

# Information Technology Governance and Innovation Adoption in Varying Organizational Contexts: Mobile Government and Software as a Service

## Dissertation Paper

Winkler, Till J.

### *Document Version*

Final published version

### *Publication date:*

2014

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### *Citation for published version (APA):*

Winkler, T. J. (2014). *Information Technology Governance and Innovation Adoption in Varying Organizational Contexts: Mobile Government and Software as a Service: Dissertation Paper*. Humboldt Universität.

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# **INFORMATION TECHNOLOGY GOVERNANCE AND INNOVATION ADOPTION IN VARYING ORGANIZATIONAL CONTEXTS: MOBILE GOVERNMENT AND SOFTWARE AS A SERVICE**

## **DISSERTATION PAPER**

Till J. Winkler, Humboldt-Universität zu Berlin, School of Business and Economics, Institute of Information Systems, Spandauer Str. 1, 1078 Berlin, Germany

Date of doctoral defense seminar: July 12, 2012, date of publication: November 16, 2012  
First examiner: Prof. Oliver Günther, Ph.D., Second examiner: Prof. Carol V. Brown, Ph.D.

### **ABSTRACT**

The governance of information technology (IT) in organizations—understood as the locus of key IT decision rights—is shaped by the emergence of new IT innovations, and can also proactively be designed to influence an organization’s ability to innovate through IT. The research presented in this paper contributes to the Information Systems literature by addressing the neglected interrelationship of IT governance and organizational technology adoption. Following a multi-method research paradigm, four consecutive studies have been conducted each in two contemporary adoption scenarios: (1) the implementation of Mobile Government (M-Government) services by public sector agencies, and (2) the implementation of Software as a Service (SaaS) delivery models for enterprise information systems. As a group the results of these studies extend the classic rationale of a strategy-structure fit underlying prior IT governance theory by demonstrating that (1) in public sector organizations more centralized governance can facilitate process and service innovations, and (2) for external delivery models such as SaaS efficiency strategies can favor a decentralization of IT decision rights. The eight studies provide relevant implications for IT decision makers in governmental and entrepreneurial contexts.

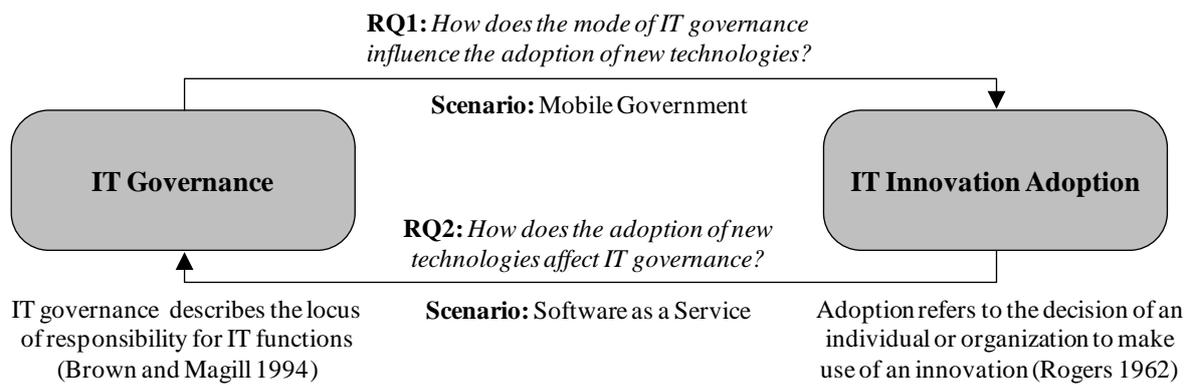
Keywords: *IT governance, IT Innovation, IT Adoption, Mobile Government, E-Government, Software as a Service, Cloud Computing, Empirical studies, Multi-method research.*

## INTRODUCTION

Innovation is the primary source of competitive advantage for companies and the basis of economic development (Schumpeter 1926). Most organizations, both in the public and private sector, constantly face the challenge to innovate, i.e., to introduce novel products or services as well as to improve internal processes to compete on the external market and increase productivity (e.g., Bhoovaraghavan et al. 1996; Gopalakrishnan and Damanpour 1997). Information technology (IT) today plays a pivotal role in organizational innovation adoption, given that hardly any product innovation, service innovation or process innovation can succeed without being supported, if not enabled, by IT (e.g., Davenport 1993).

