236
		W02	2.575	6.631	-5.631	6.631		
		W03	0.268	0.072	0.928	0.072		
		<i>Sum</i>	2.924	6.709	-3.709			
		<i>Squared Sum</i>	8.550					
	Shared Style	W04	0.660	0.436	0.564	0.436	0.822	0.438
		W05	0.807	0.651	0.349	0.651		
		W06	0.646	0.417	0.583	0.417		
		W07	0.568	0.323	0.677	0.323		
		W08	0.704	0.496	0.504	0.496		
		W09	0.555	0.308	0.692	0.308		
		<i>Sum</i>	3.940	2.630	3.370			
	<i>Squared Sum</i>	15.524						
Support	W10	0.105	0.011	0.989	0.011	0.300	0.086	
	W11	0.697	0.486	0.514	0.486			
	<i>Sum</i>	0.802	0.497	1.503				
	<i>Squared Sum</i>	0.643						
Success of the IT Solution	Success of the IT Solution	E01	0.395	0.156	0.844	0.156	0.754	0.459
		E02	0.477	0.228	0.772	0.228		
		E03	0.817	0.667	0.333	0.667		
		E04	0.886	0.785	0.215	0.785		
	<i>Sum</i>	2.575	1.836	2.164				
<i>Squared Sum</i>	6.631							
Change Success	Change Success	E05	0.914	0.835	0.165	0.835	0.865	0.625
		E06	0.900	0.810	0.190	0.810		
		E07	0.763	0.582	0.418	0.582		
		E08	0.521	0.271	0.729	0.271		
	<i>Sum</i>	3.098	2.499	1.501				
<i>Squared Sum</i>	9.598							
Project Success	Project Success	E09	0.831	0.691	0.309	0.691	0.841	0.573
		E10	0.756	0.572	0.428	0.572		
		E11	0.606	0.367	0.633	0.367		
		E12	0.814	0.663	0.337	0.663		
	<i>Sum</i>	3.007	2.292	1.708				
<i>Squared Sum</i>	9.042							

A 4.7. Model modification

A 4.7.1 Reliability Assessment of 2nd modified model

		Indicators	Factor loading (p=***)	Squared Factor loading (SMC)	Error variance	Indicator reliability (>=0.4)	Sub-Construct reliability (>=0.6)	Average variance Extracted (>=0.5)
Study Model	Chance Success	Readiness for change	0.874	0.764	0.236	0.764	0.468	0.298
		Knowledge about CM	0.322	0.104	0.896	0.104		
		Participative Style	0.166	0.028	0.972	0.028		
		<i>Sum Squared Sum</i>	<i>1.362</i>	<i>0.895</i>	<i>2.105</i>			
Study Model	IT Success	Readiness for change	0.736	0.542	0.458	0.542	0.353	0.212
		Knowledge about CM	0.284	0.081	0.919	0.081		
		Participative Style	0.115	0.013	0.987	0.013		
		<i>Sum Squared Sum</i>	<i>1.135</i>	<i>0.636</i>	<i>2.364</i>			
Study model	Project success	Change success	0.643	0.413	0.587	0.413	0.417	0.277
		IT Success	0.375	0.141	0.859	0.141		
		<i>Sum Squared Sum</i>	<i>1.018</i>	<i>0.554</i>	<i>1.446</i>			
		<i>Sum Squared Sum</i>	<i>1.036</i>					

Know-ledge of CM	S03	0.327	0.107	0.893	0.107	0.085	1.291
	S10	0.734	0.539	0.461	0.539		
	<i>Sum Squared Sum</i>	<i>1.061</i>	<i>0.646</i>	<i>1.354</i>			

Participat iver style	W04	0.674	0.454	0.546	0.454	0.949	7.499
	W05	0.878	0.771	0.229	0.771		
	W06	0.613	0.376	0.624	0.376		
	W08	0.690	0.476	0.524	0.476		
	W11	0.600	0.360	0.640	0.360		
	<i>Sum Squared Sum</i>	<i>3.455</i>	<i>2.437</i>	<i>0.640</i>			

