



A Foundation

The first chapter of this cumulative dissertation is divided into five parts. It starts with insights into the field of IT innovation, explaining the motivation for this work and the role of IT in the innovation process of non-IT companies. The second part (A.2) presents the major research questions. Afterwards, Section A.3 describes the structure and overview of the studies included in this thesis, while Section A.4 explains the research design. Finally, the anticipated contribution is specified in Section A.5.



1 Motivation

Today's IT departments are undergoing a fundamental shift from acting as business-supporting units towards being drivers of innovation (Westermann et. al., 2014). For most IT departments, this means that business managers have a different expectation of their IT department's work than in previous decades. The original role of providing data or increasing the efficiency of existing processes (Guillemette and Paré, 2012) has become a major contributor to the innovation process (Melville et al., 2004). As firms constantly face global competition to be innovative, they are pressed to focus on corporate entrepreneurship (CE), which has a positive influence on innovation performance (Covin and Sievin, 1991). As a result, CE is garnering more attention in the area of innovation and management research (e.g., Carsrud and Brännback, 2011; Habtay, 2012). The special issue of the MISQ "Information Technology and Innovation" underlines the importance of that topic for the IS community as well. The challenge for firms is to integrate new digital technologies and IS components into non-IT goods to raise the value of their products (Nambisan, 2013). Even traditional industries like energy providers will have to address this challenge. Cyber physical systems – an integration of sensor and actuator networks into the physical grid – enable providers to predict maintenance and thereby improve their grid management. These new opportunities lead to new management strategies. For example, Volkswagen has also already started cooperation with leading IT companies Google and Apple (Volkswagen, 2014). These strategic alliances highlight the importance of traditional industries collaborating with the IT sector when internal IT is unable to develop the necessary innovations. Besides these changes, firms are challenged by consumerization (Gregory et al., 2014), the phenomenon of consumers bringing their technologies and expectations to the workplace (Ruch and Gregory, 2014), which turns the direction of innovation upside down. Today, innovation emerges from the private use of technology (Niehaves et al., 2012) and corporate IT is in danger of being dropped from the innovation process if they cannot fulfill these expectations (Gregory et al., 2014). In this case, business managers will collaborate with external partners and find a way around corporate IT (Niehaves et al., 2012). This dependence on external partners in such an important process as innovation is particularly dangerous. To avoid those dependencies, IT departments must transform their role from functioning as an operand resource to being an operant resource that triggers innovation (Nambisan, 2013). To create innovations in such



an interconnected environment, IT managers need to redefine their employees' focus towards a more innovative behavior (Leidner et al., 2010; Watts and Henderson, 2006). They must also create a company environment that allows employees to be innovative, as innovations come from the “machine rooms” of organizations, from each individual at the operational level (Kuratko and Audresch, 2009). Furthermore, internal IT departments should leave their familiar terrain and open up their innovation channels to the environment, e.g., customers and partners (Yoo et al., 2012). Concepts like open innovation (Chesbrough, 2003) are widely used in other areas of the company; IT must adopt these concepts to gain knowledge and new ideas from the external environment (Dahlander and Gann, 2010).

The goal of this thesis is to provide deeper insights into the field of IT innovation in non-IT companies. Practitioners like CIOs and middle managers of IT departments should be guided to choose the appropriate style of leadership to create an innovation environment for their employees. At the same time, further research should be supported by evaluating three research models presented in part B and shedding light onto the field of innovation in in-house IT departments. As this cumulative thesis sees itself as a starting point into the field of IT corporate entrepreneurship, it will design the path for further research in this field.

2 Research Questions

The innovativeness of IT departments is crucial not only for IT companies like Google or Apple but also for traditional industries, such as the automotive sector or energy suppliers. While IT technologies have been embedded in an increasingly wide range of products (Yoo et al., 2010), the path to innovation has changed in the last few years. Management innovation (Birkinshaw et al., 2008) as well as disruptive business models use new digital technologies to reduce the complexity of, e.g., communication with potential sources of innovation (Johnson et al., 2008). This is very important for concepts like open innovation, which build upon the exchange between a company and external partners (e.g., customers or vendors) (Chesbrough, 2003). Lichtenthaler (2011) defines open innovation as “[...] systematically performing knowledge exploration, retention, and exploitation inside and outside an organization’s boundaries throughout the innovation process.” This process of exchange can be supported by the use of social media and other parts of the Web 2.0, leading to a faster development of new ideas and products. Besides external influences,



new developments in the area of digital components, e.g., smaller sensors for wearables, lead to new opportunities and help add more digital value to products that were previously unconnected to the digital world (Woodard et al., 2013).