Organizations typically bundle functions that are specialized on planning, designing and operating IT resources in a—however structured—IT function (Agarwal and Sambamurthy 2002). The alignment of the IT function with the business organization is commonly viewed as the central concern of IT governance (e.g., Brown and Magill 1994; Sambamurthy and Zmud 1999; Schwarz and Hirschheim 2003; Weill and Ross 2004), a crucial—if not the most fundamental—dimension of which is the allocation of IT decisions rights between business and IT stakeholders. In fact, companies that struggle with a lack of innovativeness often ask who should be responsible for managing IT-based innovations (e.g., Power 2012). Considering that innovations stem from the integration of multiple stakeholders (Gopalakrishnan and Damanpour 1997), IT-based innovation adoption is a key governance issue.

In line with the broader organization science literature (e.g., Daft 2009), the IT governance literature emphasizes that there is no universal way for designing IT governance. Rather the ‘best’ way of governing IT functions depends on certain, foremost business-related, contingencies, first of all the fit to the business strategy (see Brown and Grant 2005, p. 703, for an overview). However, as Brown and Grant (2005, p. 704) also note, “absent from the list of [contingent] variables is [still] a discussion on technology and technology adoption, where



**Figure 1. Overall research model**

surprisingly, little to no research was found.” This appears particularly surprising given the past pendulum swings between centralized and decentralized forms of organizing IT (Evaristo et al. 2005; Peak and Azadmanesh 1997).

The research presented in this dissertation aims to cumulatively enhance our understanding of the role of IT governance across two specific IT adoption scenarios. It is guided by two principal research questions: RQ1: *How does the mode of IT governance influence the adoption of new technologies*, and conversely RQ2: *How does the adoption of new technologies affect organizational IT governance?* Definitions for both key concepts of this research are provided in Figure 1.

To address these research questions, I consider two distinct IT-based innovation scenarios that have recently attracted much attention both in theory and in practice. The first refers to the implementation of Mobile Government (M-Government) services by public agencies, the second to the adoption of Cloud-based Software as a Service (SaaS) for enterprise information systems in private sector. For each of these two different innovation scenarios, four separate studies have been conducted that use qualitative and quantitative empirical methods. Regarding RQ1, I demonstrate how the strategic context as well as the mode of IT governance in municipalities influence the extent and focused target-group of M-Government efforts. Regarding RQ2, I demonstrate how in different enterprise contexts Cloud computing impacts IT governance and under which circumstances decision rights for SaaS differ from those over on-premise (local) applications. Overall, these findings extend the classic strategy-structure fit

by outlining IT governance with respect to the public sector as well as to Cloud delivery models.

In the following sections I will first briefly describe Mobile Government and Software as Service as two contemporary IT-based innovations, before I outline the foundations of IT governance. Then, I explain the multimethod paradigm used in this research. A synopsis of the four studies conducted in each of the two innovation scenarios follows. The paper closes with a discussion of the theoretical and practical implications of this research and a conclusion.

### **Mobile Government**

Mobile Government (M-Government) refers to the use of wireless and mobile technology, services, applications and devices for citizens, businesses and all government units to improve public services (Kushchu and Kuscu 2003). It is thus an extension of Electronic Government (e.g., Scholl 2006) that has been driven by the penetration of mobile devices and the mobile Internet. Akin to E-Government, different foci of M-Government can be differentiated, in simple terms: internal and external M-Government.

Internal M-Government applications in this dissertation are viewed as process innovations. That is, by using mobile technology, public agencies can handle internal processes more effectively and efficiently (Trimi and Sheng 2008). Examples include the equipping of government staff (especially field workers) such as police, firefighters, and field inspectors with mobile devices to provide them with appropriate information and allow for on-the-spot data processing (Kushchu and Kuscu 2003). External M-government applications provide informational or transactional services to citizens or businesses, and can therefore be understood as service innovations. Early examples include disaster notifications, traffic news or even voting via SMS (Al-khamayseh et al. 2006; Rossel et al. 2006; Trimi and Sheng 2008). Today, an increasing number of cities offer applications (i.e., smartphone apps) that

provide a variety of information related to living in that city and include increasing transactional functionality and two-way communication (e.g., see Vitako 2011, pp. 10-14).

