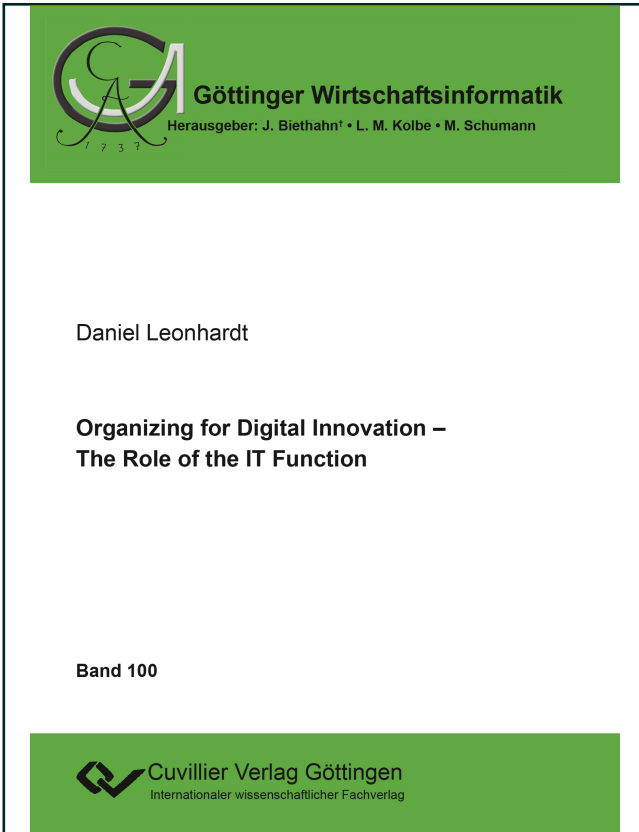




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Organizing for Digital Innovation - The Role of the IT Function



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I. Introduction

In the first section of this chapter, A.I.1, the general motivation for the overarching research question of this cumulative dissertation, as well as its relevance for research and practice, is presented. Afterwards, the research gaps and questions (A.I.2) and research context and design (A.I.3) are explained. Next, section A.I.3 describes the anticipated contributions for research and practice. Finally, the structure of the thesis is presented (A.I.5).

I.1 Motivation

Firms across industries are currently at different stages in their unique digital transformation journeys (e.g., Yeow et al. 2018). Originating from the rapid advancements in digital technologies, companies from industries as diverse as media, health, automotive, and energy are increasingly engaging in digital innovation activities (OECD 2017). Since the impact of digital technologies is not restricted to enterprise use, but rather affects all areas of life (Loebbecke and Picot 2015), consumer demand for purely digital or digitally enhanced products and services is increasing (Lucas et al. 2013). In conjunction with the danger of new entrants disrupting existing fields of business with digital offerings (Tumbas et al. 2017b), established firms are pressured to engage with digital innovation (Tumbas et al. 2018).

However, digital technologies exhibit very distinctive characteristics, namely re-programmability, data homogenization, and self-reference, that imply a layered architecture (Yoo et al. 2010). Based on these characteristics, digital innovations also feature unique properties, such as generativity and convergence, leading to organizing challenges for incumbent companies (Yoo et al. 2012). For instance, due to their generative nature (Zittrain 2006), digital innovations are dynamic and adaptable. Whereas most physical products, like for instance the automobile, are developed and built up until a specific release point, ruling out changes afterwards, digital products and services can easily be extended or modified after their release (Kallinikos et al. 2013). A vivid example of the impact of integrating digital technologies in physical products are Tesla's over-the-air updates to their cars that can change, extend, and even add new functionality (Nambisan 2017). As a result, firms need to organize differently and require different capabilities to deal with the continuous adaptations of their digital innovations to changing environmental conditions or shifting customer preferences (e.g., El-Sawy and Perreira 2012; Yoo et al. 2012).

