A SOCIAL CAPITAL PERSPECTIVE ON SYSTEMS AGILITY

by

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ABSTRACT

Organizations responding to business challenges have long been concerned about the technologies they are using and the contributions of these technologies to their ability to make the necessary changes quickly and effectively. This dissertation posits that the relationship between the Information Systems (IS) group and the business is also of concern to organizations responding to business challenges. In addition, a new way of classifying challenges is outlined, suggesting that both equivocality and stakeholder complexity of the business challenge predict whether there will be successful systems agility. An empirical study involving 131 IS and business managers confirms that the IS to business relationship, equivocality, and stakeholder complexity make a difference in systems agility success, with interesting results regarding the moderating effect of relational capital in equivocal agility challenges.

INDEX WORDS: Social Capital, Agility, Relationships, Equivocality, Stakeholders

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1.0 Introduction

The introductory section of this dissertation first provides the motivation for the study. Then, the research questions are discussed. A conceptual model is displayed. Finally, the importance and contributions of the study are summarized.

1.1 Motivation

Organizations face challenges continuously in our highly competitive global business environment. The response to these challenges many times involves information systems. The ability of an organization to respond to a challenge utilizing information systems is systems agility. Whether an organization possesses systems agility will have many impacts, one of which may be to contribute to the competitiveness of the organization. For example, once Dell introduced the ability for its customers to customize their own computer based on customer specific criteria, many competitors in this industry considered the extent to which they could change their information systems (IS) to offer comparable flexibility. The organization's capability to respond to this challenge requires information systems being able to handle these custom packages as one part number. Another example of a challenge with competitive implications is where a competitor in a specific country offers the ability to buy three different types of products on one order and one invoice and your system requires separate orders and invoices for the three different types of products. Customers in that country are raising the question, why can't you offer just one order and one invoice? These are brief examples where the ability of an organization to respond to challenges requires changes to information systems, and a firm's ability to make those changes has competitive implications. The apparent link between systems agility and competitiveness supports further research into the factors that affect systems agility.

In each of these examples, several factors will influence whether the organization possesses systems agility. There is a common thought among practitioners and academics that the technology makes the difference between being able to respond to the challenge or not being able to respond to the challenge (Chen 2004; Cochran 2008). However, this is only one factor. In certain situations, the relationship between the information systems/information technology (IS/IT) group and the business will also impact systems agility. Especially in highly equivocal situations, meeting the challenge requires a "meeting of the minds" about the best way to proceed with the quandary. Back to our Dell example, in that situation, meetings between the business and IS to determine whether there was a strong business case, the actual expected outcome of the endeavor, exactly what functionality was needed, and comparison of the expected outcome against the expected cost is required. IS and the business need to be able to work through and agree on each of these points prior to designing and implementing a solution. If there are poor relationships between those two groups, the process of coming to agreement could be difficult and take a great deal of time. In other situations, the number of stakeholders involved in the challenge will impact systems agility. Back to our billing and invoicing example, this is a country specific request in an international company that operates in 80 countries. Each country is a stakeholder and their needs as well as the implications to each country will need to be considered in the design and implementation of the solution. We term this concern stakeholder complexity. In situations with high stakeholder complexity, having strong relationships in place between the IS/IT group and the various business stakeholders will facilitate resolving the challenge. These examples bring to light the importance of systems agility and its antecedents. Very little literature has addressed the role of the relationship between business and IS in successfully meeting systems agility challenges.

The operations/manufacturing literature explores the agility concept, just touching on the impacts of information systems or information technology (Narasimhan et al. 2006; Paulraj et al. 2007; Sharifi et al. 2001a; Sharifi et al. 2001b; Swafford et al. 2006b). The value of information systems has been theorized to reside in its ability to act as a platform for agility (Sambamurthy et al. 2003). However, there is not agreement as to the role of information systems or information technology in agility (Arteta 2004; Breu 2002; Lee et al. 2006; Oosterhout et al. 2006; Sambamurthy et al. 2003; Setia et al. 2008; Tallon 2008; Weill et al. 2002). On the one hand, IS/IT is thought to enable agile competitive moves (Hagel et al. 1999; Rayport et al. 1995). On the other hand, IS/IT has been recognized to act as a challenging factor (Sambamurthy et al. 2003) or even an inhibiting factor in business agility (Oosterhout et al. 2006; Overby et al. 2006). For example, inflexible legacy infrastructures have been identified as one inhibiting factor to agility (Oosterhout et al. 2006). Given this lack of clarity in the role of IS/IT in agility, there has been a call for research that answers the questions about how IS/IT enables or hinders agility (Overby et al. 2006).

One answer to this question lies in understanding that perhaps the people (and their relationships) involved in the agility challenge play a significant role in the ability of the organization to respond to the challenge, and further that the importance of these relationships may vary with the situation. The relationship between IS and the business has been identified as important in certain contexts (Cohen et al. 2006; Coughlan et al. 2005; Feeny et al. 1998; Henderson 1990; Ross et al. 1996), but presumably those that are equivocal or those that involve a large number of stakeholders (stakeholder complexity), will benefit more from stronger relationships between IS and the business. Exploring these influences (stakeholder complexity, equivocality, and social

capital) and their interrelationships with successful agility should help clarify why sometimes information systems are seen as an enabler and other times they are seen as an inhibitor to systems agility.

This dissertation brings together concepts from the resource based view and IT capabilities literature as a framework for understanding the systems agility concept and its antecedents. Next, it utilizes organization information processing, stakeholder, and social capital concepts to define the antecedents to systems agility. Hypotheses are developed exploring the relationships between systems agility and its antecedents, as well as the moderating effects of social capital on the relationship between the type of challenge and systems agility. A field study using a survey of 131 IS and business managers, is developed to collect data to test the hypotheses.

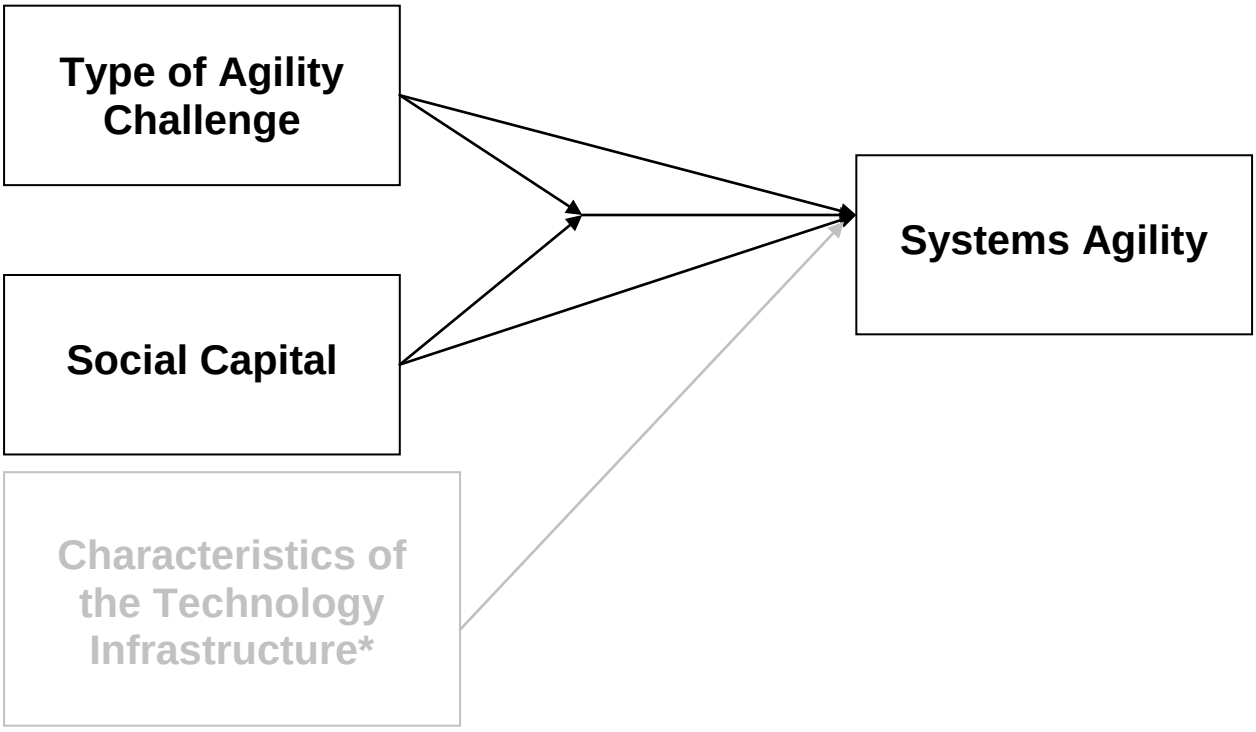
1.2 Research Questions

Three research questions will be addressed:

1: What is the relationship between the type of challenge and systems agility?

2: How does social capital impact systems agility?

3: What are the moderating effects of social capital on the relationship between the type of challenge and systems agility?



Conceptual Model (Figure 1)
*Characteristics of the technology infrastructure has been studied in previous work (Chen 2004; Cochran 2008), and is included as a control in this work

1.3 Importance and Contributions

This dissertation will contribute to academic literature in several ways. First, this dissertation builds on previous work that looks at systems agility and it further refines a measure of systems agility. Second, a classification of the challenges facing the IS group is developed. Equivocality and stakeholder complexity are presented as common characteristics that are highly relevant to systems agility success. Third, this dissertation will explore the extent to which social capital between the IS group and various stakeholders is critical in responding to challenges. MIS academia will benefit from a better understanding of the impact of that relationship between the IS/IT group and the business group on systems agility.

This dissertation will contribute to practitioner knowledge by explaining specific types of social resources (in particular the relationship between IS and the business) that are relevant to systems agility and will encourage practitioners to nurture these competencies. Further, we hope to expand agility considerations within organizations to include the type of agility challenges that organizations face.

2.0 Framing the Problem in the Literature

This research is drawn from three literature streams: the resource based view, IT capabilities, and social capital literature. This literature overlaps in various ways, so first we will offer a brief synopsis of the interpretation and application of this literature to build our nomological net in this paragraph. Then, in subsequent paragraphs, we will explore the literature more deeply. One of the basic tenants of the resource based view (RBV) is that organizations can garner sustained competitive advantage from resources that are valuable, rare, inimitable, and non-substitutable (Barney 1986; Wernerfelt 1984). This view allows for understanding social capital as a resource. Capabilities are defined as the ability to assemble, integrate, and deploy valued resources (Amit et al. 1993; Bharadwaj 2000). Systems agility is therefore interpreted as a IT capability.

2.1 IT Competence, Resources, and IT Capabilities

The original insight from RBV was that firms had idiosyncratic resources. Following that, efforts to be more specific about what "resources" might mean have led to confusion about the definitions and relationships between IT competence, resources, and IT capabilities. IT competence has been defined as routines and activities (Peppard et al. 2004) which would imply that "management of supplier relationships" is an IT competence; however, "external relationship management" has also been classified as a resource (Wade et al. 2004) as noted (Gordon et al. 2007). Likewise, shared knowledge and flexible IT infrastructure have been identified as capabilities (Ray et al. 2005) and resources (Karimi et al. 2007; Wade et al. 2004). These are a few examples of the confusion between an IT competence, IT resources, and IT capabilities found in the literature. To further confuse the issue, the term IT Capability, is also used interchangeably to describe IT resources (Bhatt et al. 2005), to have a relationship with IT resources (Bharadwaj 2000; Karimi et al. 2007; Ravichandran et al. 2005), to be a class/type of resource (Bharadwaj 2000; Collis et al. 1995; Ray et al. 2005; Wade et al. 2004) and to be

comprised of competences (Feeny et al. 1998). One attempt has been made to clarify the relationship between Competence, Resources, and Capability. "…resources are what an organization has under its control or at its disposal; competencies are the abilities of the organization to develop, mobilize and use those resources; capability is what the business can achieve through focused investment and deployment of competencies (Peppard et al. 2004)." Another attempt to clarify the issue was made by Pavlou and Sawy (Pavlou et al. 2006) who introduced IT leveraging competence (the ability to effectively use IT functionalities to support ongoing IT related strategic activities).

We follow the lead of Bharadwaj (2000) and Grant (1991) in distinguishing resources from capabilities and using these terms to describe applicable constructs because this most succinctly defines the relationship between social capital (a resource) and systems agility (an IT capability). A capability is the ability of the organization to develop, mobilize and use resources (Bharadwaj 2000; Ross et al. 1996). Resources are the tangible (IT infrastructure), intangible (social capital) and human resources (skills) (Bharadwaj 2000; Grant 1991; Ross et al. 1996).

Table 1 – Many Conceptualizations of IT Competence or IT Capabilities

Authors	Definition	Dimensions
(Tippins et al. 2003)	The extent to which a firm is knowledgeable about and effectively utilizes IT to manage information within the firm is an IT competence. (p. 748)	IT knowledge IT operations IT objects
(Feeny et al. 1998)	Each core capability is a combination of competency units. (p. 16)	Relationship building Leadership Informed Buying Contract Facilitation Making Technology Work Vendor Development Architecture Planning Contract Monitoring Business Systems Thinking

Authors	Definition	Dimensions
(Ross et al. 1996)	"…we concluded that the value and inimitability of a firm's IT capability depended on the status of their human, technology and relationship assets." (p33)	**Human Asset** – business understanding, technical skills, increased communications **Technology asset** – sharable technical asset and DB technology, architecture, data platform, and standards **Relationship Asset** (p35) – "…we found that the more IT staff people and clients worked together, the more they communicated, coordinated, negotiated, laughed, and cried together, up and down the hierarchy, the stronger the partnership became and the more effective both were at planning, developing new applications, and using their current information technology."
(Bharadwaj 2000)	"…a firm's IT capability is defined here as its ability to mobilize and deploy IT-based resources in combination or copresent with other resources and capabilities. (p.171) IS capability "is not so much a specific set of sophisticated technological functionalities as it is an enterprise-wide capability to leverage technology to differentiate from competition." (p.186)	The **tangible resource** is comprised of the IT infrastructure components, the **intangible resource** is comprised of things like knowledge assets, customer orientation, and synergy, and the **human resources** are comprised of technical and managerial IT skills.
(Marchand et al. 2000)	Information orientation is an overarching concept that measures the capabilities of a company to effectively manage and use information.	They describe 15 competencies in 3 capabilities. The three capabilities are Information Technology Practices, Information Management Practices, Information Behaviors and Values.
(Peppard et al. 2004)	IS capability is comprised of IT competencies, which are comprised of resources. It is only at the enterprise level that IS capabilities manifest themselves. (p. 180)	
(Amit et al. 1993)	IT competence "a firm's capacity to deploy resources, usually in combination, using organizational processes, to effect a desired end" (p. 35)	
(Wang et	An organization's ability to	

Authors	Definition	Dimensions
al. 2007)	effectively use IT-based resources in combination with other organizational resources is an IT capability.(p. 40)	

In this research the focus is on the IT capability we call systems agility. We define systems agility as the ability of the organization to quickly and successfully change its information systems as part of its response to business agility challenges. A useful framework is provided by Bharadwaj (2000), which is very similar to other frameworks, please see Table 2. According to Bharadwaj: the tangible resource is comprised of the IT infrastructure components, the intangible resource is comprised of things like knowledge assets, customer orientation, and synergy, and the human resources are comprised of technical and managerial IT skills.

