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Successful IT-Intensive Interorganizational Relationships: the role of governance

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DEDICATION

To Ash and the kids

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Abstract

Successful IT-Intensive Interorganizational Relationships: the role of governance

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The purpose of this dissertation is to understand the role of governance in successful information technology-intensive interorganizational relationships (IT-IORs). The importance of *IT* in IT-IORs means that in addition to the challenges associated with managing organizational relationships there are also challenges that come with IT that crosses organizational boundaries. This dissertation explores these challenges and the relationship between technology and governance in three essays. Governance is broadly defined as organizational design – the structure and formal and informal coordination mechanisms that are used for achieving direction, control and coordination. Central to each essay is the concept of "fit" - from its roots in contingency theory to its future potential in focusing on the interaction between organizations and the promise of IT. The findings in Essay 1 suggest there is still value in using the early conceptualizations of fit. The "fit as matching" perspective enables a better understanding of the importance of "good governance" on performance by detangling formal coordination mechanisms, contingencies and IT-IOR success. Essay 2 provides empirical evidence that

configurational thinking, based on the "fit as gestalts" view of fit, has much promise and that the novel Qualitative Comparative Analysis (QCA) method is one way of exploring this complex view of fit using configurations of structure and formal and informal coordination mechanisms. Essay 3 contributes to evolving views of fit in IS research by empirically examining instances of the affordances and constraints – the potential – of technology as well as specific examples of actualization through organizational design changes in a single organization over its 40+ year lifespan. In general, the dissertation suggests that fit is achieved, and organizational success realized, when the potential of IT and the design of an organization are aligned.

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Introduction

Introduction

Organizations are increasingly joining together to develop, manage and use IT to achieve joint goals – a phenomenon I define as an IT-intensive interorganizational relationship (IT-IOR). IT-IORs are a growing phenomenon in many domains but especially in public safety. There are two key challenges facing IT-IORs – challenges associated with the governance of the interorganizational relationships and challenges associated with the governance of IT. The challenges related to technology make IT-IORs unique among IORs (Hui et al., 2008). Both sets of challenges are important for IT-IOR success – governance is believed to be important to the success of IORs (Provan & Milward, 2001) and effective IT governance is believed to be important to successful organizations (Weill & Ross, 2004).

Context and motivation

In public safety a prominent example of an IT-IOR is the Capital Wireless Information Net (CapWIN) - an IT-intensive interorganizational relationship among local, state and federal government agencies in the Washington, DC metropolitan area of the United States. A key trigger in the formation of CapWIN was an incident in 1998 when a man threatened to jump off of the Woodrow Wilson Bridge outside of Washington D.C. The Woodrow Wilson Bridge is owned and maintained by the District of Columbia but one end of the bridge terminates in the State of Virginia and the other in the State of Maryland. Public safety officials struggled for hours to respond to the emergency due to an inability to share information and coordinate activities across the multiple jurisdictions and agencies. It was clear in the analysis that followed the incident that

the challenges were not only technological but organizational in nature (Fedorowicz et al., 2007; Maggio & Shiftan, 2004).

IT-intensive interorganizational relationships like CapWIN serve as the motivation for this dissertation. I have been a part of a National Science Foundation (NSF)-funded project on IT-intensive interorganizational relationships for public safety (the Public Safety Networks (PSNs) Study - Project # IIS-0534877 & IIS-0534889) from the beginning of my doctoral studies. From a practical standpoint I am interested in helping groups of public safety organizations respond more effectively to emergencies and preserve life and property. From a theoretical standpoint the nature of these IT-intensive interorganizational relationships represent an opportunity to revisit the concept of *governance* as well as the relationship between governance and *technology.*

Public vs. Private Sector

Given the public sector context of this dissertation, it is important to consider whether the context would limit the generalizability of the findings of the dissertation. A key question then is how the public sector is different from the private sector and how might these differences increase or decrease generalizations across sectors? A significant stream of research has emphasized the distinctive nature of the public sector (cf. Bozeman & Bretschneider, 1986, 1994; Kelman, 2005, 2007; Rainey & Bozeman, 2000; Rocheleau, 2006; Van der Wal et al., 2006). General differences between the private and public sector include the private sector emphasis on profitability and sustainability (Van der Wal et al., 2006) and the public sector emphasis on accountability and openness (Bozeman & Bretschneider, 1986). The differences are important, especially in light of the different legal and environmental constraints faced by each sector. However, much of the literature has emphasized differences in terms of the external interaction of firms with clients or government organizations with the public (cf. Kelman, 2007). Some researchers have argued that the "new public management" movement has resulted in a

convergence of the public and private sectors (cf. Ferlie, 2002). The movement to reinvent government in the early 1990s led to an emphasis on planning and continuous improvement in government activities (Osborne, 1993). The focus on planning and continuous improvement - ideas borrowed from the private sector – emphasize how public organizations function internally – both within public organizations and between them. When viewed internally, recent research has suggested, "the available evidence does not provide clear support for the view that public and private management are fundamentally dissimilar in all important respects" (Boyne, 2002, p. 118). Markus and Bui (2011) recently suggested that the public sector may be more complex than the private sector and that conclusions drawn from the public sector may also apply to the private sector.

As Kelman (2007) noted, "all organizations have both goals, and constraints that put boundaries around what they may legitimately do to achieve their goals" (p. 228). Government agencies may show a higher tendency to collaborate (cf. Fedorowicz et al., 2007) but the frequency of IOR formation in the private sector shows a similar willingness to collaborate, with reasons ranging from economic necessity to institutional legitimacy (Oliver, 1990). The actual governance of both public and private IOR is an important area of research and a potential contribution to both streams of research. In general, a shift is occurring from studies of *government* to studies of *governance* in the public sector – a shift that highlights the structures and mechanisms that guide collective action (Kelman, 2007) as well as address conflict and enable the effective and efficient use of resources for communities of organizations (Provan & Kenis, 2007). This shift presents an opportunity for both new findings in public sector research as well as the potential to adapt governance findings in government to the private sector (Kelman, 2007). In this dissertation the external context is the public sector but governance success and governance contingencies are expected to be shared across both sectors. As little research

attention has been on the governance of IT-IORs in either industry, additional research is needed to determine, which, if any, findings ultimately apply.

Theoretical background

In this section I begin by describing and defining governance as it is a central concept in this dissertation. The following sections describe contingency theory and the concept of fit generally as well as the views of fit I adopt in each essay. This theoretical background is followed by a brief overview of each of the three essays that make up this dissertation.

Governance

In the context of IT-related phenomenon the definition of governance often varies depending on the phenomenon under investigation (Markus & Bui, forthcoming). In the context of IT-IORs it is necessary to adopt a definition able to capture both organizational as well as IT-related governance concerns. In this dissertation governance is defined generally as "the means for achieving the direction, control, and coordination of wholly or partially autonomous individuals or organizations on behalf of interests to which they jointly contribute" but the term is rarely explicitly articulated (Lynn, Heinrich, & Hill, 1999). I am interested in the "means" used for achieving direction, control and coordination in IT-IORs. This general definition is closely aligned with earlier work on *organizational design* where organizational design was viewed as a combination of *structure* and *coordination mechanisms (*Galbraith, 2000; Goold & Campbell, 2002). Markus et al. (2012) defined the combinations of hierarchical reporting relationships and divisions of labor as *structure*, a similar definition is found in Mintzberg (1993). Markus and colleagues (2012) also identified formal and informal *coordination mechanisms*.

The distinction is important because the term *governance* continues to be frequently used but is commonly operationalized only as formal and informal coordination mechanisms to the

exclusion of structure (Markus et al., 2012). I agree with Whittington (2002) and Markus and colleagues (2012) that structure and coordination mechanisms should be studied together as complements (rather than as substitutes as implied in Galbraith (1994; 2008). This point is critical because structure and coordination mechanisms are believed to interact and co-evolve over time and jointly influence performance (Markus et al., 2012). Investigating one but not the other dimension of governance may lead to incorrect conclusions about the influence of governance on performance. This is especially important for designers of intra- and interorganizational relationships like IT-IOR because governance should be designed to match the contingencies organizations face.

Contingency theory

One of the earliest and persistent theoretical arguments used to explain the design of organizations is contingency theory (Demers, 2007). Contingency theory developed as a response to the universalistic "one best way" argument for organization design. Thompson (1967) argued that firms face uncertainty that lead managers to do all they can to protect the internal core while adapting the external-facing part of the firm to better cope with the uncertainties, or contingencies, in the environment. Lawrence and Lorsch (1967) argued that there are different types and amounts of contingencies that a firm is likely to face, each requiring a different approach by the firm to achieve "fit" with its environment. Galbraith (1973) later argued that there is no one best way to organize a firm and that the potential means of organizing are not equally effective. Implicit in each of these arguments is the notion that achieving fit between the structure of an organization and its environment equals improved performance.

Contingency theory is one of many theories used to understand the relationship between organizations and the environment they operate in. Two other dominant theories are resource dependence theory and transaction cost theory. Resource dependence theory suggests that

organizations compete for survival based on access to scarce and valuable environmental resources (Pfeffer & Salancik, 1978). The theory has been used to explain why organizations join with other organizations in various forms as a way to gain access to scarce resources or to prevent other organizations from gaining access to those sources. Resource dependence theory remains a valuable tool for understanding organizations actions in the environment they compete in but, as tool for understanding the governance or design of organizations, it is inadequate. It is inadequate because the theory emphasizes the external focus of organizations and has little to say about the internal workings of an organization (Demers, 2007). Governance is by definition concerned with both the external focus as well as the internal workings of an organization(s).

Another dominant theory used for understanding the relationship between organizations and the environment they operate it in is transaction cost theory. Transaction cost theory, first proposed by Coase (1937) but modified to its most widely used form by Williamson (1985) emphasizes transactions as the unit of analysis to explain the nature of organizations and the relationship between organizations and their environment. Typically this relationship is operationalized as an organizational form for reducing the costs of transactions. The forms examined are markets, hierarchies or hybrid forms (Ghoshal & Moran, 1996). The theory is frequently used to understand the creation of interorganizational relationships but not how they are governed (Provan et al., 2007). Each form has different characteristics that make it more appropriate for certain transactions but the variations within the forms are not considered. Those variations - the "means", the elements of governance - are what I am interested in identifying and are what are important for explaining the success of IT-IORs. As such transaction cost theory does not provide the explanatory power needed for the phenomenon I am interested in.

The contingency theory perspective focus on "fit" has highlighted the internal design of an organization and how the design of an organization should "fit" or "align" with contingencies

in the environment. It is also important to note that organization theorists have articulated both internal and external fit. External fit "demands that organizations match their structures and processes to their external settings" (Miller, 1992, p. 159). To achieve internal fit organizations "must establish complementarities among aspects of structure and process" (Miller, 1992, p. 159). Note that both the internal and external views of fit are concerned with the governance, as I have defined it, of organizations and the potential link of appropriate governance "fit" with organizational performance (Drazin & Van de Ven, 1985). A contingency theory perspective, particularly the concept of fit, is thus an appropriate theoretical approach for my research interests and questions – that the governance of organizational relationships and the governance of IT are related to performance.

The concept of "fit"

The concept of "fit" is central to contingency theory and fit remains both its most promising feature as well as the target of most of the theory's critics (Demers, 2007). As fit is a central part of each of my essays it is important to be clear about what I mean and the view of fit I adopt. To begin with, a review of the dominant views of fit is useful. An early important paper that attempted to provide some clarity around the different conceptualizations of fit is the work of Drazin & Van de Ven (1985). They suggested there are three different ("both unique and complementary") views of fit: selection, interaction, and systems. Briefly, these are described as:

- Selection views are essentially congruence theories that "simply hypothesized that organizational context (whether environment, technology, or size) was related to structure (centralization, formalization, complexity) without examining whether this context-structure relationship affected performance" (p. 517)

- Interaction views consider fit as "an interaction effect of the context and structure of an organization on performance – much like the classic studies of the interaction of sun, rain, and soil nutrients on crop yields (Van de Ven, 1979)" (p. 517)
- Systems views of fit suggest "the understanding of context structure performance relationships can only advance by addressing simultaneously the many contingencies, structural alternatives, and performance criteria that must be considered holistically to understand organization design" (p. 519)

A similar approach to understanding fit in IS research can be found in Umanath (2003) who proposed that conceptualizations of fit can be grouped into fit as congruence, fit as contingency and fit as holistic configurations. These line up with the selection, interaction and systems views suggested by Drazin & Van de Ven (1985).

The dominant view of fit

The most cited work on fit in management research is the work of Venkatraman (1989) on the concept of fit in *strategy* research. Venkatraman argued that the concept of fit was often criticized in strategy research because researchers frequently did not match their conceptual view of fit with appropriate statistical measurement. He argued for six perspectives on fit: 1) fit as moderation; 2) fit as mediation; 3) fit as matching; 4) fit as gestalts; 5) fit as profile deviation; and 6) fit as covariation. The bullet points that follow contain a brief definition of each perspective from Venkatraman (1989) as well as a more recent description of each of the fit perspectives from a paper by Bergeron and colleagues (2001) on IT strategy research.

- Venkatraman defined *fit as moderation* as "the impact of the predictor (e.g., strategy) varies across the different levels of the moderator (e.g., environments)" (p.424). Later, Bergeron et al. (2001) defined fit as moderation for IT strategy research as "the

interactive effect of the strategic orientation of a firm and its strategic management will have implications on firm performance" (p. 127).

- Venkatraman defined *fit as mediation* as an "intervening mechanism (e.g., organizational structure) between an antecedent variable (e.g. strategy) and the consequent variable (e.g. performance" (p. 428). Bergeron et al. (2001) defined fit as mediation for IT strategy research as "strategic IT management is an intervening variable between strategic orientation, structure, environmental uncertainty, and firm performance" (p. 127).
- Venkatraman defined *fit as matching* as "fit is a theoretically defined match between two related variables. This is a major point of departure from the previous two perspectives because fit is specified without reference to a criterion variable, although, subsequently, its effect on a set of criterion variables could be examined. Stated differently, a measure of fit between two variables is developed independent of any performance anchor, which is unlike the previous two perspectives" (p. 430-1). Bergeron et al. (2001) defined fit as matching for IT strategy research as "fit in an IT management context exists when strategic IT management matches environmental uncertainty (or matches structure, or strategic orientation). Whether the match improves firm performance would then be tested" (p. 128).
- Venkatraman defined *fit as gestalts* as "the degree of internal coherence among a set of theoretical attributes" (p. 432) and borrowed ideas from Miller on configurations. Bergeron et al. (2001) described fit as gestalts in IT strategy research as "based on an internal congruence conceptualization, whereby fit is seen as a pattern" (p. 128).
- Venkatraman defined *fit as profile deviation* as "fit is the degree of adherence to an externally specified profile" (p. 433). In IT strategy research Bergeron et al. (2001) described this as "the degree of adherence to a specified profile of strategic IT

management, environmental uncertainty, structure, and strategic orientation, has a significant effect on performance" (p. 128).

- Finally, Venkatraman defined *fit as covariation* as "a pattern of covariation or internal consistency among a set of underlying theoretically related variables" (p. 435). Bergeron et al. (2001) suggested this is "the appropriate coalignment of environmental uncertainty, structure, strategic orientation, and strategic IT management that will influence performance" (p. 128).

Early contingency-based strategy and organizational design research adopted a fit as moderation approach (Venkatraman, 1989) as did contingency-based IS research (Bergeron et al., 2001). Several researchers have noted that the interesting (but challenging – conceptually and methodologically) work would likely come from the *fit as gestalts* and *systems* research (cf. Bergeron et al., 2001; Drazin & Van de Ven, 1985; Doty et al., 1993; Umanath, 2003).

Configurational approaches are rooted in the *fit as gestalts* and *systems* ideas of fit. Configurations have been defined broadly as "any multidimensional constellation of conceptually distinct characteristics that commonly occur together" (Meyer et al., 1993, p. 1175). Miller (1986) argued for configurations as an improved approach for understanding "fit" – "cohesive configurations reduce the number of possible ways in which the elements combine" (p. 236). Configurational approaches, as predicted by earlier contingency researchers, have suffered from criticisms over the conceptualization and analysis of configurations (Short et al., 2008; Snow et al., 2006). Qualitative comparative analysis (QCA) has been advocated as a promising method to deal with the configurational view and its complex causality and nonlinear relationships. Researchers in both strategy (Fiss, 2007) and IS (Fichman, 2004; Lyytinen & Damsgaard, 2011) have argued for QCA as a way to move configurational approaches forward.

The view of fit in essays 1 and 2

When viewed in the light of this brief review of contingency theory and fit more generally, the first two papers in my dissertation follow the evolution of thinking around fit. The first essay has a proposition based on the universalistic "one best way" view of organizational design but then moves to propositions based on what can be called a contingency theory view of fit. Specifically, the approach taken is a *fit as matching* approach but with an important difference – performance is included as part of the overall analysis. As Venkatraman (1989) and Bergeron and colleagues (2001) pointed out – *fit as matching* emphasizes a fit between two variables - in this case between governance and relationship/technology/data variables for successful IT-IORs.

This has a couple of important implications. The first is that one of the purposes of the first essay is to problematize the concept of governance effectiveness which so many researchers have dealt with by equating the concept circularly with the consequences it is hypothesized to have (cf. Reinking, 2011). The matching perspective allows for the separation of governance fit variables from performance. The second is that I do want to identify good governance in successful IT-IORs and this is also possible using the fit as matching approach. But rather than identify the instances of fit and then subsequently link these to performance in a separate analysis I look at successful IT-IORs and then look for good governance matches. Similar approaches may be a way to renew interest in more traditional views of fit, especially for researchers similarly interested in understanding the fit between variables expected to be important for effective performance but too often entangled with performance.

The second essay is rooted in the *fit as gestalts* and *systems* views of fit. In it I take a configurational view to empirically examine configurations of IT-IOR governance. Using QCA methods I identify governance configurations ("paths" in the language of QCA) associated with effective IT-IORs. This essay also has an important implication for fit-based research. The study

is an empirical example of configurational research based on theoretically derived configurations and the novel QCA method. As noted, theorists have identified configuration-related ideas of fit as the important next step for a more robust understanding of fit but the research has been largely conceptual and the methods inadequate at this point (Fiss, 2007). The essay shows there is real promise in both configurational thinking for improved understanding of organizational design as well as exciting opportunities using QCA methods.

Evolving views of fit

Before discussing the view of fit and potential contribution of my third essay it is important to discuss more recent alternatives to conceptualizations of fit being explored in IS literature. Interestingly, these researchers have moved away from using the term "contingency theory" but have maintained the central concept of fit. The authors in this stream of research are interested in exploring conceptualizations of fit between organizations and technology – more specifically enterprise systems.

Misfits and misalignments

In a stream of research Soh and colleagues (Soh et al., 2000; Soh & Sia, 2004) have researched what they call "misfit" or "misalignment" of enterprise systems packages (like SAP) and organizational design in organizations. In Soh et al. (2000) "misfits" are defined as "the gaps between the functionality offered by the package and that required by the adopting organization. As a result, organizations have had to choose among adapting to the new functionality, living with the shortfall, instituting workarounds, or customizing the package" (p. 47). They categorize misfits as data misfits ("incompatibilities between organizational requirements and ERP package in terms of data format, or the relationships among entities as represented in the underlying data model" (p. 48)), "functional misfits" ("incompatibilities between organizational requirements and

ERP packages in terms of processing procedures required" (p. 49)), and "output misfits" ("incompatibilities between organizational requirements and the ERP package in terms of the presentation format and the information content of the output" (p. 50)).

In a subsequent paper on ERP packages, Soh & Sia (2004) focus on what they call "misalignments", defined as "misalignments as differences between the structures embedded in the organization (as reflected by its procedures, rules and norms) and those embedded in the package" (p. 376). Soh and colleagues are interested in identifying misalignments and the organizational responses to misalignments. Soh and colleagues are examining fit but stay away from the contingency theory literature entirely, probably to keep the decades old debates from clouding their important findings – that ERP packages have characteristics that require organizational responses in order to achieve alignment and subsequent success.

Fit as coverage and fit as enablement

Strong and Volkoff (2010) build on the work of Soh and colleagues on "misfit" and "misalignment" but also tackle the issue of "fit" from prior research directly. Though they do not cite "contingency theory" they do review "the classic work on fit by Venkatraman (1989)" (Strong & Volkoff, 2010, p. 733) that empirical contingency research frequently cites in order to illustrate how their conceptualization of fit is different. Strong and Volkoff (2010) acknowledge the work of Venkatraman has been important but that it is inadequate because it does not address the nature of IT. They make two strong statements about fit and technology in the IS literature: 1) "From a research perspective, our theoretical argument is that the concept of fit in the MIS literature is underspecified primarily because the IT artifact itself has been underspecified" (p. 731)" and 2) "Fit studies in the MIS literature rarely include a clear theoretical characterization of the IT artifact. In the MIS literature overall, the IT artifact is underspecified, and often treated as a black box (Orlikowski and Iacono 2001)" (p. 732).

Strong and Volkoff (2010) introduce the concepts of "fit as coverage" and "fit as enablement" as alternatives for understanding fit between organizations and enterprise systems (ES in their paper). Fit as coverage "means the ES meets the organization's requirements (i.e.., it includes the features that the organization needs to operate and that users need to do their work)" (p. 746). Fit as enablement "means the ES permits and enables the organization to operate more effectively, and users to do their work more efficiently, than was the case without an ES" (p. 746). They suggest these two new conceptualizations of fit are "tailored to IT artifacts, that is, they capture how the IT artifact affects the conceptualization of fit, rather than being fit forms of generic variables as in Venkatraman's forms" (p. 748).

Fit in essay 3 – affordances, constraints and actualization

In my third essay I also stay away from discussing "contingency theory" and do not explicitly talk about fit but my third essay follows this new and important line of thinking. The theoretical foundation of the third essay is the technology affordances and constraints theory (TACT). As articulated by Majchrzak & Markus (forthcoming), TACT emphasizes that the *potential* uses of technology suggest both the positive and negative potential of technology. *Affordances* are the "action potential" of technology. *Constraints* are the ways technology can keep individuals or users from accomplishing a particular goal. Importantly, the concepts are best understood as relational, meaning the affordance or constraint is only apparent when interacting with an individual or organization – through the actualization of the affordances or constraint.

Put another way, the concepts are best understood when there is fit or misfit between the potential of the technology and the response of the individual or organization Prior research has emphasized the interaction at an individual level but I extend the concept specifically to the organizational level. I review the life of a successful organization and identify instances where affordances and constraints were met with actualization (changes in organizational design) to

achieve fit or alignment between the technology and organizational design. I argue that consistently achieving this fit has been critical to the success of the organization.

My dissertation can indeed be seen as an exploration of the concept of fit, particularly in IS research – from its roots in contingency theory to its future potential in focusing on the interaction between organizations and the characteristics of IT. In essay 1 I show there is still some value in using the early conceptualizations of fit. The fit as matching perspective enabled me to better understand the importance of good governance on performance by detangling governance and IT fit. The second essay provides empirical evidence that configurational thinking, based on the fit as gestalts and systems views of fit, has much promise and that novel QCA methods are one way of exploring this complex view of fit. The final essay is part of the recent evolution of thinking about fit in IS research where the focus is on the affordances and constraints – the potential – of technology. Fit is achieved when the nature of IT and the design of an organization are aligned. This line of thinking has the potential to help move IS research forward by focusing on the IT artifact while emphasizing the design of organizations and thus leading the charge in breathing new life into the concept of fit across multiple disciplines.

In the next section I briefly review each of the three essays including an overview of the methods and findings.

Essay 1 - What is Good Governance? An Exploratory Study of Alternative Conceptualizations and Implications for the Success of IT-Intensive Interorganizational Relationships

The purpose of essay 1 is to understand what "good governance" is in successful IT-IORs. It is generally assumed that effective governance leads to success, but relatively little empirical research has conceptualized the characteristics of good governance. I articulate three

key challenges faced by IT-IORs that each require effective governance - 1) relationships among the organizations, 2) technology, and 3) data. Using a contingency theory perspective I considered two alternative conceptualizations of effective governance: first, the universalistic argument that governance of a certain type (specifically, having a formal governance mechanism such as a steering committee) and second, governance that fits key contingencies (concerning relationships, technology, data, or all three).

Method

The study relies on responses to a larger survey conducted on PSNs as part of the NSF project. To identify successful IT-IORs I created an index outcome measure as has been used by Massina and Pettigrew (2003) in studies of organizational design and change as a way to synthesize what are normally individual organizational elements into a single outcome score. The contingencies were identified as theoretically important in prior research on IORs, IT and data governance. Due to the nature of the data – this is secondary use of the survey, the medium N (45) and that fact that it is non-parametric I used cross-tabulations to analyze "fit as matching" between employing a steering committee and key contingency variables.

Findings

The exploratory findings support the propositions that employing a steering committee (the universalistic perspective) as well as governance that "fits" key technology contingencies are indicators of "good" governance in the context of IT-IORs. Suggestions for additional research on IT-IORs and alternate conceptualizations of fit are discussed. I conclude by briefly describing and suggesting a configurational view of fit as a promising approach for future research.