Appendix 4 – Details of the statistical analysis

Construct	Sub-construct	Indicators	CFA Results				Reliability Analysis	
			Factor loading (p=***)	Squared factor loading (SMC)	Error variance	Indicator reliability (>=0.4)	Sub-construct reliability (>=0.6)	Average variance Extracted (>=0.5)
Readiness for change	Organisational valence	H01	0.982	0.964	0.036	0.964	0.912	0.776
		H04	0.874	0.764	0.236	0.764		
		H10	0.775	0.601	0.399	0.601		
		<i>Sum</i>	2.631	2.329	0.671			
		<i>Squared Sum</i>	6.922					
	Personal valence	H06	0.612	0.375	0.625	0.375	0.905	0.662
		H08	0.887	0.787	0.213	0.787		
		H23	0.923	0.852	0.148	0.852		
		H24	0.669	0.448	0.552	0.448		
		H25	0.922	0.850	0.150	0.850		
		<i>Sum</i>	4.013	3.311	1.689			
	<i>Squared Sum</i>	16.104						
	Change discrepancy	H02	0.827	0.684	0.316	0.684	0.946	0.814
		H03	0.969	0.939	0.061	0.939		
		H05	0.962	0.925	0.075	0.925		
		H09	0.842	0.709	0.291	0.709		
		<i>Sum</i>	3.600	3.257	0.743			
	<i>Squared Sum</i>	12.960						
	Management support	H11	0.624	0.389	0.611	0.389	0.835	0.634
		H12	0.918	0.843	0.157	0.843		
		H14	0.818	0.669	0.331	0.669		
		<i>Sum</i>	2.360	1.901	1.099			
	<i>Squared Sum</i>	5.570						
	Change self-efficacy	H18	0.773	0.598	0.402	0.598	0.858	0.605
		H19	0.718	0.516	0.484	0.516		
H20		0.678	0.460	0.540	0.460			
H21		0.920	0.846	0.154	0.846			
<i>Sum</i>		3.089	2.419	1.581				
<i>Squared Sum</i>	9.542							
IT success	IT success	E03	0.760	0.578	0.422	0.578	0.853	2.987
		E04	0.957	0.916	0.084	0.916		
		<i>Sum</i>	1.717	1.493	0.507			
		<i>Squared Sum</i>	2.948					
Change success	Change success	E05	0.917	0.841	0.159	0.841	0.871	0.636
		E06	0.901	0.812	0.188	0.812		
		E07	0.537	0.288	0.712	0.288		
		E08	0.776	0.602	0.398	0.602		
		<i>Sum</i>	3.131	2.543	1.457			
<i>Squared Sum</i>	9.803							
Project success	Project success	E09	0.831	0.691	0.309	0.691	0.866	0.620
		E10	0.796	0.634	0.366	0.634		
		E11	0.880	0.774	0.226	0.774		
		E12	0.619	0.383	0.617	0.383		
		<i>Sum</i>	3.126	2.482	1.518			

Appendix 4 – Details of the statistical analysis

		Squared Sum	9.772	
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A 4.7.1 Estimates of 3rd modified model

Unstandardised Regression Weights		Estimate	S.E.	C.R.	P	Label
Change_success	<--- Change_readiness	1.427	.146	9.791	***	par_36
IT_success	<--- Change_readiness	.710	.166	4.281	***	par_37
Change_self-efficacy	<--- Change_readiness	1.000				
change_discrepancy	<--- Change_readiness	1.552	.140	11.074	***	par_30
Management_support	<--- Change_readiness	.375	.098	3.810	***	par_31
Personal_valence	<--- Change_readiness	1.360	.136	10.036	***	par_32
Organisational_valence	<--- Change_readiness	1.456	.149	9.761	***	par_33
Project_Success	<--- Change_success	.442	.062	7.119	***	par_34
Project_Success	<--- IT_success	1.147	.252	4.561	***	par_35
E09	<--- Project_success	1.000				
E10	<--- Project_success	.778	.069	11.227	***	par_1
E12	<--- Project_success	.669	.081	8.281	***	par_2
E11	<--- Project_success	.929	.073	12.674	***	par_3
E01	<--- IT_success	1.000				
E02	<--- IT_success	1.157	.295	3.924	***	par_4
E03	<--- IT_success	1.734	.362	4.786	***	par_5
E04	<--- IT_success	1.656	.340	4.870	***	par_6
E05	<--- Change_success	1.000				
E06	<--- Change_success	1.024	.056	18.316	***	par_7
E08	<--- Change_success	.972	.078	12.475	***	par_8
E07	<--- Change_success	.628	.088	7.123	***	par_9
H10	<--- Organisational_valence	.898	.077	11.701	***	par_10
H04	<--- Organisational_valence	1.000				
H25	<--- Personal_valence	.941	.051	18.506	***	par_11
H24	<--- Personal_valence	.562	.059	9.459	***	par_12
H23	<--- Personal_valence	1.000				
H08	<--- Personal_valence	.987	.060	16.552	***	par_13
H07	<--- Personal_valence	.715	.118	6.070	***	par_14
H06	<--- Personal_valence	.709	.083	8.569	***	par_15
H09	<--- change_discrepancy	.995	.061	16.277	***	par_16
H05	<--- change_discrepancy	1.000				
H03	<--- change_discrepancy	.961	.032	29.828	***	par_17
H02	<--- change_discrepancy	.925	.059	15.609	***	par_18
H16	<--- Management_support	.989	.292	3.384	***	par_19
H15	<--- Management_support	1.000				
H14	<--- Management_support	1.563	.322	4.855	***	par_20
H13	<--- Management_support	1.367	.312	4.384	***	par_21
H12	<--- Management_support	1.862	.376	4.957	***	par_22
H11	<--- Management_support	1.583	.339	4.674	***	par_23
H22	<--- Change_self-efficacy	.587	.091	6.466	***	par_24
H21	<--- Change_self-efficacy	1.000				
H20	<--- Change_self-efficacy	.547	.061	9.014	***	par_25
H19	<--- Change_self-efficacy	.966	.097	9.990	***	par_26
H18	<--- Change_self-efficacy	1.103	.097	11.332	***	par_27
H17	<--- Change_self-efficacy	.948	.125	7.565	***	par_28
H01	<--- Organisational_valence	1.071	.057	18.830	***	par_29