Table 2 – Conceptualizations of Interest

Bharadwaj (2000)	Tangible Resources	Intangible Resources	Human Resources
Ross et al. (1998)	Technology Asset	Relationship Asset	Human Asset
Sambamurthy et al. (2003)	Quality of the infrastructure	Nature of the IS/business partnerships	IT Human Capital
This Dissertation	Application infrastructure characteristics (Difficulty of Technology)	Social Capital	Not Included

Recent research has used the (Ross et al. 1996) framework to explore the impact of the relationship asset, human asset and technology asset on ERP capabilities (Karimi et al. 2007). Their findings were that the relationship asset was directly related to building ERP capabilities. There was not support for the technology asset or the human asset being directly related to building ERP capabilities. This (Karimi et al. 2007) supports our decision to attempt to tease out the impact that social capital has on systems agility. Further, it has been noted that in IT competences of managing IS/IT and delivering business value, a close relationship is required

between the IS and business staff at all levels (Peppard et al. 2004). "This demands a close partnership between IS staff and business staff at all levels, both in formal processes and informal working relationships (Chan, 2002) and indicates why it is necessary to have a close relationship between IS professionals and other employees." (Peppard et al. 2004, p. 183) Next, we will review the literature on systems agility, then we will bring in social capital and the type of challenge.

2.2 Defining Systems Agility: Business Agility and Systems Agility

What is this elusive business agility that organizations wish to gain? There have been many different academic and practitioner conceptualizations of business agility (see table 3) from various disciplines such as MIS, operations management, supply chain management, sports literature, and strategic management. As well, several practitioner publications have addressed the concept of agility. Some notable definitions of agility from these literature streams are summarized in Table 3 below:

Table 3 – Business Agility Definitions

	Literature Stream	Source	Definition
1	MIS	Sambamurthy et al (Sambamurthy et al. 2003)	"…the ability to detect opportunities and seize those competitive market opportunities by assembling the requisite assets, knowledge, and relationships with speed and surprise."
2	Strategy	D'Aveni; Goldman et al 1995; as cited by Sambamurthy et al 2003	"Agility is the ability to detect opportunities for innovation and seize those competitive market opportunities by assembling requisite assets, knowledge, and relationships with speed and surprise."
3	Strategy	Zaheer and Zaheer (Zaheer and Zaheer 1997)	Breaks agility into two parts alertness and responsiveness.
4	Strategy	Haeckel (Haeckel 1999)	Defines adaptive companies in terms of sense-and-respond organizations, stating that truly adaptive corporations must "… manage information in a particular way; it must be managed as a system; and its leaders and employees must commit themselves to

	Literature Stream	Source	Definition
			very different behaviors and responsibilities" essentially stating that sense-and-respond organizations function very differently than traditional organizations. It is believed that Haekel is referring to the adaptability of corporations as a form of agility for corporations.
5	Practitioner	Gartner (Gartner 2001)	"Agility is the ability to respond quickly and effectively to rapid change and high uncertainty."
6	Practitioner	Dove 2001 (Dove 2001)	"Agility is the ability to manage and apply knowledge effectively, so that an organization has the potential to thrive in a continuous changing and unpredicted business environment. Agility implies not only the ability to respond to unanticipated change (response ability) but also to act proactively with regard to change"
7	MIS	(Oosterhout et al. 2006)	"Business agility is being able to swiftly change businesses and business processes beyond the normal level of flexibility to effectively manage unpredictable external and internal changes (p134)."
8	MIS	(Zain et al. 2005)	Firm's ability to generate the required information for management decision-making in a turbulent environment.
9	MIS	Enterprise Agility (Overby et al. 2006)	The ability of firms to sense environmental change and respond readily.
10	Operations Management	Agility in manufacturing firms (Sharifi et al. 2001b)	Ability to sense, respond to, and exploit anticipated or unexpected changes in the business environment.
11	MIS	Organization Agility (Setia et al. 2008)	Organization's ability to (1) Discover new opportunities for competitive advantage (2) Harness the existing knowledge, assets, and relationships to seize these opportunities; and (3) Adapt to sudden changes in business conditions
12	Operations Management	(Kidd 2000)	"An agile enterprise is a fast moving, adaptable and robust business. It is capable of rapid adaptation in response to unexpected and unpredicted changes and events, market opportunities, and customer requirements. Such a business is founded on processes and structures that facilitate speed, adaptation and robustness and that deliver a coordinated enterprise that is capable of achieving competitive performance in a highly dynamic and unpredictable business environment that is unsuited to current enterprise practices".

Regardless of the specifics of the agility definitions, for example the operational, partnering, and customer dimensions (Sambamurthy et al. 2003), these definitions seem to have an underlying theme that there is speed in response to, or in sensing a new problem or opportunity[1]. The changes that are the focus of business agility, we propose, are born of "agility challenges". "While many organizations recognize the need for organizational agility, as well as the potential of IS to support that need, it is important to understand specifically where IS can impact organizational agility." (Cochran 2008, p.13) The following Figure 2 (drawn from Justin Cochran 2008 and Daniel Chen 2004) provides a picture of the proposed relationship of systems agility to organizational agility. As can be seen in this figure, organizational agility clearly breaks into two components: sensing and responding. Sensing agility involves sensemaking, knowledge reach and richness, and information availability. Responding agility requires changing organization work processes, which in turn requires a change to its human activities, and also to the information systems which support these human activities. Note that the outcome of systems agility is often a change in IS infrastructure. We focus on the responding ability as previous interviews (Goodhue et al. 2009) have indicated that perhaps the larger role for IS is in responding rather than sensing. For a full discussion of the figure please see the dissertation of Justin Cochran (2008) or Daniel Chen (2004).

[1] Notably, in these definitions of agility, effort is not explicitly captured. We recognize that effort will play a role in one's ability to respond to an agility challenge, but along with the aforementioned authors, we do not think that the concept of agility should capture the notion of effort. We rather argue that effort should be captured as a separate construct if needed. For the purposes of this dissertation research, we will not be capturing effort or ease in any of our concepts. We are looking at the "ability" in many constructs, not the effort associated with the ability.

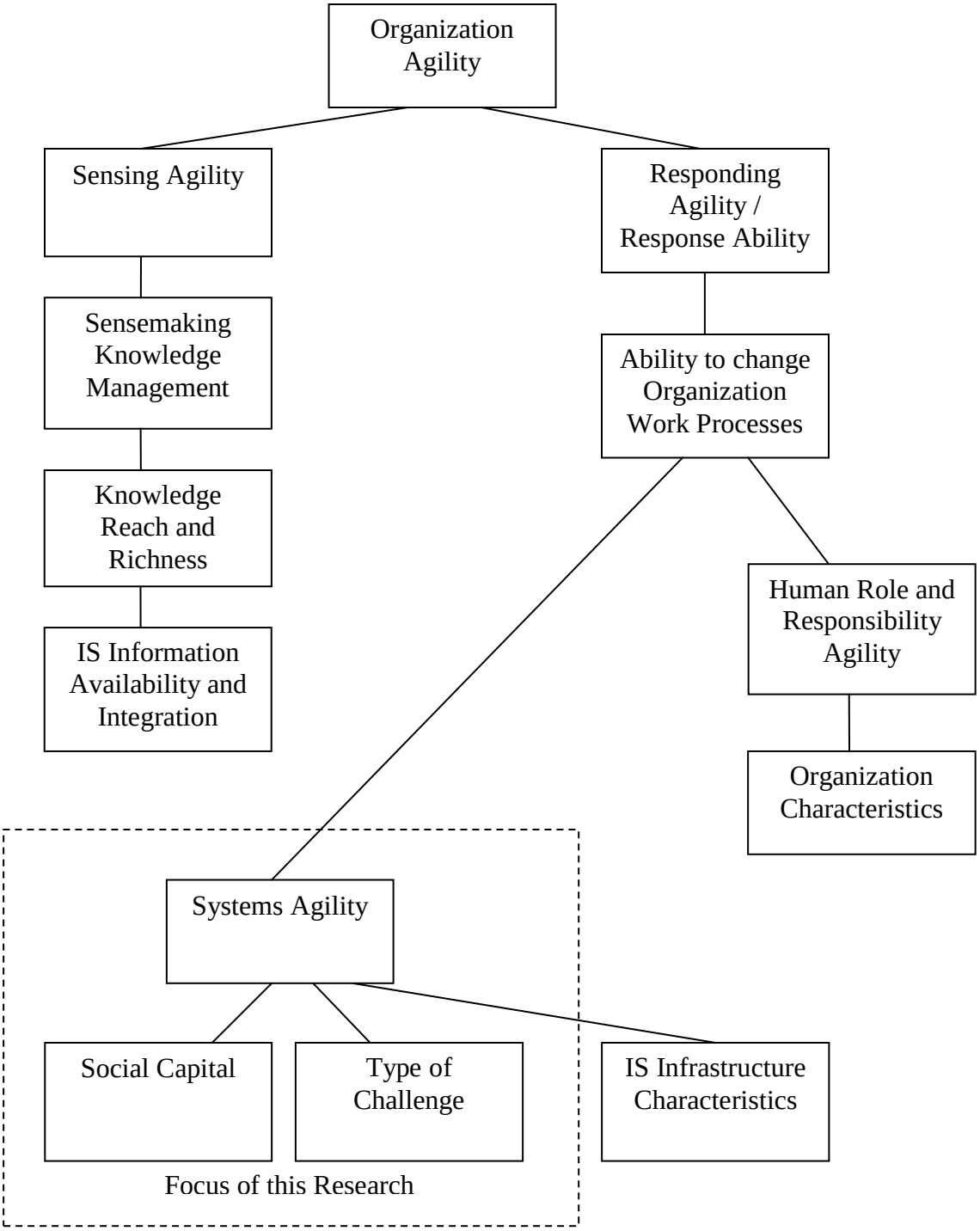


Figure 2 - Adapted from Chen and Cochran

2.2.1 Systems Agility

Indeed, research has suggested that how an organization is able to respond to an agility challenge will to some degree be dependent on how their information systems are able to handle this request. There is agreement in the literature, both practitioner and academic, that IT plays a role in agility (Bharadwaj 2000; Coronado 2003; Dix 2007; Helft 2006; Overby et al. 2006; Paulraj et al. 2007; Sambamurthy et al. 2003; Swafford et al. 2006b). Many times, IT is seen as an enabler for business agility (Dix 2007; Oosterhout et al. 2006; Overby et al. 2006; Swafford et al. 2006b). Recently there has been some interest in defining systems agility as is evidenced by the following definitions in Table 4.

Table 4 – Systems Agility Definitions

	Source	Definition
1	Information systems agility (Abrahamsson et al. 2002)	The ability of information systems development and deployment methods to swiftly adapt to the changing business requirements
2	Globally distributed system development agility (Lee et al. 2006)	The capability of globally distributed teams to rapidly develop and deploy systems by assembling globally distributed IT assets and expertise, in order to tap emerging business opportunities at dispersed geographic locations.
3	Information systems development agility (Lyytinen et al. 2006)	The ability of an information systems development organization to sense and respond swiftly to technical changes and new business opportunities
4	Systems agility (Chen 2004)	An organizational ability to successfully change its information systems to meet business needs.
5	IT capability (Swafford et al. 2006b)	The extent to which IT systems (internet technologies, project management software, B2B technologies, ERP) and infrastructure are used in an organization's value chain (VC) to adapt and support the changing requirements of the competitive marketplace. (p125)
6	Supply chain agility (Swafford et al. 2006a)	The supply chain's capability to adapt or respond in a speedy manner to a changing marketplace or environment.
7	Systems agility in this dissertation	The ability of the organization to quickly and successfully change its information systems as part of its response to agility challenges.

With the exception of Chen (2004), these definitions all have a slightly different focus than that of this dissertation. The focus of systems agility in these definitions include development

methods (Abrahamsson et al. 2002), dispersed geographic locations (Lee et al. 2006), exploration and exploitation (Lyytinen et al. 2006), and IT capability in value chain agility (Swafford et al. 2006b). Similar to Swafford et al. (Swafford et al. 2006a; Swafford et al. 2006b) who defines an IT capability as the ability of IT to respond the needs of the value chain, Chen (2004) and we define systems agility in response to agility challenges. We utilize the definition provided by Chen 2004) with an emphasis on the ability to respond: the ability of the organization to quickly and successfully change its information systems as part of its response to agility challenges. This is consistent with classifying it as an IS capability which requires assembling, integrating, and deploying resources (Amit et al. 1993), in that being able to quickly and successfully change information systems will require assembling, integrating, and deploying resources.

2.3 The Intangible Resource – Social Capital

Recent work by Wang and Alim (Wang et al. 2007) has followed the lead of Bharadwaj (Bharadwaj 2000; Bharadwaj et al. 1999) empirically testing the relationship between the generic IT capability (utilizing InformationWeek 500 ranking index as a proxy for IT capability) and firm value, without focus on the relationship. The IS to business relationship has been identified as understudied in research projects (Coughlan et al. 2005). The focus of this dissertation is on better understanding the IS to business relationship (the intangible resource – social capital) and its effects on the specific IT capability of systems agility.