Contribution

The findings from essay 1 contribute to both theory and practice. The essay contributes to theory by problematizing the concept of governance effectiveness and by extending contingency theory. By adopting a fit as matching perspective for good governance in successful IT-IORs I uncover the possibilities that a fit as matching perspective can still provide. I began to identify other ways of conceptualizing "good governance" based primarily on a steering committee as an example of a formal coordination mechanism but suggest future research should continue to theorize about what characteristics are associated with good governance. The essay contributes to practice by providing insight for public safety practitioners – most notably that in *IT*-intensive interorganizational relationships a steering committee may be needed to meet the demands of technology contingencies. This is an intuitive finding but one worth sharing as IT-IORs become more common.

Essay 2 - IT Interorganizational Design: Contingent Fit or Holistic Configuration of Structure and Governance?

The purpose of essay 2 is to understand whether a configurational approach to governance, broadly defined as the IT interorganizational design of IT-IORs, can add important insights to governance research. Specifically, I argue that *structure* and *formal and informal coordination mechanisms* as complements may explain effectiveness better than either structure or mechanisms do alone. I take a new approach to this important question by 1) extending contingency theory using a configurational approach, 2) performing an empirical analysis in the interorganizational setting of IT-IORs, and 3) showing the promise of a novel method of analysis – qualitative comparative analysis (QCA).

Method

Originally developed by Charles Ragin (1987) for political science, QCA, unlike traditional, variable-based approaches does not treat configurations as separate, independent elements but instead uses Boolean algebra to treat configurations as different types of cases – as unique combinations of related attributes (Fiss, 2007). Key to QCA is the idea that "relationships among different variables are often best understood in terms of *set membership*" (Fiss, 2007, p. 1183, italics in original). The method provides a way to develop, define and analyze configurations in organizational research as suggested by Fiss (2007) for strategy research and Fichman (2004) for IT innovation. Briefly, the QCA depends on deciding the relevant configurational elements based on "theoretical and substantive knowledge" (Fiss, 2007, p. 1184).

The next step is to create a truth table that shows all possible configurations of those elements and whether the configurations lead to the outcome the researcher is interested in (Fiss, 2007). One can quickly come up with very large numbers of configurations. But it is important to note that not all possible configurations are hypothesized to exist, a concept known as *limited diversity* (Ragin, 1987; 2000). Limited diversity explains, as Miller (1996) suggested, that the power of configurations comes from the fact that most configurations are unlikely to exist empirically but a few "are for more common" (p. 506). Additionally, more than one configuration is likely to lead to the outcome of interest – a concept known as *equifinality* (Fiss, 2007). Analysis in this paper was done using the fsQCA software developed by Ragin. The software relies on the Quine-McKluskey algorithm to reduce the truth table to a set of logic statements using Boolean algebra. The software analyzes similarities among the configurations and reduces the configuration to necessary and/or sufficient conditions for the outcome of interest to occur (high performance in this study). A *necessary* condition must be present for an outcome to occur. A *sufficient* condition produces the outcome by itself.

Findings

Analysis resulted in two paths to high performance for IT-IORs – two configurations of structure and formal and informal mechanisms. The first is the combination of a hierarchical reporting structure combined with a mandate. The second is a lack of prior information sharing combined with written rules for IT resources combined with an IT steering committee. The first path raises interesting questions. Does creating a separate entity require a mandate? Without additional longitudinal research it is impossible to know whether the participating organizations lobby for a mandate because they lack the power (and resources) to create a separate entity without it or the entity and hierarchical reporting are a visible symbol of the IT-IOR in order to attract resources/legitimacy. The second path is contrary to prior research in that it suggests successful IT-IOR governance (design configurations) can exist in *the absence of prior information sharing* among participating organizations if there are also rules about IT resources and an IT steering committee. This essay is an important first step and future theoretical development and research are needed to understand the important interaction structure and coordination mechanisms with the ultimate goal the design of superior configurations for IT interorganization design.

Contribution

Essay 2 contributes to theory, methods and practice. The paper contributes to theory by making a strong argument for considering IT organizational design as a combination of structure and formal and informal coordination mechanisms by showing that it is the combination and likely interaction of the elements that leads to success. In addition, finding that prior information sharing among participants is not needed for interorganizational relationships to be successful is a finding that is contrary to the common views on interorganizational relationships. By revisiting configurational approaches using QCA analysis the paper contributes to this novel method and

highlights its promise in new contexts and disciplines. Finally, a key contribution to practice is also the finding that successful IT-IORs can exist even if there has been no prior information sharing among participating organizations. What is critical for participants and managers to keep in mind is the importance of rules about IT resources and the creation of an IT steering committee.

Essay 3 - Technology affordances, constraints and actualization through organizational design changes

The purpose of essay 3 is to explore the relationship between technology and organizational design over time. I argue that the materiality of technology does matter – that "technologies have features and functionalities regardless of whether humans recognize or use them" (Majchrzak & Markus, forthcoming) - and suggest opening the "black-box" of technology for a better understanding of the relationship between technology and organizations. In this essay I use the concept of organizational design as analogous to my broad definition of governance – a combination of both the hierarchical reporting relationships and divisions of labor in an organization (cf. Mintzberg, 1993) and formal and informal coordination mechanisms (Markus et al., 2012). Based on the concepts of technology affordances and constraints at the organizational level – defined as affordances for organizing – I identify instances of the actualization of affordances and constraints though changes in organizational design using a single retrospective, longitudinal case study. The findings add to the growing literature on technology affordances and constraints at the organizational level and point to future research.

Method

The data used in this case study comes from a unique combination of longitudinal, retrospective and archival sources (see Table 1). I began to follow the organization beginning in 2009 and have done site visits at headquarters, conducted informal interviews and observations

and have attended annual meetings, board of director meetings and other meetings since that time. Retrospective data comes from 11 formal interviews with key individuals inside and outside the organization. Finally, one informal interview lead to boxes full of archival data that was subsequently supplemented by other archival data held at headquarters. Taken together they represent over 400 pages of board meeting, conference meeting and other committee meeting minutes from pre-founding (1960s) to present day as well as other internal (e.g. training) and external (e.g. marketing) documents.

Table 1.1 Types and sources of case study data for essay 3

Type of data	Source of data
Longitudinal	Site visits, informal interviews, observations at HQ, annual meetings, board of director meetings and workshops from 2009 – present
Retrospective	11 formal interviews
Archival	Review board meeting, conference meeting and other committee meeting minutes from pre-founding (1967) to present; other internal (e.g. training) and external (e.g. marketing) documents

For analysis I adopted the critical incidents approach first developed by Flanagan (1954) and others. A critical incidents approach "facilitates the investigation of significant occurrences…identified by the respondent, the way they are managed, and the outcomes in terms of perceived effects" (Chell, 1998, p. 56). Interviewees were asked to identify critical "incidents" in the history of the organization related to changes in technology and organizational design. To get around issues of recall bias I reviewed the history of the organization presented both internally and externally to identify the critical incidents deemed important as part of the organization's institutional history. I then reviewed the archival data, particularly the various meeting minutes, to see the concerns, debates and decisions made during the meetings that occurred during what were identified as critical incidents. Based on this triangulation of data, I identified three critical incidents of technological change and changes in governance in the IT-

IOR. I labeled the three incidents as 1) "A national network" (the incident occurred from 1966 – 1970); 2) "The proactive upgrade" (the incident occurred from 1978 – 1981); and 3) the "Introduction of XML/web services" (the incident occurred from 1998 – 2002). I then identified instances of affordances, constraints and actualization through organizational design changes within and across each incident.

Findings

Within each incident I found an instance of an affordance or constraint as well as actualization through organizational design changes. I identified the affordance/constraint and actualization as follows: A *standardizing technology and data affordance* was actualized primarily through a change in the hierarchical reporting relationship and division of labor. The *constraint of relying on vendors and proprietary technology* was overcome through formal coordination mechanisms (e.g. rules about access to the system). The *enabling interoperability affordance* was actualized through both informal and formal coordination mechanisms (e.g. a strategic committee and informal encouragement of XML).

Contribution

The essay contributes to both theory and practice. Contributions to theory include empirical evidence to support the largely conceptual technology affordances and constraints theory (TACT). Although additional evidence is needed the findings support this promising theory. Second, the study expands the idea of TACT at the organizational level by including empirical evidence of affordances for organizing which is also in the early, conceptual stage. Finally, by using organizational design as a way to identify actualization in organizations the study presents a complete framework with empirical support for TACT at the organizational level.

The essay contributes to practice by emphasizing that the nature of technology does matter for organizational design and that the interaction of the two matters for organizational success. The findings suggest that in the interaction of technology and organizations – in this case the actualization of affordances and constraints through organizational design – agency matters and that managers have options for unlocking the promise of technology.

Summary

The three essays in this dissertation add to our understanding of successful IT-IORs by re-examining the concept of governance - broadly defined as organizational design - and the relationship between governance and technology. Each essay is an exploration of the concepts and this important relationship. I use a different method in each essay but each is rooted in the concept of fit. Essay 1 is a "proof of concept" study using cross-tabulations. Essay 2 is a configurational study using the novel QCA method. Essay 3 is a single retrospective, longitudinal case study. Although each essay has its own contributions to theory and practice, collectively this dissertation is a return to the "roots" of governance by once again broadly conceptualizing governance as organizational design - something consisting of hierarchical reporting relationships and divisions of labor (structure) as well as informal and formal coordination (governance) mechanisms. Similarly, this dissertation traces the history and evolution of contingency theory and the concept of fit and explores future opportunities for extending this important concept. Finally, the dissertation suggests that nature of technology matters and that the relationship between technology and governance matters for success. For researchers this represents promising areas of research. For practitioners it highlights the importance of governance and the opportunities for finding success in the interaction between governance and technology. The remainder of this dissertation is structured as follows. The three individual essays that make up the dissertation are found in the next three chapters. The final chapter is the conclusion.

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Essay 1 - What is Good Governance? An Exploratory Study of Alternative Conceptualizations and Implications for the Success of IT-Intensive Interorganizational Relationships[1]

Abstract

Increasingly, interorganizational relationships (IORs) are facilitated and strengthened by IT-enabled information sharing. Often, the connected organizations develop, operate and manage the IT that supports their interaction, a phenomenon defined in this study as an IT-intensive IOR (IT-IOR). For IT-IORs there are three key challenges – concerning 1) relationships among the organizations, 2) technology and 3) data – that require effective governance. This study considers two classic alternative conceptualizations of effective governance for organizational success: 1) the universalistic argument that governance of a certain type (specifically, having a formal governance mechanism such as a steering committee) versus 2) governance that fits key contingencies (concerning relationships, technology, data, or all three) . Exploratory findings based on analyzing responses to a survey conducted on IT-IORs in the public sector support the conclusion that having a steering committee as well as governance that fits key technology contingencies are indicators of "good" governance in the context of IT-IORs, suggesting support for both the universalistic and contingency theory perspective of governance in IT-IORs. Suggestions for additional research on IT-IORs and alternate conceptualizations of fit are discussed.

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Introduction

Organizations form interorganizational relationships (IORs) to achieve goals that they cannot achieve independently (Wood & Gray, 1991). Frequently, interorganizational relationships are facilitated and strengthened by IT-enabled information sharing. The connected organizations may develop, operate and manage the IT that supports their interaction - a phenomenon defined in this study as an IT-intensive IOR (IT-IOR).

The governance of an IT-IOR is important because it is believed to lead to IT-IOR success (Provan & Kenis, 2007). Governance is defined in this paper as "the means for achieving the direction, control, and coordination of wholly or partially autonomous individuals or organizations on behalf of interests to which they jointly contribute" (Lynn et al., 1999) This study is focused on the "the means" used for achieving direction, control and coordination in IT-IORs.

In addition to the typical challenges associated with the governance of relationships between organizations, the focus on technology makes IT-IORs different than other IORs in important ways. As noted by Hui et al. (2008) technology makes a difference in two key ways: 1) the knowledge needed for acquiring, maintaining and using IT is often distributed across organizations making direction, control and coordination a challenge; and 2) technology is constantly changing meaning that IT investment and IT skills need to keep up, a challenge that is even more pronounced across organizational boundaries because technology and IT skills may be heterogeneously distributed across organizations.

An illustrative example of an IT-IOR and the governance challenges an IT-IOR faces is the Capital Wireless Information Net (CapWIN) in the Washington, DC metropolitan area in the United States. CapWIN is an interorganizational relationship whose purpose is to develop an

integrated wireless network to support ongoing interagency coordination in routine and emergency situations (Fedorowicz et al., 2007). From the beginning, the governance challenges facing CapWIN have been apparent to participating organizations (Maggion & Shiftan, 2004). A key challenge was managing relationships among organizations diverse in both functional type (for example police, fire and homeland security) and government level (federal, state and local). In addition, CapWIN had governance challenges associated with the development and use of interorganizational information technology (Maggion & Shiftan, 2004) as well as the sharing and use of data (Cushing & Pardo, 2005) across agencies that may have their own proprietary technology and data standards. Each of these three challenges—of relationship, technology, and data—required effective governance.

The challenges associated with CapWIN are an example of the differences between IORs and IT-IORs as articulated by Hui et al. (2008). The challenges and the growing IT-IOR phenomenon represent an opportunity for understanding how successful IT-IORs are governed effectively. To date, however, researchers have lacked "the adaptation of theories and research foci" to reflect the nature of IT-IORs (Hui et al., 2008. p. 257). Contingency theory and the concept of governance "fit" combined with concepts from the IOR and IT governance literatures can move this research forward in two important ways. First, combining IOR and IT governance research provides a way for understanding the unique challenges of IT-IORs that neither research stream is able to do on its own. Second, when combined with contingency theory the combination of IT and IOR research enables theorizing around what the important elements of IORs and IT governance are and how, when fit is achieved, the elements lead to IT-IOR success.

A key formal coordination mechanism consideration in the context of IT-IORs like CapWIN is the steering committee (Maggion & Shiftan, 2004; Markus & Bui, 2011). Steering committees can provide important interorganizational policy guidance as well as develop

technology standards and recommend technology investments (Maggion & Shiftan, 2004). A universalistic, one-size fits all argument would suggest that the challenges associated with IT-IOR governance always require a steering committee. Indeed researchers in the IOR (Provan & Kenis, 2007) and IT governance (Huang et al., 2010) literatures have recently suggested that a formal coordination mechanism like a steering committee with the authority to make decisions on relationships and technology is needed rather than to leave these decisions to informal coordination mechanisms. The alternative, contingency theory perspective, suggests that the need for a steering committee depends on the contingencies an IT-IOR faces (such as relationship, technology and data contingencies).

The question addressed in this paper is: What is good governance in IT-IORs? That is, which conceptualization of effective governance best accounts for the success of IT-IORs? The answers evaluated in this exploratory study include: 1) the universalistic argument of a formal coordination mechanism such as a steering committee in every instance and 2) a steering committee that fits contingencies related to relationships among the organizations, technology, and data (the contingency theory argument) An exploratory analysis was conducted on data from a survey of IT-IORs in the public sector. Exploratory findings support the propositions that having a steering committee as well as governance that fits key technology contingencies are measures of good governance in the context of IT-IORs.

Theory

This section begins with a review of contingency theory and the view of fit adopted in this paper. This is followed by a review of the literature relevant to IT-IORs: first the literature on governance of IORs is reviewed and then the literature on IT and data governance is reviewed. The section concludes with a discussion of performance and the challenges associated with identifying and measuring performance using contingency theory in the context of IT-IORs.

Contingency theory and "fit"

Contingency theory grew out of the literature on organizational design and was developed as a response to the universalistic argument that there is "one best way" to design an organization. Lawrence and Lorsch (1967) argued that organizations face different uncertainties, or "contingencies" in the environment they operate in and that each contingency required a different design in order for the firm to respond effectively. Galbraith (1973) later argued that there was no one best way of organizing, but that not all means of organizing were equally effective. A central concept in contingency theory has to do with this concept of "fit" – for example that achieving fit between the structure of an organization and its environment results in improved performance (Venkatraman, 1989; Umanath, 2003).

Contingency theory and the concept of fit remain important in many disciplines (Demers, 2007), but there is some debate about what "fit" means and concern that researchers are not clear about which of the many conceptualizations of fit they adopt in their research (Venkatraman, 1989; Umanath, 2003). Venkatraman (1989), still the most cited work on contingency theory and fit (Strong & Volkoff, 2010), articulated six conceptualizations of fit – *fit as moderation* (the interactive effect of a predictor on a moderator); *fit as mediation* (an intervening mechanism between an antecedent and a consequent); *fit as matching* (a theoretically derived match between two variables independent of performance); *fit as gestalts* (fit as a pattern based on internal coherence); *fit as profile deviation* (fit as a "degree of coherence" to some external profile); and *fit as covariation* (internal consistency among a set of underlying related variables).

This study is based on a *fit as matching* perspective in order to examine whether there is a theoretically derived match between a steering committee as a formal coordination mechanism and important relationship/technology/data contingencies IT-IORs face. It is also critical to note an important difference in this study compared to other studies based on a fit as matching

perspective - performance is an important part of the overall analysis. Contingency studies employing the fit as matching perspective typically separate the consideration of a theoretically derived match from the influence of that match on performance (Venkatraman, 1989; Bergeron et al., 2001). In this study, rather than identify the instances of a match between a steering committee and key contingencies and then subsequently link the match to performance in a separate analysis the goal is to review successful IT-IORs and then identify instances of fit as matching. In order to identify the relevant coordination mechanism and contingencies in IT-IORs, the next section includes a definition of IOR governance, followed by a review of the dominant theoretical perspectives in IOR research. This is followed by a review of IT and data governance research.

IOR Governance

Interorganizational relationships are generally defined as "…transactions, flows, and linkages that occur among or between an organization and one or more organization in its environment" (Oliver 1990). The governance of IORs is important because it is widely believed to be related to IOR performance but is rarely explicitly considered (Provan & Kenis, 2007). One reason for the lack of IOR governance research is that governance has become a loaded term heavily dependent on context and academic discipline (Markus & Bui, 2011). The general view of IOR governance adopted in this paper is "the means for achieving the direction, control, and coordination of wholly or partially autonomous individuals or organizations on behalf of interests to which they jointly contribute" (Lynn et al., 1999). In particular, the study is focused on the "the means" used for achieving direction, control and coordination in IT-IORs. Alternative views would suggest either there is one best way (the universalistic view) for achieving direction, control and coordination versus the means depend on certain contingencies (the contingency theory view).

There are many ways for achieving direction, control and coordination. Researchers have suggested structure (i.e. hierarchical reporting relationships) (Galbraith, 2000; Goold & Campbell, 2002; Mintzberg, 1993) and informal and formal coordination mechanisms (Tsai, 2002; Whittington, 2002). In the context of IORs, researchers have recently argued that a formal coordination mechanism like a steering committee is the most critical mechanism for IOR success (Provan & Kenis, 2007). As noted, the additional challenges associated with acquiring, maintaining and using IT across organizations that are otherwise autonomous and may have proprietary technology and data make the need for a formal coordination mechanism like a steering committee even more pronounced. Yet, IOR research has focused less on specific coordination mechanisms and their influence on IOR performance (Provan et al., 2007; Ring & Van de Ven, 1994) and more on how and why IORs form. The IOR formation research is often based on three theoretical approaches: (1) transaction cost theory, (2) resource dependence theory and (3) relational/exchange theory - that have each been argued to be critical to understanding IORs (cf. Alexander, 1995; Barringer & Harrison, 2000; Kilduff & Tsai, 2003: Oliver & Ebers, 1998). Each of these theoretical perspectives will be discussed briefly next to see what each has to say about the need for governance in IORs before turning to the research on IT and data governance as a way to understand governance and organizational success in the context of IT-IORs.

IOR – common theoretical perspectives

Transaction cost theory was proposed by (Coase, 1937) and refined by Williamson (1985) to explain why organizations exist and persist. Transaction cost theorists focus on transactions as the units of analysis to explain the nature of organizations and the relationships between organizations and the market. Although the theory has many variants, researchers typically analyze the characteristics of transactions to identify the organizational form best able to

reduce transaction costs based on transaction characteristics. The organizational forms typically examined are markets, hierarchies or hybrid forms (Williamson, 1985). Implicit in the theory is the idea that effective governance is governance that matches the nature of the transactions between organizations but left unanswered is the question of whether there are variations within each governance type, some of which are more effective than others. In essence, the assumption is that one market is much like any other, although the market design literature challenges that assumption through detailed analysis of the features of auctions and markets.

In IS research on interorganizational systems, transaction cost theory has been used as the foundation of the electronic market hypothesis which suggests that information systems "shift transactions from hierarchies to markets by lowering external coordination or transaction costs" (Robey et al., 2008). The implicit assumption here is also that the shift and reduction in transaction costs leads to improved organizational performance.

Resource dependence theory in strategic management literature is a theory about organizational survival with a focus on the scarce and valuable resources for which organizations compete (Pfeffer & Salancik, 1978). Organizations join IORs as a strategic response to resource availability, uncertainty and dependence (Oliver, 1990), because increased power and control over other organizations is thought to lead to survival. Thus, survival is the criterion of IOR success rather than efficiency, but how resources are most effectively governed internally is relatively underexplored (Demers, 2007).

Finally, the relational/exchange perspective extends transaction and resource dependence theories by emphasizing the historical and social context of transactions (Heide, 1994). The theory emphasizes the shared norms and values that come from repeated interactions (Brown et al., 2000). In IOR research, Oliver (1990) called this a matter of "reciprocity" and suggested

organizations form IORs "for the purpose of pursuing common or mutually beneficial goals or interests" (p. 244). The relational/exchange perspective introduces the idea that the actual relationships in an IOR, with all of their history and complexity, must also be governed in addition to transactions and resources. Unfortunately, research adopting this perspective rarely considers governance explicitly; good governance – the choice of appropriate structure and in particular coordination mechanisms - is implied to be in place in successful (e.g. surviving) IORs (Provan et al., 2007).

In summary, transaction cost, resource dependence and relational/exchange theories are helpful for understanding what needs to be governed in IORs - transactions, resources and relationships, but they do not shed much light on the characteristics of effective governance (Provan et al., 2007). Nor do they offer guidance about how the effective governance of information technology (IT), including data, may play a role in the success of IT-IORs. IT represents a significant investment in time and resources (Brynjolfsson, 1993; Devaraj & Kohli, 2003; Prasad et al., 2010) meaning that IT-IORs have multiple technology-related issues to govern. Examples could include investments in fixed assets or contracts for IT services as well as multiyear commitments for the operation, maintenance and improvement of IT products and services (Hui et al., 2008). To understand how managers can cope with the challenges associated with IT, a review of the research on IT governance is necessary.

IT governance

Early investigations into the introduction and use of IT in organizations focused on whether IT added value to organizations. As early as the 1960s, Garrity (1963) argued that the structure of the IT function could have an impact on firm performance. Research on the "productivity paradox" (Brynjolfsson, 1993) continues, but accumulated evidence strongly suggests that IT can improve organizational performance under certain conditions (cf.

Brynjolfsson & Hitt, 2000; Melville et al., 2004). The question for many IS researchers now is not whether IT has effects, but rather how IT is most effectively governed (Prasad et al., 2010). As was the case in early research on IORs, IT governance studies originally focused on particular IT governance structures: centralized, decentralized or hybrid organizational forms. The debate over which is the best IT governing structure continues (Brown & Grant, 2005) , heavily informed by contingency theory and the notion of "fit" (Umanath, 2003).

Initially IT governance research focused on single contingencies such as a company's organizational structure. Some studies linked centralized organizations with centralized IT governance and decentralized organizations with decentralized IT governance (Ahituv et al., 1989; Ein-Dor & Segev, 1982; Tavakolian, 1989). Others found that no link existed (Olson & Chervany, 1980). Researchers quickly moved to identifying and analyzing additional contingencies. Three of the most important early contingencies beyond enterprise organizational structure were business strategy (cf. Tavakolian, 1989), industry type (cf. Ahituv et al, 1989; Clark, 1992) and firm size (cf. Ein-Dor & Segev, 1982), although the empirical results were similarly mixed (Brown & Grant, 2005). Researchers subsequently analyzed multiple interacting contingencies to better understand the complex nature of IT governance (Brown & Magill, 1994; 1998; Sambamurthy & Zmud, 1999). Examples beyond structure, strategy, and size include organizational culture, the locus of control for system approval and internal satisfaction with the management and use of IT (Brown & Magill, 1994).