Altogether, emerging M-Government solutions represent a broad range of potential IT innovations that are currently still in an early stage of adoption, potentially also due to diverse IT management challenges. Therefore, for the studies in this scenario I particularly focus on RQ1: how different IT governance approaches influence Mobile Government adoption.

### **Software as a Service**

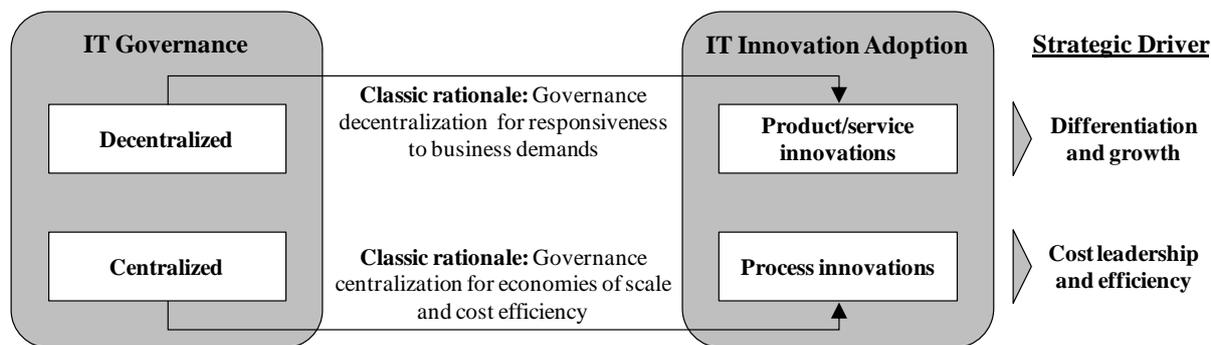
Software as a Service (SaaS) refers to a delivery model how enterprise software is provided, and thus from a user perspective can be regarded as a process innovation. In a SaaS model, software is provided via the Internet by an external provider who serves multiple customers (tenants) by the same instance (Cusumano 2010). SaaS has evolved from earlier forms of web-based delivery such as application service providing (e.g., Günther et al. 2001; Susarla et al. 2003) and is now commonly considered a part of Cloud computing (Armbrust et al. 2010). Compared to traditional enterprise software, which is either hosted on dedicated instances at a provider side or installed on the company's own infrastructure (i.e., 'on-premises'), SaaS generally allows for greater economies of scale due to a better utilization of infrastructure resources. Economically, it is often emphasized that SaaS customers 'rent' software (and the underlying infrastructure resources) instead of buying perpetual-use licenses (e.g., Choudhary 2007).

Today, SaaS has become the largest segment of the market of Cloud-based services and generally includes most of the traditional enterprise software, e.g. Enterprise Resource Planning, Customer Relationship Management as well as Content, Communications and Collaboration application types (Gartner 2009). Applications that are 'web-native,' such as email, teleconferencing and web-hosting, are obviously more likely to be procured via SaaS than those that require local hardware and integration (e.g., engineering and design, production planning and automation systems). The prior literature on SaaS adoption largely

explains this by the lower application specificity, lower strategic value, lower uncertainty, and higher imitability of SaaS applications (Benlian et al. 2009). However, the literature has produced few insights on the management challenges related to SaaS (Bento and Bento 2011), including the question whether SaaS adoption and the external delivery of business applications could lead to a ‘shift’ of IT responsibilities from IT towards business units (Yanosky 2008). Given the increasing adoption of SaaS models, the studies involving this scenario focus on RQ2: how SaaS adoption affects IT governance for these specific business applications.