Social Capital is a broad construct that has been defined in a number of ways (Adler et al. 2002). However, there is much consistency among these definitions. We draw heavily from the original definition from Jacobs (1965) where social capital describes the network of strong, interpersonal ties that provide a basis for trust, cooperation, and collective action (Jacobs 1965). Social capital

is a resource that is created by the interactions of members of an organization. It is comprised of the close, personal ties that members in an organization possess in varying amounts. In this way, it is a resource that individuals within an organization possess as well as a valuable resource to the organization. Coleman (Coleman 1988) describes social capital as norms, obligations, expectations, trustworthiness, and information channels and points out that a group in which there is extensive trust (one aspect of social capital) will accomplish much more than a group without trust. Social capital is also an appropriable resource, i.e. social relationships are utilized for purposes other than socializing (Adler et al. 2002; Coleman 1988; Nahapiet et al. 1998) . Some of the benefits of social capital involving information are access to information and information exchange (Adler et al. 2002; Nahapiet et al. 1998)

There has been much research on social capital outside of MIS literature (Burt 2000; Chang et al. 2006b; Gabbay et al. 1998; Inkpen et al. 2005; Leana 1999; Leana et al. 2006; Liao et al. 2005; Moran 2005; Oh et al. 2006; Shaw et al. 2005; Tsai 2000; Uzzi 1999; Weisinger et al. 2005) with considerable emphasis on networks (Burt 2000; Gabbay et al. 1998; Inkpen et al. 2005; Moran 2005; Tsai et al. 1998; Uzzi 1999) and on intellectual capital (Tsai et al. 1998; Tsai 2000; Wu et al. 2005; Youndt et al. 2004). Within the MIS literature, social capital has been studied in relation to various phenomena (table 5), including network analysis (Bergquist et al. 2001; Mendez-Duron et al. 2009; Robert et al. 2008) and intellectual capital (Kankanhalli et al. 2005; Lengnick-Hall et al. 2004; Newell et al. 2004; Reich et al. 2003; Robert et al. 2008).

Table 5 – MIS Social Capital Studies

Phenomena of Interest	Method	Authors
Knowledge integration in ERP project team	Exploratory Case	(Newell et al. 2004)
Electronic knowledge repositories	Survey	(Kankanhalli et al. 2005)
Knowledge integration in virtual teams	Experiment with network analysis	(Robert et al. 2008)
Outsourcing		(Chou et al. 2006; Miranda et al. 2005; Rottman 2008; Rottman et al. 2008)
Competitive advantage in ERP systems	Conceptual	(Lengnick-Hall et al. 2004)
ERP implementation Success	Survey	(Wang et al. 2006)
Open source software project or firm success	Network analysis	(Bergquist et al. 2001; Mendez-Duron et al. 2009; Stam et al. 2008)
Adoption of Electronic Trading Systems	Interviews	(Montazemi et al. 2008)
Knowledge Contributions in Electronic Networks of Practice	Survey	(Wasko et al. 2005)

As can be seen in the selected MIS literature and management literature, phenomena that require collaboration throughout the organization like ERP implementation, outsourcing, knowledge work, or virtual teams are topics of interest involving social capital. This is presumably because these are situations that are likely to require social capital. Systems agility is a good example where the collaboration between different parts of the organization is often necessary for success and where social capital is helpful for quick resolution.

We focus on the social capital between the IS group and the business. This relationship has been previously studied in conceptual and case study research (Feeny et al. 1998; Henderson 1990; Ross et al. 1996). As defined by Ross et al. 1996 (p.35):

"…we found that the more IT staff people and clients worked together, the more they communicated, coordinated, negotiated, laughed, and cried together, up and down the hierarchy, the stronger the partnership became and the more effective both were at planning, developing new applications, and using their current information technology."

This dissertation uses social capital theory to clarify how the IS/Business relationship affects a firm's ability to respond to an agility challenge using social capital theory.

2.3.1 Social Capital will Facilitate Systems Agility

Systems agility requires IS and business people to quickly agree on an effective solution to an agility challenge. However, IS and business people generally have different perspectives on any situations involving business processes and systems. These different perspectives can form a barrier to agreement when action must be taken. IS people generally have a systems focused view rather than business focused view. This is merely an artifact of the primary purpose of the IS department. On the one hand, the IS department is tasked with ensuring efficient, operational systems to support the business – and has a rich nuanced view of how systems support the business. The business departments, on the other hand, have a clear purpose of increasing sales, introducing new products, etc. – and have a rich and nuanced view of how best to achieve these goals often without much thought to the impact that their suggested actions might have on information systems. These differing foci come from different experiences within the company, which build different perspectives. Although both perspectives include valuable knowledge, the differences between them can form a gap in understanding that must be reconciled before an agility challenge involving information systems can be resolved.

For example, consider an agility challenge to develop and implement a new pricing strategy. The business people look at the implementation of the pricing strategy as the right approach to

remaining competitive in the market place. From the business people's perspective, the quicker they implement this solution, the quicker they can more effectively compete, gain market share, and increase sales. However, the IS people might look at the new pricing strategy as a new programming nightmare that would be easier to implement after the implementation of an ERP system. From their experience, they know that the quick implementation of an ad-hoc program to address this request will only burden them in the future as they prepare to implement the ERP system. Even this simple caricature of the differences shows that the two different perspectives contain valid concerns that must be addressed and reconciled before either party will agree on a solution. To reduce this gap in understanding, both parties must listen, acknowledge the valuable information in each perspective, and work together towards a compromise.

Social capital can help reduce the gap in understanding that exists between IS and business. The first step toward bridging the gap is listening to the different perspectives. In situations where there is little social capital, many times IS and business people do not even bother to listen to each other's perspectives and ideas. In one example from the author's experience, both business and IS personnel were trying to get the data cleaned up for an ERP implementation. One of the 40 or so business people involved had not taken necessary action and claimed no knowledge of a looming deadline. When she was told that an e-mail had been sent by the IS project manager, she admitted not having even opened the e-mail. In this situation, she did not know the IS project manager, and saw no reason to even read the e-mail. In situations where the other party is a total unknown, there is little motivation to listen to the other person's ideas. In situations where there is social capital, the goodwill between the parties (Adler et al. 2002) is motivation (Nahapiet et al. 1998) to at least listen to the other person's perspectives and ideas.

If social capital exists between two parties, each is more likely to try to acknowledge expertise and value of the different ideas presented by the other party. Most people in organizations can identify situations where in a meeting they disagree with another party. If the other party is someone with whom they have a good relationship, they are more likely to hear them out and acknowledge the value of their ideas, even though these ideas may differ substantially from their own. If these two people do not have a good relationship, one party is likely to quickly dismiss the other's ideas as of little informational value and focus on their own agenda of getting their own ideas accepted.

Case study research indicates there is sometimes a "them and us" mentality between the IS and business groups in some organizations and better relationships are suggested to combat this mentality and help IS and business work together (Coughlan et al. 2005). Social capital creates a situation in which better relationships help both parties to work together toward a compromise (Adler et al. 2002; Coleman 1988; Leana 1999; Prusak et al. 2001).

Social capital provides the goodwill (Adler et al. 2002) and motivation (Tsai et al. 1998) necessary to allow people to listen to each other. Likewise, it helps people gather the information necessary (Adler et al. 2002) to understand and acknowledge the different ideas presented. Finally, the cooperation (Prusak et al. 2001) or even solidarity (Adler et al. 2002) brought by social capital will help IS and business work together (Adler et al. 2002; Coleman 1988; Leana 1999; Prusak et al. 2001) to successfully resolve agility challenges. Previous research supports the notion that social capital is related to building IS capabilities (Karimi et al. 2007). Therefore, since systems agility requires business and IS to bring their different

perspectives together into an agreed action plan, and social capital helps different parties communicate and cooperate:

H1: Social Capital will positively impact systems agility.

This hypothesis is consistent with empirical work looking at social capital impacts in outsourcing projects (Miranda et al. 2005; Rottman 2008; Rottman et al. 2008). Social capital is more important in certain circumstances, i.e. in certain types of challenges. Before explaining the three dimensions of social capital to be explored in this dissertation, we will look at the types of challenges where social capital is most salient.

2.4 Types of Agility Challenges

There have been several conceptualizations of "types" of agility challenges that focus on where the challenge came from in the environment, though consistent terminology does not exist for defining this. One classification scheme breaks the challenges into the type of change needed (anticipated, created, unpredicted, and unprecedented) along with market turbulence, changing customer requirements, competition based changes, changes in technology, and social factors (Sharifi et al. 2001a). This case study research explores what is required for agile manufacturing (Sharifi et al. 2001a). Another example of conceptualizing the types of agility challenges based on where in the environment the problem originated has been termed "change factors requiring agility" (Oosterhout et al. 2006). These "change factors" are: social and legal changes, business network changes, competitive environment changes, customer needs changes, technology changes, and internal changes (Oosterhout et al. 2006). Both these classification schemes focus on where the agility challenge originates. We suggest that this may not be what makes the

agility challenge difficult to resolve. Whether or not the agility challenge was anticipated is another classification scheme (Cochran 2008). This dissertation posits that looking at other characteristics of the problem, like equivocality and stakeholder complexity, will shed light on why some challenges are harder to resolve than others.

2.4.1 Equivocality

Equivocality has been defined as the presence of multiple and conflicting interpretations about a phenomenon (Daft et al. 1986; Weick 1979) or as having an uncertain nature or classification (Merriam-Webster 2008). Many times equivocal situations involve ill-defined issues or exist when management cannot agree on exactly "what" the problem is or "what" the right solution is.

Equivocality has been examined in terms of task analyzability and task variety of organizations (Perrow 1967). This examination formed the foundation for equivocality being studied in terms of media richness theory ((Daft et al. 1986; Daft et al. 1987; Dennis et al. 1998; Dennis et al. 1999; Kahai et al. 2003; Lengel et al. 1988; Zimmer et al. 2008)), knowledge sharing (Adler 1990), strategic marketing decision-making (Neill et al. 2007), escalation of commitment (Bragger et al. 1998; Bragger et al. 2003; Brecher et al. 2005; Drummond 1994; Drummond 1998; Ingersoll et al. 1992), new product development (Koufteros et al. 2005; Koufteros et al. 2002), and organizational design (Lewis 2004) to name a few areas. Clearly organizations are facing equivocality in a number of situations, and it is of interest how equivocality in these situations affects the organization. Of interest to this dissertation is how equivocal agility challenges affect the organization's systems agility.

Simon (1965) would refer to these equivocal situations as requiring non-programmed decisions. Picking up on Simon's ideas about how to solve these problems, we conclude that equivocality can have many sources. Equivocality is present when it is not clear what the nature of the problem is, it is not clear which is the best criteria for choosing a solution, or it is not clear which of multiple solutions is best. This dissertation's focus is on the IS group's ability to respond (systems agility). So, if the business brings a problem to the IS group that is ill-defined or if the IS group has a problem defining what a good solution would be when the problem first surfaces, those problems would be termed equivocal. We will seek to focus on the difference between agility challenges where the IS and business groups have a hard time defining the solution (highly equivocal challenges) and challenges that have very little equivocality.

Some challenges are immediately straight forward (the gap is narrow); some are equivocal (the gap is wide). In unequivocal challenges, little or no time is required for managing equivocality. For example, if a company utilizing an ERP system is informed of a tax law change and a patch is available from the ERP vendor, then there is no ambiguity about business requirements and there is no ambiguity about the solution. This challenge can be resolved quickly as there is no delay due to trying to fully understand the problem or convince the other party that the problem needs remedy.

In equivocal challenges, there is so much ambiguity in the challenge that time and effort must be asserted to resolve the equivocality so that action can be taken. For example, offering the ability for a customer to create a custom computer based on their individual preferences involves understanding how important it is to the business that this is available and what extent of

customization of the machine is necessary. Although Dell offered the most customizable machines, in order to compete with Dell, the organization has to offer some customization, but there is doubt as to whether the competitor has to offer the complete customization offered by Dell. The organization must assess whether limited customization makes more sense given the organization's current infrastructure, capabilities, and strategic vision. Agreeing on these items will be necessary to go forward with this initiative.

2.4.1.1 Equivocality Will Impede Systems Agility

Systems agility requires swift reaction to and resolution of a challenge. Quickly coming together to understand the problem by IS and the business is imperative in systems agility. Both IS and the business will want to fully understand the problem and the possible solutions prior to resolving an agility challenge. The business problem is very different from the IS problem associated with the business problem. In cases where systems agility is required, there are a number of different areas where problems implementing a solution can arise, and all parties need to have an understanding of these problem areas to make an informed decision about the resolution. The business problem may be outdated pricing algorithms that are making the company less competitive. The IS problem associated with the outdated pricing algorithms may be an inflexible infrastructure that will not allow quick implementation of any solution. However, quickly understanding the problem in terms of the limitations of the systems and the necessities of the business is important to systems agility. The more time spent exploring options – either in terms of different pricing algorithms by the business, or in terms of exploring the technical options by IS – the slower the process of implementing a solution. If business and IS cannot settle on a workable solution in reasonable time, the challenge will not be successfully addressed.

Equivocal challenges require more time to resolve because of the ambiguous nature of these challenges. A sufficient understanding of the situation that allows deliberate, reasonable choices for action must be accomplished. A considerable amount of time will be spent negotiating an acceptable understanding of the situation (Weick 1979). Ultimately people involved in the challenge will rely on judgment calls, rules of thumb, or intuition to make decisions about this problem. Convincing each other that a particular judgment call is best also requires time.

For example, back to our pricing challenge, there are pricing packages that might be added into the existing infrastructure that might be the best solution. However, building the algorithms into a custom application may suit the organization better in the future, when a packaged solution will not meet their needs. This unknown outcome is not predictable, but it is expected that the IS group do some due diligence to determine which of the solutions is "best", when the "best" is simply a guess. This due diligence requires time, and a comfort level with the equivocality of the situation will be created. Therefore, equivocal challenges will require more time (creating an acceptable understanding of the issues) to resolve than unequivocal challenges; and will make it hard to achieve systems agility:

> *H2: The amount of equivocality in the challenge will be negatively associated with systems agility.*

2.4.2 Stakeholder Complexity

Daft and Lengel term the second dimension of organization information processing as uncertainty (Daft et al. 1986). However, in this domain, it is hard to discern to what exactly uncertainty would refer. As well, numerous attempts to understand uncertainty and equivocality have yielded definitions and operationalization of uncertainty that include equivocality and vice versa (Dennis et al. 1998; Dennis et al. 1999; Kahai et al. 2003). For this reason, researchers have sometimes ended up dropping one or the other from their work, and utilizing either measures of uncertainty or of equivocality, with the assumption that one captures the other. Another related concept, that is also often confused with uncertainty is complexity (Schoonhoven et al. Sep., 1980) . While uncertainty is defined as how much information is lacking or how difficult it will be to acquire the needed information (Daft et al. 1986), complexity is defined by in the systems literature as having two major sources: the number of elements and the number of relationships between the elements (Flood et al. 1993; Warfield 1994). Another close definition of complexity comes from the task complexity literature "…a complex task was defined has having several interrelated and conflicting elements to satisfy (p.42) (Campbell 1988)". We choose to focus on one type of complexity (Campbell 1988) that is important in our domain: The number of different perspectives (represented by different stakeholders) involved in the agility challenge that are involved in the agility challenge.