Kuratko and Audresch (2009) maintain that innovation comes from the operational level of a company. Therefore, managers must create an innovative environment that allows non-managing employees to be creative (Leidner et al., 2010; Watts and Henderson, 2006). Managers should motivate their employees to acquire new knowledge and experiment with new ideas (Floyd and Lane, 2000). This thesis addresses the lack of research regarding whether extrinsic motivation can be induced top-down to positively influence entrepreneurial intention (Wales et al., 2011). Accordingly, the first research question is derived as follows:

RQ1: Can extrinsic motivation influence IT employees' endogenous motivation towards a more entrepreneurial intention?

The changing role of IT in the business context does not only belong to technical innovations and the upcoming consumerization of IT; it also concerns corporate IT, which risks being left behind in this competition (Gregory et al., 2014). In this case, business managers might collaborate with external partners and develop innovations without involving their own IT employees (Niehaves et al., 2012). For internal IT this means facing the challenge of opening up to external partners, e.g., outsourcing partners or customers, and starting to collaborate with them. It is important that IT departments acquire the right knowledge at the right time, applying it and consolidating any necessary information for future use. Identifying and transferring knowledge from distant sources will be particularly challenging, as this is a complex task (Salge et al., 2012). However, open innovation introduced by Chesbrough (2003) might be the key for mastering this serious challenge. Managers must develop a strategy to anchor concepts, such as knowledge sourcing (Dahlander and Gann, 2010), thus creating the environment necessary for their employees to work innovatively. While the positive effect on the outcome and innovation process has already been verified for other industries (Davey et al., 2010), empirical evidence of the role of external innovation collaboration and openness in the context of business IT is lacking, along with research on the role of the individual level in this process (Kinnamon and Fabian, 2010). Therefore, RQ 2 is posed as follows:



RQ2: What is the influence of openness and absorptive capacity on IT entrepreneurship?

Alongside the key role of customers in the process of open innovation (Pralhad and Krishnan, 2008; Sawhney et al., 2005), IT outsourcing partners can be a source of knowledge for innovations. Because long-term partners (e.g., outsourcing partners) have a deep knowledge and understanding of the core business of their clients, they are able to provide the knowledge needed for innovation, making it easier for their client to adopt it. There are various prerequisites for a good exchange: reciprocity is positively related to the attitude of knowledge sharing (Bock et al., 2005) and the same applies to social interaction ties, which offer the best conditions for information exchange (Yli-Renko et al., 2001). Research question three therefore examines the role of social interaction in the innovation process.

RQ3: Are social interactions between internal IT employees and the outsourcing partners important in the process of internal innovation?

Section C deals with a practical application of IT innovation in non-IT industries. Global warming and increasing levels of greenhouse gases in the atmosphere are some of the biggest problems of this century, with risks for both humans as well as their natural surroundings (McMichael et al., 2006); environmental sustainability is one way of addressing this challenge. IS research also recognizes this important topic, focusing on its contribution in themes like Green IS and Green by IS (e.g., Watson et al., 2010; Seidel et al., 2013). The transportation sector is responsible for a high proportion of greenhouse gas emissions (Hensher, 2008). Hence, new means of transportation, e.g., battery electric vehicles, can help in the movement towards more sustainable transportation (Eisel and Schmidt, 2014). The diffusion of electric vehicles is still low because customers are reluctant to accept the new technologies due to concerns about their ability to effectively replace conventional vehicles (Eisel and Schmidt, 2014). In this case, IS could play a key role in fostering greater acceptance by supporting users with more information. This could help persuade customers to buy an EV, thereby spreading this sustainable means of transportation. Research question four therefore deals with the role of mobile applications in reducing reservations about EVs and helping to spread the technology.

RQ4: What is the role of mobile applications concerning the disruptive potential of EVs?



3 Structure of the Thesis

This cumulative thesis comprises four parts (see Figure 1). The first and last parts frame four interrelated studies, while the middle section concerns the research questions described in Section A.2. The following figure illustrates the structure of this thesis.