Accordingly, firms with existing organizing logics and capability bases often face tensions regarding the development of digital innovations (e.g., Svahn et al. 2017). While current research offers some insights in general organizing principles of digital innovation (Yoo et al. 2012), or how single firms organize for digital innovation (e.g., Svahn et al. 2017; Yeow et al. 2018), there are still few theoretical findings on how firms should design their specific intra-organizational structures and which capabilities are needed to successfully develop digital innovations (Kohli and Melville 2019; Nambisan et al. 2017). More specifically, it is unclear how the established IT function is affected by the increasing relevance of digital innovation.

Historically, the IT function has played an outsider role with regards to power and influence in most companies (Gannon 2013; Lucas 1984). Even though information technology became more and more vital to business success, the IT department did not profit equally and mostly remained in a support function role, while the widespread diffusion of outsourcing and the consumerization of IT even decreased the relevance of the internal IT function (Gannon 2013). However, the ongoing digitalization places increased demands on the IT function (Urbach et al. 2019). Due to the growing relevance of digital innovation, IT is not only used to support business processes and drive efficiency, but often relates to products, services, and business models in an external-facing role (Kohli and Melville 2019; Nambisan et al. 2017). As IT becomes directly embedded in products and services, there are new possibilities for the IT function to contribute to innovation activities beyond just supporting other departments with information and communication technologies (Tarafdar and Tanriverdi 2018). For instance, Svahn et al. (2017) describe how Volvo redefined the role of the IT department and founded a new sub-unit to deal with additional demands regarding digital innovation. This potential role change for the IT function is reflected in the following interview quote (Svahn et al. 2017, p. 7):

Now, the IT Department is involved in end-user functions. That's new...Suddenly, we are responsible for a number of structural functions in the car-or rather, outside the car, but as part of the product.

Thus, in addition to managing existing IT assets, the IT function faces demands to explore innovation opportunities by identifying new technological opportunities and developing prototypes (Gregory et al. 2015; Urbach et al. 2019). However, most current IT departments are not ideally set up to meet the additional demands from digital innovation opportunities, as they rather assume an internal service provider role. In this reactive role, IT functions prioritize standardization, costs, and efficiency over innovation and experimentation to support the business functions (Andersson and Tuddenham 2014; Guillemette and Paré 2012; Urbach et al. 2017, 2019; Vithayathil 2018). Since this organizational setup fits neither in terms of structure nor in terms of capabilities to the requirements of digital innovation, firms react by establishing new structures, such as digital labs or units (e.g., Haffke et al. 2017), or new roles, like the Chief Digital Officer (CDO) (e.g., Tumbas et al. 2017a, 2018), to potentially improve their digital innovation performance. However, information systems (IS) research has yet to systematically investigate the interaction of digital innovation and the IT function both in terms of organizing configurations and organizational capabilities.

Accordingly, this thesis aims to contribute to two main research goals. The first overarching goal of this dissertation is:

Goal 1: Understand how the increasing prevalence of digital innovation is changing the IT function's organizing.

Secondly, since it is also unclear whether organizing changes within the IT function actually lead to digital innovation performance and which capabilities are needed in that regard. Therefore, the second goal of this research is as follows:

Goal 2: Understand how the IT function can contribute to the effective and efficient development of digital innovations.

I.2 Research Gaps and Research Questions

As outlined above, this dissertation connects the increasing relevance of digital innovation in established companies with organizing implications for the IT function. More specifically, this thesis addresses three different research question at the intersection of digital innovation and organizing logics of the IT function. Figure A:1 provides a graphical representation of the focus of each research question. The detailed theoretical background to all relevant topics is provided in chapter A.II.