In stakeholder literature, a stakeholder can be a person, group, neighborhood, organization, institution, society, or natural environment (Mitchell et al. 1987). We are taking the approach of defining a stakeholder as representing a distinct perspective in the organization. The classic definition of a stakeholder is "…any group or individual who can affect or is affected by the

achievement of the organization's objective (Freeman 1984)." We are specifically talking about stakeholders that are involved in the challenge. Stakeholders in the pricing challenge might include marketing, finance, and sales. Stakeholders may have a variety of reasons for being involved in the challenge, and thus have a variety of relationships to the challenge. In a particular challenge the stakeholder may invoke power, legitimacy or urgency to influence other stakeholders involved in the challenge. According to stakeholder theory (Mitchell et al. 1987), a stakeholder may possess all of those attributes, one of those attributes, or any combination of those attributes. A large number of such stakeholders would add complexity to resolving a challenge.

2.4.2.1 Challenges with a Large Number of Stakeholders will Impede Systems Agility

In situations where there are a number of stakeholders involved there is a potential for conflicting interests and different perspectives representative of each stakeholder, complicating the process of coming to a resolution. As was argued earlier, a process for reconciling perspectives between IS and business involves 1) each party listening to the other party, 2) each party acknowledging the other's ideas and perspectives 3) the parties working together toward a compromise/resolution. This process must be replicated for all the stakeholders involved in the agility challenge. The more stakeholders involved, the more time it will take to come to agreement about how to proceed with the challenge because each stakeholder will have their own perspective and potentially conflicting interests. When more time is required to reconcile these perspectives and interests, a quick resolution of the challenge is more difficult to achieve.

Stakeholder theory holds that "Managers must develop relationships, inspire their stakeholders, and create communities where everyone strives to give their best to deliver the value the firm

promises" (Freeman et al. 2004, p. 364). In each challenge facing an organization, the IS and the primary business unit must work together to inspire all the different stakeholders in the challenge to give their best to deliver a good resolution to the challenge. Not only are the IS and business people working together to convince the other stakeholders to work together to come up with a solution, they are working at ensuring the self-interest of each stakeholder does not complicate the situation to a point where a solution is not achievable. Reconciling conflicting interests as well as working through the process to reconcile the different perspectives of the stakeholders will take time and make successful systems agility more difficult and less likely.

H3: Challenges characterized as high in stakeholder complexity will be negatively associated with systems agility.

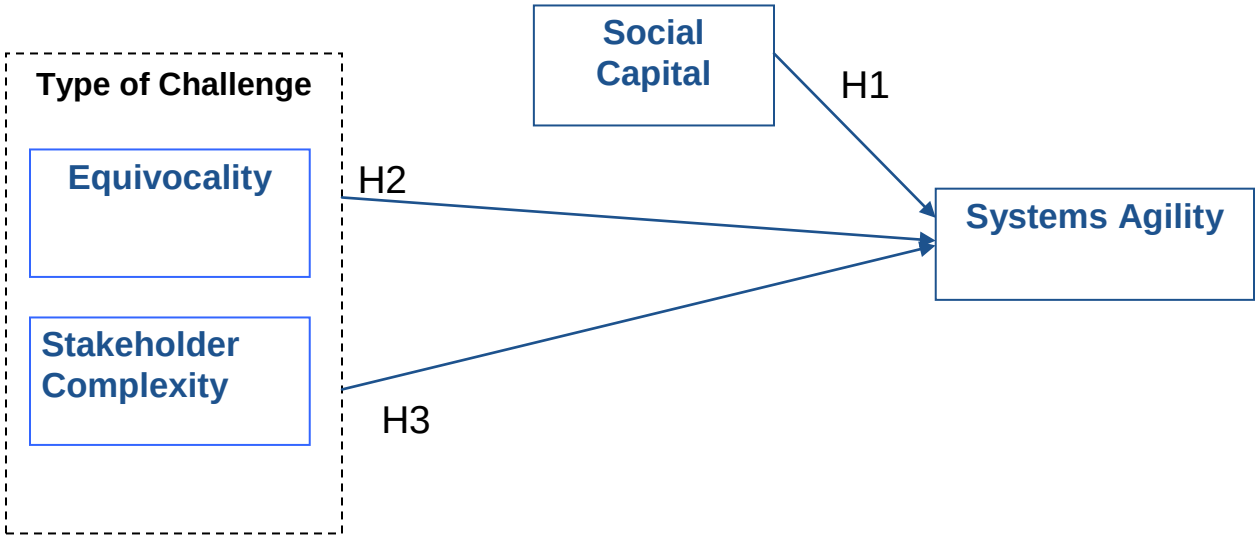


Figure 3 – General Research Model

Now that the main relationships between social capital, the types of challenges, and systems agility have been explained, we will delve into the different dimensions of social capital and their moderating role in these relationships.

2.5 The Moderating Effects of Social Capital

In all agility challenges, there is a gap in understanding that is formed because IS and the business have differing perspectives; however, in equivocal agility challenges, the gap is wider and harder to bridge. Because of the ambiguity involved in the challenge there are more avenues that have to be explored and agreement achieved. There may be a feeling that ambiguity resides more in the area of the business or more in the area of IS, but in the end, there is no way to remove this ambiguity from this situation. Because in equivocal situations there is no way to completely clarify the situation, there is a requirement that there is some agreement, even in the presence of open questions. Each party involved in the challenge will need to explore the ideas of the other parties involved to build a comfort level with the ambiguity or open questions in the situation in order to eventually take action. In this way, equivocality can be removed as a hurdle to resolving the challenge.

On average, there is some equivocality in every business challenge. In less equivocal situations, social capital is not needed as much. The problem and solution are well defined, and the course of action is straight forward and not in debate. In less equivocal situations, differences in the perspectives of the IS person and business person is not of concern, as there is already agreement about the problem and the solution. In highly equivocal situations, equivocality must be reduced to an acceptable amount or a decision has to be made about how to handle the equivocality before action is taken. Social capital provides one way of helping people to resolve equivocality

and to take action. When dealing with a highly equivocal situation, a business person in a good relationship with an IS person is more likely to accept that the IS person has a valuable perspective on the issue, and that the IS person is making his or her recommendation with the best interest of the business in mind. Social capital provides motivation for the free exchange of ideas (Tsai et al. 1998), trust (Coleman 1988; Leana 1999), and channels for information flow (Burt 1997; Burt 2000; Gabbay et al. 1998; Inkpen et al. 2005) necessary for the business person to come to this conclusion, and to eventually compromise or agree with the IS person (and vice-versa). So, while the business person is no more clear about the exact answer to the problem, they are comfortable going forward with a resolution because they have communicated their ideas to the IS person and listened to the IS person's ideas and trust the IS person (and vice-versa). The more equivocal the challenge, the more social capital will help in bridging this gap and coming to a common understanding of the challenge.

> *H4: Social capital will moderate the relationship between equivocal challenges and systems agility, such that the more social capital, the weaker the negative link between equivocal challenges and systems agility.*

Likewise, social capital will help bring the stakeholders to agreement and resolution of the challenge by providing a foundation for bringing forth the different perspectives and interests involved in the agility challenge and helping the stakeholders, IS, and the business come to agreement about a solution to a challenge. The greater the stakeholder complexity, the more important the social capital:

H5: Social capital will moderate the relationship between challenges involving many stakeholders and systems agility, such that the more social capital, the weaker the negative link between stakeholder complex challenges and systems agility.

2.5.1 The Three Dimensions of Social Capital

Social capital has been conceptualized to have three dimensions: structural, cognitive, and relational capital (Nahapiet et al. 1998) as shown in figure 4. Each dimension will be described in detail followed by its hypothesized relationship as a moderating variable.

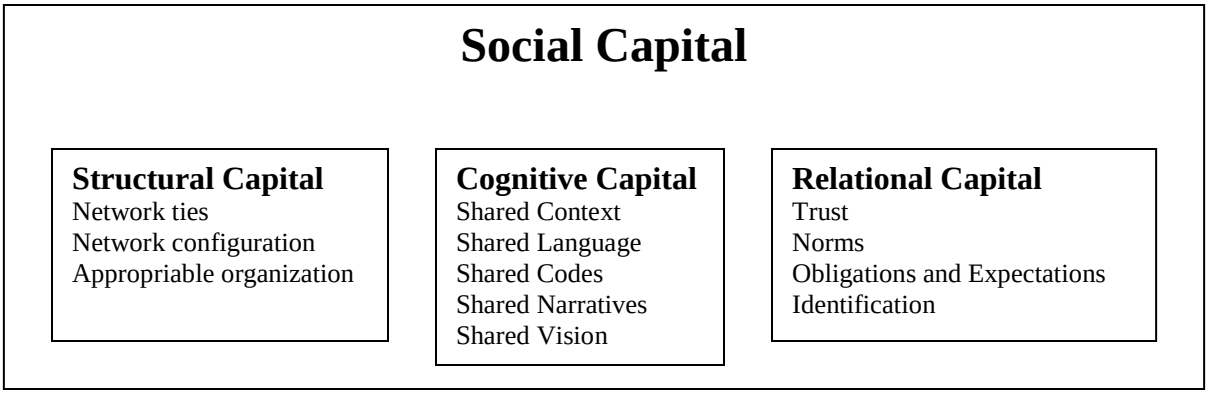


Figure 4 – The Three Dimensions of Social Capital

2.5.1.1 Structural Capital

The structural dimension is composed of network ties, network configuration and/or appropriable organization, with the basic premise of structural social capital being that network ties provide access to resources and information. Network ties include the interaction or networking part of social capital. The network ties or the relationships that the actor possesses along with the location of these relationships in the social structure of the organization are represented by structural capital. The basic premise of social capital theory is that network ties also provide

access to resources and information. Information in this context would include alternate perspectives, different needs in different parts of the organization, etc. Access to resources is very important to the efficient operation of organizations. Research in network analysis supports the notion that network ties provide channels of information flow that enhance the ability of the organization (or individual) to act (Burt 1997; Burt 2000; Gabbay et al. 1998; Inkpen et al. 2005).

Network ties can be conceptualized in terms of formal and informal ties. Formal ties are often created by the organization or group to ensure there are avenues for communication. Conference calls, meetings, etc. create formal ties in an organization or formal structural capital within an organization. Informal ties are more readily controlled by the individual. Examples of informal ties are "hall-talk", non-work related phone conversations, etc. These are informal ties in which the business and IS people engage. These informal conversations are building a link between the IS and business person. Informal social ties have been found to curb opportunism in economic exchange relationships (Grannovetter, 1985; Uzzi, 1996; Baker, Faulkner and Fisher, 1998; Ingram and Roberts, 2000). Several studies of informal or friendship ties between top executives of separate firms have yielded results that indicate these ties lead to joint problem-solving and the exploitation of opportunities that benefit both firms (Westphal, Boivie, Chng, 2008; Uzzi 1996; Nevin, 1990, Baker et al 1998).

Appropriability refers to the ability of the network ties to be appropriated to support some other actions than are originally intended. For example, perhaps a social network is in place that allows a salesman to collect information about the current needs of customers. If an organization

determines that knowing when a customer is offering a promotion might help the organization better forecast their customers' needs, that same social network may provide this opportunity. This principle is transferable to the routines that are performed within an organization. Social networks may be in place to ensure a particular routine is efficiently processed. Appropriability allows the current social networks to be used in support of work related goals.

Resolving agility challenges involving information systems often requires people from IS and several different parts of the business to come together to resolve the challenge. There is the presumption that each stakeholder (IS and business) has legitimate concerns that need to be incorporated into the thinking of the other. The more different these perspectives are, the less clear it is how the problem should be seen, which means there is more equivocality. Ultimately equivocality must be resolved enough that all agree on the right action. To do this, each of the participants in the challenge must express their concerns, ideas, or perspective. There must be ways of getting this information about their concerns, ideas and perspectives to the right parties involved in the challenge. Structural capital will provide such needed channels for information flow (Burt 1997; Burt 2000; Gabbay et al. 1998; Inkpen et al. 2005). Formal structural capital, such as that created by formal meetings provide a structured path for people involved in the challenge to get together to discuss topics of concern. The positive interactions in this formal avenue for communication, provides for information flow and facilitates developing relationships between the participants and thus provides a type of social capital necessary for resolving these challenges. Formal and informal links provide paths for coming to agreement about how to handle the equivocality of a situation, and thus improves systems agility. The more

equivocal a situation, the more important these links become in helping to bridge the gap in understanding the equivocality and in moving past the equivocality.

> *H4a: Structural social capital will moderate the relationship between equivocal challenges and systems agility, such that the more structural social capital, the weaker the negative the link between equivocal challenges and systems agility.*

In challenges involving many stakeholders structural capital between stakeholders (business and IS) will similarly provide an avenue for the exchange of ideas and information. However, in challenges involving many stakeholders, the more stakeholders involved means more need for channels and even networks to exchange information. In these challenges it becomes more important to use networks for relaying information. Structural social capital becomes more important, facilitating communication, which could help all parties come to a common agreement on the solution.

> *H5a: Structural social capital will moderate the relationship between challenges involving many stakeholders and systems agility, such that the more structural capital, the weaker the negative link between challenges involving many stakeholders and systems agility.*

2.5.1.2 Cognitive Capital

The cognitive dimension of social capital refers to the existence of shared context, shared narratives, shared language, shared vision, and shared codes between the parties subject to social exchange. Shared language and shared codes allow people to gain access to other people and

information that other people possess by providing a mechanism for exchange. Rich understandings are often conveyed by shared myths, stories, and metaphors that are common across the organization and have a shared understanding among the members of the organization. Nahapiet and Ghoshal (1998) define two ways that this type of cognitive social capital is manifested: shared code and language and shared narratives. Both get at the ability of actors to communicate and communication is necessary for resolving equivocality and building trust and common goals which helps in resolving equivocality. Shared language and codes, facilitates access to information that other people possess by providing a mechanism for such exchange. Within organizations, many times vocabulary is built that facilitates the easy communication and social exchange among its members. Another form of cognitive social capital is shared narratives. Shared narratives are myths, stories, and metaphors which provide rich meaning to individuals in an organization. These rich understandings are common across the organization and provide a shared understanding within the organization. Shared narratives are another way that organizations provide for common understanding and for clear and efficient communication.

Shared vision is also recognized by Tsai and Ghoshal (Tsai et al. 1998) as a proxy for the cognitive dimension of social capital. Shared vision is defined as common goals or and aspirations. Utilizing the argument made by Tsai and Ghoshal (Tsai et al. 1998), these common goals will provide motivation for members of both the IS and business groups to exchange ideas freely. Cognitive capital provides the means for members of both the IS and business groups to exchange information freely and eases communication between the IS and business groups.