More recently, Brown and Grant (2005) pointed out that the work of Weill and Ross (2004) bridges the debate over structure and the contingency approach by expanding IT governance structures beyond centralized, decentralized and hybrid; recall that Weill and Ross (2004) reviewed prior research in order to develop their own IT governance archetypes labeled as business monarchy (individual or group of business executives make IT decisions), IT monarchy

(individual or group of IT executives make IT decisions), feudal (business unit leaders or process owners make IT decisions), federal (combination of business executives and business unit leaders make IT decisions), IT duopoly (IT executives along with executives or business unit leaders make IT decisions), and anarchy (each individual user makes IT decisions). Weill and Ross also considered IT governance forms in relation to major IT governance domains: IT decisions, IT principles, IT architecture, IT infrastructure strategies, business application needs, and IT investment and prioritization.

Data governance

The importance of data and the need to govern data effectively as distinct from IT has been identified in some case studies of individual IT-IORs (cf. Ake, 2005; Tyworth & Sawyer, 2006) and is receiving increased attention in the practitioner literature (cf. Adler, 2007; NASCIO, 2008). A small but growing number of researchers are working in a stream of "data governance" research. This stream of research grows out of the earlier work of Goodhue and colleagues (1988; 1992) on the importance of managing the data resource in companies. Khatri and Brown (2010) borrowed heavily from IT governance and the contingency perspective for their research on data governance including developing their own five interrelated data governance domains similar to Weill & Ross (2004) – data principles, data quality, metadata, data access and data lifecycle.

Though the renewed emphasis on data as distinct from IT is just beginning it holds promise and is important in the context of IT-IORs. The data governance concept of data quality in particular is important. For example, in data governance there is a need to establish the intended use requirements of data (Khatri & Brown, 2010) a problem that is even more pronounced when the data crosses organizational boundaries. As with IT governance research there is still an opportunity to identify effective governance contingencies.

IT-IOR Performance

Effectiveness and success are notoriously difficult to measure in general (Venkatraman & Ramanujam, 1986) as well as in contingency research (Reinking, 2011). Identifying and measuring success is particularly challenging in the context of IT-IORs because researchers in the two important areas of interest – IORs and IT governance – have struggled with understanding success. For example, in IOR research Provan and Milward (2001) argued IOR success is difficult to understand because of a level of analysis problem (i.e. is success a measure of organizational, interorganizational or societal success?). In IT governance research, success remains problematic in part because the tenuous link between IT governance and organizational success is rarely carefully examined (Jacobson, 2009).

Though this study is based on a fit as matching perspective, an important contribution to this approach is to focus on successful IT-IORs - thus performance is critical to the study. Early contingency researchers were critiqued because they either did not include performance or because they struggled to conceptualize performance (Weill & Olson, 1989; Demers, 2007).

However, the challenges associated with conceptualizing performance did not stop researchers from theorizing, developing and testing potential performance measures (Reinking, 2011). As Reinking (2011) noted, research that includes IT should include both organizational and system performance measures, an argument made earlier by Weill & Olson (1989). Otley (1980) noted the difficulty of measuring effectiveness and argued that researchers should identify variables which are suspected to lead an organization toward effective performance.

Accordingly, the emphasis in this study is on IT-IOR performance measures that reflect the unique nature of IT-IORs and are suspected to lead toward effective IT-IOR performance. The idea that successful IORs should successfully manage the participation of organizations,

handle conflict and successfully acquire and utilize IOR resources is taken from IOR research (Provan & Kenis, 2007). This conceptualization of performance includes elements of IORs (participation and conflict) as well as IT (acquiring and utilizing *IT* resources in IT-IORs).

Summary – IT-IOR governance, fit and performance

The theory section has highlighted contingency theory, IT-IOR governance dimensions and performance. This review supports the conclusion that successful IT-IORs employ coordination mechanisms that effectively addresses three dimensions: 1) the relationships among the participating organizations, 2) technology, and 3) data. In the next section, propositions based on this conclusion – that fit between coordination mechanisms and key contingencies lead to successful IT-IORs – are identified and tested in an exploratory analysis of IT-IORs based on survey data.

Propositions

As reviewed, in both IOR and IT governance research, the argument that effective governance leads to organizational success is often implicit and not directly tested. A notable exception is the Weill and Ross (2004) study, which showed that effective IT governance (operationalized in terms of executive perceptions of governance effects) resulted in higher profits. This study builds on this argument and suggests specifically that IT-IORs with effective, or good, governance are more successful than IT-IORs with ineffective governance. In this section propositions are developed based on literature that has suggested definitions of good governance and the links between good governance and success.

The universalistic argument that governance with certain characteristics is always better than governance with other characteristics can be found in some leading practitioner work - for example governance that conforms to standards such as those published by CoBIT or the IT

Governance Institute, (cf. Van Grembergen, 2004). For IT-IORs, the universalistic argument is that IT-IORs should have a steering committee (i.e. more than an informal committee or working group) for effective governance. This is based on a synthesis of research on IOR and IT governance.

In IOR research governance remains under studied (Provan et al., 2007) but a review of related research highlights the importance of a steering committee for effective governance. Provan and Kenis (2008) argued that a formal committee like a steering committee is "the most obvious mechanism for maintaining stability" in IORs (p. 245). Graddy (2008) suggested that a steering committee is critical for IORs to respond to changes in the environment. Alexander (1995) argued that a steering committee is important in order to deal with interdependence and perceived problems among participating organizations in an IOR.

In IT governance research Weill and Ross (2004) found that all successful organizations relied on steering committees with IT responsibilities. Huang and colleagues (2010) suggested a steering committee as "integral to an effective system of IT governance" (p. 288). Other researchers have highlighted the importance of steering committees for the coordination of IT resources (Karimi et al., 2000), and for approving IT projects and initiatives and developing IT policies (Earl, 1989; 1993). Under a universalistic argument, because there are multiple challenges for IT-IORs related to relationships, technology, and data a steering committee might always be appropriate. This leads to the first proposition:

> **Proposition 1 (universalistic proposition):** IT-IORs that employ a formal governance mechanism such as a steering committee are more effective than IT-IORs that do not employ such a mechanism.

The leading alternative to universalistic arguments such as Proposition 1 is the contingency theory argument that "one size does not fit all", but rather that the best approach

depends on contingencies. Although early IT governance researchers emphasized size, structure and strategy among the most important contingencies (Brown & Grant, 2005) this did not preclude subsequent attempts to both extend prior research as well as identify new areas for contingency-based IT governance research (Reinking, 2011). For example, Brown and Magill (1994) identified satisfaction with management of technology, satisfaction with technology use, and the "strategic grid of current/future applications" as additional IT governance contingencies.

As Brown and Magill (1994) argued in IT governance research, researchers should be clear about their overall view of fit and contingencies should be based on a "conceptual framework based on prior literature", which serves as a starting point for definitions and operationalizations (p. 373). As noted, this study adopts a *fit as matching* view of fit between a steering committee and key contingencies and based on prior IOR and IT governance literature important IT-IOR contingencies are identified. Before developing specific propositions to be tested it is important to be clear what a general contingency proposition looks like.

Although prior research suggests IT-IOR governance may be effective based solely on having a steering committee (the universalistic view), contingency theory would not privilege a steering committee over governance that does not include a steering committee. Rather the appropriateness of a steering committee depends on key contingencies. For example, IT-IORs that employ formal governance mechanisms in the face of high levels of certain contingencies will be more effective than IT-IORs that do not employ formal governance mechanisms in the face of those contingencies. Similarly, IT-IORs facing low levels of certain contingencies will be more effective without formal governance mechanisms than similarly situated IT-IORs with formal governance mechanism (because formal governance is expensive and difficult). Each of the subsequent propositions is a subset of this first general contingency theory-based proposition and focuses on the steering committee as a formal governance mechanism:

> **Proposition 2 (general contingency theory proposition):** IT-IORs are more effective when they achieve fit between the governance mechanisms they employ and the contingencies they face.

In any IOR, a key set of factors has to do with the relationships between organizations. This is particularly critical in IORs with multiple participating organizations as "their multi-party membership provides more complexity than a summation of dyadic relationships" (Doz et al., 2000). Often the "multi-party membership" includes diverse types of organizations and this diversity may require different governance arrangements (Provan & Kenis, 2007). In addition, successful IOR governance should be able to manage the participation of organizations as well as effectively handle conflict (Provan & Kenis, 2007). This leads to the following proposition:

> **Proposition 2a:** IT-IORs are more effective when they achieve fit between employing a steering committee and key *relationship* contingencies**.**

As defined, an IT-IOR relies on technology that crosses organizational boundaries. A stream of related IS research has focused on information systems that cross organizational boundaries as an interorganizational information sharing system or interorganizational system (Barrett & Konsynski, 1982; Cash & Konsynski, 1985). Even more recent definitions have focused on the linking of business processes across organizations and the role IS plays in facilitating information collaboration (Robey et al., 2008). These broad definitions of interorganizational systems highlight technology as the second set of contingencies to examine. In addition to the IOR that allows systems to cross individual organization boundaries, technology enables the organizations to be connected, strengthens relationships and creates joint opportunities for growth and information sharing. However, as Hui et al., (2008) argued, there are important technology challenges for IT-IORs. The first is that the knowledge needed for acquiring, maintaining and using IT is often distributed across organizations making direction, control and coordination a challenge; and the second is that technology is constantly changing

meaning that IT investment and IT skills need to keep up among the participating organizations. This leads to the following proposition:

> **Proposition 2b:** IT-IORs are more effective when they achieve fit between employing a steering committee and key *technology* contingencies**.**

Often IT-IORs rely on information sharing to achieve goals. Data and information are simple terms with many complex and competing definitions but the view in this study follows the lead of most data governance researchers and does not differentiate between the two (Wende, 2007). The definition in this study comes from Khatri and Brown (2010) who suggested that data are something that are documented and have value or potential value. Weber et al. (2009) and others in the early stages of data governance research have borrowed heavily from concepts found in IT governance including a reliance on the contingency perspective. For example, Weber et al. (2009) are explicit in their argument that "contingencies affect data governance" (p. 3). Khatri and Brown (2010) similarly used a contingency perspective in their suggestion that a steering committee could potentially be the most appropriate structure for data governance. Accordingly, the importance of distinct but related contingencies associated with data in addition to relationships and technology in IT-IORs is critical and leads to the following proposition:

> **Proposition 2c:** IT-IORs are more effective when they achieve fit between employing a steering committee and key *data* contingencies.

Finally, it may be the combination of the key relationship, technology and data contingencies rather than the individual contingencies that are critical for determining fit for good governance and successful IT-IORs. The combination of the three may offer another explanation of success, leading to the final proposition:

> **Proposition 2d:** IT-IORs are more effective when they achieve fit between employing a steering committee and the combination of key *relationship, technology and data* contingencies.

To test the propositions and to point the direction for future theoretical and empirical analysis, an exploratory analysis of a unique data set on IT-IORs was conducted. The methods are described in the next section.

Method

This section outlines the methods used for the exploratory analysis of the propositions. The section begins with a description of the context and the data. This is followed by a discussion of the outcome concept and measures (IT-IOR success), the governance contingencies, and the exploratory analysis.

Context

The focus of the exploratory analysis is public safety IT-IORs in the United States (US). These are highly interdependent IORs collaborating on public safety issues with particular emphasis on the development and use of IT for information sharing and interoperability between police and other public safety organizations. A secondary analysis was conducted of data collected from a survey of public safety networks as part of a National Science Foundation (NSF)-funded project (the Public Safety Networks (PSNs) Study - Project # IIS-0534877 & IIS-0534889) focused on public safety networks (PSNs) in the U.S. CapWIN, described briefly in the introduction, is an example of the type of PSN investigated by the study.

The public sector

IT-IORs are a growing phenomenon in both the public and private sector. The focus of this study is on IT-IORs in the public sector. This may raise some concern about the potential generalizability of this study. As additional instances of IT-IORs are found in the private sector they will need to be compared with public sector IT-IORs. However, although much research has emphasized distinctive nature of the public sector (cf. Bozeman & Bretschneider, 1986; 1994;

Kelman, 2005; 2007; Rainey & Bozeman, 2000; Rocheleau, 2006) this research emphasizes the differences in the values of the public versus private sector. For example, the public sector emphasizes accountability and openness (Bozeman & Bretschneider, 1986), and the private sector emphasizes profitability and sustainability (Van der Wal et al., 2006). This literature has also focused on interactions between government organizations and the public (cf. (Kelman, 2007), not on the relationships and technology *among* public sector organizations that is the focus of this study. When viewed in this light public sector differences may be less significant than they first appear. Some researchers (cf. Markus & Bui, 2011) have suggested that the public sector may be more complex than the private sector and that therefore conclusions drawn from the public sector may also apply to the private sector whereas the reverse may not hold.

As part of the larger project a survey was developed by the research team covering a range of topics including the features, goals, user characteristics and challenges facing PSNs. In addition, the survey included questions about organizational and data governance and performance. 136 PSNs were identified and contacted about participating in the survey. Senior personnel (e.g. CIO, director, or manager) representing 87 PSNs participated in telephone interviews conducted by a professional survey research organization. Cleaning of survey responses resulted in 80 usable surveys. Some of the PSNs participating in the survey were not yet operational, for example they were only in the planning stages or had otherwise not been officially formed. As a result of, these PSNs were not asked questions about performance outcomes or success measures. As a result of the missing performance questions there were 47 usable responses and the analysis in this study is based on them.

Outcome: IT-IOR Success

As stated, the implicit assumption is that there is a relationship between good governance and success and this study takes a novel approach to attempt to test this relationship. This is done

by taking a fit as matching approach between a formal coordination mechanism like a steering committee and key contingencies in successful IT-IORs. Public safety IT-IOR success is a multi-dimensional concept, comprising relationship, technology, and data elements. An exploratory success index was created as a review of prior research indicated that no other researchers have attempted to combine the elements in this manner. However, creating an index, or composite, outcome measure has been used in studies of organizational design and change as a way to synthesize what are normally individual organizational elements into a single outcome score (cf. Massina & Pettigrew, 2003). The individual elements of the index in this study come from prior research and survey respondents indicated that they were important measures of success in IT-IORs. For the relationship, technology and data measures, the elements have been previously identified as theoretically important. For example, the broad definition of interorganizational governance from Provan and Kenis (2007) suggests key interorganizational relationship success concepts are the encouragement of collective action, successfully handling conflict and successfully acquiring and utilizing IOR resources. In public safety IT-IORs, information sharing is critical. In order for information sharing to take place the relevant data must be available. Accordingly data availability is included as a success concept. Data governance research is in its infancy but data governance researchers have emphasized multiple dimensions of data quality as important outcomes (Khatri & Brown, 2010; Weber et al., 2009). Data quality was included as a success concept.

As research on the concept of technology success in IORs is scarce the concepts of success come from prior IS research studies. In the survey, senior personnel identified technology elements that were indeed important performance metrics in the IT-IOR prior to rating their improvement. Cost, system reliability and functionality were identified by respondents as important technology success measures and these measures align with prior IS research. Cost is

an important and typical measure of IS success (Alter, 1999; DeLone & McLean, 2003). System reliability is similarly an important and common critical measure of success in IS research (Alter, 1999; Butler & Gray, 2006). Finally, functionality is another common IS measure of success (DeLone & McLean, 2003). Though many have criticized and extended the DeLone and McLean (1992, 2003) measures (cf. Seddon, 1997) over the years, cost and functionality remain important measures of IS success (Petter et al., 2008). Each success concept, its operationalization and the coding scheme for measuring success are included in Table 1.

Table 2.1 Measures used for exploratory IT-IOR success index

Category	Success Measures	Description	Coded Measurement Score
Relationship	Participating members are satisfied with their influence	Are participating members satisfied with their influence on the interorganizational relationship?	Score of '1' if members are satisfied Score of '0' if members are mixed or are not satisfied
	Disagreements among members impede success	Do disagreements impede the success of the interorganizational relationship?	Score of '1' if disagreements do not impede success Score of '0' if disagreements may or may not impede success Score of '-1' if disagreements do impede success
Technology	Cost	Have costs improved?	Score of '1' if cost has improved a lot/some Score of '0' if cost has not changed/worsened
	System Reliability	Has system reliability improved?	Score of '1' if system reliability has improved a lot/some Score of '0' if system reliability has not changed/worsened
	Functionality	Is missing functionality a problem?	Score of '1' if functionality is not problem Score of '0' if functionality is a problem
Data	Data Availability	Are key data available?	Score of '1' if data availability is not a problem Score of'0' if data availability is a problem
	Data Quality	Are there issues with data quality?	Score of '1' if data quality is not a problem, Score of '0' if data quality is a problem

Good governance: key concepts

This section includes a description of how key concepts were operationalized in the propositions for good governance. To operationalize good governance concepts, particularly for

relationship, technology and data contingencies, the study relied on prior theoretical and conceptual work as the basis for relevant contingencies for public safety IT-IORs. The key concept of a steering committee was operationalized simply based on whether the IT-IOR had a steering committee or not.

Relationship contingencies

The relationship contingencies are based on a key concept – the diversity of participating organizations. Provan and Kenis (2007) suggested that the diversity of organizations involved was a key contingency factor for interorganizational governance. Based on their review of IOR research they argued that diversity has been conceptualized in part as homophily, or similarity among organizations. In the context of public safety IORs in the U.S. the participating organizations can differ in functional type as well as government level. Research on emergency response has indicated there are important differences in the culture, capabilities and priorities of the various emergency response agencies (Wise and Nader, 2002). Public policy researchers have similarly argued that federal, state and local governments have important differences (Mandelker et al., 2006). Accordingly, two measures were included for organizational diversity as relationship contingencies – functional type (e.g. police, fire, and homeland security, etc.) and organization type (local, state and/or federal level of government).

Technology contingencies

Technology in IORs often represents a significant investment of time and resources which may be fixed assets or contracts for IT services as well as on-going commitments for the operation, maintenance and improvement of IT products and services. These technology-related investments were operationalized as three specific technology contingencies. The first consideration was whether the IT-IOR outsourced any of its IT services in order to capture the increasing trend toward and complexity associated with public sector outsourcing (Vilvovsky

2008). The second consideration was whether providing a cross-agency IT infrastructure for information sharing was a planned purpose of the IT-IOR. The third consideration was whether an objective of the IT-IOR was to upgrade or replace shared IT infrastructure. The second and third considerations come from prior research on CapWIN and other public safety collaborations that have indicated that shared IT infrastructure is a significant factor for effective collaboration (cf. Fedorowicz et al., 2007; Maggion & Shiftan, 2008). Combined, the three technology contingencies relate to the importance of considering IT in IT-IORs as noted by Hui et al. (2008) because 1) the knowledge needed for acquiring, maintaining and using IT is often distributed across organizations; and 2) technology is constantly changing meaning that IT investment and IT skills need to keep up.

Data contingencies

Three data contingencies for public safety IT-IORs were also considered. First, public safety IT-IORs by definition are interested in adding public safety data sources to share with participating organizations though information overload is a legitimate concern in government information sharing (Gil-Garcia et al., 2009). Accordingly, a consideration was whether increasing data sources was an objective as a data contingency. The new stream of literature on data governance emphasizes data quality (Khatri & Brown, 2010) and prior research on public safety collaborations has highlighted the problems with data incompatibility (Gil-Garcia et al., 2005). This contingency was operationalized as whether a primary purpose of the IT-IOR was developing standards for interorganizational data exchange. Finally, data security is an important consideration in most settings where data crosses organizational boundaries but it even more critical when that data is confidential or otherwise regulated as it often is in the public sector (cf. Fedorowicz et al., 2007). An emphasis on increasing data security was also included as a data contingency.

Exploratory Analysis

The exploratory analysis began with a computing of a coded success index score for each of the 47 PSNs far enough long in operational status to have performance outcomes. An additive score was coded for each case using the seven measures from the relationship, technology and data success categories, again based on similar approaches in research on organizational design by Massina and Pettigrew (2003) and others. A success index was created with a range of a high of 7 to a low of -1 (see Table 2). The distribution of the cases by coded success index score is shown in Table 2.

Table 2.2 Distribution of cases by coded success index score

Success Index Coded Score (7 = highest, 1 = lowest)	7	6	5	4	3	2	1	0	-1
# of cases	1	8	8	9	8	7	0	3	3

Next the highest scoring cases were identified (coded with a score of 4 or higher) as well as the lowest scoring cases (coded score of 3 or lower). This resulted in a set of 45 cases (25 successful and 20 unsuccessful) for analysis. For the relationship, technology and data contingency categories operationalization was either as "low" or "high" level contingencies. The specific contingencies for each category and the associated coding are found in Table 3. In each category, if only one of the contingencies was present the category was coded as having "low" level contingencies. If two or more (or both in the case of the relationship contingencies) of the contingencies was present the category was coded as having "high" level contingencies. This approach for determining "high" and "low" level contingencies has been similarly used in prior fit as matching contingency theory-based research, most notably by Alexander and Randolph (1985) who identified a set of technology considerations and used them to determine whether the technology contingency was "routine" or "nonroutine".

Governance "fit" was similarly coded using the conceptualization of "low" and "high" fit. As argued previously, a steering committee may be more appropriate than no steering committee based on certain factors or contingencies but the inverse is also true. A "high" coded value for a contingency category required a steering committee in order to be considered "high fit" but inversely a "low" coded value for a contingency category with no steering committee was also considered "high fit". "Low fit" was operationalized as either "high" contingencies with no steering committee or "low" contingencies with a steering committee (see Table 4). A steering committee for "low" contingencies may at the surface seem to also be appropriate but there is some prior research that has indicated that formalized governance in this context (i.e. "low" contingencies) is unnecessary or even counterproductive (cf. Zenger et al., 2002).

Table 2.3 Operationalization of contingencies

Contingency Categories	Operationalization of Contingencies	
Steering committee	No steering committee exists	A steering committee exists
	"Low"	"High"
Relationship	Only one of the following: - 3 or more functions supported - 2 or more organizational types supported	Both of the following: - 3 or more functions supported - 2 or more organizational types supported
Technology	Only one of the following: - currently outsourcing IT services - providing a cross-agency IT infrastructure for public safety information sharing is a planned purpose - upgrading/replacing IT infrastructure is a primary objective	Two or more of the following: - currently outsourcing IT services - providing a cross-agency IT infrastructure for public safety information sharing is a planned purpose - upgrading/replacing IT infrastructure is a primary objective
Data	Only one of the following: - objective is to increase data sources -developing standards for interorganizational data exchange is a planned purpose - increasing data security is a primary system objective	Two or more of the following: - objective is to increase data sources - developing standards for interorganizational data exchange is a planned purpose - increasing data security is a primary system objective

Table 2.4 Coding for low and high fit

	No steering committee	Steering committee
Low levels of (relationship, technology, data) contingencies	High fit	Low fit
High levels of (relationship, technology, data) contingencies	Low fit	High fit

The exploratory nature of the propositions and the secondary survey data did not lend itself to advanced statistical analysis. Adopting a fit as matching approach, analysis focused on the potential associations between conceptually and theoretically derived contingencies. The survey instrument was not developed to test a particular model, the data set is relatively small, and the data under investigation is non-parametric. Therefore cross-tabulations were chosen for analysis to identify relationships for the universalistic and contingency propositions. A cross-tabulation analysis does not identify or measure causal relationships but rather is a measure for identifying an association between variables (Fisher, 1970). Fisher's Exact Test was used for the cross-tabulation analysis as it is a recommended when sample sizes are small and there are cells with an expected value less than 5 (Bower, 2003; Fisher, 1970; Upton, 1992). The goal of the analysis is to identify patterns and associations, leading to new and improved research for explaining good governance and its relationship with success in IT-IOR contexts. The analysis is thus an exploratory examination of good governance in IT-IORs. Findings are discussed in the next section.

Findings

This section includes a brief review of the results of the analysis for each of the propositions for good governance in IT-IORs. The discussion section that follows this section includes a detailed discussion of the significant and insignificant findings.

Formalized governance is good governance (the universalistic proposition)

> **Proposition 1:** IT-IORs that employ a formal governance mechanism such as a steering committee are more effective than IT-IORs that do not employ such a mechanism.

The findings indicate support for the universalistic proposition. The Fisher's Exact Test P value is 0.034 which is significant at $p < .05$ (see Table 5). A steering committee may indeed be one indicator of good governance in IT-IORs.

Table 2.5 IT-IOR success by steering committee (N = 45)

	Unsuccessful	Successful
No steering committee	#27, #94, #115, #9, #75, #85, #108, #122 N=8	#88, #73, #86 N=3
Steering committee	#15, #67, #112, #61, #96, #101, #142, #20, #52, #93, #109, #160 N=12	#7, #30, #68, #106, #107, #111, #121, #125, #148, #16, #21, #40, #45, #113, #119, #17, #22, #63, #99, #129, #97, #105 N=22

Fisher's Exact Test, p = .034 (significant at p <. 05)

Good governance fits key relationship contingencies

> **Proposition 2a:** IT-IORs are more effective when they achieve fit between employing a steering committee and key *relationship* contingencies.

There was no support for this proposition. The Fisher's Exact Test P value was 0.257 which is not significant at $p < .05$ (see Table 6).