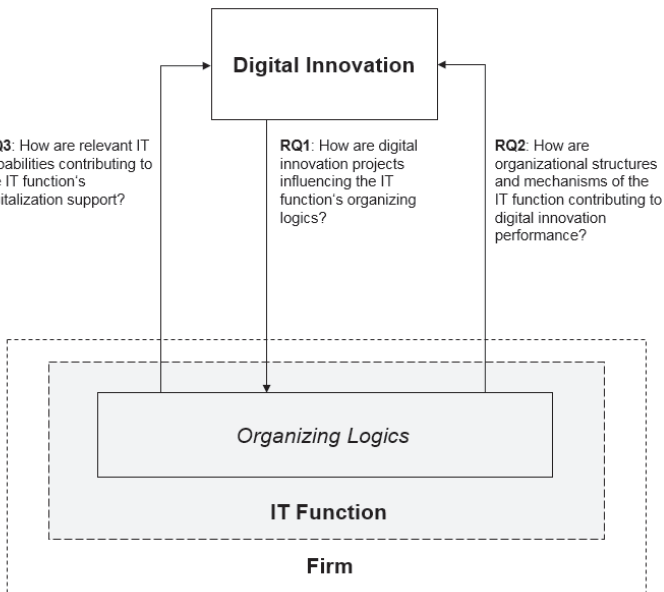


Figure A-1. Overview of Research Questions

First, current research acknowledges that the IT function is facing new demands and needs to transform, due to the impact of digital innovation, but also admits that “the appropriate role of corporate IT [...] is still unclear” (Urbach et al. 2017, p. iii). More specifically in that regard, the increasing prevalence of digital innovation could have different implications for the IT function, as their role in digital innovation projects is not specified. Historically, most IT functions assumed an outsider role in their firms with low power and status (Gannon 2013) leading to archetypical roles resembling system providers (Guillemette and Paré 2012; Urbach et al. 2019), which are aiming to support business processes in a reactive way. Accordingly, they are mostly focusing on standardization and efficiency to reduce the IT-associated costs for the company (Sambamurthy and Zmud 2000). However, digital innovation’s unique characteristics

are bound to organizing challenges as they require increased speed and flexibility together with the capability to integrate heterogeneous knowledge sources and cooperate with diverse external partners (Svahn et al. 2017; Yoo et al. 2012). As a result, the organizing logic of many established IT functions does not fit to the demands of digital innovation leading to potential tensions (Svahn et al. 2017; Urbach et al. 2017, 2019). As companies increasingly engage in digital innovation activities, it is thus unclear how the IT function's organizing logics are affected. In that regard, the experiences made in digital innovation projects could trigger organizational change of established IT functions. Therefore, the first research question relates to the effect of digital innovation on the IT function's organizing logics:

1) How are digital innovation projects influencing the IT function's organizing logics?

This dissertation aims to examine the interaction of digital innovation and organizing logics of IT functions reciprocally. Therefore, not only the influence of digital innovation projects is relevant, but also how IT functions can organize successfully. In that regard, prior research offers some general implications for organizing (Yoo et al. 2012), as well as insights how single firms deal with the organizing challenges and consequent tensions of developing digital innovations successfully (e.g., Svahn et al. 2017; Yeow et al. 2018). However, existing research offers no systematic results with reference to how the IT function's organizing is related to successful digital innovation across industries and specific contexts.

On the one hand, current research lacks a governance perspective on digital innovation including the role of the IT function in different governance configurations. For instance, it is unclear whether it is beneficial or detrimental to digital innovation performance when the IT function has the formal decision rights for the digital innovation process. Moreover, recent research points to the role of the CDO as an organizing option for improving the interdepartmental alignment between IT and business functions. While these studies offer insights why organizations establish a CDO role and which different tasks they might undertake (e.g., Haffke et al. 2016; Tumbas et al. 2017a, 2018), the relationship between the CDO role and actual digital innovation performance remains unexplored.

On the other hand, current research has not yet provided a systematic view on the IT function's organizational power and the influence on digital innovation performance, as IT functions are generally in control of their companies' IT resources and IT capabilities (e.g., Tiwana and Kim 2015), which are also highly relevant for digital innovation. Faced with additional demands from digital innovation (e.g., Urbach et al. 2019), increased organizational support for IT could help the IT function to contribute to their firm's digital innovation activities effectively.

Thus, the second research question is concerned with the relationship of different organizational structures and mechanisms of the IT function and the firm's digital innovation performance:

2) How are organizational structures and mechanisms of the IT function contributing to digital innovation performance?