## **FOUNDATIONS OF IT GOVERNANCE**

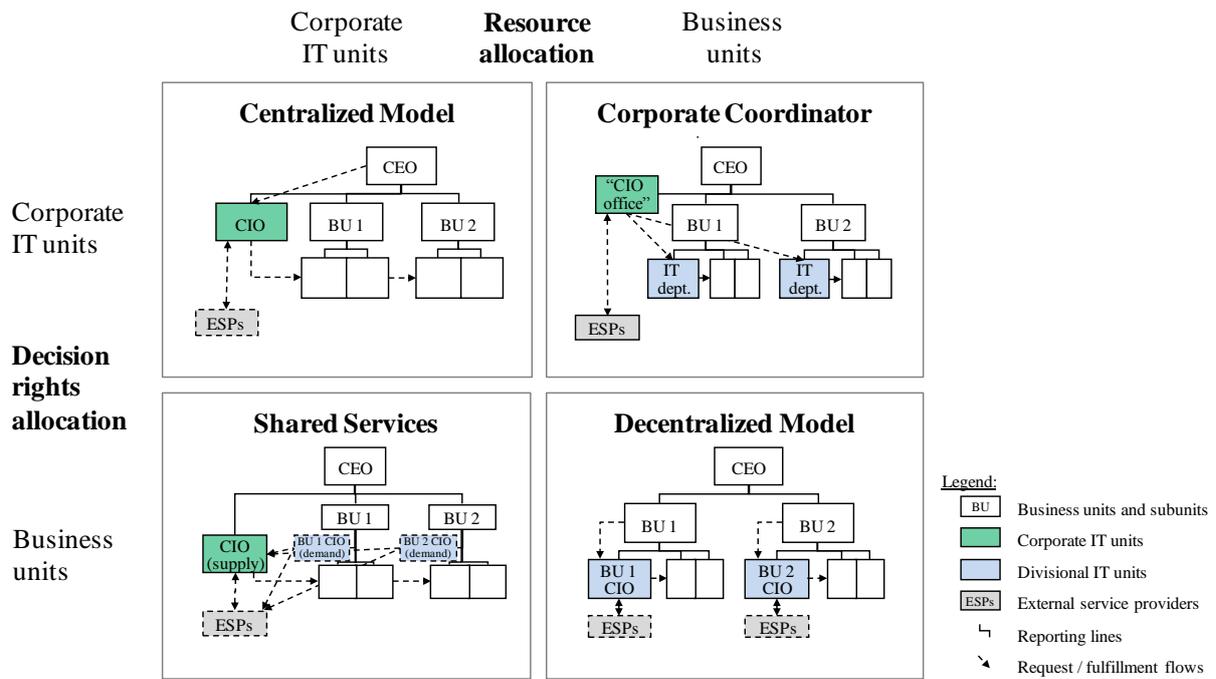
IT governance is commonly understood as a subset of corporate governance that has evolved from IS strategy (Webb et al. 2006). One of the most important—if not the most crucial—challenges in IT governance design is the degree of centralization of the IT function (Brown and Magill 1994). Over the past decades, IT organizations have oscillated between centralized and decentralized forms (Evaristo et al. 2005; Peak and Azadmanesh 1997), where centralization typically refers to allocating decision making at the corporate level, while decentralization refers to decisions at the divisional level or even lower organizational levels (Brown and Magill 1994). Past research has proposed the classic rationale of a strategy-structure fit as influencing the ‘choice’ of the right degree of centralization (Agarwal and Sambamurthy 2002; Brown and Grant 2005). This rationale can also be related to governance designs for product/service and process innovation (see Figure 2): Firms that seek competitive advantage primarily through differentiation (i.e., by product and service innovations) tend to decentralize IT governance structures in order to ensure responsiveness to the needs of internal and external customers. Firms that follow a cost leadership strategy tend to centralize IT governance in order to leverage internal economies of scale and implement certain process innovations (Agarwal and Sambamurthy 2002; Sambamurthy and Zmud 1999; Weill and Ross 2004).



**Figure 2. Strategy-structure fit for IT-based innovations**

Further, in this research we distinguish two different dimensions of centralization: the centralization of IT decision making and the centralization of IT resources (including the IT workforce). This conceptualization is consonant with the agency theoretic paradigm that distinguishes decision control and decision management rights (Fama and Jensen 1983). The allocation of *IT decision rights* includes two primary decision areas: IT applications and IT infrastructure operations. A pattern in which infrastructure decisions are centralized, but business application decisions are primarily made by business units, has also been termed a federated or federal model (Sambamurthy and Zmud 1999). More recently, Weill and Ross (2004) proposed a five-part classification scheme with different patterns associated with different business strategic priorities. The *allocation of IT resources* captures the locus of the IT human and technology resources within the enterprise (i.e., those resources required for implementing IT decisions), which is similar to the notion of decision management (Fama and Jensen 1983). Although some prior literature has implied that IT decision rights and IT resources reside together in an organization, we argue that these two dimensions should be considered separately (cp. Brown and Grant 2005).