Table 2.6 IT-IOR success by fit with relationship contingencies (N = 45)

	Unsuccessful	Successful
Low fit	#15, #112, #115, #20, #61, #142 N=6	#107, #111, #121, #125, #16, #113, #99, #97, #7, #30, #40 N=11
High fit	#27,#67, #94, #9, #85, #96, #101, #52, #93, #108, #109, #160, #75, #122 N=14	#68, #106, #148, #21, #45, #119, #17, #22, #63, #129, #105, #73, #86, #88 N=14

Finding: P value = 0.257 and thus not significant at $p < .05$

Good governance fits key technology contingencies

> **Proposition 2b:** IT-IORs are more effective when they achieve fit between employing a steering committee and key *technology* contingencies.

The findings indicate support for this proposition. The Fisher's Exact Test P value is 0.049 which is significant at $p < .05$ (see Table 7). Fit between a steering committee and key technology contingencies may be a useful indicator of good governance in IT-IORs.

Table 2.7 IT-IOR success by fit with technology contingencies (N = 45)

	Unsuccessful	Successful
Low fit	#115, #61, #108, #122 N=4	#106, #125, #16, #21, #113, #119, #17, #22, #63, #88, #73, #97 N=12
High fit	#15, #27, #67, #94, #112, #9, #75, #85, #96, #101, #142, #20, #52, #93, #109, #160 N=16	#7, #30, #68, #107, #111, #121, #148, #40, #45, #99, #129, #86, #105 N=13

Finding: P value = 0.049 and thus significant at $p < .05$

Good governance fits key data contingencies

Proposition 2c: IT-IORs are more effective when they achieve fit between employing a steering committee and key *data* contingencies.

There was no support for this proposition. The Fisher's Exact Test P value of 0.422 is not significant at $p < .05$ (see Table 8).

Table 2.8 IT-IOR success by fit with data contingencies (N = 45)

	Unsuccessful	Successful
Low fit	#27, #94, #115, #9, #61, #85, #101 N=7	#106, #148, #119, #17, #88, #86, #97 N=7
High fit	#15, #67, #112, #75, #96, #142, #20, #52, #93, #108, #109, #122, #160 N=13	#7, #30, #68, #107, #111, #121, #125, #16, #21, #40, #45, #113, #22, #63, #99, #129, #73, #105 N=18

Finding: P value = 0.422 and thus not significant at $p < .05$

Good governance fits key relationship, technology and data contingencies

> **Proposition 2d:** IT-IORs are more effective when they achieve fit between employing a steering committee and the combination of key relationship, technology and data contingencies.

Seventeen cases (nine unsuccessful and eight successful) had either low or high fit for all three contingency categories. The Fisher's Exact Test P value was 0.547 which is not significant at $p < .05$ (see Table 9) and the proposition is not supported. A discussion of the pattern of findings, limitations and arguments for future theorizing are covered next in the discussion section.

Table 2.9 IT-IOR success by fit with relationship + technology + data contingencies (N = 17)

	Unsuccessful	Successful
Low fit (w/relationship+ technology + data contingencies)	#115 N=1	#88, #97 N=2
High fit (w/relationship + technology + data contingencies)	#67, #96, #142, #52, #93, #109, #160 N=7	#7, #30, #68, #40, #45, #129, #105 N=7

Finding: P value = .547 and thus not significant at $p < .05$

Discussion

The findings support the proposition that IT-IORs that employ a steering committee are more effective than IT-IORs that do not employ such a mechanism (the universalistic view) as well as the proposition that IT-IORs are more effective when they achieve fit between employing

a steering committee and key *technology* contingencies (see Table 10 for a summary of findings). In this section the findings are discussed in more detail.

Table 2.10 Summary of findings

Propositions	Findings	Proposition Supported?
P1: IT-IORs that employ a formal governance mechanism such as a steering committee are more effective than IT-IORs that do not employ such a mechanism	P value = 0.034, significant at p < .05 (N =45)	**Supported**
P2a: IT-IORs are more effective when they achieve fit between employing a steering committee and key *relationship* contingencies	P value = 0.257 and thus not significant at p < .05 (N=45)	Not supported
P2b: IT-IORs are more effective when they achieve fit between employing a steering committee and key *technology* contingencies	P value = 0.049, this is significant at p < .05 (N=45)	**Supported**
P2c: IT-IORs are more effective when they achieve fit between employing a steering committee and key *data* contingencies	P value = 0.422 and thus not significant at p < .05 (N=45)	Not Supported
P2d: IT-IORs are more effective when they achieve fit between employing a steering committee and the combination of key *relationship, technology and data* contingencies	P value = .547 and thus not significant at p < .05 (N=17)	Not Supported

The finding that a steering committee exists in every instance is one indicator of good governance in IT-IORs is notable as it highlights the importance of a formal coordination mechanism when IT-IORs are dealing with complex interorganizational relationship, technology and data issues. The demands placed on the governance of an IT-IOR that outsources its IT services, is committed to upgrading or replacing a shared IT infrastructure and has multiple technology devices in use by participating organizations likely requires a steering committee as a formal coordination mechanism to handle these demands.

The second significant finding was for the contingency proposition that good governance is a steering committee that fits with key technology contingencies. This finding is not surprising given the nature of IT-IORs. IT-IORs can be capital-intensive to set up and operate and a steering committee to coordinate the capital (e.g. for upgrading a shared IT infrastructure and for contracting for outsourced IT services) may be more important than relationship or data contingencies. Put another way, in an *IT*-intensive interorganizational relationship, *IT* remains the most important governance concern.

The fit propositions for relationship and data contingencies were not supported. Nor was the proposition for fit with all three – relationship, technology and data. It may be that the technological concerns inherent in IT-IORs are significant enough to subsume relationship and data contingencies. For data contingencies this mirrors the literature which to this point is a subset of IT governance literature. Additional research in the growing data governance literature may tease out some of the differences. For the organizational contingencies the diversity of organizations may also be less critical than the *IT* in IT-IOR. Future research is needed to identify and test additional contingencies, for example based on trust which has been shown to be important in both IOR (cf. Zaheer et al., 1998) and IT (cf. Hart and Saunders, 1997) research but was not a part of this study.

In general the study indicates support for the universalistic view of formal coordination in IT-IOR governance and only partial support for a contingency perspective of formal coordination – contingency fit in IT-IORs. Only fit between a steering committee and technology contingencies was supported among the contingency propositions. It may indeed be that the challenges associated with IT in IT-IORs - the outsourcing of IT services and providing and upgrading IT infrastructure – are strong enough to always require a steering committee.

This study has focused on the steering committee as the key formal coordination mechanism of successful IT-IORs and the fit between a steering committee and important relationship, technology and data contingencies. Although the inclusion of each of these elements is based on prior research it is possible that other formal and informal coordination mechanisms would lead to different results. It is also important to note that the number of cases used in the study is small and the analysis is based on analysis of a survey data set, limiting the ability to conduct complex statistical analyses. In addition, as with many studies that rely on surveys, only a single respondent commented on an arrangement with multiple organizations. Not only is there the threat of common methods bias, there is the lack of triangulation with the perspectives of other participants. Another potential limitation may be the public sector context though as pointed out the uniqueness of IT-IORs and the complexity of the public sector may also provide private sector researchers with insights.

This exploratory study was not intended as a definitive test, but rather as a proof of concept of the value of comparing alternative conceptualizations of governance fit and effectiveness in IT-IORs using a fit as matching perspective. This study is based on a comparative research design of intermediate N—filling a large gap between single and very small-N case studies and large N studies which are inappropriate when the number of instances of a phenomenon is not large. This is clearly the situation in this study, where extensive search identified fewer than 150 public safety IT-IORs, and where data were obtained for fewer than 80 operational public safety IT-IORs. Furthermore, the aim has not been to generalize the specific findings (e.g., x% of IT-IORs have ineffective governance or are successful), but rather to generalize to theory (e.g., a steering committee appears to be one important way to conceptualize effective IT-IOR governance).

Conclusion

A major contribution of the study is to revisit alternative views of good governance. By re-examining the "one best way" view of governance and the contingency theory alternatives in a new context – IT-IORs – the study highlights the value in both the universalistic view and in considering potential contingencies important for IOR and IT governance. In addition, by examining successful IT-IORs and attempting to link the match between a steering committee and key contingencies with successful IT-IORs the study indicates there is still potential in the fit as matching perspective. Traditionally the theoretical and conceptual work that goes into identifying potential contingencies and the potential relationships between them is held separate from performance outcomes. This study and the exploratory findings highlight the possibilities of considering both. Future research should continue to theorize about potential contingencies in each of the categories – relationship, technology, and data. In addition, future research would benefit from designing a study to identify and test the potential interaction of relationship, technology and data contingencies over time.

Finally, longitudinal studies of IT-IORs would uncover when particular coordination mechanisms are employed and why. It may be that a steering committee is critical in the beginning for IT-IOR governance but that other formal and informal coordination mechanisms become more important later on as contingencies change and interact. Some research suggests that formal coordination mechanisms like steering committees are difficult to design and implement early on but are easier to change later (Markus et al., 2012). Understanding the drivers for and timing of the creation of a steering committee would be of particular interest to practitioners interested in designing effective IT-IORs.

As an example, a promising avenue for future research is to analyze fit via a configuration perspective (based on the fit as gestalts view of fit articulated by Venkatraman

(1989)). Configurations are conceptual tools for capturing the complexity inherent in organizational life (Ketchen & Shook, 1996). They are related to the contingency perspective in their emphasis on fit, but unlike the individual contingencies used as part of a contingency perspective, the configurational approach focuses on “multidimensional constellation[s] of conceptually distinct characteristics that commonly occur together” (Meyer et al., 1993). Miller (1986) argued for configurations as an improved approach for understanding fit and suggested that “cohesive configurations reduce the number of possible ways in which the elements combine” (p. 236). Put another way, the key assumption in configurational approaches is “that ideal type configurations have the highest level of fit between the contextual and organizational elements and, consequently, the highest level of effectiveness" (Sharma & Yetton, 1996). Of course, building on this concept of fit is only one approach. There are certainly others. The larger point is that good governance is an important concept in its own right and that alternative views of governance and fit have value as theoretical perspectives for understanding what good governance is.

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Essay 2 - IT Interorganizational Design: Contingent Fit or Holistic Configuration of Structure and Coordination Mechanisms?[2]

Abstract

The resources required for initial investment, continued maintenance and periodic "refresh" of IT are substantial, leading both practitioners and researchers to seek to understand how organizations can best benefit from IT. A key concept for understanding the relationship between IT and organizations is the concept of "fit". Researchers have suggested organizations can be designed to "fit" with technology for successful performance but the findings are mixed. Two factors contribute to the mixed findings. The first is variation in the definition of IT organizational design and the second is the debate over and limitations associated with the concept of "fit". This study adopts a view of IT organizational design "fit" as a configuration of structure and coordination mechanisms. A configurational approach is based on a view of fit as holistic, complex and multidirectional. Specifically, this study 1) extends contingency theory using a configurational approach to fit, 2) includes an empirical analysis in an interorganizational setting, and 3) highlights the promise of a novel method of analysis – qualitative comparative analysis (QCA). Findings suggest the importance of both structure and coordination mechanisms in IT organizational design configurations.

Introduction

Interest in the effective use and management of information technology (IT) remains high, because the stakes continue to be high. The resources required for initial investment,

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continued maintenance and periodic "refresh" of IT are substantial, leading both practitioners and researchers to seek to understand how organizations can best benefit from IT. A significant stream of research now exists that attempts to explain the contribution of IT organizational design to organizational performance based on the concept of "fit" between organizational design and key contingencies. Despite some evidence that effective IT organization design does contribute to organizational performance (cf. the work of Weill, 2004; Weill & Ross, 2004; 2005) the evidence is mixed (Aral & Weill, 2007).

Two factors contribute to the mixed findings. The first is considerable variation in the definition of IT organizational design or "IT governance" (Webb, 2006; Markus et al., 2012). The most common definitions focus on the responsibility of organizational executives (cf. Van Grembergen, 2004) or the right to make specific IT decisions (Weill & Ross, 2004). The current emphasis on decision making authority and other formal and informal *coordination mechanisms* has come at the expense of further understanding the role of *structure,* defined as the hierarchical reporting relationships and division of labor (Markus et al., 2012). This distinction is important because structure and coordination mechanisms may interact and jointly contribute to organizational performance but the interaction or link to performance is not yet clear (Markus et al., 2012).

The second factor is the debate over and limitations associated with the concept of "fit". Although there are multiple conceptualizations of fit (Venkatraman, 1989), IT organizational design researchers have relied on relatively simple views of fit, most notably as an interaction between two variables (Brown & Grant, 2005). Key criticisms of this view of fit include its inability to shed light on the potential interactions between multiple and complementary contingencies as well as the tenuous link between contingencies and organizational performance (Demers, 2007).

A configurational approach, based on the fit as gestalts (Venkatraman, 1989) or systems view of fit (Umanath, 2003) has the potential to extend the concept of fit. A fit as gestalts view is based on the idea that fit is holistic, complex and multidirectional. Configurations, generally defined as "any multidimensional constellation of conceptually distinct characteristics that commonly occur together" (Meyer et al., 1993, p. 1175) are a potential tool for understanding a fit as gestalts view (Venkatraman, 1989). Developing and analyzing configurations for IT organizational design enables researchers to understand the importance of and potential interaction of structural and coordination mechanism elements.

Although the relationship between structure and coordination mechanisms is important in both IT intra- and interorganizational contexts (Markus et al., 2012), the design of interorganizational relationships (IORs) has received limited attention as pointed out by Provan and colleagues (2007). Yet organizations are increasingly relying on the development, management and use of IT to achieve IOR goals. These IT-intensive IORs (IT-IORs) are unique combinations of IT and IORs (Hui et al., 2008), and as such they provide an opportunity to apply a configurational approach to IT interorganizational design.

The purpose of this paper is to explore an alternative form of fit in organizational design based on the configurational approach and to determine whether and how configurational elements for structure and coordination mechanisms combine for organizational effectiveness. Specifically, the paper 1) extends contingency theory using a configurational approach, 2) includes an empirical analysis in an interorganizational setting, and 3) highlights the promise of a novel method of analysis for a configurational approach to fit – qualitative comparative analysis (QCA).

The remainder of the paper is structured as follows. The next section contains a review of contingency theory including alternative conceptualizations of fit and the theory's strengths and weaknesses. This is followed by a discussion of a configurational approach as a promising tool for improving contingency theory based on a dynamic and holistic view of fit. This is followed by an overview of IT organizational design as a combination of structure and coordination mechanisms. The next section contains an argument for a configurational approach to IT organizational design in an interorganizational context – IT-IORs in public safety. The configurations are then analyzed using the novel QCA method followed by a description of the analysis and findings. The paper concludes with contributions to theory and practice and avenues for future research.

Theory

This section begins with a review of contingency theory, configurations and alternative conceptualizations of fit. The remainder of the section is devoted to a review of IT intra- and interorganizational design and the development of structural and coordination mechanism elements for IT interorganizational design configurations.

Contingency theory

Contingency theory developed as a response to the universalistic "one best way" argument for organizational design. In an early statement of contingency theory, Thompson (1967) argued that firms face uncertainty that lead managers to do all they can to protect the internal core while adapting the external-facing part of the firm to better cope with the uncertainties, or contingencies, in the environment. Lawrence and Lorsch (1967) argued that there are different types and amounts of contingencies that a firm is likely to face, each requiring a different approach by the firm to achieve fit with its environment. Galbraith (1973) later argued that there is no one best way to achieve fit, or organize a firm, and that the potential means of

organizing are not equally effective. Implicit in each of these arguments is the notion that achieving fit between the structure of an organization and its environment equals improved performance. Researchers began to identify potential contingencies to use to explain fit between organization design and the environment. Early contingency studies focused on single contingencies such as strategy (Chandler, 1962), technology (Woodward, 1962) and size (Blau, 1970).

Despite its widespread adoption and use in many disciplines contingency theory faces several criticisms (Demers, 2007). There are concerns over how contingency theory concepts such as fit and performance are operationalized for empirical research (Umanath, 2003). Perhaps the most serious criticisms are that contingency theory is not a theory at all but "an orientation strategy" (Schoonhoven, 1981, p. 62) and that the theory is reductionist – that the complex and dynamic concept of fit is reduced to individual parts of an organization rather than understood as the interaction of parts as part of a whole (Demers, 2007). More specifically, as Meyer and colleagues (1993) pointed out, contingency theory ignores complex interactions and nonlinear relationships by instead focusing on "linear relationships involving unidirectional causation" (p. 1177).

As Umanath (2003) and others (cf. Demers, 2007) have pointed out, there are multiple views of fit under the broad umbrella of contingency theory. Many of the criticisms are directed at views of fit where a contingency variable is a simple mediating or moderating variable (Umanath, 2003). However, these represent only a partial background of the views of fit. Contingency theorists have also argued for a more holistic, complex and multidirectional view of fit. For example, Drazin & Van de Ven (1985) articulated a systems view of fit with the understanding that the relationship among concepts "can only advance by addressing simultaneously the many contingencies, structural alternatives, and performance criteria that must

be considered holistically to understand organization design" (p. 519). Venkatraman's (1989) seminal review of fit perspectives labeled this a *fit as gestalts* view of fit, described as "the degree of internal coherence among a set of theoretical attributes" (p. 432). Bergeron et al. (2001) suggested the fit as gestalts view is based on an internal congruence among important concepts with fit as a pattern. The fit as gestalts view of fit forms the basis for configurational approaches (cf. Meyer et al., 1993) of organizational design, discussed next.

Configurations

A promising approach for improving and extending contingency theory based on the systems and gestalts view of fit is the use of configurations, an approach that is seeing renewed interest in organization theory and strategy research after several years of neglect (Short et al., 2008; Snow et al., 2006). Configurations are essentially conceptual tools for capturing the complexity inherent in the reality of organizational life (Ketchen & Shook, 1996). Configurations have been defined broadly as "any multidimensional constellation of conceptually distinct characteristics that commonly occur together" (Meyer et al., 1993, p. 1175). Miller (1986) argued for configurations as an improved approach for understanding "fit" – "cohesive configurations reduce the number of possible ways in which the elements combine" (p. 236). Miller (1996) later clarified this statement, suggesting configurations are common groupings of elements and that the power of configurations comes from the fact that most configurations are unlikely to exist empirically "while relatively few are for more common" (p. 506).

Configurational approaches began as an attempt to combine strategy, structure and process variables into one integrated view of the organization (Snow et al., 2006). Examples include Galbraith's (1977) star model; the Peters and Waterman (1982) 7-S model; the prospector, defender, analyzer configurations proposed by Miles and Snow (1978) and the "structure in 5's" synthesis of prior research by Mintzberg (1980). In these studies, fit is still

central to the explanation but fit is elevated from a single contingency to configurations of common elements - the argument is that certain configurations are more appropriate than others and fit between the configuration and environmental contingencies results in improved performance.

Additionally, Meyer and colleagues (1993) argued that the configurational approach represented a departure from traditional contingency theory where researchers have "been preoccupied with abstracting a limited set of structural concepts – centralization and formalization, for example – and measuring their relationships with a limited set of abstracted situational concepts, such as size and technological uncertainty" (p. 1176). For example, the Miles and Snow configurations that have been widely adopted across multiple disciplines are used to classify organizations based on how organizations align processes and capabilities with the environment they operate in. The continued popularity of the Miles and Snow configurations comes in part from the parsimony of the configurations, their applicability across industries and their linkages with the actual strategic choices of firms (Desarbo et al., 2005).

Configurational approaches have also recently become a topic of specific interest in IS research, most notably by Fichman (2004), El Sawy et al. (2010) and Lyytinen and Damsgaard (2011) who advocated configurational approaches as a way to understand the elements that combine for the diffusion of IS innovations as well as for IT strategy. Although often not explicit, research on IT organizational design has followed a similar trajectory from traditional views of contingency theory fit to configurations. The next section contains a review of the IT organizational design literature, beginning with the concept of structure.

IT organizational design

Structure - defined as activities divided into units and their hierarchical reporting relationships (Markus et al., 2012) - has long been believed to be important for understanding IT organization design. As early as the 1960s, Garrity (1963) argued that structure of the IT function could have an impact on organizational performance by finding that successful firms organized computer systems along divisional lines. This early study was the first of many to focus on whether and how the structure of IT "fit" the structure of the home organization (Brown & Grant, 2005). This stream of research continues today as questions remain over whether the organization of IT should be centralized, decentralized or a hybrid combination of the two (Brown & Grant, 2005).

A key difference in the later studies is the use of the structure of the home organization as an element to explain the organization of IT. Some studies linked centralized organizations with centralized IT organization and decentralized organizations with decentralized IT organization (Ahituv et al., 1989; Ein-Dor & Segev, 1982; Tavakolian, 1989). However, others found that no link existed (Olson & Chervany, 1980). Subsequent research focused on business strategy, industry and organization size as key elements for explaining the organization of IT (Brown & Grant, 2005). Results were similarly mixed as some researchers found a link between conservative business strategies and centrally organized IT while others found no association between industry type and IT organization or between firm size and IT organization (Ahituv et al., 1989; Clark, 1992).

The focus of research has subsequently shifted from IT structure to IT coordination mechanisms (Brown & Grant, 2005). Research in this vein uses decision making authority and other formal and informal coordination mechanisms to explain success. Though the focus has moved to coordination mechanisms rather than structure the argument remains one of fit,

particularly a contingency theory view of fit. In the recent stream of research on IT governance there is some evidence that coordination mechanisms contribute to organizational performance but results have been mixed (Aral & Weill, 2007). A commonly cited example is the work of Weill & Ross (2004) who suggested that firms that effectively allocate IT decision rights had higher profits. The concept of fit and its relationship to performance remains critical in research on IT organizational design but the reliance on contingency theory and the omission of structural elements have made additional insight into IT organizational design, fit and performance difficult.

IT intra*organizational design configurations*

Although IS researchers have not historically employed configurational analyses, the work of Brown and Magill (1998) and Sambamurthy and Zmud (1999) on multiple contingencies for intraorganizational IT design could be argued to be a rough version, or first step, towards configurations (cf. Meyer et al., 1993). Similarly, the work of Weill and Ross (2004) in developing archetypes for IT decision rights, though implied, is configurational in nature as they developed six archetypes based on the decisions made around five IT elements – IT principles, IT architecture, IT infrastructure strategies, business application needs and IT investment. The argument can be made that the now ubiquitous concepts found in the literature to describe the IT function - the centralized, decentralized, and hybrid structure - are configurational in nature. Indeed, Peterson et al. (2000) explicitly called these concepts configurations in their investigation of additional hybrid configurations using integration mechanisms as configuration elements.

The aforementioned instances of recent configurational-based IT organizational design research are important contributions as they expand the research beyond simple contingency arguments as has been advocated by Sambamurthy and Zmud (1999) and Brown and Grant (2005). However the studies neglected the interaction between structure and coordination mechanisms and the potential contribution of that interaction on performance (Markus et al.,

2012). For example, the configuration-based work of Weill & Ross (2004) is based on decision rights and the configurations developed by Peterson and colleagues (2000) are based on expanding the centralization/decentralization/hybrid structural argument. The next section includes a discussion of potential configurations based on a combination of structure and coordination mechanisms.

Potential configurations - the relationship among and between structure and coordination mechanisms

Researchers have advocated a configurational approach to organizational design in research as diverse as corporate governance (Beatty & Zajac, 1994; Davis & Useem, 2002; Grandori, 1997; Grandori & Soda, 2006; Greenwood & Hinings, 1993) and open source governance (Markus, 2007). As mentioned, organizational design is broadly defined in this study as a combination of *structure* - the hierarchical reporting relationships and divisions of labor - and informal and formal *coordination mechanisms* (Markus et al., 2012). This definition hearkens back to earlier research on organizational design (cf. Galbraith, 2000; Goold & Campbell, 2002) that emphasized both elements rather than coordination mechanisms alone (Whittington, 2002). Galbraith (1973; 1994; 2008) implied structure and coordination mechanisms are substitutes. Lowndes and Skelcher (1998) argued that structure is where coordination mechanisms take place. Others have suggested they are complements (Whittington, 2002) and should be studied together as they may co-evolve over time and jointly influence performance (Markus et al., 2012). A recent empirical example can be found in the work Argyres & Silverman (2004) who found a complementary relationship between hierarchical reporting and rules about R&D project funding in the organizational design of corporations. The complementary view suggests a configurational approach to organizational design based on the fit as gestalts view with structure and coordination mechanisms interacting as complements for effective organizational performance.

Some organizational researchers have suggested a complementary nature among coordination mechanisms. For example, Poppo and Zenger (2002) suggested complementarities between informal coordination mechanisms and formal coordination mechanisms. They argued that formal mechanisms may positively build on informal coordination mechanisms and jointly lead to effective performance. Dekker (2004) also focused on formal and informal coordination mechanisms and suggested informal and formal coordination mechanisms may serve as both substitutes and complements. Dekker (2004) suggested the relationship is likely complex and nonlinear and is worth additional consideration. This prior organizational research suggests organizational design configurations may include different combinations of coordination mechanisms but has not considered the relationship between coordination mechanisms and structure.