In addition to analyzing the relationship of different organizational structures and digital innovation performance, this thesis also focuses on the impact of certain organizational capabilities of the IT function. Firms that want to remain competitive in the digital era are required to develop IT capabilities to leverage the potential of digital technologies for their respective business models (Bharadwaj et al. 2013; Rai et al. 2012; Sambamurthy et al. 2003). As a result, IT functions are demanded to contribute to digital innovation beyond their existing tasks like a reliable and secure management of enterprise IT systems and infrastructure.

First, owing to the generativity of digital innovations (Yoo et al. 2012), organizational agility becomes an essential capability for companies as a whole, but also the IT function in particular. The ability to sense environmental change and external opportunities as well as to act on them “with speed and dexterity” (Nazir and Pinsonneault 2012, p. 158), is especially relevant in the generative field of digital innovation. Driven by the nature of digital technologies, firms can constantly change and adapt the functionality of their innovation outcomes (Nambisan 2017). However, as customer preferences and demands are becoming more dynamic as well (Yoo et al. 2012), it is not sufficient to initially develop a digital innovation, but companies are required to continuously experiment and react to customer feedback in an iterative manner (El Sawy and Perreira 2013). Thus, the IT function’s organizational agility should be vital to a firm’s digital innovation performance.

Second, existing research points to paradoxical requirements (Gregory et al. 2015) and tensions (Svahn et al. 2017) for IT functions engaging in the digital business world, stemming from the differences between existing internal IT systems and infrastructures and digital innovations. While the IT function is expected to manage the company’s existing IT landscape in an efficient, secure, stable, and reliable fashion with a focus on standardizing systems and saving costs, digital innovation demands speed and experimentation in a volatile, dynamic environment (Gregory et al. 2015; Urbach et al. 2019). As a consequence to these opposing demands, IT functions in business practice are establishing bimodal structures to organizationally separate exploitative and explorative IT activities (Haffke et al. 2017). From a theoretical standpoint, the ability to simultaneously pursue the contradictory demands of exploration and exploitation with the goal of resolving these paradoxes is referred to as organizational ambidexterity (e.g., Gibson and Birkinshaw 2004; Tushman and O’Reilly 1996). With regards to corporate IT functions, IT ambidexterity describes the capability to balance and simultaneously satisfy the requirements of managing the existing landscape of IT applications (exploitation) as well as contributing to digital innovation (exploration) (Gregory et al. 2015). Therefore, high digital innovation performance would require IT function’s to be ambidextrous. In conclusion, the third research question connects organizational capabilities of the IT function with digital innovation performance:

3) How are relevant IT capabilities contributing to the IT function’s digitalization support?

1.3 Research Context and Design

This thesis contains four studies using different data collection and analysis methods relating to the three research questions posed in the previous chapter. The first study addresses the impact of digital innovation projects on the IT function's organizing logics with a qualitative case study approach (e.g., Yin 2009). Relying on a structural equation modeling method (e.g., Chin 1998), study two offers results for both the first and the second research question by focusing on power implications for the IT function originating from digital institutional pressures, as well as their respective digital innovation performance implications. Study three addresses the impact of different governance configurations on digital innovation performance using a configurational approach (e.g., Dess et al. 1993). Finally, the fourth and last study addresses the influence of organizational capabilities of the IT function on digital innovation performance again with a structural equation modeling approach, thereby answering research question three. Table A-1 summarizes the research design of the included studies in this dissertation. By combining qualitative, quantitative and configurational methods, this thesis follows a mixed-methods approach (e.g., Venkatesh et al. 2016) to benefit from the advantages of the different research approaches.