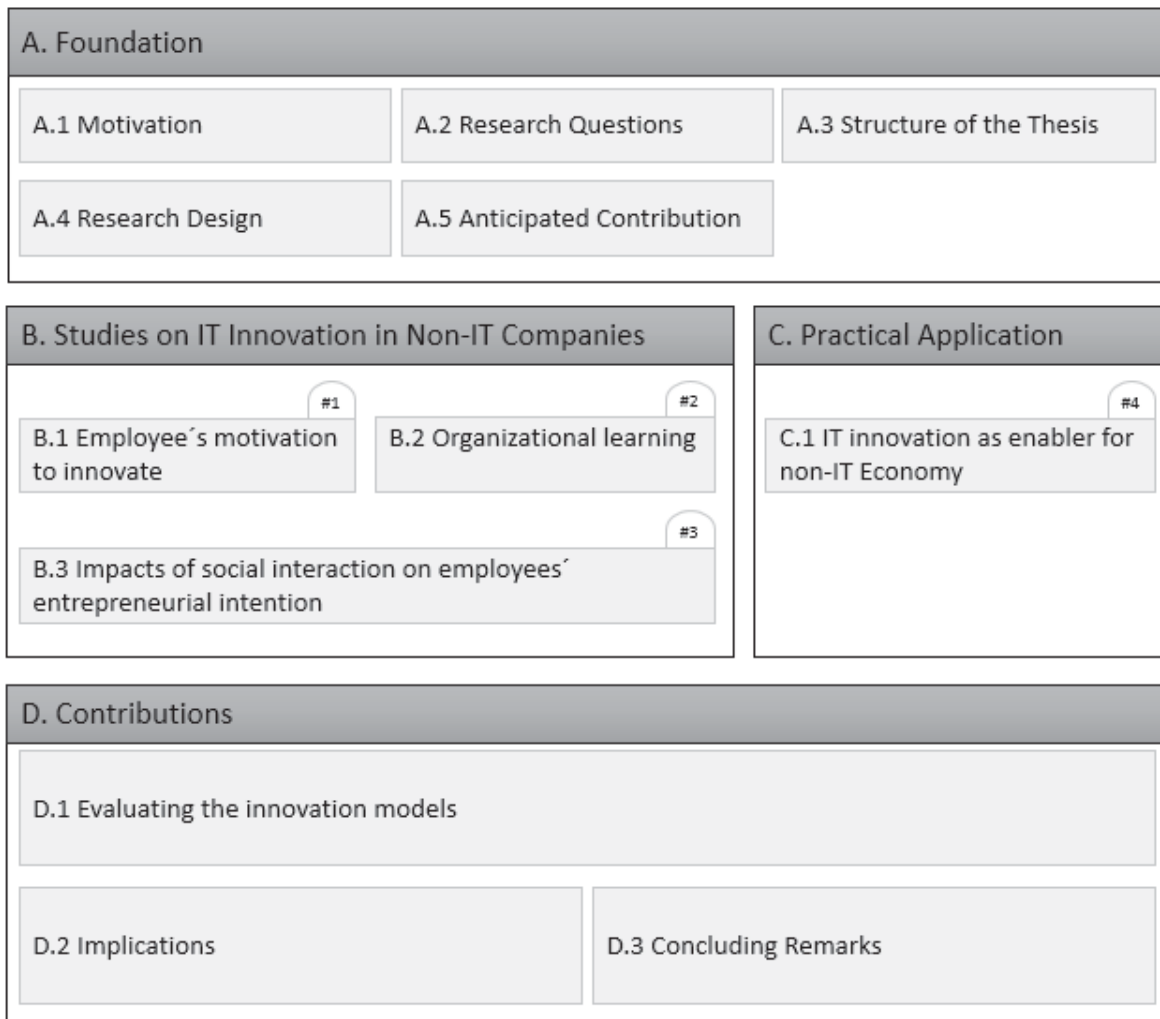


Figure 1 - Structure of this Thesis

Part A starts with the motivation, followed by the four core research questions covered in this thesis. Afterwards, the structure of this work is presented. The chapter concludes with the research design and anticipated contribution.

The publications in Part B form the core of this thesis. These three publications address three of the four core research questions. Section B.1 addresses whether extrinsic motivation can influence the endogenous motivation of IT employees towards a more entrepreneurial intention. The study within examined the influence of job design



constraints, the corporate environment, and contextual motivation on individual entrepreneurial intention. Section B.2 takes a deeper look into the role of openness and absorptive capacity in the context of IT entrepreneurship in non-IT companies. The third research question – regarding the importance of social interactions in the internal innovation process – is covered in B.3, with the study offering insights into the importance of shared goals, social interaction ties, trust, and the norm of reciprocity in the innovation process.

Part C represents a practical application for IT innovations in non-IT industries and covers the last research question: What is the role of mobile applications concerning the disruptive potential of EVs? The study presents attributes that are related to both electric and conventional vehicles. In a second step, app stores were searched to find apps addressing the negative attributes connected with EVs in order to demonstrate their potential impact. All publications in Parts B and C have been published in the leading IS conference proceedings (see Table 1).

The final chapter (Part D) reflects the findings of the studies from Parts B and C and provides a brief overview of the findings regarding the research questions from Section A.2. It also highlights the contribution to research as well as information and guidelines for practitioners. Part D ends with concluding remarks as well as describing the limitations of this cumulative thesis and the need for further research.