IT organizational design researchers have investigated coordination mechanisms given particular structures. For example, DeSanctis and Jackson (1994) identified and examined the potential relationship between structural characteristics and coordination mechanisms. Brown (1999) looked at coordination mechanisms within centralized and federal (hybrid) structures and suggested that informal coordination mechanisms may actually provide a foundation for structure. A key point in Brown's (1999) argument is that the less costly informal coordination mechanisms may need to be in place before the more costly and difficult structure is developed but she also suggested that understanding how the elements potentially interact called for additional research. Research in this vein suggests combinations of structure and coordination mechanisms may make up organizational design configurations.

Prior research has highlighted the importance of structure and coordination mechanisms and made some attempts to highlight the potential interaction between them by highlighting the need for one element (e.g. coordination mechanisms) given the other (e.g. structure). What is not

yet understood is whether one element or group of elements (e.g. coordination mechanisms) may be adequate on their own or if there are particular combinations or configurations of structure and coordination mechanisms that are associated with successful organizations and interorganizational relationships. Knowing about such configurations would contribute to our knowledge of organizational design as a complex and holistic concept, add to the fit as gestalts view of fit and lead to new areas of research. The next section includes the argument for extending IT organizational design to an *inter*organizational context.

IT inter*organizational design configurations*

Much work can still be done on the dynamic relationship between structure and coordination mechanisms in an *intra*organizational context as there are mixed findings on IT organizational design within a single organization (Brown & Grant, 2005). Yet organizations are increasingly forming *inter*organizational relationships to achieve goals that they cannot achieve independently (Wood & Gray, 1991). Frequently, interorganizational relationships are facilitated and strengthened by IT-enabled information sharing. In increasingly common instances, the connected organizations develop, operate and manage the IT that supports their interaction, a phenomenon defined in this study as an IT-intensive IOR (IT-IOR). An example of an IT-IOR is CapWIN, an interagency collaboration of local, state and federal agencies whose mission is to enable interoperable technology and data for public safety responders in Washington, D.C. (U.S) metropolitan area (Fedorowicz et al., 2007). Though common in public safety there are growing instances of IT-IORs in health care (e.g. NEHEN) and financial services (e.g. VISA).

The trend towards IT-intensive relationships that cross organizational boundaries – whether across divisions in a multinational enterprise (MNE) (Markus et al., 2012), or interorganizational relationships (IT-IORs) are a growing but understudied phenomenon (Croteau & Dubsky, 2011). In addition to the typical challenges associated with managing relationships

between organizations the focus on technology makes IT-IORs different than other IORs and their design especially challenging (Hui et al., 2008). The combination of IT and interorganizational elements call for theorizing across both the IT and IOR disciplines. Although additional theorizing is needed (Provan et al., 2007), the work of Provan and Kenis (2007) serves as an important starting point as they have begun to describe important elements of IOR design. IT organizational design researchers have similarly neglected interorganizational contexts but have suggested important elements for the design of organizations with multiple business units that can be drawn from. Accordingly, this study draws upon the work of Provan and Kenis (2007) and important IT organizational design research to develop elements of IT interorganizational design for IT-IORs. The elements are then analyzed as configurations in order to determine the importance of structure, coordination mechanisms and combinations of both for high performing IT-IORs.

A key task of configurational analysis is to determine which elements should be considered for analysis and which should be left out (Ragin, 1987; Snow et al., 2008). The focus of this study is on identifying important organizational design configurations – based on potential combinations of structure and coordination mechanisms - for successful IT-IORs. Relying on a fit as gestalts view of fit, the elements should theoretically and conceptually potentially "fit" together (Fiss, 2007). It is important to note that configurational elements can be at multiple levels of analysis and may or may not include environmental elements (Greenwood & Hinings, 1988; Meyer et al., 1993).

The elements theorized to combine as configurations of interorganizational design for successful IT-IORs are described and developed based on prior theory in the following sections. Briefly, they are: (1) an environmental element – mandate; (2) an element for structure – a hierarchical reporting relationship; and (3) three coordination mechanism elements - (a) an IT

steering committee; (b) rules about IT resources; and (c) prior information sharing among participating organizations.

1) Environmental element - mandate

Environmental elements are often critical to IOR formation (C. Oliver, 1990). An important environmental element in the context of interorganizational design is whether the interorganizational relationship is mandated or not, the *first* configuration element included in the analysis. Mandated formation of interorganizational relationships is an important consideration in both the private and public sector but has not received adequate research attention (C. Oliver, 1990, Rodrigues et al., 2007). A mandate for interorganizational collaboration is particularly relevant in the public sector due to the importance of both legislative and gubernatorial action (Provan & Kenis, 2007). However, mandates based on legal or regulatory requirements from legislation and industry or professional regulatory bodies are not uncommon in the private sector (C. Oliver, 1990). As one example, the SEC has recently mandated the use of XBRL in the presentation of financial statements in publicly listed companies. Rodriguez and colleagues (2007) and others have suggested that having a mandate may influence the choice of structure and coordination mechanisms used and their interaction and this may ultimately influence IOR performance.

2) Interorganizational structure element - hierarchical reporting

Coordination mechanisms may depend on structure (Lowndes & Skelcher, 1998) and vice versa (Whittington, 2002). The interaction between structure and mechanisms is critical for effective performance. This is true in both intra- and interorganizational contexts. Markus et al. (2012) defined structure as hierarchical reporting relationships in an intraorganizational IT design context. In intraorganizational contexts hierarchical reporting relationships can often be identified via an organization chart and clearly understood within an organization. By contrast, in

interorganizational relationships where there are often many autonomous participating organizations structure can be more difficult to identify. Recent work on the design of interorganizational relationships by Provan & Kenis (2007) suggests a key distinction is whether participating organizations select (from among participating organizations) or create an entity to which they report to or whether the interorganizational relationship lacks a central entity to which the participating organizations report. In the latter case participating organizations do not report to a separate entity for the interorganizational relationship and thus do not rely on a formalized structure. Structure, defined as a formal hierarchical reporting relationship to a central entity for the participating organizations in an IOR, is the *second* configuration element and the key structural element.

3) Coordination mechanism elements

The contrast between having a structure (and thus a hierarchical reporting relationship) in an interorganizational relationship or not highlights the importance of viewing coordination mechanisms in addition to structure. Coordination mechanisms may exist as a necessity where no hierarchical reporting relationships exist in order to achieve some level of coordination and control. However, coordination mechanisms may also develop precisely because hierarchical reporting relationships exist and must be worked around for effective performance. This is the complementary view described above that runs counter to what Galbraith (1973; 1994; 2008) suggested is a continuum of formal and informal organization design coordination mechanisms. In this study, the view is of structure and coordination mechanisms as potentially complementary. The next section highlights three critical coordination mechanisms based on prior IT and IOR research – (a) an IT steering committee, (b) rules about IT resources and (c) prior information sharing.

a) Coordination mechanism element – IT steering committee

A key coordination mechanism discussed in IT organizational design research is the IT steering committee, the *third* configuration element. Weill and Ross (2004) found that IT steering committees were linked to improved performance in successful organizations. More recently, Huang and colleagues (2010) suggested an IT steering committee as "integral to an effective system of IT governance" (p. 288). IT steering committees are critical for the coordination of IT resources (Karimi et al., 2000) and for approving IT projects and initiatives and developing IT polices (Earl, 1989; 1993). Though it is unclear that prior research has studied IT steering committees as a mechanism specifically in an interorganizational context, prior research has noted the importance of a committee such as a board of directors or executive committee for interorganizational relationships (Provan & Kenis, 2007). This suggests a steering committee with IT responsibilities and authority is important in interorganizational contexts where there is a need for the effective development, use and management of interorganizational IT for improved performance.

b) Coordination mechanism element – rules about IT resources

The *fourth* configuration element is a rules coordination mechanism, specifically rules about IT resources. As highlighted, a significant stream of IT organizational design research has emphasized rules and/or decision rights as critical for successful performance (Brown & Grant, 2005). Examples include rules about IT investment approval, IT project prioritization, IT architecture, IT infrastructure strategies, and business application needs (Brown & Grant, 2005; Weill & Ross, 2004). In an interorganizational context rules also play an important coordination function and have received much attention. For example (Ring & Van de Ven, 1994) identified the creation of rules as an important part of the development and performance of interorganizational relationships, particularly if the business risk is high. Grandori (1997) suggested that in organizational design rules may serve as the best of all possible coordination

mechanisms. As the resources required for initial investment, continued maintenance and periodic "refresh" of IT are substantial in both an IT intra- and interorganizational design context, rules likely play an important role for achieving high performance.

c) Coordination mechanism element – prior information sharing

The *fifth* configuration element is the coordination mechanism of prior information sharing among participating organizations. Though potentially related to trust, information sharing has been highlighted as a coordination mechanism in its own right. DeSanctis and Jackson (1994) highlighted information sharing as an important coordination mechanism across business units within an organization. More recently Garcia-Dastugue and Lambert (2003) and Moyaux et al. (2006) highlighted the importance of prior information sharing as coordination mechanism across organizational boundaries in high performing supply chains. Given the nature of IT-IORs – where IT and information are critical and focal elements of the interorganizational relationships - previous information sharing among the participating organizations is included as an important configurational element that leads to successful performance.

Summary – IT interorganizational design configurations

Configurational approaches, rooted in a fit as gestalts perspective, have the potential to move fit research beyond simple interactions between variables to a holistic understanding of groups of variables and complex causality and in so doing uncover links between fit and organizational performance. In this section, five potential configuration elements of IT interorganizational design have been identified as important based on prior research given the nature of IT-IORs: (1) an environmental element – mandate; (2) an element for structure - hierarchical reporting relationship; and (3) three coordination mechanism elements - (a) an IT steering committee, (b) rules about IT resources; and (c) prior information sharing among participating organizations.

Method

Unfortunately, configurational research has suffered criticisms over the development and analysis of configurations (Short et al., 2008; Snow et al., 2006). Researchers have argued that a configurational approach can help uncover links to organizational performance but the empirical results are decidedly mixed (Fiss, 2007). Delery and Doty (1996) suggested additional testing is necessary but Fiss (2007) argued that the major problem with configurational approaches to this point is a "mismatch between methods and theory" (p. 1181). Fiss (2007) pointed out that the holistic nature, complex causality and nonlinear relationships implied in configurational approaches are at odds with traditional methods of organizational analysis and suggested the qualitative comparative analysis (QCA) method as a promising method. A similar argument has been recently made by Fichman (2004) and Lyytinen and Damsgaard (2011) for extending research on the diffusion of IS innovations and by El Sawy et al. (2010) for IS strategy. The method also holds great promise for extending both configurational approaches and IT organizational design research – for example for analyzing the combinations of structure and coordination mechanisms highlighted above. The remainder of this paper is devoted to a review of QCA and a test of its ability to analyze interorganizational design configurations in IT-IORs. The next section includes a description of the context of the study – public safety IT-IORs. This is followed by a description and application of QCA.

Context: IT-intensive interorganizational relationships

The data for the configurational elements used in this study comes from a larger study on highly interdependent interorganizational relationships for public safety, defined as public safety IT-IORs. That study was funded by the National Science Foundation (NSF) under the Public Safety Networks (PSNs) Study - Project # IIS-0534877 & IIS-0534889. Public safety IT-IORs are focused on the development and use of IT for information sharing and interoperability between

police and other public safety organizations. CapWIN, described in the introduction, is an example of a public safety IT-IOR.

As part of the NSF study, an exploratory survey was developed by the research team covering a range of topics including the features, goals, user characteristics and challenges facing public safety IT-IORs. In addition, the survey included questions about organizational and data management and performance. 136 public safety IT-IORs were identified and contacted about participating in the survey. Senior personnel (e.g. CIO, director, or manager) representing 87 of the IT-IORs participated in telephone interviews conducted by a professional survey research organization. Initial cleaning of survey responses resulted in 80 usable surveys. However, this study is focused on IT-IORs at the federal, state or local level who share a major purpose of providing cross-agency IT infrastructure in order to emphasize the importance of IT structure and coordination mechanisms. Only IT-IORs that were operational and thus able to answer questions about the operational performance of the IT-IOR were included. These steps – focusing on the specific IT infrastructure purpose and the emphasis on operational performance resulted in 32 public safety IT-IORs for analysis in this study. That number represents an intermediate-N study – too large for individual case analysis but too small for typical robust statistical analysis – and thus an ideal candidate for a configurational approach and QCA methods (Ragin, 1987, 2000).

QCA

Originally developed by Charles Ragin for political science, QCA, unlike traditional, variable-based approaches does not treat configurations as separate, independent elements. QCA uses Boolean algebra to treat configurations as different types of cases – as unique combinations of related attributes (Fiss, 2007). Key to QCA is the idea that "relationships among different variables are often best understood in terms of *set membership*" (Fiss, 2007, p. 1183, italics in original). Variables are not analyzed independently but as parts of distinct sets. The method is

based on a fit as gestalts view of fit and provides a way to develop, define and analyze configurations in organizational research. While the concept of set analysis has been around since at least the seminal work of Zadeh (1965) in the early 1960s the concept and method has remained largely in the realm of mathematics and artificial intelligence. More recently Ragin (1987; 2000) refined the method for research in the social sciences, Fiss (2007) has begun to use it in organizational theory and strategy and Fichman (2004) suggested it as a promising approach for IT innovation research.

There are two main QCA methods – crisp set and fuzzy set (Ragin, 1987, 2000). The former employs dichotomous variables; the latter approach allows for multichotomies or partial membership, but the crisp-set approach is by far the most commonly used (Rihoux & De Meur, 2009). A crisp-set allows for the operationalization of data in an element to be fully "in" or "out" (Merminod & Rowe, 2011). This operationalization makes sense given the nature of the data for this analysis - the nature of the elements are dichotomous (e.g. is the IT-IOR successful or not; was there a mandate or not). The process of using the crisp-set QCA method begins with deciding on the relevant elements that may make up a configuration. This is a critical step and should be based on "theoretical and substantive knowledge" (Fiss, 2007, p. 1184).

Once the elements have been decided upon, the next step is to create a truth table that shows all possible configurations of those elements and whether the configurations lead to the outcome the researcher is interested in (Fiss, 2007). As an example, let each element be considered to be a dichotomous 0 or 1 for "absence" or "presence" (a common approach). With N elements and two possible values (0 or 1) there are 2^N potential configurations, which can quickly become a very large number for researchers to work with (Ragin, 2000). However, it is important to note again that not all possible configurations are hypothesized to exist, a concept known as *limited diversity* (Ragin, 1987; 2000). Limited diversity explains, as Miller (1996) suggested, that

the power of configurations comes from the fact that most configurations are unlikely to exist empirically but a few "are far more common" (p. 506). The benefits of limited diversity include recognizing what design elements should or should not go together and based on this "studying limited diversity will allow us to identify additional design combinations that may extend or improve existing configurations" (Fiss, 2007, p. 1189). In addition, more than one of the configurations that does exist empirically may lead to the outcome under investigation – a concept known as *equifinality* (Fiss, 2007). A benefit of equifinality is that "knowledge about different paths can be used to construct a superior configuration that may be more robust to changes in the environment" (Fiss, 2007, p. 1189). In the context of this study of configurations of structure and coordination mechanisms for IT interorganizational design it is expected that a limited number of configurations will exist empirically and that more than one configuration will result in effective performance. Configurations can serve as a starting point for research on additional elements with the ultimate goal the design of "superior configurations" for IT interorganization design. The next section includes a discussion of the operationalization of the configurational elements used in the study to build a truth table.

Operationalization of performance

As the focus of the study is the interaction of structure and coordination mechanisms for effective performance, a performance index was developed. A performance index rather than an individual performance measure was used to capture the overall purpose of a public safety IT-IOR - which is the development, management and use of IT for the sharing of public safety information. The use of an index, or composite, outcome measure has been used in studies of organizational design and change as a way to synthesize what are normally individual organizational elements into a single outcome score (cf. Massina & Pettigrew, 2003).

Accordingly, the index measure used here covers overall operational performance, technology functionality and improved data sharing. Over operational performance is a general indicator of whether the IT-IOR is performing successfully or not. Technology functionality is a common measure of success in IS research (DeLone & McLean, 1992; 2003) and a key element for successfully performing IT-IORs (Maggion & Shiftan, 2004). Though many have criticized and extended the DeLone and McLean measures over the years (cf. Seddon, 1997), functionality remains an important measure of IS success (Petter et al., 2008). Finally, improved data sharing is key to public safety IT-IORs (Fedorowicz et al., 2007) and increasingly a measure of successful performance for data governance researchers (Khatri & Brown, 2010). Performance was operationalized as high if there was improvement in all three areas and low if there was no improvement or reduced performance in one or more of the measures.

Operationalization of configurational elements

Configurations were operationalized for the five elements of IT interorganizational design discussed above (see Table 1). The elements as reviewed in the theory section are based on "theoretical and substantive knowledge" of IT-IORs (Fiss, 2007, p. 1184). To review, an environmental element was included - whether the IT-IOR was mandated or not. Based on the definition of structure as hierarchical reporting relationships (Markus et al., 2012) and the research on entities for reporting in interorganizational relationships (Provan & Kenis, 2007), structure was operationalized as whether the participating organizations report to a separate entity or not (in some IT-IORs the participating organizations do not report hierarchically to a separate, central entity but rather work together via informal and formal coordination mechanisms).

Table 3.1 Operationalization of configuration elements

Configuration Elements	Operationalization	Source
External pressure: Formal mandate	IT-IOR was mandated by legislative or gubernatorial action	Provan & Kenis (2007); Rodriguez et al. (2007)
Structure: Designated hierarchical reporting relationship	IT-IOR participating organizations have a hierarchical reporting relationships to a separate entity	Markus et al. (2012); Provan & Kenis (2007)
Coordination mechanism: IT steering committee	IT-IOR has a committee with IT decision-making authority	Huang et al. (2010); Provan & Kenis (2007); Weill & Ross (2004)
Coordination mechanism: Written rules about IT-related resources	IT-IOR has rules related to IT resources	Grandori (1997); Ring & Van de Ven (1994); Weill & Ross (2004)
Coordination mechanism: Prior information sharing	IT-IOR member organizations have had previous IT-enabled collaboration with each other	DeSanctis & Jackson, (1994); Garcia-Dastugue & Lambert (2003); Moyaux et al. (2006)

The three coordination mechanisms – an IT steering committee, rules about IT resources and prior information sharing among participating organizations – were operationalized as follows. The IT steering committee mechanism was operationalized as whether a steering committee exists and whether that committee has IT responsibilities and authority. Specifically, for a configuration to include this element there could not only be a steering committee but the committee had to have at least one of the following: authority to prioritize IT-IOR technical projects; authority to make decisions about IT procurement for the IT-IOR; or responsibility over developing architectural plans or technical standards that apply to the IT-IOR.

The rules coordination mechanism was operationalized as whether there are rules about IT resources. Specifically, in order for this element to exist there had to be written policies or regulations specifying who can access data via the IT-IOR. By focusing on written policies for data access via the IT-IOR the elements captures two critical IT-related pieces – the data and the system – that represent significant costs and risks.

As mentioned, prior information sharing among participating organizations has been identified as an important coordination mechanism across business units (cf. DeSanctis and Jackson, 1994) as well as across organizational boundaries (cf. Moyaux et al., 2006). Accordingly, prior information sharing was operationalized as whether data sharing was a commonly accepted practice among participating organizations before the current IT-IOR was initiated.

Analysis – truth table

The five theoretically-derived elements of interorganizational design for identifying high performing IT-IORs were used to develop a truth table. With six total elements there are 2^6 = 64 possible combinations. However due to both the fact that 32 IT-IORs were examined and the concept of limited diversity 20 combinations were identified. The truth table with the operationalization of the key elements (with a dichotomized Y/N for the presence or absence of each element) and the cases found for each configuration is summarized in Table 2 (only the 20 configurations found to exist are included due to space limitations).

Table 3.2 Truth table

Man date	Hierarchical Reporting	IT Steering committee	Rules about IT resources	Prior information sharing	High Performance	IT-IOR by Case #
Y	Y	Y	Y	Y	Y	21, 22, 34, 129
Y	Y	Y	Y	N	Y	7, 40, 101, 105, 109, 142
Y	Y	Y	N	Y	Y	201
Y	Y	Y	N	N	Y	47, 140
Y	Y	N	Y	Y	Y	115
Y	Y	N	Y	N	Y	86, 88
Y	Y	N	N	Y	Y	106
Y	N	Y	Y	Y	N	67
Y	N	Y	Y	N	Y	20
Y	N	N	Y	Y	Y	27
N	Y	Y	Y	Y	Y	39, 121
N	Y	Y	Y	N	Y	10
N	Y	Y	N	N	N	15
N	Y	N	Y	N	N	122
N	N	Y	Y	Y	Y	68
N	N	Y	Y	N	Y	4
N	N	Y	N	Y	Y	45
N	N	Y	N	N	Y	16, 160
N	N	N	Y	Y	Y	108
N	N	N	N	N	Y	94

The next step and purpose of a crisp-set QCA is to reduce the truth table combinations to a set of logic statements using Boolean algebra. There are software packages available to analyze similarities among the configurations and reduce the configuration to necessary and/or sufficient conditions for the outcome of interest to occur (high performance in this study). A *necessary* condition must be present for an outcome to occur. A *sufficient* condition produces the outcome by itself. As recommended, the QCA software developed by Charles Ragin (1987, 2000) was used. The software relies on the Quine-McKluskey algorithm to reduce the truth table to a set of logic statements. The Quine-McKluskey algorithm is an algorithm for systematically reducing Boolean algebra functions (Ragin, 2000). Put another way, the algorithm is based on "repeated

applications of the distributed law and the fact that X OR (NOT X) is always true" (Sarkar et al., 2001). Findings based on this novel method are discussed next.

Analysis – logic statements

QCA provides both intermediate and parsimonious solutions. The intermediate solutions are often more easily interpretable but parsimonious solutions identify the conditions essential for identifying the outcome of interest (Ragin, 2008). The focus was on the parsimonious solutions in order to understand which "paths" (or configurations) lead to a high performance outcome. Based on the concept of equifinality multiple paths to high performance are expected (see Table 2). Indeed the use of the Quine-McKluskey algorithm in the QCA software resulted in several potential paths (reduced logic statements) to a high performance outcome. Ragin (2008) has recently sought to develop measures to help identify the importance of individual paths when multiple paths are found. Two such measures are *consistency* and *coverage*. Consistency is "the degree to which the cases sharing a given combination of conditions…agree in displaying the outcome in question" (Ragin, 2008, p. 44). Coverage is the "degree to which a cause of causal combination 'accounts for' instances of an outcome. When there are several paths to the same outcome, the coverage of a given causal combination may be small. Thus, coverage gauges empirical relevance or importance" (Ragin, 2008, p. 44).

Findings

Both consistency and coverage measures were used to identify the most relevant paths to high performance. Included here are findings with a consistency of 1.0 (highly consistent) and coverage of at least .25. Prior research has suggested a minimum of .75 for consistency (Ragin, 2008). As described above, coverage is the % of all cases that is covered by a configuration. Like R^2 in statistical analysis there are no specific rules for a coverage level that is acceptable (Ragin, 2006). The .25 level was chosen as a conservative baseline given the small number of

configurations analyzed. The analysis resulted in two potential paths for high performing IT-IORs (Table 3) with the first path accounting for more "coverage" than the other. Stated as reduced logical statements for high performance ("*" = logical "and";" ~" = logical "not") they are: (1) hierarchicalreporting*mandate (coverage = .58) and (2) ~priorinformationsharing*writtenITrules*ITsteeringcommittee (coverage = .31). Put another way, the two paths of interorganizational design for high performing IT-IORs are 1) IT-IORs that have the combination of a hierarchical reporting structure AND a mandate and 2) IT-IORs that have the combination of NO prior information sharing AND written rules for IT resources AND an IT steering committee.

Table 3.3 Summary of findings

Path for high performance	Consistency	Coverage
hierarchical reporting to separate entity AND mandate	1.0	.58
NOT prior information sharing AND written rules AND IT steering committee	1.0	.31

The findings based on the novel QCA method provide interesting insight. The findings highlight two distinct paths to high performance for IT interorganizational design in public safety IT-IORs: 1) a more formal, structure-based path (a mandate and hierarchical reporting to a separate entity) and 2) a no-prior information sharing, coordination mechanism only path (i.e. absence and presence of certain coordination mechanisms). Each path is discussed next, followed by a discussion section of the theoretical implications of the findings.

Interestingly, the path with the element for structure (hierarchical reporting) does not include a coordination mechanism. But this path does include a mandate as well as hierarchical

reporting to a separate entity. It may be that setting up a separate entity is sufficiently costly that it cannot happen in the absence of a mandate. The creation of a hierarchical reporting structure may be part of the mandate (and the hierarchical reporting may be to the very entity that issued the mandate). Another explanation may be that actors lobby for a formal mandate (particularly in the public sector) for what they want to do but lack the power to do in the absence of a mandate. Finally, a hierarchical reporting structure may serve as a visible symbol (and purpose of the mandate) of the IT-IOR in order to attract resources and/or legitimacy (Provan & Kenis, 2007).