Table A-1 Overview of the Research Design of the Included Studies

No	RQ	Methodology (Seminal work)	Data collection	Data analysis
1	1	Multiple case study (Yin, 2009)	In-depth Interviews as well as secondary data (press releases, firm documents)	Coding
3	1, 2	Structural equation modeling (Chin 1998)	Survey	Partial least squares analysis
2	2	Configurational analysis (Dess et al. 1993)	Survey	Fuzzy set qualitative configurational analysis (fsQCA)
4	3	Structural equation modeling (Chin 1998)	Survey	Partial least squares analysis

This thesis aims to address the complex interaction of digital innovation and the IT function by combining different methodological and theoretical perspectives. The first study uses a qualitative and rather inductive approach to generate new insights by relying on a multiple case study including in-depth interviews. This qualitative perspective allows to understand organizational phenomena in their social and cultural context and is particularly suited to answer "how"-questions and generate new theoretical insights (Avison and Myers 2005; Yin 2009). In contrast, both study three and four are strictly quantitative using a deductive approach to confirm or reject hypotheses developed by using prior literature and theory. In that regard, these studies represent the epistemological and ontological assumptions of quantitative positivist research in IS (Straub et al. 2005). The second study cannot be clearly labeled as inductive or deductive as it combines both perspectives in a retroductive theory building approach (Park et al. 2017). While the general configurational approach is quantitative and is based on prior literature, the configurational analysis is not hypothesis-based and the results are subsequently used to generate new theoretical propositions in a rather inductive manner (Ragin 1994; Park et al. 2017).

Following Banker and Kauffman's (2004) typology of IS research stream, this thesis clearly belongs to the stream relating to *IS organization and strategy*. Closely connected to the neighboring disciplines organizational science and strategic management, the four studies delve into the interaction of the IT department's organizing logics and digital innovation. This research stream is characterized by a blend of qualitative and quantitative methods with the level of analysis spanning from individuals to organizations (Banker and Kauffman 2004). In that regard, the individual studies in this dissertation are applying both qualitative and quantitative approaches on the firm-level with an explicit focus on the IT function.

In social sciences, such as information systems research, it is important to consider different philosophical assumptions. Regarding epistemology, IS research generally differentiates between positivist, interpretive and critical perspectives (Chua 1986; Orlikowski and Baroudi 1991). Positivism implies an objective reality with the goal of discovering causal relationships using measurable properties unbiased from the researcher's observation (Avison and Myers 2005; Tsang 2014). In contrast, under an interpretive perspective, reality is subjectively influenced by the observer (i.e., the researcher). Thus, phenomena can only be understood in their context and by taking the meanings and actions of relevant actors into account (Orlikowski and Baroudi 1991). As a third perspective, critical realism assumes an objective reality that consists of structures, mechanisms, and events and is different from scientific theoretical descriptions of this reality. Research with a critical realism stance prioritizes explanation over prediction to create theory on why and how a phenomenon occurred (Tsang 2014; Wynn and Williams 2012). All studies in this dissertation take on a positivist epistemological perspective as they either include the identification and verification of cause-effect relationships (Orlikowski and Baroudi 1991) or a qualitative case study approach that rather aims for theoretical than empirical generalization and rather develops than tests theory (Tsang 2014).

Moreover, information systems research can be divided in two fundamentally different paradigms. First, design science focuses on problem solving by developing new artifacts through which knowledge on the effective design of information systems can be advanced. Therefore, design science mostly follows a mindset similar to engineering to address important business problems (Hevner et al. 2004; Peffers et al. 2007). On the contrary, behavioral science can be compared to natural sciences, because it primarily aims to develop and justify theories (i.e., generate truth, whereas design science focuses on utility) to explain or predict phenomena (Hevner et al. 2004). All studies included in this dissertation are positioned as behavioral science studies, as they aim to understand how digital innovation and the IT function's organizing logics interact. Therefore, this thesis prioritizes the generation of truth by revealing theoretical relationships between relevant constructs over problem-solving and artifact development.

With regards to theory, Gregor (2006) differentiates between five theory types in IS research. All studies in this dissertation can be classified as type IV theories, which aim to both explain and predict phenomena, as they either include specific hypotheses or testable propositions in the form of theoretical models representing causal relationships.