No	Outlet	Ranking	Status	Section	Research Question	Contribution
#1	International Conference on Information Systems	A	Published	B1	How can extrinsic motivation influence IT employees' endogenous motivation towards a more innovative intention?	Understanding the role of endogenous motivation in the context of corporate entrepreneurship
#2	European Conference on Information Systems	B	Published	B2	What is the influence of openness and absorptive capacity on IT entrepreneurship?	Understanding the role of openness and organizational learning in the process of innovation
#3	Multikonferenz der Wirtschaftsinformatik	D	Published	B3	How important are social interactions between internal IT employees and the outsourcing partners in the process of internal innovation?	Understanding the role of social interaction in the process of innovation behavior
#4	International Conference on Wirtschaftsinformatik	C	Published	C1	What is the role of mobile applications concerning the disruptive potential of EVs?	Practical application: IT support to enable disruptive innovations in sustainable mobility

Note: The ranking is based on the VHB Jourqual 3 ranking.

Table 1 - Studies of this Thesis

4 Research Context and Design

In their paper “Exploring IT-enabled innovation: A new paradigm?” in the *International Journal of Information Management*, Ashurst, Freer, Ekdahl, and Gibbons (2012) call for contributions to investigate how IT can be involved in business innovation. Prior research found evidence that leading companies in the exploitation of IT are surpassing their competitors in the area of innovation, indicating that companies overcome the doubts regarding the ability of IT to contribute to their business innovations. This idea is confirmed by Brynjolfsson (2010), who states, “[...]the way companies implement business processes, organizational change, and IT-driven innovation is what differentiates the leaders from the laggards. Rather than levelling the playing field, IT is actually leading to greater discrepancies.” This cumulative thesis contributes to the emerging field of IT-enabled business innovations by evaluating influencing factors on the individual



entrepreneurial intention of IT employees in non-IT companies. In addition, this thesis explores the function of IT managers and the underexplored role of IT as an enabler of innovation, which is the focus of the special issue of the MIS Quarterly (Nambisan, 2014). Therefore, three independent studies are provided, aiming to shed light on various aspects of the innovation intention of individuals within IT departments.

The field of information systems lies at the interface between business administration and computer science. Research in this field differentiates between two types of research paradigms: design science and the behavioral approach. Behavioral science research tries to identify the laws describing how the world works. It validates and develops theories explaining the interaction between tasks, technologies, and humans (Hevner et al., 2004). In contrast, design science seeks to contribute utilities by developing IS artifacts with the goal of provide effectiveness, which results in solutions that can be transferred from research to practice (Wieringa, 2009). This cumulative thesis follows the behavioral paradigm. It should help to create a deeper understanding of the path to innovation, referring to the interaction between technologies, management, and humans (Hevner et al., 2004). From the five research streams of Banker and Kauffmann (2004), this study follows the stream of “IS organization and strategy” (see Table 2). The core section (Parts B and C) mainly uses models and surveys, focusing on the business unit and the individual.



Research Stream	Level of Analysis	Methodologies Used
Decision Support and Design Science	System level, mostly in conjunction with human users or business processes, up to the level of a strategic business unit	Mathematical programming, forecasting, simulation, expert systems
Human-Computer Systems Design	User-focused, involving both individuals and groups	Experiments, argumentation, simulation, system testbeds
Value of Information	Individual decision makers, technologies in business process context, firm actions in market context	Decision trees, analytical models, statistical analysis, mathematical programming, simulation
IS Organization and Strategy	Individuals, groups, business units, organizations, marketplace	Models, case studies, field studies, experiments, surveys, cross-sectional and longitudinal designs, argumentation, blend of qualitative and quantitative methods
Economics of IS and Technology	Spans levels: individual decision makers, business process/product/project, strategic business unit/firm, industry, market, economy	Analytical modeling, empirical analysis and econometrics, cross-sectional and longitudinal design, experiments, simulation

Table 2 - Five Streams of IS Research (Banker and Kauffmann, 2004)

Besides the research stream and the paradigm, the epistemology choice guides the research. Prior research has defined three classifications of studies: positivist, interpretive, and critical (Chua, 1986). Positivist studies believe that companies have a structure beyond their employees' actions. To verify or falsify empirical testable theories and hypotheses, the positivist researcher uses sample surveys and experiments (Orlikowski and Baroudi, 1991). Interpretative studies instead assume that individuals have an environment that influences them. Thus, the interpretive researcher tries to understand the meanings that participants assign to phenomena. In contrast to the positivist researcher, interpretative researchers reject the idea that there are objective or factual situations that help to understand the phenomena in focus. Hence, interpretative research does not generalize from situations; it aims to understand the phenomenon within the contextual and cultural situation (Orlikowski and Baroudi, 1991). The goal of critical studies is to critique the status quo. They aim to transform restrictive and alienating social conditions by exposing structural contradictions within social systems as well as deep-rooted and fundamental assumptions and convictions (Orlikowski and Baroudi, 1991). This thesis follows the