This is especially important in equivocal situations where perspectives must be shared and common goals and common language make it easier to arrive at a mutual understanding of the issue. This will enable the IS and business people to work together effectively. Cognitive capital means the IS and business share many of the same perspectives and can more easily see shared goals. When focused on the same goals, the IS and business people will more easily acquiesce their needs for the benefit of the shared goal. This ability to compromise will lead to quicker meeting of the minds about equivocal situations. This will lead to greater systems agility in equivocal situations. The more equivocal the challenge, the more important cognitive social capital will be in coming to a resolutions.

> *H4b: Cognitive social capital will moderate the relationship between equivocal challenges and systems agility, such that the more cognitive capital, the weaker the negative the link between equivocal challenges and systems agility.*

There is a similar need for a focus on a shared goals and easy communications in situations with a large number of stakeholders. With all the conflicting interests of the stakeholders, having a shared goal among the IS and business groups becomes more important in helping to drive the actions and decisions (and ultimately collaboration) of all the stakeholders. Imagine people from 30 different countries speaking 30 different languages trying to work together to resolve an issue. Understanding each other's jargon and language will improve communications between the numerous stakeholders involved with the challenge. These commonalities of shared language and shared goals provided by cognitive capital will facilitate compromise and cooperation when it is needed most, in situations with many stakeholders.

H5b: Cognitive social capital will moderate the relationship between challenges involving many stakeholders and systems agility, such that the more cognitive capital, the weaker the negative the link between challenges involving many stakeholders and systems agility.

2.5.1.3 Relational Capital

The relational dimension of social capital refers to the expectations and obligations of the relationship. These assets include trust, norms, obligations and expectations, and identification (Nahapiet et al. 1998). Relationships that embody trust, norms, obligations and expectations, and identification between people in the relationship build a cooperative atmosphere. Trust is associated with less opportunistic behavior and a willingness to be vulnerable to another party (Mishira 1996). Thus, when trust is present, business people can act in cooperation with IS people without fear of being taken advantage of in certain situations.

As Weick (Weick 1979) points out, in equivocal situations, people spend a considerable amount of time coming up with an "acceptable version" of what is going on. The "acceptable version" is a less equivocal version of what is going on, assuming that this means some meeting of the minds has happened. It is much easier to come to a meeting of the minds if there is trust, a sense of obligations and expectations, norms of cooperation and identification with each other pursuing a common goal. In equivocal situations, resolving the challenge requires much negotiation and effort to come to a common understanding. In these situations it is more important to have good relationships that facilitate negotiation and understanding.

H4c: Relational social capital will moderate the relationship between equivocal challenges and systems agility, such that the more relational capital, the weaker the negative the link between equivocal challenges and systems agility.

The effect of relational social capital will be similar in challenges involving many stakeholders. There will be less "second-guessing" and more collaboration and communication in situations where there is relational social capital. With a large number of people involved, this is important to keep making progress toward a solution. Relational capital amongst stakeholders improves their ability to work together and make progress toward a solution, and thus is important in situations with large numbers of stakeholders.

H5c: Relational social capital will moderate the relationship between challenges involving many stakeholders and systems agility, such that the more relational capital, the less negative the link between challenges involving many stakeholders and systems agility.

3.0 Complete Research Model

This Section displays the complete research model that is analyzed in the following Sections.

This representation is perhaps easier to comprehend than the complete research model as tested that is displayed in Section 5.

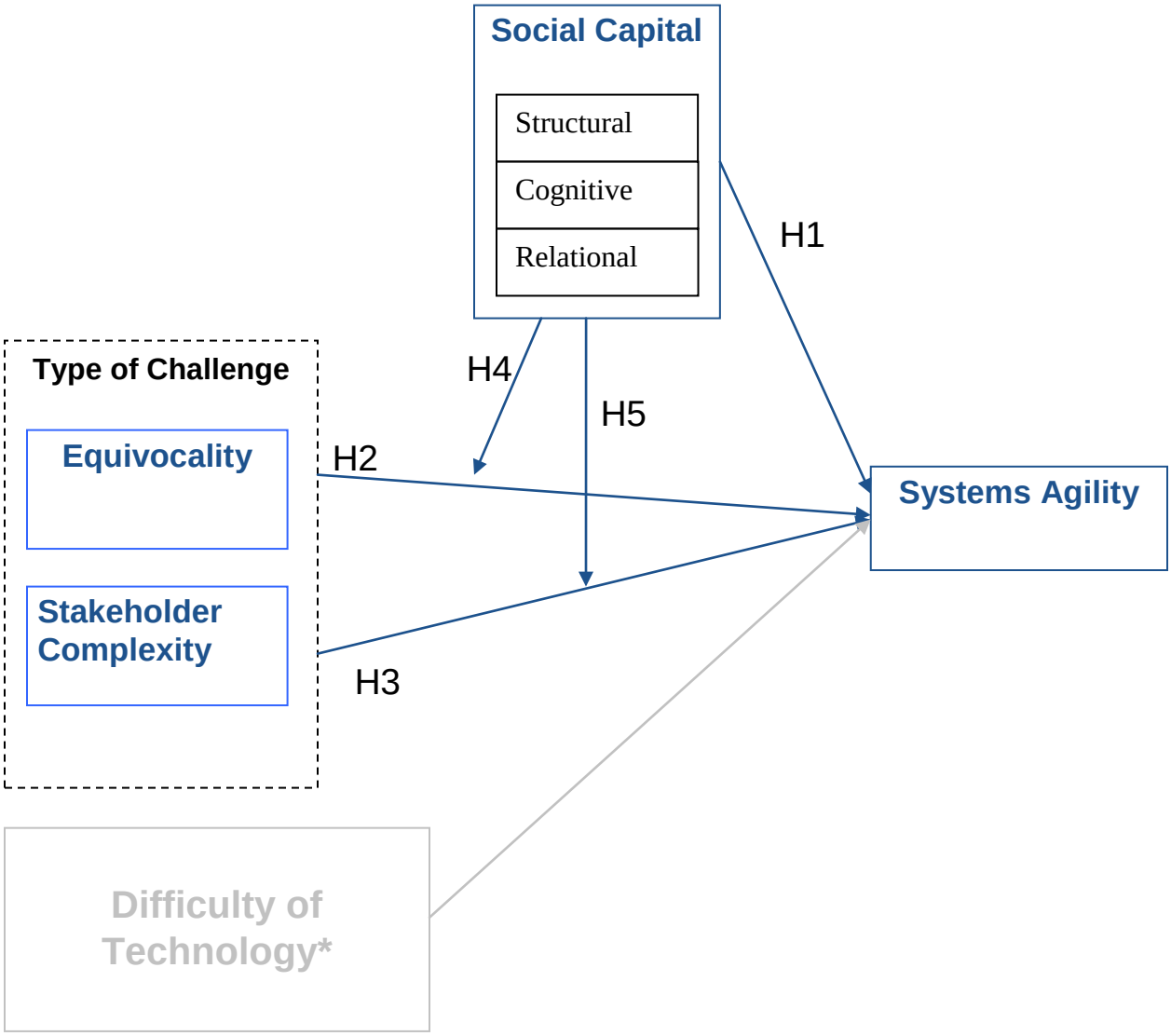


Figure 5 - Complete Research Model

3.1 Construct Definitions

The following table (Table 6) contains the construct definitions. These definitions were used to operationalize the variables.

Table 6 – Construct Definitions

Category	Construct	Definition
Type of Agility Challenge	Complexity	The number of people representing different perspectives in the organization that will be affected by the agility challenge.
	Equivocality	Challenges where uncertainty or ambiguity exists in: 1. The origin/nature of the challenge 2. Which criteria is best criteria for choosing a solution 3. Which of multiple solutions is best
Systems Agility		Systems agility is the organizational ability to successfully and swiftly change its information systems in response to agility challenges.
Social Capital	Cognitive	Refers to the existence of shared vision or language between the IS group and the business groups subject to social exchange.
	Structural	Network ties, network configuration and/or appropriable organization in terms of informal and formal ties
	Relational	Refers to the assets that comprise the relationships or expectations and obligations of the relationship. These assets include trust, norms, obligations and expectations, and identification.

4.0 Research Methodology

Section 4 explains the overall research design, questionnaire development, and operationalization of variables. The final items that were utilized in the study are listed in this section.

4.1 Overall Research Design

This research design includes a cross-sectional survey to explore the phenomenon of interest. Being able to sample a large set of employees in different organizations will lead to generalizability and external validity or the validity with which conclusions are drawn about the generalization of causal relationship to and across populations of persons, settings and times (Cook et al. 1979). Three different survey instruments have been designed. Given the nature of the questions about social capital, some questions must be tailored for the individual IS, business, and consultant respondents.

In general, surveys can be administered via paper and pencil, the internet, or over the phone. For convenience for the intended respondents, the survey was administered via paper and pencil and the internet. This way enabled recruiting participants via e-mail with a link to the website as well as in person. The paper and pencil option was available for those the researcher met in person (and the respondent had the time right then to fill out the survey), or for those who received the e-mail request for participation, but were not comfortable filling out the questionnaire over the internet. Phone interviews can prove very useful and fruitful, but the target respondent to this survey is usually tied up in meeting throughout the day and conducting phone interviews would have been more intrusive in that we would have had to schedule time that the interviewee could talk for at least 15 minutes. This might have become a logistical nightmare, and even discouraged some from participating. Therefore, administering this survey over the phone was not pursued. Although triangulation is desirable (Gallivan 1997; Kaplan and

Duchon, 1988, Grey, 2004, Mingers, 2001), it is not included as part of this proposal. However, previous interviews (Goodhue et al. 2009) provided guidance for development of these instruments. As with all cross sectional survey research, we lack the ability to claim causation as this is not a longitudinal study, nor a laboratory experiment (Cook et al. 1979; McGrath 1982).

The unit of analysis in the survey was the agility challenge. This research hoped to investigate how the strength of the link between social capital and systems agility changed based on different types of challenges. Therefore, several respondents from a given company was acceptable as it was unlikely that all respondents provided the same agility challenge. Given the wide range of industries represented, and the approach to acquiring respondents, it is unlikely that any one agility challenge or company is overly represented. The desired respondent would be a manager in an organization with both business and IT knowledge. This is required as there are questions that require both types of knowledge. However, we believe that limiting the respondents to managerial level IS or business actors will ensure sufficient knowledge. The researcher was able to make personal contact through e-mail, phone, or in person with many respondents to the survey.

4.2 Questionnaire Development

Scale development followed established procedures (Gray 2004; Netemeyer et al. 2003) and clear, concise, single barreled questions were the goal. Although existing questions were utilized whenever possible, some new items were utilized. Every effort was made to avoid the pitfalls of questions that were prejudicial, hypothetical, double barreled, assumptive, leading, imprecise, or knowledge based (Gray 2004). The review of the questions (described in detail below) by practitioners in a mini-pilot, by academics and practitioners in the sorting exercise, and by the

committee members was an attempt to ensure clear questions. Survey questions were developed based on the conceptual definitions shown previously in Table 6.

Content validity is the degree to which items in an instrument reflect the content universe to which the instrument will be generalized (Bagozzi 1979; Bagozzi 1982; Boudreau et al. 2001; Cook et al. 1979; Goodhue 1998). Content validity ensures that the measures correspond to theoretical constructs. Content validity was established by developing conceptual definitions developed based on literature reviews and the aforementioned interviews (Churchill 1979). To further elicit content validity, expert judges (industry and academics) were asked to classify the final items for face validity (Boudreau et al. 2001; Crano et al. 1973) as part of the mini-pilot.

A literature review was performed for existing measurement items of these constructs. When available and applicable, existing questions from previous instruments were utilized. Several items were developed specifically for this study. Table 7 summarizes the sources for existing measures where applicable. Appendix A contains the actual items that the items from which the items were drawn. The final survey questions are contained in the following sections and Appendix B.

Table 7: Sources of Measurement Items

Construct Items	Source
Relational Capital	(Brown et al. 1986; Chatman et al. 2001; Goodman et al. 1998; Robert et al. 2008; Simons et al. 2000)
Structural Capital	(Jansen et al. 2006; Jaworski et al. 1993; Preston 2004)
Cognitive Capital	(Cohen et al. 2006; Lederer et al. 1996; Preston 2004; Reich et al. 1996)
Equivocality	Inspired by (Daft et al. 1986; Neill et al. 2007; Simon 1965; Weick 1979)

Stakeholder Complexity	Inspired by (Goodhue 1995)
Systems Agility	(Chen 2004)
Difficulty of Technology	New
Routineness	(Goodhue 1995)
Environment	(Birkinshaw et al. 1998; Dill 1958; Jansen et al. 2006; Volberda et al. 1997)

We refined the measures in two stages. First, following Moore (1988) a sorting exercise was carried out where practitioners and academics were asked to classify the measures into the appropriate construct. The instructions were contained in the document. Appendix C contains the "answer" version of the sorting document filled out for this exercise. The results of this exercise were then reviewed and revisions to the questions were made. Appendix D contains the original questions and how they were modified after the sorting exercise. Each question that received a score of 70% correct or less was reviewed. In the review, we looked at the misclassifications to determine if there was one particular construct with which it was being confused (Note Appendix D sometimes reflects more constructs that the item was confused with than the percentage would suggest. This is due to some respondents putting more than one answer.). The construct's average percentage correct was also reviewed (Table 8).

Table 8: Average Percentage of Correct Sorting

Construct	%Correct	Notes
Consulting Capital	100.0	
Difficult	75.0	
Enviroment	85.0	One question accounts (suppliers, clients, regulators) for 7/9 erroneous classification
Equivocality	88.0	Two of five questions account for all the problems
General Cognitive Capital	86.7	
General Relational Capital	80.0	One question (sharing of information) accounts for all but one incorrect classification
General Structural Capital	90.0	
Stakeholder Complexity	100.0	
Routine	96.7	
Specific Cognitive Capital	80.0	

Specific Relational Capital	77.5	One question (sharing of information) accounts for 6/8 incorrect classifications
Specific Structural Capital	85.0	
Systems Agility	96.0	

In the second stage, three prototypes (one each for IS, business, or consultants) of the survey with randomized questions were developed and administered in person or over the phone to 10 practitioners in a mini-pilot exercise. The practitioners involved in completing the prototype questionnaire were of various backgrounds (3 business respondents, 4 consultant respondents, 3 IS respondents) to ensure each version of the survey was reviewed. As the practitioner had questions about the items on the survey, he/she was able to easily question the researcher. In this way, the researcher found problems in the instrument before presenting it to a larger audience. Based on their feedback, the measures were refined, an estimate of 15 minutes to complete the survey was deemed to be accurate, and the front page of the survey was significantly altered. The respondents said that after thinking of the "agility challenge" the survey went rather quickly, but several respondents noted (and we witnessed) that it could take as long as 5-10 minutes to think of an agility challenge before starting the survey. So, we added an explanation of agility challenges to the website and the survey hoping to save respondents time. Upon review of the sorting exercise results and the mini-pilot each committee member reviewed these measures and a final version of the survey was created. Appendix B shows the final version of the questions sorted by construct, including all changes. Where applicable, variations for business or consultant respondents are indicated.