I.4 Anticipated Contributions

As a whole, this thesis sheds light on the interaction of digital innovation and the IT function, which constitute the two major research fields to which each individual study contributes. In addition, the results provide several relevant implications for business practice, particularly for managers confronted with the challenge to successfully develop digital innovations in established companies.

First, each study offers theoretical contributions to the general field of digital innovation. Since this research stream, especially with regards to the management of digital innovation (Nambisan et al. 2017), can still be considered as in its infancy, established theory is limited. Most relevant for the topic of organizing for digital innovation are Yoo et al.'s (2012) established general characteristics of digital innovation (i.e., convergence, generativity) and how they lead to general implications for organizing (i.e., distributed and combinatorial innovation). For the actual implementation of digital innovations in firms and associated organizational practices, research is still lacking (Ciriello et al. 2018). Apart from insights into single companies and their unique approaches to managing the demands of digital innovation (e.g., Svahn et al. 2017; Yeow et al. 2018), general implications, particularly for the IT function, are scarce. Thus, the anticipated contributions with regards to the digital innovation research stream are threefold. Perceiving the growing prevalence of digital innovation as a starting point, study 1 and 2 could offer insights into how the increasing pressure for digital innovation (Tumbas et al. 2018), as well as digital innovation projects in general, influence intra-organizational power structures and organizing logics. Moreover, this work aims to introduce a digital innovation governance perspective in study 3 that builds on the large body of existing IT governance research (e.g., Weill and Ross, 2004). Furthermore, study 4 should generate insights into required organizational capabilities for digital innovation.

As a second research stream, this work is highly relevant for literature on the internal IT function and their role in the company as a whole. Based on the historical tasks and responsibilities of IT functions, their role mostly relates to a corporate support function (Gannon 2013; Guillemette and Paré 2012) with limited involvement in product innovation processes (Tarafdar and Tanriverdi 2018). While current research acknowledges new demands for the IT function based on the increasing relevance of digital innovation, the “appropriate role of corporate IT – and how IT leaders can fulfill that role – is still unclear” (Urbach et al. 2017, p. iii). Therefore, this thesis aims to contribute to research on the IT function in two different ways. First, it could shed light on organizational change for the IT function as a result from the growing relevance of digital innovation. In that regard, it is important to understand how and why digital innovation could have implication for the IT function's organizing logics and organizational power. In the second perspective, this work aims to provide insights into the reverse relationship by contributing to an understanding how IT functions can effectively contribute to digital innovation, particularly in terms of organizational power (study 2), governance configurations (study 3) and organizational capabilities (study 4).

In addition, this thesis might have relevant implications for managers challenged by the requirements of digital innovation. On the one hand, managers could draw from the results of

this thesis to learn how the IT function can contribute effectively to digital innovation, which organizing configurations are beneficial as well as which organizational capabilities are needed. On the other hand, this thesis could help to understand how digital innovation projects are inducing organizational change and which associated mechanisms could be addressed by managers to facilitate required change.

The following table (A-2) provides a summary of the anticipated contributions.

Table A-2. Summary of Anticipated Contributions

Audience		Anticipated Contribution
IS Research	Digital Innovation	(1) Insights into organizational consequences of digital innovation projects and digital institutional pressure in incumbent firms. (2) Introducing a governance perspective for digital innovation and insights into the effectiveness of different governance configurations. (3) Insights into required organizational capabilities for successful digital innovation
	IT Function	(1) Implications how and why digital innovation projects and digital institutional pressure induce organizational change for the IT function in terms of organizing logics. (2) Understanding how IT functions can contribute effectively to digital innovation with regards to organizational structures, mechanisms and required organizational capabilities.
Business Practice		(1) Implications how the IT function can successfully organize for digital innovation in terms of organizational capabilities, governance configurations and organizational power. (2) Understanding of the organizational implications of digital innovation projects on the IT function in incumbent firms.