The second path is also very interesting. Based on prior literature, one might expect to find a high-performing configuration consisting of an element for prior information sharing alone or in combination with rules or other coordination mechanisms. However the findings indicate that a high performing IT interorganizational design configuration can exist in *the absence of prior information sharing* if there are also rules about IT resources and an IT steering committee. A related research stream contains a debate about the role of trust and other formal coordination mechanisms. Although trust is a concept with many definitions and applications some research has found trust, defined as the "stable perception of actors about the intentions of other actors" (a perception that comes from repeated interaction), can substitute for formal coordination mechanisms (Edelenbos et al., 2007, p. 30). Others have found trust and formal coordination mechanisms are complementary and potentially additive (e.g. trust enhances formal coordination) (cf. Jagd, 2010; Vlar et al., 2007).

In the context of the IT-IORs in this study, with an emphasis on IT that crosses organizational boundaries, the findings indicate that the potential informal interaction that can grow out of the familiarity associated with a prior information sharing relationship is not needed as long as there are formal rules about IT resources and an IT steering committee. When the emphasis is on developing an interorganizational IT infrastructure, informal access to the

infrastructure, rogue procurement and informal standards are potential threats to an effective IT-IOR. Having no prior information sharing relationship may force organizations to rely on the direction of an IT steering committee and refer and adhere to the formal rules about IT resources, particularly when the resources required for initial investment, continued maintenance and periodic "refresh" of IT in IT-IORs continue to be substantial.

Discussion

The review of prior research revealed alternative potential configurations of structure and coordination mechanisms – structure alone, coordination mechanisms alone or a combination of structure and coordination mechanisms. Interestingly, one path was found which included structure and another with a combination of coordination mechanisms. No path included a combination of structure and coordination mechanisms. However, each of the five theoretically derived elements of interorganizational design developed in this study are included in the two paths. It is the interactions and lack of interactions that are surprising. Although some researchers have suggested structure and coordination mechanisms may serve as substitutes the theoretical argument in this paper also considered the possibility that in at least one configuration they would actually be complements and their interaction lead to successful organizational performance (Markus et al., 2012).

The findings in the present study do not include a combination of structure and coordination mechanisms for high performing IT-IORs but do highlight the importance of both structure and coordination mechanisms as potential distinct paths to high performance in IT-IORs. In addition, each of the *coordination mechanisms* developed in the study – written rules about IT resources, IT steering committee and prior information sharing are shown to interact as a configuration. And *structure*, which is likely to be the element that is mandated rather than

individual coordination mechanisms was found to indeed interact with mandate in one of the paths to high performance.

Although surprising because it is thought that structure and coordination mechanisms elements interact, the findings do highlight the importance of viewing both structure and coordination mechanisms. In this study, each is present in a path to high performance. Focusing on one versus the other would give a limited and misleading view of IT interorganizational design configurations in high performing IT-IORs in this context. Future theorizing may identify additional structure and coordination mechanism elements in order to determine if they combine differently or similarly provide alternative paths to success. In addition, the timing of the design of structure and coordination mechanism may also play an important role. For example, Markus and colleagues (2012) have suggested that hierarchical reporting relationships and divisions of labor are easier to "design" and implement in the beginning stages of organizational life and harder to change later on. The formal and informal coordination mechanisms are harder to "design" and implement but easier to change. Future research should consider the temporal nature of organizational design elements. Longitudinal case studies that cover the beginning and follow the lifespan of IT-IORs would be especially appropriate and useful. Such studies could investigate whether, why and how timing matters. For example, as mentioned, it is not known whether a mandate precedes structure or vice versa and if the order matters. For the coordination mechanisms, is an IT steering committee a precursor (and creator) of written rules or can rules come first and lead to the development of an IT steering committee? The findings indicate important configurations for high performing IT-IORs but how the elements combine and in what order over time would lead to important insights for both theorists and practitioners interested in IT-IOR design and success.

Longitudinal case studies may require additional views of fit beyond fit as gestalts. A promising avenue of research has emphasized the role of technology in shaping fit in organizational design – of the potential of technology and the response of organizations to that potential in the form of changes in organizational design (cf. Majchrzak & Markus (forthcoming). Broadly defined as technology affordance and constraint theory (TACT) this theoretical perspective may prove useful in understanding why and how interorganizational design configuration elements interact over time in IT-IORs.

Conclusion

The configurational approach used in this study is a promising way to extend simple conceptualizations of fit to a more holistic, complex and multidirectional view of fit and the link between fit and high performance. Configurations enable researchers to theorize how complex elements of organizational design group together in high performing organizations. In this study, five elements of interorganizational design were found to combine into two paths for high performing IT-IORs: 1) the combination of a hierarchical reporting structure AND a mandate and 2) the combination of NO prior information sharing AND written rules for IT resources AND an IT steering committee.

There are challenges to generalizability in the study. The survey relies on the observations of a single respondent in a multiple organization context. This is a common concern in many studies that rely on surveys and there is the threat of common methods bias and a lack of triangulation with the perspectives of other participants. A second concern is the public sector context and its implications for the generalizability of the conclusions. Although much research has emphasized the distinctive nature of the public sector (cf. Bozeman & Bretschneider, 1986; 1994; Kelman, 2005; 2007; Rainey & Bozeman, 2000; Rocheleau, 2006), this literature has not focused on relationships among public sector organizations (cf. Kelman, 2007). Furthermore, the

public sector may involve greater complexity than the private sector and the conclusions drawn from the public sector may apply to the private sector, while the reverse may not be true (Markus and Bui, 2011). Future research is needed to examine IT-IORs in both sectors but this study is an important first step in the public sector with findings that are of interest in the private sector. Finally, although QCA is a promising novel method, it is only beginning to be tested empirically and it still needs a standardized way to apply it as well as report findings (Lacey & Fiss, 2009).

The study has highlighted the importance of considering both IT structure and coordination mechanisms in an interorganizational context. The study extends both contingency theory and configurational approaches for understanding "fit". The study also emphasizes the importance of IT organization design and fit for high performing IT-IORs as well as suggests there is potential in QCA as a method for analyzing configurations. The study contributes to practice by emphasizing that there are potentially multiple paths to successful performance and begins to provide managers with an understanding of the elements available for successful IT organization design. As shown in this study, IT organization design configurations contribute to successful performance and researchers must turn their attention to both structure and coordination mechanisms together rather than in isolation.

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Appendix – Table A.1 Configuration element coding

Configuration Element	Survey Question(s) used	Coding	Range of Survey Responses
Mandate	Q87A – To what extent 'legislative mandate' play a role in the initiation of the IT-IOR> Q87B – To what extent did 'Governor's executive order' play a role in the initiation of the IT-IOR?	Yes if yes (1 or 2) on either Q87A or Q87B No if no (3) on either Q87A or Q87B	1 = to a great extent 2 = to some extent 3 = not at all 4 = don't know 5 = does not apply
Hierarchical Reporting	Q29 Where does the IT-IOR report?	Non-hierarchical if each organization reports to own (1) Hierarchical for all others	1 = each member reports to its own authority 2 = office of the CIO 3 = Exec. branch administration dept. other than CIO 4 = Exec. branch public safety 5 = Legislative branch 6 = Judicial branch 7 = An independent entity 8 = Other
IT steering committee	Q30 Is there a formal governance body for the IT-IOR? Q39H Is 'prioritizing IT-IOR technical projects' an important responsibility of the IT-IOR governance body? Q39J Is 'making decisions about IT procurements and services contracts for the IT-IOR' an important responsibility of the IT-IOR governance body? Q39K – Is 'developing IT architectural plans or technical standards that apply to the IT-IOR' an important responsibility of the IT-IOR governance body?	No if no formal governance body or if yes formal governance body but no on Q39H, J and K Yes if formal governance body and yes (1 or 2) on Q39H, J or K	Q30: 1 = yes formal governance body; 2 = no formal governance body Q39H, J, K: 1 = very important 2 = somewhat important 3 = not important
Rules about IT-related resources	Q50H There are written policies or regulations specifying who can access data via the IT-IOR	Yes if 1 No if 2 or 3 Not included if 4	1 = to a great extent 2 = to some extent 3 = not at all 4 = does not apply

Prior information sharing among participating organizations	Q85 Before the IT-IOR was initiated, was data sharing a commonly accepted practice among participating organizations?	Yes if 1 or 3 No if 2 Not included if 4	1 = yes 2 = no 3 = among some members 4 = don't know
Performance	Q62 How has overall operational performance improves since the initiation of the IT-IOR? Q63 The IT-IOR's technology provides the expected functionality Q65 Has data sharing among IT-IOR participating organizations improved as a result of the IT-IOR?	High performance is improvements on three questions (answered 1 or 2 for all questions) Low performance is no improvement on one or more of the three questions	Q62 & 65 1 = improved a lot 2 = improved some 3 = no change 4 = worsened 5 = don't know Q63 1 = strongly agree 2 = agree 3 = neither agree nor disagree 4 = disagree 5 = strongly disagree 6 = not applicable

Essay 3 - An evolving view of "fit" - technology affordances, constraints and actualization through organizational design changes[3]

Abstract

Streams of research as diverse as the work on information technology (IT) governance and innovation emphasize the importance of organizational design for the effective management and use of technology. This research has traditionally been carried out using contingency theory perspectives of "fit", but contingency theory is much maligned for its limited views of fit. This study adopts and expands the concepts of technology affordances, constraints and actualization to examine fit between technology and organizations over the 40+ year lifespan of a single organization. Findings highlight two examples of technology affordances, one example of a technology constraint, and actualization for all three through specific changes in the structure and coordination mechanisms employed by the organization. The implications of this view of fit on the success of the organization as well as suggestions for future theorizing are discussed.

Introduction

Streams of research as diverse as the work on information technology (IT) governance (Brown & Grant, 2005) and innovation (Dewett & Jones, 2001) emphasize the importance of organizational design for the effective management and use of technology. Interest in the relationship between technology and organizational design is at a crossroad. The question of whether and how technology influences organizational design has fallen out of favor (Orlikowski & Scott, 2008) and has become clouded with concerns over technological determinism (Leonardi

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& Barley, 2008). Nowhere is this more evident than in the changing conceptualizations of "fit" - the idea that organizations should be designed to fit contingencies like technology in order to be successful.

Fit as a concept is most commonly associated with contingency theory. Contingency theory has long been a common perspective for understanding the influence of technology on people and organizations (Orlikowski, 2010; Umanath, 2003). Although contingency theory has often been criticized for being deterministic (Demers, 2007), some say that the more important concern when considering technology is neglect of the materiality of technology (Leonardi & Barley, 2008). Neglecting the materiality of technology leads to an underdeveloped understanding of fit (Strong & Volkoff, 2010). Considering the characteristics of technology leads to a view of fit based on the potential of technology and the changes an organization makes to its organizational design to fulfill that potential (Leonardi & Barley, 2008). Few researchers have studied the influence of technology on specific elements of organizational design, defined in this study as a combination of structure (hierarchical reporting relationships and divisions of labor) and informal and formal coordination mechanisms (Markus et al., 2012). Two important examples include how changes in payroll technology resulted in changes in administrative rules at Stanford (March et al., 2000) and how the introduction of a new IT tool changed the informal relationships within an organization (Leonardi, 2007).

A promising approach to further understand fit as a relationship between the potential of technology and the design of organizations is the concept of *affordances for organizing* (Zammuto et al., 2007). Affordances for organizing "depend not only on the functionality characterizing the information technology, but also on the expertise, organizational processes and procedures, controls, boundary-spanning approaches, and other social capacities present in the organization" (Zammuto et al., 2007). Affordances alone are not enough for organizational

success. At the individual level, Strong et al. (2009) suggested the concept of *actualization* – "the engagement of a user with an affordance in pursuit of specific goals as made possible by the affordance" (p. 6). Researchers have not yet identified instances of actualization at the organizational level even though the concept of affordances for organizing suggests some form of actualization is necessary if organizations are to benefit from technology.

This study uses the concepts of affordances for organizing and actualization in order to identify elements of organizational design that are influenced by technology. The goal is to begin to understand how and why technology and organizational design elements develop into affordances for organizing over time and to identify instances of actualization and relate actualization to organizational success. To accomplish this, the paper is based on an in-depth case study of an organization that has been centered on technology from its founding (1960s) to present day. Using a combination of longitudinal, retrospective and archival data analysis in combination with critical incidents analysis, three critical incidents were identified in the life of the organization. Each of the critical incidents includes instances of both affordances for organizing and actualization through organizational design changes in the life of this successful organization. Each of the affordances, constraints and examples of actualization are discussed individually, followed by a discussion of how they combine and relate to organizational success.

The paper begins with a review of research on the relationship between technology and organizations under the umbrella of "fit" as well an overview of the debates over the materiality of technology and technological determinism. This is followed by a discussion of the concept of affordances for organizing as a way to understand the interaction between technology and organizations as well as an argument for adopting the concept of actualization at an organizational level to articulate how organizations find value in affordances for organizing. Next is an argument for focusing on changes in elements of organizational design as a useful tool for

understanding actualization. The remainder of the paper is focused on the details of the case study, with findings, discussion, and implications for future research.

Theoretical background – technology and organizations

Technology has deeply penetrated organizational life (Orlikowski & Scott, 2008) and the relationship between technology and organizations was an early focus of both IS (Brown & Grant, 2005) and organizational (Orlikowski, 2010) researchers. Yet the relationship between technology and organizations is at a crossroad due to debates over the materiality of technology and concerns over technological determinism (Leonardi & Barley, 2008). In both streams of research the concept of "fit" is central to understanding the relationship between technology and organizations. This section begins with a review of contingency theory and alternative views of fit. Technological determinism and materiality are reviewed before moving to evolving views of fit, particularly technology affordances and constraints theory (TACT). Finally, the concept of organizational design is described in more detail.

Contingency theory and conceptualizations of fit

The importance of technology to organizational design is evident in early research on technology and organizations. Both Woodward (1958; 1962) and Perrow (1967; 1970) argued that technology matters for organizational design. Successful organizations were those that were able to find a "fit" between the characteristics of technology and organizational design. This research is at the foundation of contingency theory – the idea that there is no one best way to design an organization, but rather that how to design an organization for effectiveness depends on the "fit" between an organization and critical elements or contingencies (Galbraith, 1973; Thompson, 1967; Lawrence & Lorsch, 1967). Contingency theory continues to be an important and useful theory but the theory is often criticized because of questions over multiple conceptions

of "fit" (Umanath, 2003), and the argument that contingencies - technology in particular – are deterministic (Orlikowski, 2010).

The most cited work on fit in management research in general is the work of Venkatraman (1989) on the concept of fit in *strategy* research. Venkatraman suggested that the frequent critiques of contingency theory were rooted in researchers' inconsistency in matching their conceptual view of fit with appropriate statistical measurement. He argued for six perspectives of fit: 1) fit as moderation (the interactive effect of a predictor on a moderator); 2) fit as mediation (an intervening mechanism between an antecedent and a consequent); 3) fit as matching (a theoretically derived match between two variables independent of performance); 4) fit as gestalts (fit as a pattern based on internal coherence); 5) fit as profile deviation (fit as a "degree of coherence" to some external profile); and 6) fit as covariation (internal consistency among a set of underlying related variables).

Early contingency-based strategy and organizational design research adopted a fit as moderation approach (Venkatraman, 1989) as did contingency-based IS research (Bergeron et al., 2001). Several researchers have noted that the interesting (but challenging – conceptually and methodologically) work would likely come from advances in the *fit as gestalts* research (cf. Bergeron et al., 2001; Drazin & Van de Ven, 1985; Doty et al., 1993; Umanath, 2003; Venkatraman, 1989). The fit as gestalts view will lead to important new insight because its complex, holistic and multilinear view of fit will force researchers to find a tighter link between theory, elements of organizational design and interpretation of what "fit" means (Venkatraman, 1989). Although advances in considering how contingency elements interact (i.e., moving from the static linear relationships of mediation and moderation to complex and holistic relationships of gestalts) is an important improvement, the basic argument of fit in contingency theory is still criticized for being deterministic (cf. Orlikowski, 2010). This is particularly the case when the

contingency under investigation is technology, though there is some confusion over technological determinism and the materiality of technology (Leonardi & Barley, 2008). The distinction is important because determinism suggests agents (individuals or organizations) have no choice but materiality suggests only that technology has features and characteristics that can change what agents currently do or provide agents with entirely new opportunities (Leonardi & Barley, 2008). This important distinction and its implications for the concept of fit are discussed next.

Technological determinism

As Leonardi and Barley (2008) noted, technological determinism is directly related to early contingency theorists who examined the changes in an organization as a result of the introduction of certain technologies (cf. Woodward (1958); Perrow (1967)). In these and other early studies of the relationship between technology and organizations, organizations that were designed to "fit" the technology were successful, and those that did not "fit" were not successful. Whether the designers of the organizations had any influence was not a consideration. The introduction of technology required certain organizational designs – technology determined organizational design. This deterministic view of technology was the dominant view of researchers into the 1990s (Raymond, 2010) although some researchers were beginning to question and probe technological determinism and its role in theories of organizational change (Markus & Robey, 1988).

Researchers began to push-back against the idea of technological determinism in the 1990s in favor of an emphasis on the agency of individuals in their interaction with technology (Raymond, 2010). This period resulted in a renewed interest in Giddens' (1984) structuration theory (cf. Orlikowski & Robey, 1991) as well as new theories such as adaptive structuration theory (DeSanctis & Poole, 1994) and actor network theory (cf. Tatnall & Gilding, 1999). In relation to technology, the key element in each of the theories is the elevation of human agency in

the relationship between technology and people and organizations. As articulated by Orlikowski (2010), research that emphasizes agency often suggests technology artifacts are socially defined and produced and that the relevance of the artifacts is only evident when people interact with them. At their core these theories argue that technology is not deterministic, that is, technology on its own is not causal and the consequences of its use are attributable to human agency (Markus & Silver, 2008). Some have argued that this move toward an emphasis on human agency is too severe as it "neglects the influence of IT artifacts and their material aspects" (Raymond, 2010; p. 38). The importance of considering the material aspects of IT is discussed next.

Materiality

Leonardi and Barley (2008) have recently argued that the debate over technological determinism is flawed because there is a difference between materialism and technological determinism. As Leonardi and Barley (2008) articulated, determinism suggests human action is caused by technology whereas voluntarism suggests humans have "free will" to shape technology. Materialism is rooted in the idea that human action stems from the materiality of technology while idealists would argue that the social drives human action. The appropriate dynamic is thus between determinism (actions are "caused" by technology) and voluntarism (agents have "free will") and between materialism (action stems from the characteristics of technology) and idealism (action stems from ideas, norms and beliefs). It is possible to have materiality without determinism.

This is an important distinction because, by focusing on technological determinism, researchers have neglected the potential inherent in the materiality of technology. Materiality matters for theories concerned with the relationship between technology and organizations, because "the material properties of artifacts are precisely those tangible resources that provide people with the ability to do old things in new ways and to do things they could not do before"

(Leonardi & Barley, 2008; p. 161). Put another way, "technologies have features and functionalities regardless of whether humans recognize or use them" (Majchrzak & Markus, forthcoming).

Research on the relationship between technology and organizations has thus been held back by a significant tilt toward human agency. However, the concept of "fit" is also to blame, as technological determinism has its roots in contingency theory. At the core the problem is the materiality of technology. Early contingency theorists "never got close enough" to the technology they were examining (Leonardi & Barley, 2008; p. 163), a concern echoed in recent research that has called a neglect of the materiality of technology as a "black box" (cf. Orlikowski & Scott, 2008; Strong & Volkoff, 2010).

Recently researchers have moved away from explicitly using contingency theory but are reexamining what the concept of "fit" means as a way to open the "black box" and better understand the relationship between technology and organizations (cf. Strong & Volkoff, 2010). This recent stream of research is discussed next.

Evolving views of fit and materiality

Recent research has begun to again emphasize the materiality of technology, often identified as the functionality or potential of technology (e.g., an enterprise system), and the changes organizations make in order to take advantage of that functionality. For example, Soh and colleagues (Soh et al., 2000; Soh & Sia, 2004) have researched what they call "misfit" or "misalignment" of enterprise systems packages (like SAP) and organizational design in organizations. In Soh et al. (2000) "misfits" are defined as "the gaps between the functionality offered by the package and that required by the adopting organization. As a result, organizations have had to choose among adapting to the new functionality, living with the shortfall, instituting

workarounds, or customizing the package" (p. 47). In a subsequent paper on ERP packages, Soh & Sia (2004) focused on what they called "misalignments", defined as differences between the structures embedded in the organization (as reflected by its procedures, rules and norms) and those embedded in the package" (p. 376). The important finding in their research is that ERP packages have characteristics that require organizational responses in order to achieve alignment and subsequent success.

Strong and Volkoff (2010) built on the work of Soh and colleagues on "misfit" and "misalignment" by introducing the concepts of "fit as coverage" and "fit as enablement" as alternatives for understanding fit between organizations and enterprise systems (ES in their paper). Fit as coverage "means the ES meets the organization's requirements (i.e., it includes the features that the organization needs to operate and that users need to do their work)" (p. 746). Fit as enablement "means the ES permits and enables the organization to operate more effectively, and users to do their work more efficiently, than was the case without an ES" (p. 746). They suggested these two new conceptualizations of fit are "tailored to IT artifacts, that is, they capture how the IT artifact affects the conceptualization of fit" (p. 748).

The work of Soh and colleagues and Volkoff and Strong are examples of a broad theoretical perspective that has become known as technology affordances and constraints theory (TACT) (Majchrzak & Markus, forthcoming). The advantage of TACT is the emphasis on both the potential of technology and the responses of organizations needed to fulfill that potential – a promising alternative to other conceptualizations of fit. As this study adopts TACT as the theoretical perspective for understanding the relationship between technology and organizations, the theory and its key concepts are discussed in detail in the next section.

Technology affordances, constraints and actualization

Technology affordances are the "action potential" of technology. The concept of affordances is rooted in the ecological psychology research of Gibson (1977) who studied the behavior of animals and humans in their environments and highlighted their ability to identify the "affordances" of objects rather than focus on the object's specific characteristics (i.e., a chair is not a "chair" but a place to sit). Others have highlighted the potential of the concept of "affordances" for technology users (Gaver, 1991). Markus and Silver (2008) went a step further, arguing that the functional affordances of technology are "the possibilities for goal-oriented action afforded to specified user groups by technical objects" and were careful to note that functional affordance refers to *potential* uses" of technology (p. 622).

TACT highlights the idea that the *potential* uses of technology include both the positive and negative potential of technology (Majchrzak & Markus, forthcoming) – an idea also found in Leonardi and Barley (2008). *Affordances* are the "action potential" of technology. *Constraints* are the ways technology can keep individuals or users from accomplishing a particular goal. As Majchrzak & Markus (forthcoming) noted, both affordances and constraints are best understood as relational concepts – technology represents an affordance or constraint only when interacting with an individual or organization.

At the organizational level, Zammuto et al. (2007) defined technology affordances as *affordances for organizing* and argued that they "depend not only on the functionality characterizing the information technology, but also on the expertise, organizational processes and procedures, controls, boundary-spanning approaches, and other social capacities present in the organization" (Zammuto et al., 2007, p. 752). This definition is important, because it suggests what may interact at an organizational level with technology. However the definition, even with

potential examples, remains conceptual and is not clear about what elements of an organization interact with the affordances for organizing associated with technology.

Understanding what elements of an organization are interacting with technology is important, because, as mentioned, it is the interaction that is critical – for both affordances and constraints. Markus and Silver (2008) stated this interaction as an important and useful bridge "between the analysis of IT properties and the explanation of IT effects" (p. 617). In other words, affordances or constraints alone are not enough to understand organizational success and failure. How and why organizations respond to those affordances and constraints is needed to understand fit and potential effects.

This study relies on the view that it is through *actualization* that organizations realize the potential of affordances and constraints. Actualization has been defined at the individual level as "the engagement of a user with an affordance in pursuit of specific goals as made possible by the affordance" (Strong et al., 2009, p. 6). The concept of affordances for organizing suggests a similar engagement at the organization level. At the organizational level the responses may include changes in organizational design – the structure and coordination mechanisms. The next section describes the concept of organizational design.

Organizational design

Organizational design is a combination of both the hierarchical reporting relationships and divisions of labor in an organization (cf. Mintzberg, 1993) and formal and informal coordination mechanisms (Markus et al., 2012). This definition is aligned with the earliest work on technological change and organizations – what Woodward (1958) articulates as span of control, centralization of authority and formalization of rules and procedures. Markus and colleagues (2012) argued that hierarchical reporting relationships and divisions of labor are easier

to “design” and implement in the beginning stages of organizational life and harder to change later on while the formal and informal coordination mechanisms are harder to “design” and implement but easier to change. A broad conceptualization of coordination mechanisms includes things like informal relations (Huiskonen & Pirttilla, 2002), data standards (Markus et al., 2006) and formalized business practice guidelines (Markus & Gelinas, 2008).