Appendix 4 – Details of the statistical analysis

Standardised Regression Weights			Estimate
Change_success	<---	Change_readiness	.897
IT_success	<---	Changereadiness	.732
Change_self-efficacy	<---	Change_readiness	.792
change_discrepancy	<---	Change_readiness	.981
Management_support	<---	Change_readiness	.511
Personal_valence	<---	Change_readiness	.928
Organisational_valence	<---	Change_readiness	.950
Project_success	<---	Change_success	.433
Project_success	<---	IT_success	.684
E09	<---	Project_success	.848
E10	<---	Project_success	.775
E12	<---	Project_uccess	.626
E11	<---	Project_sSuccess	.834
E01	<---	IT_success	.408
E02	<---	IT_success	.492
E03	<---	IT_success	.830
E04	<---	IT_success	.894
E05	<---	Change_success	.929
E06	<---	Change_success	.915
E08	<---	Change_success	.779
E07	<---	Change_success	.545
H10	<---	Organisational_valence	.777
H04	<---	Organisational_valence	.875
H25	<---	Personal_valence	.921
H24	<---	Personal_valence	.666
H23	<---	Personal_valence	.919
H08	<---	Personal_valence	.885
H07	<---	Personal_valence	.481
H06	<---	Personal_valence	.623
H09	<---	change_discrepancy	.840
H05	<---	change_discrepancy	.962
H03	<---	change_discrepancy	.970
H02	<---	change_discrepancy	.827
H16	<---	Management_support	.379
H15	<---	Management_support	.432
H14	<---	Management_support	.793
H13	<---	Management_support	.602
H12	<---	Management_support	.868
H11	<---	Management_support	.706
H22	<---	Change_self-efficacy	.525
H21	<---	Change_self-efficacy	.894
H20	<---	Change_self-efficacy	.675
H19	<---	Change_self-efficacy	.724
H18	<---	Change_self-efficacy	.785
H17	<---	Change_self-efficacy	.594
H01	<---	Organisational_valence	.980

Appendix 4 – Details of the statistical analysis

Squared Multiple Correlations	Estimate
Change_readiness	.000
Change_success	.805
IT_success	.536
Change_self-efficacy	.628
Management_support	.261
change_discrepancy	.961
Personal_valence	.862
Organisational_valence	.903
Project_success	1.044
H01	.961
H17	.353
H18	.616
H19	.525
H20	.456
H21	.799
H22	.275
H11	.499
H12	.754
H13	.363
H14	.629
H15	.187
H16	.144
H02	.684
H03	.940
H05	.926
H09	.705
H06	.389
H07	.231
H08	.784
H23	.845
H24	.443
H25	.848
H04	.765
H10	.604
E07	.297
E05	.863
E08	.607
E06	.837
E04	.799
E03	.688
E02	.242
E01	.167
E12	.391
E11	.695
E10	.600
E09	.719