These two dimensions for the structural organization of the IT function are illustrated in the 2x2 matrix in Figure 3. In addition to the Centralized and Decentralized polar extremes, there are two other IT organization archetypes. In the Shared Services model, IT decision rights are highly decentralized, but the IT resources that perform IT tasks are highly centralized. In the Corporate Coordinator model the IT resources are highly decentralized or outsourced, but a



**Figure 3. Four IT organization archetypes**

central office holds a higher degree of IT decision rights. Although other important dimensions to ‘configure’ an IT organization include coordination mechanisms, financial autonomy, sourcing arrangements, and IT-related capabilities and skills, this research focuses on these two fundamental governance dimensions. A deeper discussion of the four organization archetypes and the additional design dimension can be found in Chapter 2 of the dissertation.

### METHODOLOGICAL APPROACH

To address the two research questions, an incremental, post-positivist, multimethod approach was followed (cp. Petter and Gallivan 2004). The research studies for each scenario started with qualitative (intensive) approaches to identify potentially relevant variables from a smaller number of cases, followed by quantitative (extensive) studies designed to test these variables in a larger sample and increase the generalizability of results (Mingers 2003). After these quantitative studies (surveys), another set of qualitative studies were conducted in both scenarios to investigate selected cases in-depth and address previously insufficient or inconclusive results. In this sense this approach, where empirical findings from one study as

**Table 1. Research methods overview**

Chapter	Qualitative methods				Quantitative methods			
	Interviews <sup>b</sup>	Content analysis <sup>c</sup>	Grounded theory <sup>(b)c</sup>	Case study <sup>(b)c</sup>	Survey <sup>b</sup>	Structural equation modeling <sup>c</sup>	Clustering/Subgroup Analysis <sup>c</sup>	Simulation <sup>bc</sup>
4.1	X	X			X	X	X	
4.2	X	X	X	X				
4.3					X	X		
4.4				X				X
5.1	X		X	X				
5.2					X	X	X	
5.3 <sup>a</sup>	(X)			X				
5.4 <sup>a</sup>					(X)	X	X	

a Data based on a previous study (X)

b Data generation method

c Data analysis method

well as the insights of the researcher could be taken into account in a subsequent study, can be characterized as an incremental one. In the sense of a post-positivist paradigm, all models and relationships gained from these studies are regarded as one potential way of interpreting real-world phenomena (and not as natural science like ‘laws’). Early advocates of such methodological pluralism as well as of an evolutionary view of scientific progress may be seen in modern philosophers like Paul Feyerabend and Thomas Kuhn (Hoyningen-Huene 2002). Although in the IS field, the appearance of multimethod research in top-tier publications has remained relatively scarce (Mingers 2003), the richness and reliability of different kinds of multimethod approaches are commonly recognized (Mingers 2001).

Table 1 provides an overview of the different methods for data acquisition and data analysis across the eight studies (Chapters 4 and 5 of this dissertation). The studies using qualitative methods primarily employed data from interviews and used content analysis as well as grounded theory methods to for data analysis (Glaser 1992; Strauss and Corbin 1990), often combined with positivist case study approaches (e.g., Eisenhardt 1989; Fernández 2005; Yin 2002). Quantitative studies relied on data from three different surveys and employed structural equation modeling techniques (PLS-SEM, e.g., Chin 1998; Hair et al. 2011), besides one study using simulation methods (subchapter 4.4). The detailed motivations for the

choice of the respective method as well as the methodological details are provided in the subchapters of this dissertation.

## **RESEARCH STUDIES AND KEY FINDINGS**

This section summarizes the four separate studies conducted for each of the two innovation scenarios.