The survey was administered via paper and via the web at ashleyrdavis.com. The on-line survey was designed so that the respondent had to answer every question except the "number of years

with the company" and consultant involvement questions that were not applicable to the respondent. Thus, if a respondent made it to the end of the survey, the survey was complete. Practitioners were recruited from Manhattan Associates, America's SAP User Group (ASUG). SAPPHHIRE conference, Project Management Institute meetings, and from practitioners the researcher knows through personal relationships. The questions were randomized in the final version of the survey. An example of the final randomized questions is included in Appendix E.

4.3 Operationalization of Variables

This section outlines how each of the constructs in the research model was operationalized. Table 8 shows the sources of the items. The operationalizations are presented in the order that they appear in table 8. For lists of the items that the items were based on, please see Appendix A.

4.3.1 Relational Capital

Relational capital was defined in Section 3 to contain the assets that comprise the relationships or expectations and obligations of the relationship. These assets include trust, norms, obligations and expectations, and identification. Table 10 contains the actual items used in the survey.

Table 9: Final Items for Relational Capital Measure

Item	Item Wording
Rel_C	The IS people and the business people involved in the selected agility challenge got along well together.
Rel_B	There was an atmosphere of trust between the business and IS people involved in the selected agility challenge.
Rel_A	For the selected agility challenge, both the business and IS people involved could be counted on to do their part.
Rel	There was a norm of collaboration between the IS people and the business people involved in the selected agility challenge.

4.3.2 Cognitive Capital

In chapter 3, cognitive capital was defined in terms of the existence of shared vision or language between the IS group and the business groups subject to social exchange. Three questions (Cog_E, Cog_D, Cog_A) that are meant to cover the shared language part of cognitive capital (CogCapLA) are included. The other three questions (Cog_C, Cog_B, Cog) are intended to cover the shared vision part of cognitive capital (CogCapSV).

Table 10: Final Items for Cognitive Capital Measure

Item	Language or Vision	Item Wording
Cog_E	Language	When business people came to IS with the selected agility challenge, both were able to use a common vocabulary for communication the issues.
Cog_D	Language	The language used by business people when describing the agility challenge was easily understood by the IS people
Cog_C	Vision	In the context of this agility challenge, business and IS people saw the priorities in the same way.
Cog_B	Vision	In the context of this agility challenge, business and IS people shared a common vision for the role of IS.
Cog_A	Language	The IS and business people used common terms for describing the selected agility challenge.
Cog	Vision	In the context of this agility challenge, business and IS people agreed on the key IS management issues affecting the challenge.

4.3.3 Equivocality

In chapter 3 equivocal challenges were defined to have uncertainty or ambiguity in the origin/nature of the challenge, determining which criteria is best for choosing a solution, in choosing a solution of multiple options. After reviewing several existing measures of equivocality (Chang et al. 2006a; Koufteros et al. 2005; Neill et al. 2007) and determining that most existing items would confound other constructs in our model, we operationalized equivocality. Utilizing Simon's (Simon 1965) model of problem solving, we narrowed our focus to operationalizing equivocality in problem solving. The questions account for equivocality in

intelligence, design and choice. Intelligence refers to the problem solver trying to formally define the problem (Simon 1965). Our interpretation of this was that equivocality existed if the problem solver was not clear about the nature of the problem. Two questions were devoted to intelligence: Equiv_A and Equiv. Design refers to activities related to the formation and analysis of alternative (Simon 1965). Equiv_C accounts for design equivocality where the problem solver is not clear which is the best criteria for choosing a solution. Finally, choice refers to evaluating multiple solutions (Simon 1965). Equiv_D and Equiv_B refer to the lack of clarity around choosing which solution is best.

Table 11: Final Items for Equivocality Measure

Item	Simon	Item Wording
Equiv_D	Choice	When this selected challenge was presented to the IS group, it was not clear which solution was best overall.
Equiv_C	Design	The IS group had a clear understanding of how to get to the solution when first presented with this selected agility challenge.
Equiv_B	Choice	When the IS group was presented with the selected agility challenge, the criteria for choosing the solution was not clear.
Equiv_A	Intelligence	When first presented with this challenge, clarifying the true needs and possible solutions required a lot of interaction between the business and IS people. *this question was subsequently dropped
Equiv	Intelligence	It was not immediately clear how to define the selected agility challenge when the IS group was first presented with it.

4.3.4 Structural Capital

In chapter 3 structural capital was defined as network ties, network configuration and/or appropriable organization in terms of informal and formal ties. Structural Capital was operationalized as consisting of two parts, informal structural capital and formal structural capital. Whereas formal structural capital exists in the links between IS and the business that are created when meetings, conference calls or other planned events are structured to facilitate exchange of ideas; informal structural capital exists in more social links between IS and the

business. Informal social capital exists in social exchanges, like "hall-talk" or non-work related phone calls. The "Connectedness" items (Jansen et al. 2006; Jaworski et al. 1993) were slightly modified to account for the IS to business relationship. As well, "structural systems of knowing" scales (Preston 2004) provided inspiration for these items.

Table 12: Final Items for Structural Capital Measure

Item	Formal or Informal Structural Capital	Item Wording
StrucF_B	Formal	People in the business department interacted a lot with people in the IS department on a formal basis while resolving this selected agility challenge (e.g. official meetings, work-related phone calls, etc.)
StrucF_A	Formal	IS people attended many regular meetings and/or conference calls with business people working on this selected agility challenge.
StrucF	Formal	The IS and business people regularly attended conference calls or meetings together to discuss the selected agility challenge.
StrucI_B	Informal	There was a good amount of interaction on an informal basis (e.g. chatting about non-work related issues, joking, non-work related phone conversations, etc.) between the business and IS people involved in this selected agility challenge.
StrucI_A	Informal	The business people involved in this selected agility challenge were quite accessible (on an informal basis) to the IS people.
StrucI	Informal	There was a good amount of informal "hall talk" among business and IS people involved with this selected agility challenge.

4.3.5 Stakeholder Complexity

Stakeholder complexity was defined as the number of people representing different perspectives in the organization that was affected by the agility challenge. The measure for stakeholder complexity is in table 13.

Table 13: Final Items for Stakeholder Complexity Measure

Item	Item Wording
Stake_B	A lot of different stakeholders had to interact to develop a good solution to this selected agility challenge.
Stake_A	This selected agility challenge affected many stakeholders in the organization.
Stake	The selected agility challenge necessitated the input of many stakeholders.

4.3.6 Systems Agility

Systems agility is the organizational ability to successfully and swiftly change its information systems in response to agility challenges. New items were added to the items from Chen (2004).

Table 14: Final Items for Systems Agility Measure

Item	Item Wording
SyAgil_D	For this selected agility challenge the IS group made the needed changes in adequate time.
SyAgil_C	We met the business requirements by changing the information systems in the time frame required.
SyAgil_B	We were successful in changing the information systems rapidly enough to meet the business challenge in response to the selected agility challenge.
SyAgil_A	The effort to meet the business challenge was not derailed by difficulties in changing the information systems rapidly enough.
SyAgil	We successfully made the needed changes to our information systems to respond to the selected agility challenge in a timely manner.

4.3.7 Control Variables

The organization size and industry was included in hopes of ensuring that these do not bias our sample. Further we captured the size of the IS group. The role of the respondent was captured to ensure the respondent was the desired type (manager involved in IS issues) or closely related. Whether the challenge involved an ERP system was captured to ensure there was no bias as to the type of challenges we received. We added “Experience with the challenge” or “Routine” as a control to capture cases where it might be found that an equivocal challenge was not difficult due

to the routineness of the challenge. Environmental turbulence was included as a control since dynamic capabilities are many times defined in response to environmental change, and the effect of turbulence on dynamic capabilities is of interest. We tried to capture the extent of consultant involvement to ensure that consultant involvement does not confound our constructs. Difficulty with the application infrastructure will be included as control variables. Lastly, we asked how the challenge was resolved in an open ended question. Difficulty, Routine, and Environment were measured with Likert type scales and are explained in the following sections. The rest of the control questions can be found in Appendix F.

4.3.7.1 Difficulty (Technical)

Technical Difficulty is defined as the difficulty in a problem that is specifically accounted for by the technology. Technology can frequently help in solving a problem; likewise, technology can also hinder the resolution of a problem. Depending on the technology, different options for resolving a problem might be available. The following questions get at the role that technology plays if creating difficulty.

Table 15: Final Items for Difficulty of Technology Measure

Item	Item Wording
Dif_C	Technical constraints limited our options for implementing a solution to this selected agility challenge.
Dif_B	Our existing systems limited our ability to implement a solution to the selected agility challenge.
Dif_A	Our existing systems hindered the implementation of the solution to the selected agility challenge.
Dif	Our existing systems made it difficult to implement the solution to the selected agility challenge.

4.3.7.2 Routine

If an organization has prior experience with a problem, it would be considered routine. Consider an acquisition as an agility challenge. For some companies, it is quite routine to acquire other companies and integrate their systems. For other companies, the acquisition being described may be the first in the history of the company. Three questions were utilized to capture the construct.

Table 16: Final Items for Routine Measure

Item	Item Wording
Rout_B	When originally presented with the selected agility challenge, we had previous experience with this type of challenge.
Rout_A	When originally presented with the selected agility challenge, we had faced this type of challenge in the past.
Rout	When originally presented with the selected agility challenge, this was a familiar challenge for us.

4.3.7.3 Environment

Environment was included as a control. Environment was operationalized in terms of two dimensions: environmental turbulence and environmental competitiveness. Environmental turbulence captures how quickly the environment is changing. Questions Env_B, Env_A, and Env represent environmental turbulence. Environmental competitiveness captures the extent to which an organization has a competitive environment. Questions EnvCo_B, EnvCo-A, and EnvCo capture environmental competitiveness.

Table 17: Final Items for Environment Measure

Item	Item Wording
Env_B	In the last year, there have not been a lot of significant changes in our business environment.
Env_A	There are frequent changes needed by our suppliers, clients or regulators in our business market.
Env	In our business market, changes are taking place continuously.
EnvCo_B	Competition in our business market is intense.
EnvCo_A	Our business market is very competitive.
EnvCo	Our organization has relatively strong competitors.

5.0 Analysis and Results

Section 5 details the steps taken to complete the analysis of the data and presents the results of the analysis.

5.1 Population, Sample Frame, Respondents

Our intent was to get a variety of industries and sizes of corporations involved in the study. Therefore, we targeted professional meetings and personal contacts for soliciting responses to the survey. We attended nine events where we knew our target population would be present. In total, we handed out 84 cards at these events hoping for participation in the survey. Each person who reciprocated by giving us a card was e-mailed within the next week asking for participation in the survey. We sent (or had colleagues forward) generic e-mails to 630 people. One follow-up e-mail was sent to these 630 people. As well, we posted on four group sites on LinkedIn.com. However, we kept all the LinkedIn.com responses separate by tracking those through a separate set of surveys at agilitychallenge.com. Eight surveys resulted from our postings on LinkedIn.com. In total, we received 131 complete surveys. Utilizing a traditional approach, we looked at how many people we contacted versus the number of people that responded. We contacted 724 people (630 e-mails + 84 by card at events) and received 131 complete surveys. This would give a response rate of about 18%.

These 131 surveys represent IS, business, and consultant respondents. Table 11 includes the descriptive statistics for the respondents. There were 3 respondents that did not put the number of years with the company. As this information was only used for describing the sample, we included those responses and noted this in computing the “average number of years” with the employer. We received 66 complete surveys from business respondents, 42 complete surveys from IS respondents, and 23 complete surveys from consultants for a total of 131 surveys.

Table 18: Profile of the Respondents

Demographic Variable	Category	Frequency (n=131)	Percent
Title in the Organization:	CEO	5	4
	Director	21	16
	Sr. Manager	13	10
	Manager	43	33
	Project Manager	20	15
	Analyst	25	19
	Programmer	3	2
	Data Base Administrator	1	1
Role in the challenge:	Business Person	56	43
	Business Person - Liason	10	8
	IS Person	28	21
	IS Person - Liason	14	11
	Consultant - IS	6	5
	Consultant - Liason	13	10
	Consultant Business Person	4	3
Number of Years with Employer*	1-2	32	24
	3-5	43	33
	6-10	26	20
	11-15	16	12
	16-41	11	8

*3 people did not answer this question

Of the 23 surveys received from consultants 4 classified their role as a "business" role, while 6 classified their role as "IS". Thirty-seven of our total respondents classified their role as a "liason" role. It would seem that a disproportionate amount of the IS respondents identified themselves as liaisons, however, given the changing role of the IS professional this is quite reasonable. Given that about half of the respondents identified themselves as business respondents, we are satisfied that the sample is representative of both the IS and business perspective on this topic. Roughly 78% of the sample identified themselves at the manager level or above. Upon further examination of those that identified themselves as analyst, 17 had more

than 3 years of experience with the company. Interpreting the years of experience by itself is misleading, as the question has to do with the number of years with the company – not the number of years of total experience.

The sample also represents a diverse sampling of industries as is shown in table 19. Roughly 11% of the sample were in very small companies with 100 employees or less; while about 65% of the sample is in medium to large companies with more than 2000 employees.