The definition of organizational design in this study is purposefully broad for two reasons. First, an emphasis on formal and informal coordination mechanisms has come at the expense of an understanding of hierarchical reporting relationships and divisions of labor even though it is likely both interact over time (Markus et al., 2012). Second, as the research on affordances for organizing is still conceptual a broad definition of organizational design allows for the identification of what, why and how specific elements of organizational design change as they interact with technology affordances and constraints. As noted, research on the changes in the academic and administrative rules at Stanford found that payroll technology resulted in changes in administrative rules (March et al., 2000) and a recent study on the introduction of a new IT tool in an organization showed how the tool changed the informal relationships within an organization (Leonardi, 2007). The goal of this study is to capture instances of changes to both structure and coordination mechanisms as an organization responds to technology – to identify what changes and why and the implications of those changes on organizational success.

The theory section has included a review of research on technology and organizations and includes the view of technology adopted in this study - that the materiality of technology matters and that technology does have its own features and functionality. However materiality alone is not what is important but rather the interaction of technology and organizational design, broadly defined. The study relies on a combination of the concepts behind technology affordances and constraints theory (TACT) with the ideas of affordances for organizing and actualization to

explore the relationship between technology and organizational design over the lifespan of an organization. The remainder of this paper is devoted to the case study used to explore this relationship, followed by findings, discussion, and the implications for future research.

Method

As several researchers have argued (cf. Leonardi & Barley, 2008; Strong & Volkoff, 2010), understanding fit based on a study of technology affordances, constraints and actualization is likely best done using longitudinal data. Accordingly, this study is based on a retrospective, longitudinal case study of a single organization. This strategy is also appropriate when the researcher is studying changes in an organization over time and when the focus is on a "contemporary phenomenon within its real-life context" (Yin, 2003, p. 13). A case study approach is also appropriate because the emphasis here is not only on identifying "what" changes in organizational design in order to further expand TACT, but also in identifying "how" and "why" the interaction between technology and organizations take place (Yin, 2003). A discussion of the research setting is included next, followed by the details of data collection and analysis.

Research setting

The research setting for this study is Nlets, the international justice and public safety network. Nlets is a successful organization that has been centered on technology from its founding (1960s) to present day. Nlets is incorporated as a 501(c) (3) (nonprofit) organization in the U.S., owned by the fifty states, District of Columbia, Guam, Virgin Islands and Puerto Rico. Each of the owners has representation and elects a board from among member representatives. Day-to-day operations are handled by a professional staff of less than 30. In addition to the members with ownership in Nlets, there is a growing collection of federal, regional and strategic partners connected to the network for the purpose of sharing public safety information. The Nlets network connects each of these organizations with a direct hard-line data communication

connection. Behind the hard-line connections are nearly 1.5 million users in over 80,000 agencies. In 2011 there were over 1 Billion transactions over the Nlets network with the number of users, agencies and transactions growing every month. In addition Nlets is debt-free and operates at a significant surplus. In short, Nlets is very successful. The case study traces technology affordances, constraints and actualization through organizational design changes though three critical incidents in the history of Nlets.

Data collection and analysis

The data used in this case study of technology affordances, constraints and actualization over the life of Nlets comes from a combination of longitudinal, retrospective and archival sources (see Table 1). Longitudinal data were collected beginning in 2009 and includes site visits at Nlets headquarters and informal interviews, observations and attendance at annual meetings, board of director meetings and other meetings. Retrospective data come from 11 formal interviews lasting approximately 1 hour each (all but one were recorded and transcribed and included two interviewers) with the Executive Director, CTO, board members, staff members, state representatives and individuals outside the organization who have worked closely with Nlets for many years (see Table 2). Archival data include 400 pages of documents including board meeting, conference meeting and other committee meeting minutes from pre-founding (1960s) to present day as well as other internal (e.g., training) and external (e.g., marketing) documents.

Table 4.1 Types and sources of case study data

Type of data	Source of data
Longitudinal	Site visits, informal interviews, observations at HQ, annual meetings, board of director meetings and workshops from 2009 – present
Retrospective	11 formal interviews (see Table 3)
Archival	Review board meeting, conference meeting and other committee meeting minutes from pre-founding (1967) to present; other internal (e.g., training) and external (e.g., marketing) documents

Table 4.2 Interviewee details

Interviewee title & relationship with Nlets	Length of relationship with Nlets
Representative (and former board member)	30+ years
External partner	30+ years
Vendor & former member and president of board	25+ years
Executive Director	25+ years
CITO	25+ years
Representative	~ 10 years
Representative	~ 10 years
Vendor	~ 10 years
External partner	~ 10 years
Staff member (technical)	~ 5 years
Staff member (project management)	~ 5 years

Several of the interviewees have been with Nlets for over 20+ years (and in some instances over 30 years) and have first-hand knowledge of its history having lived through it. Others either worked for one of the founding participants before becoming part of the organization or had other direct ties to the earliest staff members at Nlets. Other interviewees had been associated for a much smaller length of time and were asked to reflect on what they felt were critical incidents given their experience and knowledge of Nlets.

The study also relies on a "critical incidents" approach as developed by Flanagan (1954) and others. A critical incidents approach "facilitates the investigation of significant occurrences…identified by the respondent, the way they are managed, and the outcomes in terms of perceived effects" (Chell, 1998, p. 56). To this end interviewees were asked to identify critical "incidents" in the history of Nlets related to changes in technology and the organizational design of Nlets. Given the nature of the data (interviews with people with many years of association with Nlets and archival data dating back over 40 years), the critical incidents approach facilitated a focus on key instances of the interaction between technology and organizational design in the history of Nlets. Interviewees were asked to identify 1) key changes in technology (e.g.,

technology type, functionality and standards); and 2) key changes in organizational design (broadly defined).

Importantly, the case study relies on a combination of data collection methods and analytic techniques spanning 40 + years. As such triangulation was vital to the analysis. For example, on its own a critical incident approach may suffer interviewee recall bias or general inconsistencies (Gremler, 2004). However, the technique represented only the first step of the analytical techniques in the case study. The data were analyzed as follows. After critical incidents were identified through interviews the incidents were compared across interviews to create a list of critical incidents. The history of the organization presented both internally (e.g., training materials) and externally (e.g., websites and marketing material) was reviewed to identify the critical incidents deemed important as part of the organization's own institutional history. Next, the archival data, particularly the various meeting minutes, we're reviewed by the author to see the concerns, debates and decisions made during the critical incidents. Based on this triangulation of data, three incidents warranted deeper investigation into instances of technology affordances, constraints and actualization. The three incidents are labeled as 1) "A national network" (the incident occurred from 1966 – 1970); 2) "The proactive upgrade" (the incident occurred from 1978 – 1981); and 3) the "Introduction of XML/web services" (the incident occurred from 1998 – 2002).

The interaction between affordances and constraints for organizing and actualization through organizational design changes were analyzed both within each incident and across the three incidents. In the sections that follow each incident is described first, followed by the associated findings. The findings are summarized after each incident. The section concludes with an analysis of the findings across the three incidents and a discussion section of the implications for the ongoing success of Nlets and future research.

Findings

An example of affordances, constraints and actualization were found in the three incidents. Interestingly, each incident did not contain examples of both affordances and constraints. The first and third incidents included an example of an affordance and no constraint but the second incident included a constraint but not an affordance. Each incident is described below, beginning with a brief description of what is happening at Nlets during the critical incident before explaining the affordance or constraint and actualization through organizational design. Quotes, as noted in each section, come from archival meeting minutes and/or interviews.

Incident 1: A national network

At its core Nlets provides a technology infrastructure enabling each of its members to share critical public safety information. However, in the beginning it wasn't clear what the organization or the network infrastructure it provided would look like. By 1963 a teletype network connected states from Maine to South Carolina, west to Ohio and West Virginia and several Southern states – each had their own regional networks and were loosely organized. Each region relied on its own teletype network and standards meaning information sharing within regions worked well, but attempts to share information across regional networks was a challenge as the following quote from this incident illustrates:

> "Most of our problems involve going from one circuit to another circuit and not so much the problems on our own circuit amongst ourselves."

In 1966 a collection of states decided to band together as an informal association - the Law Enforcement Teletype System (LETS). One western state had extra physical space and an interest in the new association and agreed to be a central location for a potential national network. The move to a national association and network was a major breakthrough but there were still

major limitations. The new network only had the capacity for 100 words per minute, and six lines connected all of the states. It was clear an upgrade would be needed soon.

Attendees at the 1969 annual conference knew an upgrade to the current system was necessary and were curious about the available technology. Five companies were invited to present proposals for what the future system might look like. The proposals are briefly summarized in Table 3.

Table 4.3 Summary of upgrade proposals at 1969 annual conference

Vendor[4]	Summary of proposal presentations
Vendor 1	Proposed a move to 55 "circuits" covering the entire U.S.
Vendor 2	Suggested the "LETS" system and U.S. Federal Bureau of Investigation's (FBI) National Crime Information Center ("NCIC") system be consolidated and then create two or four super regions in the U.S. Each region would have its own switching center.
Vendor 3	Proposed a system similar to what Nlets already had but on a smaller scale with the offer to lease the equipment to Nlets.
Vendor 4	Offered a review of what the company currently provided as part of its own internal network – five regions across the U.S. with "message switching, a private network backup reliability, alternate routing, message storage and retrieval"
Vendor 5	Point to point and point to multi-point capability; an interface between "LETS" and "NCIC" and a computer file system for storage of data

Each vendor had a different view of the future of Nlets as a system of networks. As Table 4 indicates, the proposals varied primarily on the number of regional networks that would be connected into a national system. Importantly, each proposal called for a national system of regional networks that would share technology and data standards rather than the patchwork of regional technology and data standards currently in operation. This "*standardizing technology and data"* is the first affordance for organizing for Nlets and represented the *potential* of standardizing technology and data.

[4] Meeting minutes contain actual names of the companies but the names have been changed here.

To benefit from this "*standardizing technology and data"* affordance, actualization was needed in the form of fundamental changes in organizational design. The early members recognized as much as articulated in a discussion among two participants present at that 1969 annual meeting:

> "The ultimate future of "LETS" seems to be in what type of system it will be operating."
>
> "We don't know what system we're going with. I think this would depend on what kind of organization we wanted to have."

Nlets members clearly understood the importance of the design of the organization as it related to the system of networks. The following quotes come from a discussion at the 1969 annual meeting about the future design of the Nlets organization:

> "This group, National "LETS", is a loose conglomeration of the states…We've come a long way since 1965-1966…But we really have no constitution, no bylaws."
>
> "Most of our problems involve going from one circuit to another circuit and not so much the problems on our own circuit amongst ourselves. So I think that to make this an effective, as well as an efficient operation, discipline is needed."
>
> "I'm not sure what we're looking for, but what we've got today is not the answer. What I have in mind is a more streamlined organization…We can't consolidate with any other organization…I don't know where we can put LETS. The only other avenue is to keep us as we are today, a separate entity. If we are going to remain a separate entity, then we should have an organization."

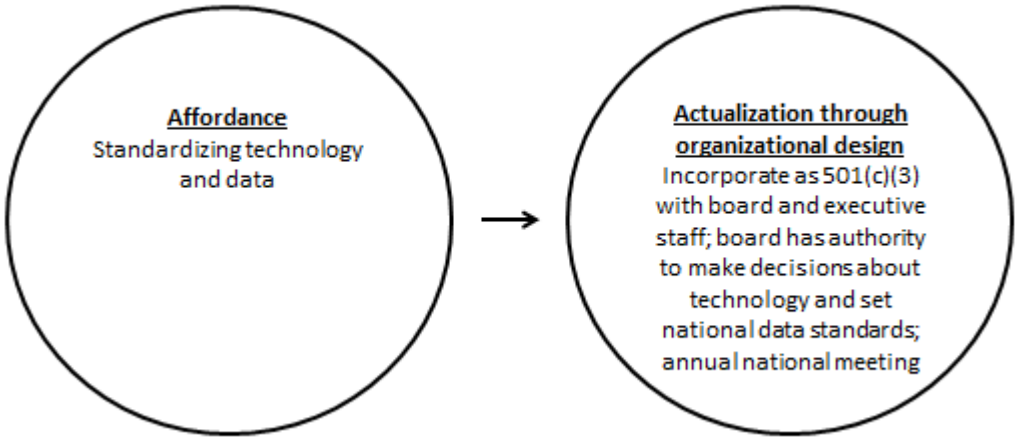
Within a year there was evidence of *actualization* and it came in the form of a change in the structure of the organization. By the next year, March 17, 1970, Nlets, Inc. was incorporated in Delaware as a 501(c) (3) non-profit organization. Nlets now had a clear structure – a hierarchical reporting relationship with a board of directors and membership and ownership from representatives from each of the states. In addition, important formal coordination mechanisms

were also developed – including the creation of annual national meetings as well as the decision to allow the new national organization to evaluate whether enforcing current restrictions on the types of messages sent on the network would reduce the strain on the network. Finally, the board was given the authority to make decisions about the proposals from the vendors in order to truly become a national network.

Incident 1 Summary of findings

Incident 1 contains clear evidence of the affordances associated with new technology available to Nlets. Five vendors were invited to present their proposal. Although different in degree, each was based on a national system of networks using standardized technology and standards. Actualization was achieved through fundamental changes in the structure (i.e. hierarchical reporting) of Nlets, most notably the incorporation as a non-profit and the creation of a board with authority to make decisions about technology and data standards. Figure 1 highlights the affordance for organizing and actualization through organizational design in Incident 1.

Figure 4.1 Incident 1 affordance and actualization



Incident 2: The proactive upgrade

Nlets worked through a series of upgrades to its network after the actualization of affordances for organizing resulted in a truly national network in incident 1. The upgrade of the very early 1980s is particularly critical in the institutional history of Nlets, because it represents the first time Nlets was able to fund an upgrade entirely on its own without any external funding. However, meeting minutes from annual and board meetings from 1979-1980 indicate an important *constraint* in the technology Nlets relied upon. That constraint for organizing was *relying on vendors and proprietary technology*.

Nlets relied on lines from U.S. General Services Administration (GSA) Telpak (a *tel*ecommunications *pack*age – the actual physical lines used for transmitting data) which were owned by the federal government and much cheaper than commercially available lines. During this time a transition was taking place as GSA, which had taken over Telpak, was transitioning lines to commercial operators. The rise in commercial lines from different companies presented challenges in increased costs, uncertainty in standards and the risk of being totally reliant on increasingly proprietary technology.

Additionally Nlets was reliant on outside vendors for the day-to-day operation and maintenance of the network and would continue to be with the new upgrade. Nlets lacked the skills in-house to assist with the upgrade and new technology. As the board indicated, Nlets hoped to "be involved in some of the programming and/or software development" but this depended on the "sophistication of the operating system involved…" The reliance on vendors' proprietary technology also meant Nlets was at the mercy of the vendors for installation, a point the board was also careful to make:

> "The last upgrade, unfortunately, required installation in 101 days…we hope this upgrade will be less hectic and result in a much improved service to our (Nlets) community."

The *constraint* of relying on vendors and proprietary technology, like affordances, only represented potential. In order to overcome this potential constraint Nlets again was able to achieve actualization through changes in organizational design; although this time the changes were not structural in nature but rather formal coordination mechanisms. The changes are discussed next.

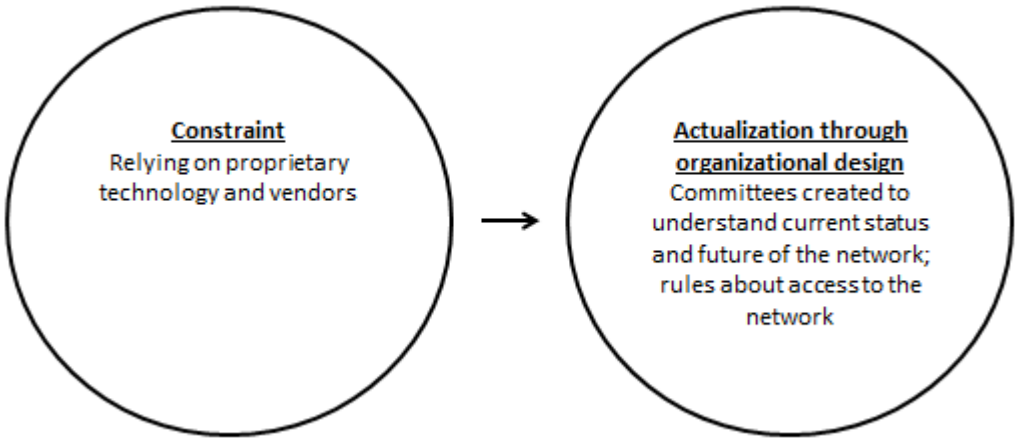
Nlets responded by creating a committee to develop a contingency plan. The Nlets board realized that if the system went down – the system that was now reliant on proprietary technology and the expertise of vendors - Nlets needed a plan to get it up and going again. The board also decided to regularly and formally evaluate the system so that it even though Nlets lacked much of the in-house expertise needed for operation and maintenance, there would be "some criteria which will provide assurances that the integrated system is functioning and in a good operational condition".

Nlets also created another committee to understand the implications of adding new users to the system and set aside a portion of monthly fees "for future upgrades and enhancements of the system", as it was clear the upkeep and enhancement of proprietary technology was becoming expensive. Finally, Nlets created formal rules about access to the networks on the system. In particular, the board noted that it had no interest in networks inside states but "when a state sent a message to (Nlets), it would become the responsibility of (Nlets) to know of and approve" the user.

Incident 2 Summary of findings

Incident 2 contains evidence of the constraints associated with the technology Nlets relied upon during this incident. A reliance on proprietary technology and vendors meant the potential existed for Nlets to experience lack of control, increasing costs and being locked-in to vendors and technology. Actualization was again achieved through changes in the organizational design of Nlets. However, the changes were in formal coordination mechanisms rather than changes in structure - most notably the creation of a committee to understand the implications of the current and future state of the system as well as rules about access to the system. Figure 2 highlights the interaction of the constraint for organizing and actualization through organizational design in Incident 2.

Figure 4.2 Incident 2 constraint and actualization



Incident 3: Introduction of XML/web services

The late 1990s presented Nlets and many other information-intensive organizations with opportunities associated with the Internet and XML (eXtensible Markup Language – a language created to structure data for communications) but Nlets was not immediately prepared to take advantage of these opportunities. The *affordance* of XML and web services was *enabling*

interoperability. The move from propriety standards on an internal network to the open world of the web and common language of XML represented a dramatic opportunity for Nlets. XML allowed for increased interoperability and the potential for Nlets to be involved in developing norms and standards and in internally connecting legacy technology to an upgraded network. XML and web services also held the promise of enabling interoperability with organizations and systems outside of Nlets. For example, Nlets had its Intranet on an U.S. Federal Bureau of Investigation (FBI) network and XML was becoming commonly used by other public safety related organizations and networks. Nlets staff members recognized the potential of XML and web services as indicated in the following quotes from members of the executive staff:

> "Probably the biggest thing was when we went to XML…the ubiquitous and everyday language of the Internet, and we broke out of our proprietary technologies. The second we did that, people were knocking on the door saying, ooh, we want to share our data with you…That really was a huge watershed moment, when we became more mainstream and standards-based."

> "As just a general milestone note, the introduction of web services and XML…and the support of them interacting with the existing legacy connections was an IT turning point and challenge for us."

XML and web services represented a powerful affordance, but once again Nlets would rely on organizational design changes to achieve actualization of the promise of the affordance. During this incident Nlets formally created a strategic planning process and committee. Nlets realized the potential of technology like XML and web services to enhance the system but lacked a mechanism for formally identifying and evaluating these opportunities. A strategic committee was a mechanism for doing this but the plan and planning process was also a signal to users that Nlets was looking to the future and the potential of new technology.

During this incident the fees to access the system were made uniform for all members and then raised significantly. This served as both a formal and informal coordination mechanism.

With the increased fees, the board was able to create separate operations and capital reserves to better equip Nlets for the maintenance of its current system as well as prepare it financially for investments in new technology. The raised fees and reserve accounts also served as a signal to members that Nlets was no longer focused on just maintaining the status quo. Nlets would now also scan the environment for ways to improve the system.

Informally, Nlets discouraged the use of proprietary standards and embraced XML and web services. During annual meetings there was less time devoted to the old, proprietary technology. Instead the meetings increasingly included presentations on the benefits of XML and discussions about how to get members to adopt it, including through seeking external grants to help with XML efforts. Finally, Nlets became significantly involved in external efforts to encourage the spread of XML through participation and leadership in standards-developing bodies.

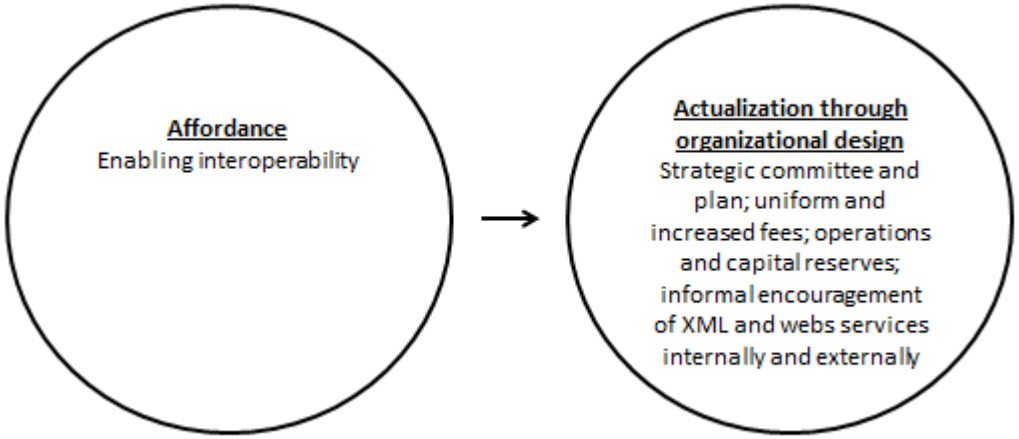
Incident 3 Summary of findings

Incident 3 contains evidence of the affordances associated with the introduction of XML and web services. The affordance of interoperability had enormous potential for the future of Nlets. Nlets responded by becoming more strategic. Once again the changes were not to the hierarchical reporting structure but rather changes in coordination mechanisms. However, in addition to the formal coordination mechanisms (e.g., committees and formal rules) of the earlier actualization informal coordination played an important role.

Specifically, actualization came through changes in formal coordination mechanisms such as the creation of a strategic committee and planning process. Fees were increased and separate operations and capital reserves accounts were reserved. Nlets was now prepared to identify and invest in technology opportunities like XML and web services. The informal

coordination mechanisms of educating both internal and external users on the benefits of XML and web services also served in the actualization of the affordance. Figure 3 highlights the interaction of the affordance for organizing and actualization through organizational design in Incident 3.

Figure 4.3 Incident 3 affordance and actualization



Findings across incidents

An affordance or constraint and actualization through changes in organizational design was identified and discussed for each of the three incidents. Table 4 includes a review of the findings in each incident. This section includes a review of the findings across the three incidents. This is followed by a discussion of the implications of the study on the evolution of thinking around fit in the relationship between technology and organizations.

Table 4.4 Affordances, constraints and actualization through organization design changes across the three incidents

Incident	Affordance	Constraint	Actualization – elements of organizational design

Incident 1 – a national network	Affordance: standardizing technology and data		• Structure
			  o Incorporate as 501(c)(3) with board and executive staff
			• Formal coordination mechanisms
			  o Board has authority to make decisions about technology and set national data standards
			  o Annual national meeting
			• Informal coordination mechanisms
			  o N/A

Incident 2 – the proactive upgrade		Constraint: relying on vendors and proprietary technology	• Structure
			  o N/A
			• Formal coordination mechanisms
			  o Committees created to understand current status and future of the system
			  o Rules about access to the system
			• Informal coordination mechanisms
			  o N/A

Incident 3 – XML/web services	Affordance: enabling interoperability		• Structure
			  o N/A
			• Formal coordination mechanisms
			  o Strategic committee and plan
			  o Uniform and increased fees
			  o Operations and capital reserves
			• Informal coordination mechanisms
			  o Encouragement of XML and web services internally and externally

In each of the three incidents highlighted in this study, Nlets was successful because it was able to achieve "fit" through actualization. Analyzing across incidents leads to three important conclusions. The *first* conclusion is that, although the potential of technology is important, to understand fit it is not enough to understand technology affordances and constraints but also what an organization does in response to affordances and constraints. Prior research has emphasized technology as either a contingency for the structure of an organization or organizational rules about IT resources (cf. Brown & Grant, 2005). Often the structure (e.g.,

centralization or decentralization) or the rules (e.g., who makes IT investment decisions) are identified explicitly in advance and technology is used as a contingency to explain one or the other. Cross-incident findings in this study indicate that this is may lead to an incomplete view of what changes in an organization. For example, an emphasis on technology leading to changes in formal coordination mechanisms like rules would neglect the changes in structure identified in the first incident or the informal coordination mechanisms identified in the third incident. If technology changes organizations, it is best to consider the overall design of the organization as a combination of structure and coordination mechanisms.