### **IT Governance and M-Government Adoption in the Public Sector**

In the first study (4.1), I investigate the intention by German municipalities to adopt different M-Government services. Based on a series of interviews, a research model is developed and subsequently tested with a sample of 50 municipal IT decision makers. The findings suggest that there is a relationship between the strategic framework (i.e., efficiency goals, innovation goals, and IT sophistication) of a municipality and the planned use of M-Government services. Public agencies possess different adoption profiles and therefore can be clustered into Innovators, IT experienced, Efficiency-oriented, and Laggards.

The second study (4.2) builds on these findings by analyzing interview data from 12 municipalities and presenting four cases (one out of each cluster) in detail to analyze the role of IT governance and the organizational context. The findings reconfirm the strategic influences from the previous study (4.1) by demonstrating that the financial situation of a municipality is a major contingent influence. Given the tight financial situation of most municipalities, this explains why municipalities to date largely focus on more efficiency-oriented internal M-Government applications (i.e., process innovations). Through cross-case analysis, I also provide evidence that the mode of IT governance—more precisely, the question of whether responsibilities for information technology *and* human resources are centralized and effectively aligned—also affects adoption of both internal and external M-Government services by public sector organizations. These two contextual contingencies for M-Government adoption are illustrated in Table 2.

**Table 2. Contextual contingencies for M-Government adoption** (adapted from subchapter 4.2)

		<b>IT governance and coordination</b>	
		Centrally coordinated and aligned*	Not effectively coordinated and aligned
<b>Financial situation</b>	Strong	Innovators Focus: Internal processes and external M-Government services	Laggards Unfocused adoption
	Moderate	IT experienced Focus: Internal processes and some external services for businesses	
	Poor	Efficiency-oriented Focus: Internal M-Government (process innovations)	

\* termed ‘transformational governance’ in the original chapter

Subchapter 4.3 then sheds more light on the citizen side of external M-Government adoption. Tests of a technology acceptance model in a survey with more than 200 participants indicate that transactional M-Government services, such as a mobile reporting service, can also be an effective means to enable more citizen participation, while perceived privacy risks do not appear as major inhibitors.

Subchapter 4.4 takes a more interventionist approach: multiple stakeholders (including municipal administration, marketing and IT) were brought together to evaluate a mobile reporting service. The use of a quantitative simulation model for this specific case helped to align these stakeholders and to demonstrate that transactional M-Government services can improve a municipality’s level of environmental information at comparable cost to internal information acquisition procedures and—in this sense—simultaneously allow for implementing a service and a process innovation.

### **Software as a Service Adoption and IT Governance in Enterprises**

The first study in the second scenario (subchapter 5.1) explores the potential impact of SaaS adoption on application-level decision rights. Decision rights for SaaS are conceptualized as two separate classes of decision control rights (decision authority) and decision management rights (task responsibility). Based on a multi-case analysis of four companies that adopted the same SaaS application (salesforce.com CRM)—two of which allocated decision rights to

**Table 3.** Contingent influences for application-level governance (based on subchapters 5.1–5.4)

Influences		Application governance		
		Business	Mixed	IT
<b>1. Context</b>	IT governance	Decentralized		Centralized
	IT goals (only for SaaS)	Efficiency		Innovation
<b>2. Initiation</b>	Origin of Initiation	Business		IT
<b>3. Application characteristics</b>	Delivery model	SaaS		On-premise
	Functional specificity	– Dual influence (indirect) –		
	Technical specificity	Low		High
	Human resource spec.	High		Low
	Scope of use	Low		High
<b>4. Organizational capacities</b>	IT knowledge in business units	High		Low
	Business knowledge in IT unit(s)	Low		High

business and two to IT units—the study proposes a contingency model with both organization-level and application-level antecedent factors of SaaS governance.

The next study (5.2) draws on multiple theoretical lenses to anchor these factors and tests a refined contingency model with a sample of 207 pairs of organizations and applications (76 of which are SaaS and 131 on-premise software). The results suggest that responsibility for SaaS-based applications is allocated more frequently to business units, which can to some extent be explained by the smaller scope of use of SaaS-based applications within organizations as well as by changing knowledge requirements for SaaS-based delivery (i.e., more business-related and less technical knowledge needs). However, the locus of the SaaS initiative (whether initially driven by business or IT units) emerges as the most influential factor for explaining application-level governance.