Table 19: Profile of the Organization

Demographic Variable	Category	Frequency (n=131)	Percent
Industry	Communications - Telecom	7	5.3
	Construction	2	1.5
	Consumer Packaged Goods	7	5.3
	Defense Contractors	2	1.5
	Distribution - Retail	8	6.1
	Distribution - Wholesale	3	2.3
	Education	8	6.1
	Federal Government	12	9.2
	Financial Services - Other	6	4.6
	Financial Services - Depository Institutions	6	4.6
	Financial Services - Insurance	8	6.1
	Healthcare - Hopitals/Healthcare Providers	4	3.1
	Information Technology	11	8.4
	Logistics	7	5.3
	Manufacturing - Discrete	9	6.9
	Manufacturing - Process	5	3.8
	Media	2	1.5
	Pharmaceuticals	1	.8
		1	.8
	Services - Professional	4	3.1
	State and Local Government	3	2.3
	transportation	3	2.3
	Utilities	1	.8
	Other	11	8.4
Number of Employees in the organization:	1-100	15	11.5
	101-500	18	13.7

	501-1,000	4	3.1
	1,001-2,000	9	6.9
	2,001 - 10,000	35	26.7
	10,000+	50	38.2
Number of Business People in the business unit involved in the challenge:	1-100	72	55.0
	101-500	25	19.1
	501-1,000	6	4.6
	1,001-2,000	4	3.1
	2,001 - 10,000	13	9.9
	10,000+	11	8.4
Number of IS people involved in the unit involved in the challenge:	1-100	70	53.4
	101-500	23	17.6
	501-1,000	12	9.2
	1,001-2,000	3	2.3
	2,001 - 10,000	13	9.9
	10,000+	10	7.6

In terms of the agility challenges, we received a nice assortment of challenges, with those where ERP was important (65), versus those where ERP was not involved at all (41) or not very important (25) pretty evenly split. So, 49.6% of the challenges involved ERP in an important way, while 50.4% of the challenges did not involve ERP at all or involved ERP in a minor way.

5.2 Measurement Validity

This section reports the assessment of the psychometric properties reliability and discriminant validity of each scale. These properties were assessed by reviewing Cronbach's alpha, the correlation matrix of the items, the correlation matrix of the constructs, chi-square difference tests, and the factor loadings in a confirmatory factor analysis. Each of these analyses is described in detail in the following section.

5.2.1 Reliability

Reliability of multiple item measures is usually estimated by Cronbach's alpha (Cronbach 1951). Analysis of Cronbach's alpha for all of the constructs uncovered acceptable reliabilities for all

but equivocality. Assessment of the correlation matrix of the Equivocality items uncovered that one question was not correlated with the others at all: Equiv_A. This question was not highly correlated with any other items in the survey, so we dropped that item from the analysis. As shown in table 20, all but one measure satisfied requirements for reliability. Although this is not as high as is generally acceptable, Equivocality is a historically difficult construct to measure and the items were not cross-loading highly with other constructs. This is evidenced by studies that end up combining equivocality with some other construct in their analysis (Dennis et al. 1998; Dennis et al. 1999; Kahai et al. 2003). In this dissertation, equivocality's reliability is above the generally recommended value of .60 for a new scale (Nunnally 1998; Nunnally and Bernstein 1994). Items were dropped in the case of Informal Structural Capital and Equivocality. The Cronbach alphas reported for these constructs are calculated after dropping questions.

Table 20: Cronbach's Alpha Scores for Constructs

Construct	Number of Items	Cronbach's Alpha
Relational Capital (RelCap)	4	.847
Formal Structural Capital (FormalSt)	3	.848
Informal Structural Capital (InformSt)*	2	.853
Cognitive Capital Language (CogCapLa)	3	.825
Stakeholder Complexity (StakeCom)	3	.767
Equivocality (Equivica)**	4	.679
Routine	3	.881
Environment	6	.939
Difficulty	4	.773

*In section 5.2.2.1 there is discussion about why we dropped StrucI_A. The Cronbach's alpha prior to dropping strucI_A was acceptable at .749, and improved after dropping StrucI_A.
**Cronbach's alpha was calculated after dropping Equiv_A

5.2.2 Discriminant Validity

The correlation matrix for the latent variables was analyzed. Correlations of more than about .8 (Bagozzi et al. 1991, Teo et al. 2003) would be evidence of discriminant validity problems. The

correlation of Cognitive Capital (Vision) with Relational capital (.865) is greater than that (Table 21).

Table 21: Estimated Correlation Matrix for Latent Variables

	RELCAP	STAKECOM	FORMALST	INFORMST	COGCAPLA	COGCAP	AGILITY
RELCAP	1						
STAKECOM	0.113	1					
FORMALST	0.587	0.401	1				
INFORMST	0.395	0.359	0.442	1			
COGCAPLA	0.49	0.028	0.298	0.317	1		
COGCAP	0.865	-0.031	0.473	0.406	0.605	1	
AGILITY	0.503	-0.133	0.222	0.278	0.356	0.568	1
EQUIVICA	-0.259	0.154	-0.11	0.001	-0.165	-0.252	-0.285

Given this issue with cognitive capital as shared vision, we dropped it from the analysis and used the one dimension of cognitive capital as shared language to represent cognitive capital. We chose to drop cognitive capital as shared vision since previous research indicates that perhaps the most important aspect of social capital in valuable outcomes is relational capital (Tsai et al. 1998). Further, we had a second measure of cognitive capital to use for the analysis, cognitive capital measured as shared language. In total, we dropped 4 questions from our analysis.

Table 22: Items Dropped from Further Analysis

Item	Item Wording
Cog_C	In the context of this agility challenge, business and IS people saw the priorities in the same way.
Cog_B	In the context of this agility challenge, business and IS people shared a common vision for the role of IS.
Cog	In the context of this agility challenge, business and IS people agreed on the key IS management issues affecting the challenge.
Equiv_A	When first presented with this challenge, clarifying the true needs and possible solutions required a lot of interaction between the business and IS people.

A much stronger test of discriminant validity is the chi-square difference test, where the constructs are tested in pairs. This test produced the following results (Table 23). This is strong

evidence that each of the constructs captures something different from all the other constructs, i.e. there is good discriminant validity. We also found that Cognitive Capital (Vision) was significantly different from Cognitive Capital (Language). Likewise, we found that Formal Structural Capital was different from Informal Structural Capital. Although we had thought that these dimensions would be significantly the same, our analysis uncovered that they were significantly different and should be treated separately for the rest of the analysis.

Table 23: Chi-Square Difference Analysis without Cognitive Capital (Vision)

Spec - One Factor	RelCap	Stake	FormalSt	InformSt	CogCapla	Agility	Equivica	Difficulty	Routine	Env
RelCap	1	112.447	106.586	182.933	6.707	154.278	63.113	154.476	213.131	404.332
Stake		1	89.338	99.388	143.388	111.233	69.634	90.384	213.003	400.336
FormalSt			1	150.334	129.027	169.603	74.987	155.76	211.936	391.097
InformSt				1	129.169	379.116	74.511	152.116	212.864	399.263
CogCapla					1	124.613	73.148	157.964	209.67	404.856
Agility						1	59.434	144.194	405.97	407.529
Equivca							1	64.951	67.808	74.205
Dif								1	158.537	398.826
Rout									1	391.684
Env										1

X(1,.05) = 3.841

5.2.2.1 Confirmatory Factor Analysis*

Because the constructs had acceptable reliability as modeled, there was reluctance to choose to exclude items solely because of poor loading. However, items Equiv (shown in Table 25) and StrucI_A (not shown in Table 25) had very low loadings at .449 and .40 respectively. In the case of Equiv, it would seem that perhaps our measure is a good measure of “Design” and “Choice” as defined by Simon (1965). Since we had already dropped the other “Intelligence” question it makes sense that the other question would be dropped, especially given the poor fit. In the case of StrucI_A, we determined that StrucI_A did not provide examples of what “on an informal

basis" meant, and therefore could be confusing to respondents. Thus we did drop both items (Table 24, see Tables 11 and 12 contain complete items). The results are presented for dropping StrucI_A first, and then dropping Equiv.

Table 24: Other Items Dropped from Further Analysis

Item	Item Wording
Equiv	It was not immediately clear how to define the selected agility challenge when the IS group was first presented with it.
StrucI_A	The business people involved in this selected agility challenge were quite accessible (on an informal basis) to the IS people.

We also found that possibly due to skewness (Table 28) or small sample size, we calculated a small negative residual (-.093) for StrucI in the confirmatory factor model without StrucI_A. In the factor model including the 3 informal structural capital questions, StrucI has a .992 loading and a residual of .016. It has been noted that when utilizing Mplus with a relatively small sample size or skewed data, negative residuals are possible (Muthen). The recommended solution if the negative residual was close to 0, is to specify 0 for the residual. Given that the residual was close to 0 (.016) prior to dropping the question, and is only slightly negative (-.093) after dropping the question, we felt that specifying a 0 residual was appropriate.

Fit is evaluated using CFI, TLI, and RMSEA. CFI and TLI should exceed .90 and RMSEA should be between 0.05 and 0.08 to demonstrate good fit (Bentler 1990; Teo et al. 2003). The TLI should be greater than .90 and the SRMR should be less than .08. The fit statistics were acceptable at: CFI=.92, TLI=.91, RMSEA=.06, SRMR .07.

Table 25: Results of Confirmatory Factor Analysis After Removal of Cognitive Capital Construct and StrucI_A

Item	Factor						
	RelCap	Stakecom	FormalSt	InformSt	CogCapLa	Agility	Equivica
REL_C	0.711						
REL_B	0.757						
REL_A	0.835						
REL	0.748						
STAKE_A		0.557					
STAKE_B		0.659					
STAKE		0.946					
STRUCF_B			0.760				
STRUCF_A			0.762				
STRUCF			0.921				
STRUCI_B				0.746			
STRUCI				1.0			
COG_E					0.805		
COG_D					0.769		
COG_A					0.771		
SYAGIL_D						0.704	
SYAGIL_C						0.854	
SYAGIL_B						0.889	
SYAGIL						0.901	
SYAGIL_A						0.613	
EQUIV_D							0.552
EQUIV_CR							0.688
EQUIV_B							0.650
EQUIV							0.449

*Because of small sample size, the Mplus run would not finish without warnings. Therefore, the measurement model was run without controls. Controls were run separately. The controls were modeled as averages in the SEM for this reason. This is consistent with suggestions by Bagozzi et al. (1998).

Convergent validity is the degree to which measuring the same construct through different methods (i.e. survey vs. interview) is in agreement. This paper does not use two distinctly different methods, so if there is agreement among measures of the same construct, the amount of shared variation for measures of the same construct should indicate the degree of convergent

validity. If all the factor loadings of the construct are statistically significant, convergent validity has been achieved (Bagozzi 1991). The significance of the factor loadings provides support for convergent validity.

5.2.2.2 Confirmatory Factor Analysis with Common Method Variance Factor

The confirmatory factor analysis was also run with a factor for common method variance to compute the amount of method bias present in the results. Following Williams, Cote, and Buckley (1998) four models were run to assess the amount of common method variance present. Model 1 is a null model with no factors and in which the variance in the measures is explained only by random error. Model 2 adds the correlated trait factors to the null model. Model 3 includes the correlated method factor, no trait factors are present. Model 4 includes both the trait and method factors, but the method factor is not correlated with the trait factor. Model 5 is Model 4 with the method factor correlated with the trait factors. This section describes the analysis following the Williams et al (1998) suggestions.

Utilizing the process described by Williams et al (1998) if methods bias exists, the methods model (Model 3) should explain significantly more variance than the null model (Model 1); and the trait and uncorrelated methods model (Model 4) should explain significantly more variance than the trait model (Model 2). In addition Williams et al (1998) specifies that the correlated methods model (Model 5) should have significantly better fit than the uncorrelated methods model (Model 4). In this analysis, we chose to use only one common method factor, thus the fifth model, where the methods factors are allowed to correlate was not needed.

Table 26: Chi-Square Difference Tests for Model Comparison

	NFI	df	Chi
Model 1*	0	276	1765.917
Model 3*	.59	252	1133.151
Model 2*	.96	232	349.140
Model 4*	.98	208	262.940

*Chi-square for df=24, p<.05 = 36.42, for model comparisons

The Chi-Square difference test in comparisons of Model 1/Model 3 and the comparison Model 2/Model 4 are significant at the .05 level. Analyzing the results of comparison of these models gives reason to calculate the percentage of variance explained by the methods factor. Williams et al. (1998) suggest utilizing Model 4 or Model 5 for analyzing the percentage of variance explained by the methods factor. As Model 5 was not run, Model 4 was utilized for this analysis The following formula gives the proportion of variance that is captured by the common method bias (Fornell et al. 1981).

$$\frac{\sum_{i=1}^{p} \lambda_{cmbi}^2}{\sum_{i=1}^{p} \lambda_{yi}^2 + \sum_{i=1}^{p} \lambda_{cmbi}^2 + \sum_{i=1}^{p} Var(\varepsilon_i)}$$

Where λ_{yi} is the ith item loading on construct y, ε_i is measurement error for the ith item, and λ_{cmbi} is the ith item loading on the common method bias factor. Utilizing the above equation, the common method factor was accounting for 18.0% of the variance when calculated with raw factor scores or 9.2% of the variance when calculated using the standardized factor scores. This falls below the recommended level of 25% common method bias (Williams et al. 1998).

5.3 Regression and Structured Equation Model Results

The following section outlines the detailed results of our regression and SEM tests for the research model. Three different models with 2 variations (one without StrucI_A and one without StrucI_A or Equiv) of each model were tested and are reported. The first model tested and reported is the original hypothesized model, with controls tested as paths to systems agility. The second model tested and reported is an exploratory model where the paths of two of the controls (Routine and Technical Difficulty) are changed to be directed at Equivocality. The third model tested and reported is an exploratory model where the paths of two of the controls (Routine and Technical Difficulty are changed to be directed at Equivocality and Systems Agility. The significance of the results for the main effects hypothesized models are reported utilizing a one-tailed p-test, as our hypotheses were in one direction and our results are consistently in the direction hypothesized. For the interaction effects, the results are reported utilizing a two-tailed p-test as the direction of the hypotheses is less certain. Figure 6 shows the complete original hypothesized research model.