The *second* important conclusion is that timing is also important. It appears that prior changes in both technology and organizational design matter. For example, while it is logical that the creation of organizational structure (i.e., hierarchical reporting relationships) may be necessary for creating standards, the challenges of dealing with vendors and proprietary technology seem to also suggest the creation of organizational structure. However in this study, the creation of hierarchical reporting relationships and division of labor appears to set the foundation for future actualization of affordances and constraints. With the hierarchical reporting relationships and division of labor firmly in place, future affordances and constraints were met with formal and informal coordination mechanisms.

This conclusion is consistent with the suggestion of Markus and colleagues (2012) that hierarchical reporting relationships and divisions of labor are easier to "design" and implement in the beginning stages of organizational life and harder to change later on while the formal and informal coordination mechanisms are harder to "design" and implement but easier to change. The decision to become a national organizational and the incorporation of Nlets as a 501 (c) (3) non-profit organization happened with relative ease. The hierarchical reporting relationships and division of labor put in place in 1970 continue to this day though there is constant pressure to

change the structure. On the other hand, as indicated in each of the incidents there have been multiple coordination mechanisms created in response to technology over the years and they frequently change. An interesting question is whether, and if so when, new technology affordances or constraints will lead to a change in structure. One member of the executive staff indicated that a change in structure was likely in the future but that it would come with considerable difficulty and could possibly lead to a fundamental change in the organization.

Finally, the *third* conclusion is that there is yet room for a configurational view of fit, although it would need to be based on both of the first findings – the importance of organizational design and timing. The changes in organizational design both within and across incidents indicate that structure and coordination mechanisms may serve as complements. The standardizing technology and data affordance was actualized primarily through a change in the hierarchical reporting relationship and division of labor. The constraint of relying on vendors and proprietary technology was overcome through formal coordination mechanisms (e.g., rules about access to the system). The enabling interoperability affordance was actualized through both informal and formal coordination mechanisms (e.g., a strategic committee and informal encouragement of XML). Viewed individually (refer again to Table 5) a configuration emerges in each incident – for example the combination of structure and formal coordination mechanisms in the first incident. Viewed together and over time a more complex pattern begins to emerge where structure, formal and informal coordination mechanisms emerge in response to technology affordances and constraints, complement each other in a "fit as gestalts" view of fit and jointly contribute to organizational performance.

Nlets was successful because the organization was able to make organizational design changes in response to the promise of technology. Findings within and across incidents indicate the value in considering technology affordances, constraints and actualization as an evolving

view of fit. The discussion section of the paper includes contributions to theory and practice and suggestions for future research.

Discussion

This study has highlighted instances of technology affordances, constraints and actualization through organizational design changes. Specifically, the study highlights two affordances and one constraint for organizing and actualization through organizational design changes in three critical incidents over the 40+ life of a single organization. The *standardizing technology and data* affordance was actualized through a change in structure, specifically the incorporation of the organization as a 501(c)(3) non-profit with a board and executive staff, with the board given authority to make decisions about technology and set national data standards and the creation of a national meeting. The *relying on vendors and proprietary technology* constraint was dealt with through coordination mechanisms, specifically with committees created to understand current status and future of the system as well as rules about system access. The *enabling interoperability* affordance was also actualized through the creation of coordination mechanisms, specifically with a strategic committee and plan, uniform and increased fees, operations and capital reserves, and the informal encouragement of XML and web services both inside and outside the organization. Findings across incidents highlight the important not only of organizational design changes but also of the timing of those changes as well as the potential complementary nature of changes.

The study contributes to theory in several ways. First, it adds to the nascent technology affordances and constraints theory (TACT) as a more robust way of thinking about fit by identifying specific examples of affordances, constraints and actualization in an organization. TACT remains largely conceptual and empirical evidence of affordances and constraints as identified in this study are needed to move the theory forward. Second, the study expands the idea

of TACT at the organizational level by including empirical evidence of affordances for organizing through changes in organizational design. Finally, by expanding the concept of actualization to organizations and using organizational design as a way to identify actualization in organizations the study presents a complete framework, with empirical support for TACT at the organizational level. More broadly, the study advances research on fit which remains an important way of understanding the relationship between technology and organizations.

The study similarly contributes to practice by showing that the nature of technology does matter for organizational design and the interaction of the two matters for organizational success. The study highlights the promise associated with technology affordances and constraints and shows that in the interaction – the actualization through organizational design – agency matters and that managers have options for unlocking the promise of technology. Rather than consider technology as a "black box" managers can begin to look for affordances and constraints and respond accordingly.

The study also leads to interesting opportunities for future research. This study is an important step but more empirical research is needed to gain clarity around the concepts of technology affordances and constraints (Majchrzak & Markus, forthcoming) across all levels of analysis. Similarly the work on actualization (cf. Strong et al., 2009) is not yet fully developed. This study, with its emphasis on the elements of organizational design, represents one approach for understanding actualization at the organizational level. Future research is needed to expand the elements of organizational design highlighted in this study as well as other means of actualization in organizations.

Limitations

This study should also be replicated in other contexts and using additional methods. The study is based on the life of a single non-profit organization in the public sector. Though the public sector context is distinctive (cf. Bozeman & Bretschneider, 1994; Kelman, 2005, Kelman, 2007, Rainey & Bozeman, 2000), technology affordances and constraints exist in every organization. This study represents one example of the interaction of technology and organizational design within an organization, and generalizability is thus limited. However, the point of the study is less on generalizability to other organizations in the public or private sector and more on generalizing to theory. Specifically, that TACT and evolving views of fit can better explain the relationship between technology and organizations than the views of fit that have dominated prior research. The study was an opportunity to examine a phenomenon in context (how and why) and there was a unique opportunity to review a variety of archival and historical data over the entire lifespan – making this study an appropriate example of a single retrospective and longitudinal case study (Yin, 2003). Additional longitudinal case studies, multiple case studies and perhaps medium-N studies are needed to continue to flesh out the important concepts before large N studies are undertaken.

Conclusion

The concepts of technology affordances, constraints and actualization through organizational design as applied in this case study resulted in interesting insights and point to future research opportunities. Specifically, this study has highlighted two affordances and one constraint for organizing and actualization through organizational design changes (structure and coordination mechanisms) in three critical incidents over the 40+ life of a single organization. The findings suggest there is much yet to be learned about the relationship between technology and organizations, and value to still be had in the concept of fit. The findings thus join a growing

stream of researchers who are calling for renewed focus on the relationship between technology and organizations. Researchers and managers will hopefully take note and turn their attention again to the concept of fit and the performance potential associated with the relationship between technology and organizations.

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Conclusion

Introduction

The purpose of this dissertation was to understand the role of governance in successful information technology-intensive interorganizational relationships (IT-IORs). The importance of *IT* in IT-IORs means that in addition to the challenges associated with managing organizational relationships there are also challenges that come with IT that crosses organizational boundaries – for example, 1) the knowledge needed for acquiring, maintaining and using IT is often distributed across organizations making direction, control and coordination a challenge; and 2) technology is constantly changing, meaning that IT investment and IT skills need to keep up across multiple organizations (Hui et al., 2008). This dissertation was thus an exploration of the relationship between technology and organizations.

The relationship between technology and organizations, although still critically important, is currently under-researched (Orlikowski & Scott, 2008; Strong & Volkoff, 2010). This dissertation focused on the important relationship between technology, organizations and organizational success in the following ways. First, I argued that the relationship between technology and organizations is best described as one of "fit", but views of fit need to continue to evolve beyond traditional contingency theory applications. Second, I adopted a view of the "organization" as one of governance or organizational design in order to understand what may change for "fit" with technology to be achieved and organizational success realized. Specifically, the definition of governance in this dissertation was a combination of structure (hierarchical reporting relationships and division of labor) (Galbraith, 2000; Goold & Campbell, 2002; Markus et al., 2012; Mintzberg, 1993) and informal and formal coordination mechanisms (Tsai, 2002; Whittington, 2002).

Each of the three essays in this dissertation examined the "fit" between technology and organizational design. In the section that follows, the view of fit, method and finding of each essay is discussed. This is followed by a more detailed discussion of what was learned from all three essays as it relates to future research on the "fit" between technology and organizations – specifically, suggestions for complementary methods (process tracing) and theoretical perspectives (institutional theory). Finally, the generalizability of the dissertation as it relates to the public sector context and theory are discussed.

The three essays

Each of the three essays in this dissertation explored an aspect of the relationship between technology and organizational design in successful IT-IORs. The exploration in each essay was accomplished via different views of "fit" and different methods. This section begins with a brief overview of the common views of fit as articulated by Venkatraman (1989) and the views of fit in each of the three essays. This is followed by a summary of the research focus, method and findings from each essay.

Alternative views of fit

Venkatraman's (1989) conceptualizations of fit remain the most common views of fit in organizational research (Strong & Volkoff, 2010). Venkatraman (1989) suggested the following alternative views of fit:

- *Fit as moderation* as "the impact of the predictor (e.g., strategy) varies across the different levels of the moderator (e.g., environments)" (p.424).
- *Fit as mediation* as an "intervening mechanism (e.g., organizational structure) between an antecedent variable (e.g. strategy) and the consequent variable (e.g. performance" (p. 428).

- *Fit as matching* as "fit is a theoretically defined match between two related variables. This is a major point of departure from the previous two perspectives because fit is specified without reference to a criterion variable, although, subsequently, its effect on a set of criterion variables could be examined. Stated differently, a measure of fit between two variables is developed independent of any performance anchor, which is unlike the previous two perspectives" (p. 430-1).
- *Fit as gestalts* as "the degree of internal coherence among a set of theoretical attributes" (p. 432)
- *Fit as profile deviation* as "fit is the degree of adherence to an externally specified profile" (p. 433).
- *Fit as covariation* as "a pattern of covariation or internal consistency among a set of underlying theoretically related variables" (p. 435).

Essay 1 of this dissertation adopted a *fit as matching* view of fit as described above. Essay 2 adopted a *fit as gestalts* view of fit as described above. Essay 3 was based on an evolving view of fit found in technology affordances and constraints theory (TACT) (cf. Majchrzak & Markus, forthcoming) where technology has affordances and constraints that an organization can actualize through organizational design changes in order to achieve fit and subsequent organizational success. The remainder of this section includes a brief review of each essay (see Table 1 for a comparison of the governance emphasis, view of fit, theoretical basis, data and method in each essay).

Table 5.1 Comparison of essays

	Essay 1	Essay 2	Essay 3
Governance focus	Formal coordination mechanisms (steering committee)	Structure and formal and informal coordination mechanisms	Structure and formal and informal coordination mechanisms
View of "fit"	Fit as matching	Fit as gestalts (configurational approaches)	Technology affordances, constraints and actualization
Theoretical basis	Contingency theory (cf. Bergeron, 2001; Umanath, 2003; Venkatraman, 1989)	Contingency theory and configurational approaches (cf. Bergeron, 2001; Fiss, 2007; Umanath, 2003; Venkatraman, 1989	Technology Affordances and Constraints Theory (TACT) (cf. Majchrzak & Markus, forthcoming; Strong & Volkoff, 2010; Zammuto et al., 2007;)
Data	Secondary data set (multiple IT-IORs)	Secondary data set from (multiple IT-IORs)	Interviews, observation, archival data from single organization
Method	Cross-tabulation	Qualitative Comparative Analysis (QCA)	Longitudinal, retrospective case study

Essay 1 - What is Good Governance? An Exploratory Study of Alternative Conceptualizations and Implications for the Success of IT-Intensive Interorganizational Relationships

The purpose of Essay 1 was to identify what it means to have "good governance" in the context of successful IT-IORs. I adopted a "fit as matching" perspective (a theoretically derived match between two variables independent of performance). In a fit as matching perspective, if performance is considered at all, it is in a separate analysis (Bergeron, 2001). However, as the focus of Essay 1 was on successful IT-IORs, a success index was created to identify successful IT-IORs. The emphasis in Essay 1 was on formal coordination mechanisms, specifically a steering committee. Propositions were developed based on a universalistic view in which IT-IORs that employ a steering committee are expected to be more effective than IT-IORs that do not employ a steering committee and a "fit as matching" contingency theory view in which IT-

IORs are more effective when they achieve fit between the governance mechanisms they employ and the contingencies they face. Theoretically-derived elements of relationship, technology and data contingencies were developed and tested. Findings suggested support for the universalistic proposition that employing a steering committee as well as governance that "fits" key technology contingencies lead to successful IT-IORs.

Essay 2 - IT Interorganizational Design: Contingent Fit or Holistic Configuration of Structure and Governance?

Essay 2 expanded the operationalization of governance to include both structure and informal and formal coordination mechanisms as configurations of *inter*organizational design in IT-IORs. Essay 3 was based on the "fit as gestalts" view of fit. A fit as gestalts view holds that fit is holistic, complex and multidirectional (Umanath, 2003; Venkatraman, 1989). Configurations, generally defined as "any multidimensional constellation of conceptually distinct characteristics that commonly occur together" (Meyer et al., 1993, p. 1175), are a potential tool for understanding fit as a gestalt view (Venkatraman, 1989). The following five elements of IT interorganizational design configurations were developed based on prior research: (1) an environmental element – mandate; (2) an element for structure - hierarchical reporting relationship; and (3) three coordination mechanism elements - (a) an IT steering committee, (b) rules about IT resources; and (c) prior information sharing among participating organizations. The Qualitative Comparative Analysis (QCA) method (Ragin, 1987; 2000) was used to analyze potential configurations and "paths" for high performing IT-IORs based on Boolean algebra and logic statements. Two paths to high performing for IT-IORs were identified: 1) the combination of a hierarchical reporting structure AND a mandate and 2) the combination of NO prior information sharing AND written rules for IT resources AND an IT steering committee. Interestingly, all five elements were found in the two paths but neither path includes both

structure and coordination mechanisms – a finding that is surprising given that prior research has suggested they interact and jointly influence performance (Markus et al., 2012)

Essay 3 - Technology affordances, constraints and actualization through organizational design change

Essay 3 also considered both structure and formal and informal coordination mechanisms but moved beyond contingency theory views of fit. The essay was based on the concepts of technology affordances, constraints and actualization to examine fit between technology and an organizational design over the 40+ year lifespan of a single, successful organization. *Affordances* are the "action potential" of technology. *Constraints* are the ways technology can keep individuals or organizations from accomplishing a particular goal. *Actualization* is the engagement of the organization with an affordance or constraint in pursuit of goals made possible by the affordance or limited by the constraint (cf. Strong et al., 2009). Findings highlighted two examples of technology affordances, one example of a technology constraint, and actualization for all three through specific changes in the structure and coordination mechanisms employed by the organization. These findings suggest that "fit" between organizational design changes and the potential of technology is an important way of understanding the relationship between technology, organizations and organizational success.

Each of the three essays in this dissertation relied on a different view of fit and method for analyzing fit, and the findings suggest there is still value in alternative views and methods. The additional insight is achieved in part by matching the view of fit with an appropriate method as suggested by Venkatraman (1989). Each essay thus provides insight on a stand-alone basis but when viewed together, it becomes apparent that each only gives a partial view of the relationship between technology and organizational design in IT-IORs. It is difficult to combine multiple

views of fit and methods into single studies. However, future research would benefit from attempting to compare data based on alternative views of fit as well as from combining views of fit in the same study where possible. In addition, future research can benefit from other methods and theoretical perspectives to complement alternative views of fit. In the sections that follow, a method and theoretical perspective that would provide value in the context of IT-IORs are discussed.

Enhancing fit – alternative methods and theoretical perspectives

In this section, process tracing - a promising method for additional insight for understanding "fit" over time - is discussed. This is followed by a discussion of institutional theory as a perspective that can add to our understanding of "fit" and complement contingency-based research.

Process tracing

A "fit as matching" perspective can identify relationships between important technology and organizational design concepts in successful IT-IORs but is not equipped to identify causality between the elements or uncover whether and how the elements may combine and influence IT-IOR success. A "fit as gestalts" view can be used to identify important elements of technology and organizational design and uncover configurations of these elements that lead to successful IT-IORs. A TACT view of fit can further identify the interaction of technology and organizational design changes over time. However, none of the perspectives is clear about the order in which changes take place over time and the causality that takes place both within and between changes in organizational design. A promising method for uncovering the changes and causality is process tracing (cf. George & Bennett, 2004).

Process tracing "can string events together in such a way as to tell a story of how outcomes occur when they can be considered to be predictable from a knowledge of process" (Matta et al., 2012, p. 169; see also Markus & Robey, 1988; Mohr, 1982). The story based on a "knowledge of process" differs from the story based on a level of predictor variables that is found in typical variance methods (e.g., more of x leads to more of y) (Markus & Robey, 1988). The goal of process tracing is to identify causal process – "the causal chain and causal mechanisms" between variables (George & Bennett, 2004, p. 206). George and Bennett (2004) suggested the following types of causal processes:

- *Linear causality* – "a straightforward, direct chain of events that characterizes simple phenomena" (p. 212)
- *Convergence* – "in a more complex form of causality the outcome flows from convergence of several conditions, independent variables, or causal chains" (p. 212)
- *Interacting* – "interacting causal variables that are not independent of each other" (p. 212)
- *Path dependent* - "cases that consist of a sequence of events, some of which foreclose certain paths in the development and steer the outcome in other directions" (p. 212)

In the context of this dissertation concerned with the governance of successful IT-IORs - the *interacting* and *path dependent* types of causal process are particularly relevant and have promise for future studies that can build on the essays in this dissertation. For example, the configurational analysis in essay 2 suggests that there are important *inter*organizational design elements in IT-IORs that are not independent and that do interact. The QCA analysis used in the essay identified configurations of interacting elements for high performing but did not uncover how, why or when the elements interact.

The exploration of technology affordances, constraints, and actualization in Essay 3 uncovered the interaction of technology and organizational design in three distinct incidents in the history of a single organization but did not consider the sequence of interaction across the three incidents. Nor did the analysis consider whether certain events or decisions (e.g., the choice of structure chosen when the organization was founded) "foreclose certain paths in the development" of the organization and steered the outcome in other directions (e.g., the choice of formal and informal coordination mechanisms in later incidents), even though it appears this would indeed be the case for elements of organizational design. For example, some researchers have argued that coordination mechanisms may both complement (cf. Jagd, 2010; Vlaar et al., 2007) and conflict (cf. Mellewigt et al., 2007) each other and that timing likely matters (cf. Camen et al., 2011). The path dependence causal process would help identify whether the order in which structure and coordination mechanisms are employed, as they interact with technology, matters. Path dependence would thus lead to new theoretical insights for organizational design as well as practitioner insight into the implications of organizational design choices.

Process tracing, and in particular an examination of interacting and path dependent causality, are methods that can add additional insight into the governance of IT-IORs, specifically and the interaction between technology and organizations generally. Another promising suggestion is to employ additional theoretical lenses to enhance our understanding of "fit" in the relationship between technology and organizations.

Institutional theory

Multiple theoretical perspectives have been used to understand interorganizational relationships and IT governance – the two key elements of IT-IORs. As reviewed in the individual essays, IOR research has relied heavily on transaction cost theory (Coase, 1937; Williamson, 1985), resource dependence theory (Pfeffer & Salancik, 1978) and

relational/exchange theories (Heide, 1994) to understand how and why IORs form and what needs to be governed, but they do not shed much light on the characteristics of *effective* governance (Provan et al., 2007). IT governance research has similarly been based on multiple perspectives but has relied largely on traditional contingency theory (Brown & Grant, 2005). The concept of fit that can add to our understanding of the relationship between technology and organizations as articulated in this dissertation can be based on both contingency theory and other perspectives of fit such as TACT. However, additional theoretical perspectives used in combination with views of fit may provide additional insight and avenues for research. One example of a promising complementary theoretical perspective is institutional theory.

Institutional theory, like contingency theory, has many variations (Scott, 1987), but the theory moves beyond assumptions of rationality. Rather, institutional theorists are interested in "socially constructed beliefs, norms, and rules and the impact of these social constructions on the behavior of organizations" (Jacobson, 2009, p. 6). Debates continue over the value of rational perspectives (like transaction cost and resource dependence theories) versus institutional perspectives, but interesting work is coming from researchers who attempt to combine them. For example, Ang and Cummings (1997) assumed that external institutional pressures exist for organizations but that rational considerations of transaction costs played an important role in the strategic response of organizations. Similarly, Jacobson (2009) suggested that IT governance research could benefit from a combination of institutional theory and rational choice theories, because the institutional perspective can provide an understanding of the context in which IT governance changes takes place. Greenwood and Hinings (1996) argued that institutional theory could help researchers understand "the interplay of organizational context and organizational action" (p. 1024).

In the context of IT-IORs and an emphasis on fit and the relationship between technology and organizations, institutional theory can help explain some of the norms, rules and beliefs that may influence the technology adopted by an IT-IOR as well as influence the choice of organizational design mechanisms. In addition to the potential influence of a mandate (as considered in essay 2) on organizational design other influences may include availability of external funding and the desire to achieve legitimacy – both among the participating organizations and as a signal to other IT-IORs. Another institutional pressure may come from the influence of professional organizations - particularly for IT staff that may belong to associations and share accreditations and training, and thus a common background. Finally, institutional pressure may come from the rise in power of individual participating organizations within the IT-IOR, who may then begin to exert institutional influence on the IT-IOR.

Theoretical perspectives of fit can continue to evolve and provide important insight on the interaction between technology and organizational design within an IT-IOR. Institutional theory can add important insight into what technology is available and why. Similarly, institutional theory may explain the range of potential organizational design elements available to IT-IORs. The difference between the external context and internal fit relates to the generalizability of the findings in this dissertation and is discussed next.

Generalizability

As noted in the introduction and each of the individual essays, given the public sector context of this dissertation, it is important to consider whether there are limits to the generalizability of this study. There are two important pieces to that question. The first has to do with the differences between the public and private sector. The second has to do with generalizing to theory.

Researchers have long emphasized the uniqueness of the public sector in the U.S. (cf. Bozeman & Bretschneider, 1986; 1994; Kelman, 2005; 2007; Van der Wal et al., 2006). A significant stream of this research emphasizes the differences in the values of the public versus private sector. For example, the public sector emphasizes accountability and openness (Bozeman & Bretschneider, 1986), and the private sector emphasizes profitability and sustainability (Van der Wal et al., 2006). There are clearly important differences in the pressures each sector faces and the contexts they operate in. However, the technology options available to both the private and public sectors are similar, as are the structure (other than the difference between a for-profit and non-profit designation) and coordination mechanisms. Future research would thus benefit from the combination of institutional theory and alternative perspectives of fit as mentioned above. Such combinations, when done in both the private and public sectors, would enable researchers to highlight the similarities and differences of fit that take place within public and private IT-IORs and perhaps isolate the institutional differences in the contexts IT-IORs operate in. This study focused on IT-IORs in the public sector. Additional analysis is needed both on other public sector IT-IORs as well as private sector IT-IORs to see if the findings and insights from this dissertation apply elsewhere.

The second generalizability issue is generalizability to theory. The public safety IT-IORs studied in this dissertation are but one example of an important and growing phenomenon. It is hoped that the findings will apply in other IT-IOR contexts, but the aim of the dissertation has been less focused on generalizing to specific findings and more on generalizing to theory or what Yin (2003) called "analytic generalizability". For example, in essay 1, generalizability is to the theory that a steering committee as an instance of a formal coordination mechanism appears to be one important way to conceptualize effective IT-IOR governance. In essay 2, generalizability is to a configurational view of organizational design which means that both structure and formal and

informal coordination mechanisms should be considered for high-performing IT-IORs. In essay 3, the generalization is that TACT and evolving views of fit can better explain the relationship between technology and organizations than the views of fit that have dominated prior research.

Conclusion

This dissertation was an exploration of the relationship between technology and organizations and in particular the concept of fit – from its roots in contingency theory to its future potential in focusing on the interaction between organizational design and the potential of technology. Essay 1 suggested there is still value in using the early conceptualizations of fit. The "fit as matching" perspective enabled a better understanding of the importance of good governance on performance by detangling formal coordination mechanisms, contingencies and IT-IOR success. Essay 2 provided empirical evidence that configurational thinking, based on the "fit as gestalts" view of fit, has much promise and that the novel QCA method is one way of exploring this complex view of fit. Essay 3 contributed to evolving views of fit in IS research by empirically examining instances of the affordances and constraints – the potential – of technology as well as specific examples of actualization through organizational design changes. Fit is achieved, and organizational success realized, when the potential of IT and the design of an organization are aligned.

Finally, this dissertation suggested that the relationship between technology and governance still matters for success. For researchers this represents promising areas of research. For practitioners it highlights the importance of governance and the opportunities for finding success in the interaction between governance and technology.

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