I.5 Structure of the Thesis

This dissertation is cumulative in nature and contains three parts. Part A is concerned with the motivation for this research endeavor (A.I.1), the research gaps and specific research questions (A.I.2), the research context and design (A.I.3), anticipated contributions (A.I.5), as well as the structure of this dissertation (A.I.3). The next Chapter (A.II) provides the theoretical background with regards to digital innovation, organizing logics, and organizational capabilities.

Part B represents the main body of this cumulative dissertation, comprising four studies that all address the interaction of digital innovation and the IT function (see Table A-3).

Table A-3. Overview of Studies Included in the Thesis.

No	Outlet	Status	Ranking (VHB)	Section	RQ	Main contribution
1	Working Paper	-	n/a	B.I	1	Develops a theoretical model on the impact of digital innovation projects on the IT function's organizing logics. Thereby, this study shows that the attributes of digital innovation projects lead to a decoupled organizing logic that does not fit to established IT service provider organizing logics. This misfit triggers new value commitments of the IT function regarding their organizing logic.
2	International Conference on Information Systems 2018	Published	A	B.I	1, 2	Explicates the positive effects of digital institutional pressure on the power of the IT function in terms of control rights and organizational support. In addition, demonstrates the positive effects of the IT function's organizational power on digital innovation performance.

3	International Conference on Information Systems 2018	Published	A	B.II	2	Develops a digital innovation governance framework and identifies effective governance configurations for high digital innovation performance and the respective role of the IT function in these configurations. Derives theoretical propositions based on the configurational results.
4	European Conference on Information Systems 2017	Published	B	B.III	3	Relates the IT function's agility and ambidexterity to effective digitalization support and demonstrates the positive effect of IT agility, which is positively moderated by an ambidextrous IT orientation.

In Part C, the findings are summarized and synthesized. Subsequently, implications for theory and practice are presented before the limitations and further research opportunities are explicated. Figure A:2 depicts the overall structure of this dissertation.

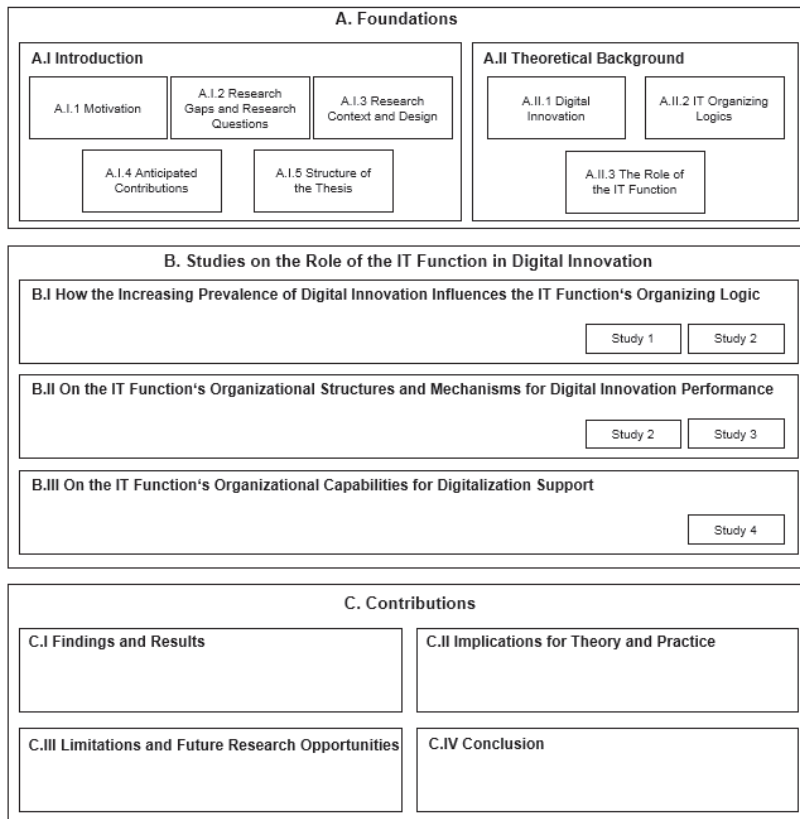


Figure A-2. Structure of the Thesis