Given the latter finding, subchapter 5.3 revisits two of the cases from the first study and uses a process-theoretic approach to analyze in-depth the emergence of different application-level governance arrangements. Based on this longitudinal view, the locus of the SaaS initiative emerges as an intermediate variable that causally links the mode of overall IT governance with a specific application-level governance outcome.

Such process view is also taken as a premise for the final study (5.4). This study reconsiders the role of the information system’s functional specificity, operationalized as the degree of

customization to company-specific requirements—a potentially influential variable that had remained inconclusive in the prior factor study (5.2)—, for determining governance. In a subsample test of the participant responses for the 76 SaaS applications, the finding is that the functional specificity has a *dual* influence on the locus of application governance, mediated both by the information system’s human asset specificity and its technological specificity.

The proposed contingent influences that emerge from these four incremental studies and their assumed effects on application-level governance are listed in Table 3 (their logical order is based on the process-view from subchapter 5.3).

## DISCUSSION

This dissertation research was motivated by the idea that IT governance can be designed for, and is likewise shaped by, IT-based innovations and the argument that this interrelationship has been neglected in contemporary IT governance research. This section discusses the key findings and their theoretical and practical implications.

Regarding the influence of IT governance on organizational innovation adoption (RQ1), the four studies in the M-Government scenario jointly demonstrate that, although municipalities face different contextual situations (such as a varying financial resources), and consequently also possess different strategic frameworks (e.g., innovation versus efficiency goals), the adoption of IT-based innovations can be improved throughout by enabling more centrally coordinated IT decision making. We found that especially for M-Government innovations that have a transformational character decision rights for IT need to be aligned with decision rights for human resource issues also in order to effectively address potential resistance to change.

While the importance of a centrally coordinated, ‘transformational’ governance for implementing process innovations (internal M-Government) is in line with the classic strategy-structure fit, it appears somewhat counterintuitive for service innovations (external M-Government services). According to the classic rationale, organizations centralize IT governance in order to implement process innovations, achieve standardization and leverage

economies of scale throughout the organization (e.g., Brown and Magill 1994; Sambamurthy and Zmud 1999; Weill and Ross 2004). For product and service innovations, however, the past governance literature as well as the wider innovation management literature (Gopalakrishnan and Damanpour 1997) emphasize the need for responsiveness to the market needs and a higher autonomy of business units as a source of innovation, and thus more decentralized IT governance.

We partly attribute this at-first-sight counter-intuitive finding to the specific public sector context. In contrast to the market-driven business units of a company, the divisions of a non-profit public sector organization may have a much lesser incentive to innovate with new products or services. Therefore innovations that change the work routines potentially encounter higher internal resistance, and therefore require more centralized empowerment and coordinated decision making. Nevertheless, some business units (especially in large firms) may also be comparable to the public sector organizations in our studies in terms of incentives to innovate and potential resistance to change, so that even here a more central (or transformational) mode of governance may be required to drive IT-based product, service and process innovations.

Practitioners can learn from this research (specifically 4.2) that more central decision making (and thus transformational governance) can be strengthened by various coordination mechanisms, such as an ‘office for organization and IT steering’ (Case A), an IT steering unit embedded in the central office for personnel administration and organization (Case C), or effective staff council participation in a joint IT steering committee (Case B). However, if decisions for IT and human resource matters are not sufficiently aligned, such as in case D, there is a threat of suboptimal innovation adoption outcomes.

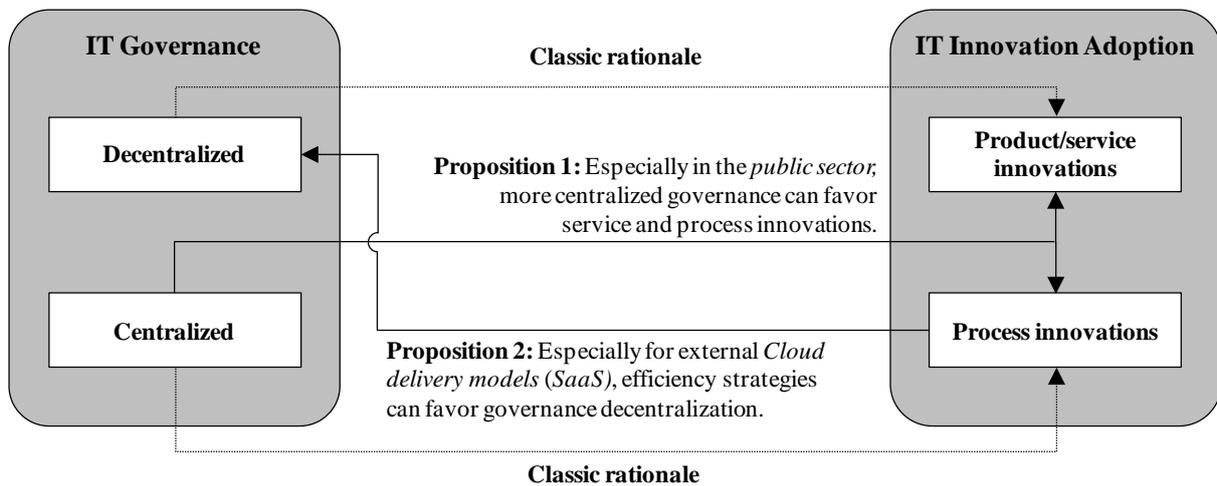
Regarding the impact of emerging IT innovations on IT governance (RQ2), the four studies in the second scenario illuminate under which contingent influences decision rights for SaaS can differ from those for traditional on-premise applications. Besides showing that SaaS

applications are indeed generally governed with greater business ownership, we also provide reasons for why this occurs. These reasons refer to both the organization context and the characteristics of the SaaS information system itself.

The most theoretically intriguing proposition emerging from the SaaS studies in terms of our overall research questions is that if the implementation of an external delivery model such as SaaS is primarily driven by an efficiency and cost saving strategy, there is an even greater motivation to decentralize its governance, i.e., to have business units primarily responsible for decision control rights and decision management rights. This proposition appears to counter the classic rationale of centralizing governance to save on cost and achieve economies of scale.

Based on all four studies, I therefore developed a transaction-cost theoretic explanation for this finding. According to this theoretical lens, companies allocate decision rights between business and IT units in a way that minimizes their total IT production and IT coordination costs. However, in contrast to traditional delivery models, for SaaS (and other external delivery models) production cost advantages largely accrue on the provider side. For this reason, the rationale of leveraging internal economies of scale becomes much weaker for SaaS, which in turn explains the greater decentralization to save on the costly coordination through an internal IT unit.

Beyond the delivery model as a moderator, coordination costs for SaaS are also influenced by the specificity characteristics of the information system, i.e., its functional, technical and human asset specificity. Depending on customization and adaption to the organization-specific context, similar SaaS applications (e.g., Salesforce CRM) may still be governed in very different ways by different organizations. Altogether, this research may therefore help practitioners assess the potential impacts that emerging delivery models such as SaaS may have on their existing IT governance arrangements.



**Figure 4. Key contributions to IT governance theory**

Figure 4 summarizes the two major propositions that emerge from this research and which extend the classic strategy-structure fit with respect to the two scenarios studied: M-Government as well as Cloud IT delivery models.

## CONCLUSION

This research addressed the neglected interrelationship of IT governance and IT-based innovation for two specific adoption scenarios: Adoption of Mobile Government in public sector organizations and adoption of Software as a Service for enterprise systems. We built on the IT governance literature and mapped the classic rationale of a strategy-structure fit to the relationship between IT governance and IT innovations. The key findings from this research extend this classic rationale by demonstrating that (1) especially in the public sector, more centralized decision rights can favor both service and process innovations, and (2) especially for SaaS delivery models, efficiency strategies can favor decentralized governance for the SaaS application. These findings provide novel insights for the different models of IT governance in public sector as well as for IT governance of Cloud systems. Although this research focuses on only two specific scenarios and these theoretical propositions remain somewhat provisional, future research can build on the proposed extension of IT governance theory and investigate IT decision rights allocations in further IT-based adoption scenarios.

## PUBLICATIONS BASED ON THIS DISSERTATION

(in order of appearance in the thesis)

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