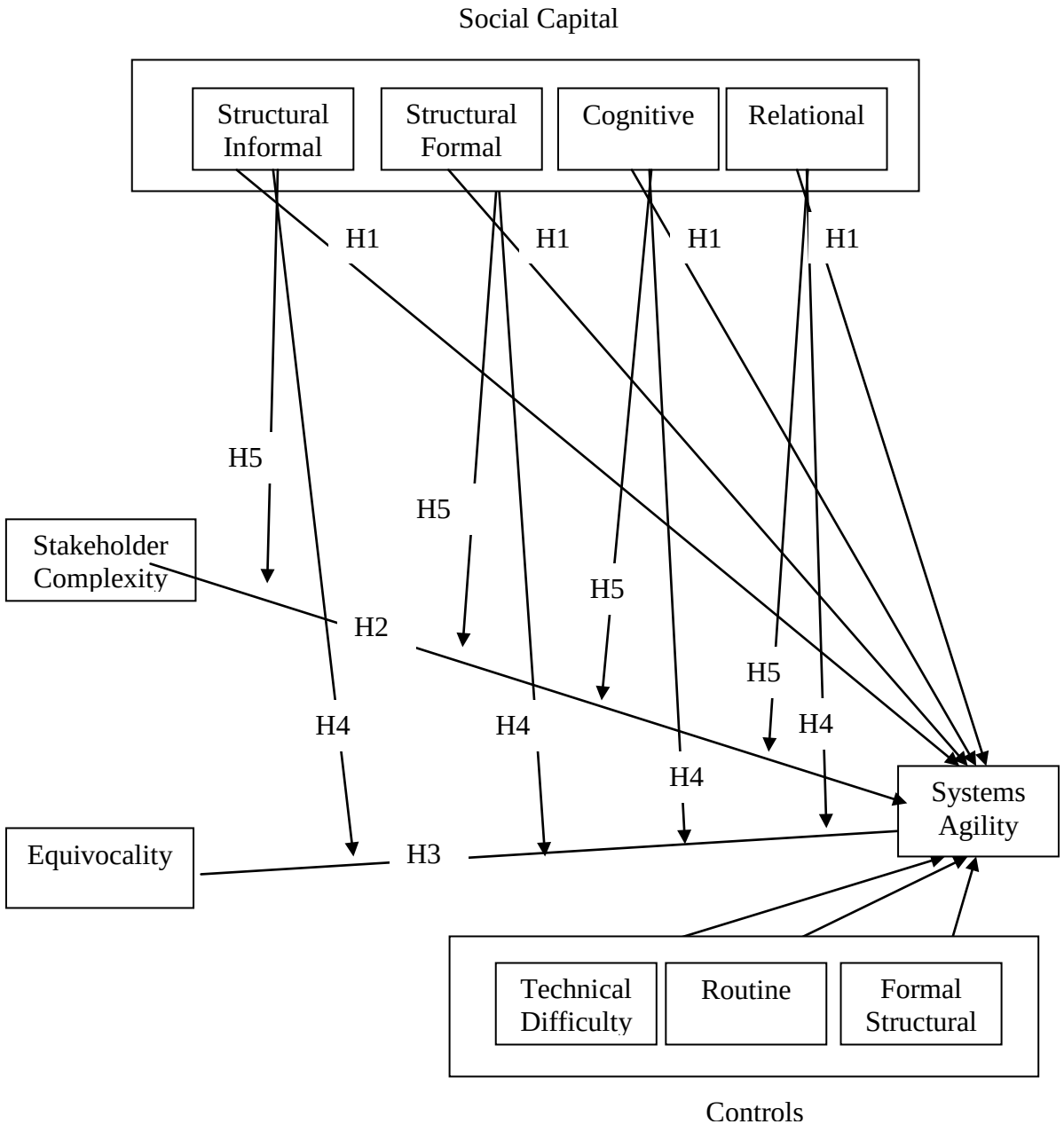


Figure 6: Complete Original Hypothesized Research Model

5.3.1 Original Hypothesized Main Effects Model

Due to the complexity of the hypothesized structural model, the structural model was run in two stages. In the first stage, the SEM was completed for the "Main Effects" model. The Maximum Likelihood (ML) estimator in Mplus was utilized for this run. This estimator assumed normality in the data. In this model no interaction terms are included. The results of the "main effects" model are shown in Table 27 and Figure 7.

Table 27: Original Model Main Effects (ML)

Model without StrucI_A Hypothesis	**Supported**	**Path Coefficient**
H1: Social Capital → Systems Agility	Partially Supported	
Structural Informal Capital → Systems Agility	Supported	.207*
Structural Formal Capital → Systems Agility	Not Supported	-.054
Cognitive Capital as Language → Systems Agility	Not Supported	.097
Relational Capital → Systems Agility	Supported	.381**
H2: Stakeholder Complexity → Systems Agility	Supported	-.179*
H3: Equivocality → Systems Agility	Not Supported	-.123
Control: Technical Difficulty → Systems Agility	Not Significant	-.114
Control: Environment → Systems Agility	Not Significant	.036
Control: Routine → Systems Agility	Not Significant	.001
Fit Statistics: CFI = .91, TLI = .89, RMSEA = .06, SRMR = .09		
Model without StrucI_A or Equiv Hypothesis	**Supported**	**Path Coefficient**
H1: Social Capital → Systems Agility	Partially Supported	
Structural Informal Capital → Systems Agility	Supported	.205*
Structural Formal Capital → Systems Agility	Not Supported	-.020
Cognitive Capital as Language → Systems Agility	Not Supported	.101
Relational Capital → Systems Agility	Supported	.324*
H2: Stakeholder Complexity → Systems Agility	Supported	-.168*
H3: Equivocality → Systems Agility	Supported	-.198*
Control: Technical Difficulty → Systems Agility	Not Significant	-.106
Control: Environment → Systems Agility	Not Significant	-.027
Control: Routine → Systems Agility	Not Significant	.027
Fit Statistics: CFI = .92, TLI = .90, RMSEA = .06, SRMR = .09		

Asterisks note significance: *.05, **.01

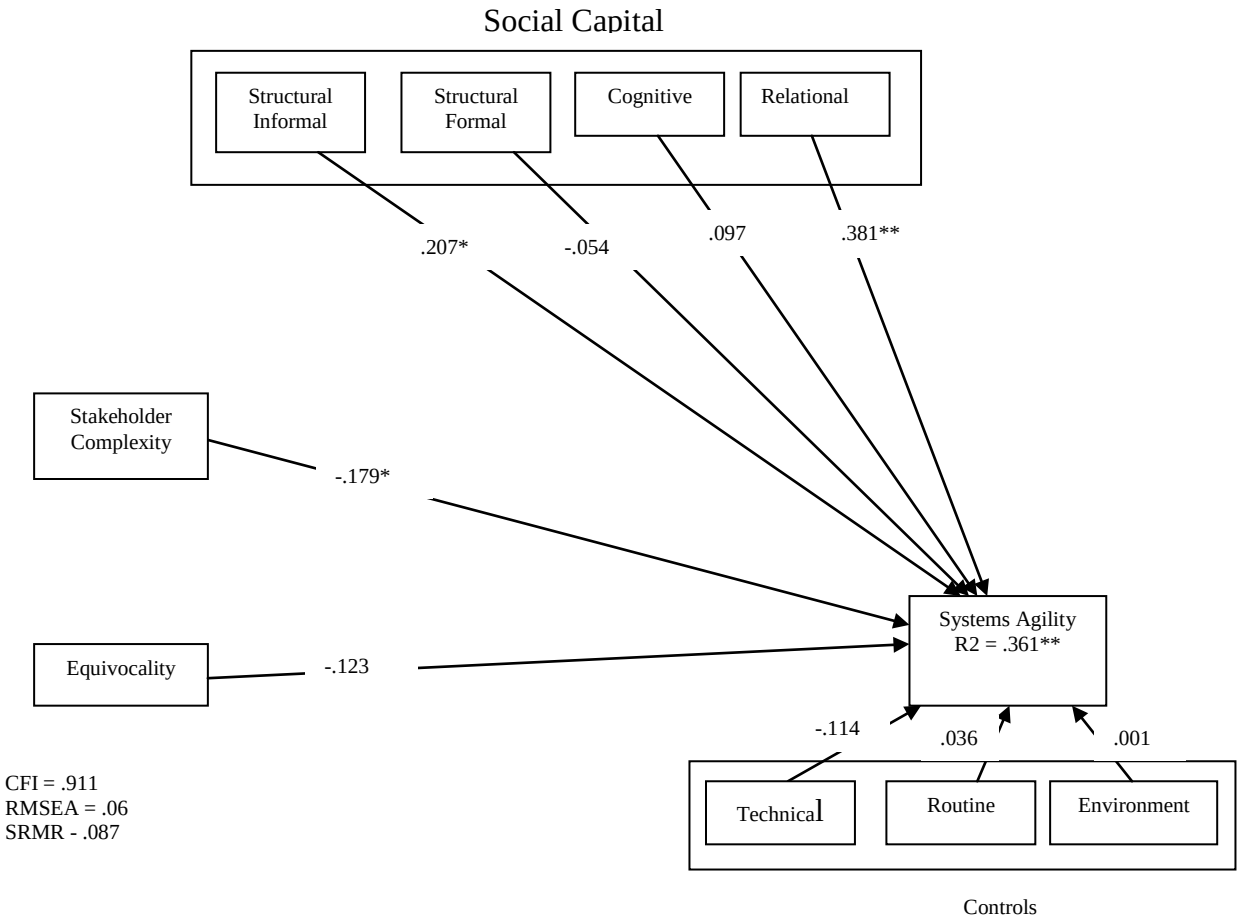


Figure 7: Original Model Main Effects without StrucI_A (ML)

Skewness and Kurtosis was tested for in the data set. The statistics generated by SPSS for our dataset follow.

Table 28: Skewness and Kurtosis Results

	N	Mean		Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Statistic	Std. Error	Statistic	Std. Error
Rel_C	131	3.51	.085	.972	-.620	.212	-.500	.420
Rel_B	131	3.21	.092	1.050	-.383	.212	-.668	.420
Rel_A	131	3.42	.089	1.015	-.608	.212	-.581	.420
Rel	131	3.37	.081	.931	-.816	.212	-.068	.420
Stake_B	131	3.98	.087	1.000	-.954	.212	.140	.420
Stake_A	131	4.16	.079	.910	-1.320	.212	1.818	.420
Stake	131	3.80	.089	1.018	-.789	.212	-.111	.420
StrucF_B	131	3.55	.099	1.138	-.633	.212	-.607	.420
StrucF_A	131	3.60	.099	1.128	-.702	.212	-.433	.420
StrucF	131	3.57	.088	1.008	-.934	.212	.314	.420
StrucI_B	131	3.06	.096	1.094	-.194	.212	-.816	.420
StrucI_A	131	3.59	.077	.876	-.761	.212	-.052	.420
StrucI	131	3.18	.090	1.034	-.360	.212	-.808	.420
Cog_E	131	3.09	.095	1.092	-.148	.212	-1.157	.420
Cog_D	131	3.15	.091	1.039	-.212	.212	-.919	.420
Cog_A	131	3.08	.091	1.038	-.170	.212	-1.077	.420
Cog_C	131	2.95	.098	1.125	.041	.212	-1.042	.420
Cog_B	131	3.30	.088	1.005	-.444	.212	-.634	.420
Cog	131	3.34	.081	.926	-.681	.212	-.079	.420
Rout_B	131	2.85	.104	1.186	-.120	.212	-1.360	.420
Rout_A	131	2.87	.106	1.211	-.037	.212	-1.136	.420
Rout	131	2.85	.100	1.147	.087	.212	-1.150	.420
Dif_C	131	3.38	.107	1.224	-.308	.212	-1.066	.420
Dif_B	131	3.44	.098	1.124	-.383	.212	-.857	.420
Dif_A	131	3.48	.098	1.126	-.478	.212	-.806	.420
Dif	131	3.46	.094	1.076	-.473	.212	-.902	.420
SyAgil_D	131	2.95	.098	1.125	-.091	.212	-1.068	.420
SyAgil_C	131	3.21	.105	1.196	-.313	.212	-1.059	.420
SyAgil_B	131	3.11	.104	1.187	-.253	.212	-1.063	.420
SyAgil_A	131	3.15	.087	.993	-.440	.212	-.961	.420
SyAgil	131	3.19	.105	1.203	-.402	.212	-1.072	.420
Equiv_D	131	3.50	.095	1.091	-.641	.212	-.462	.420
Equiv_CR	131	3.28	.093	1.062	-.314	.212	-.735	.420
Equiv_B	131	3.33	.086	.980	-.354	.212	-.725	.420
Equiv	131	3.27	.087	1.000	-.250	.212	-1.080	.420
EnvCo_B	131	4.11	.090	1.032	-1.240	.212	.940	.420
EnvCo_A	131	4.18	.089	1.019	-1.291	.212	.941	.420
EnvCo	131	4.08	.088	1.005		.212	1.178	.420

As skewness and kurtosis does exist in this dataset, the "Main Effects" model was re-run utilizing the MLM estimator in MPlus. This "…maximum likelihood parameter estimates with standard errors and a mean-adjusted chi-square test statistic that are robust to non-normality. The MLM chi-square test statistic is also referred to as the Satorra-Bentler chi-square. P484" This estimator cannot be used with interaction effects. Therefore interaction effects were not tested using the MLM estimator. As can be seen from comparison of the main effects models (Table 27 and Table 29) the significance of the paths increases when utilizing the MLM estimator, but the same significant paths come through in the analysis. The main improvement in the model comes when we remove Equiv (and StrucI_A). In the main effects models without Equiv or StrucI_A, run in ML and MLM, equivocality comes through as a significant path.

Table 29: Original Model Corrected for Skewness and Kurtosis (MLM)

Model without StrucI_A Hypothesis	**Supported**	**Path Coefficients**
H1: Social Capital → Systems Agility	Partially Supported	
Structural Informal Capital → Systems Agility	Supported	.207**
Structural Formal Capital → Systems Agility	Not Supported	-.054
Cognitive Capital as Language → Systems Agility	Not Supported	.097
Relational Capital → Systems Agility	Supported	.381**
H2: Stakeholder Complexity → Systems Agility	Supported	-.179*
H3: Equivocality → Systems Agility	Not Supported	-.123
Control: Technical Difficulty → Systems Agility	Not Significant	-.114
Control: Environment → Systems Agility	Not Significant	.036
Control: Routine → Systems Agility	Not Significant	.001
Fit Statistics: CFI = .91, TLI = .90, RMSEA = .06, SRMR = .07		
Model without StrucI_A or Equiv Hypothesis	**Supported**	**Path Coefficients**
H1: Social Capital → Systems Agility	Partially Supported	
Structural Informal Capital → Systems Agility	Supported	.205**
Structural Formal Capital → Systems Agility	Not Supported	-.020
Cognitive Capital as Language → Systems Agility	Not Supported	.101
Relational Capital → Systems Agility	Supported	.324**
H2: Stakeholder Complexity → Systems Agility	Supported	-.168*

H3: Equivocality ⟶ Systems Agility	Supported	-.198*
Control: Technical Difficulty ⟶ Systems Agility	Not Significant	-.106
Control: Environment ⟶ Systems Agility	Not Significant	-.027
Control: Routine ⟶ Systems Agility	Not Significant	.027
Fit Statistics: CFI = .92, TLI = .90, RMSEA = .06, SRMR = .07		

Asterisks note significance: *.05, **.01

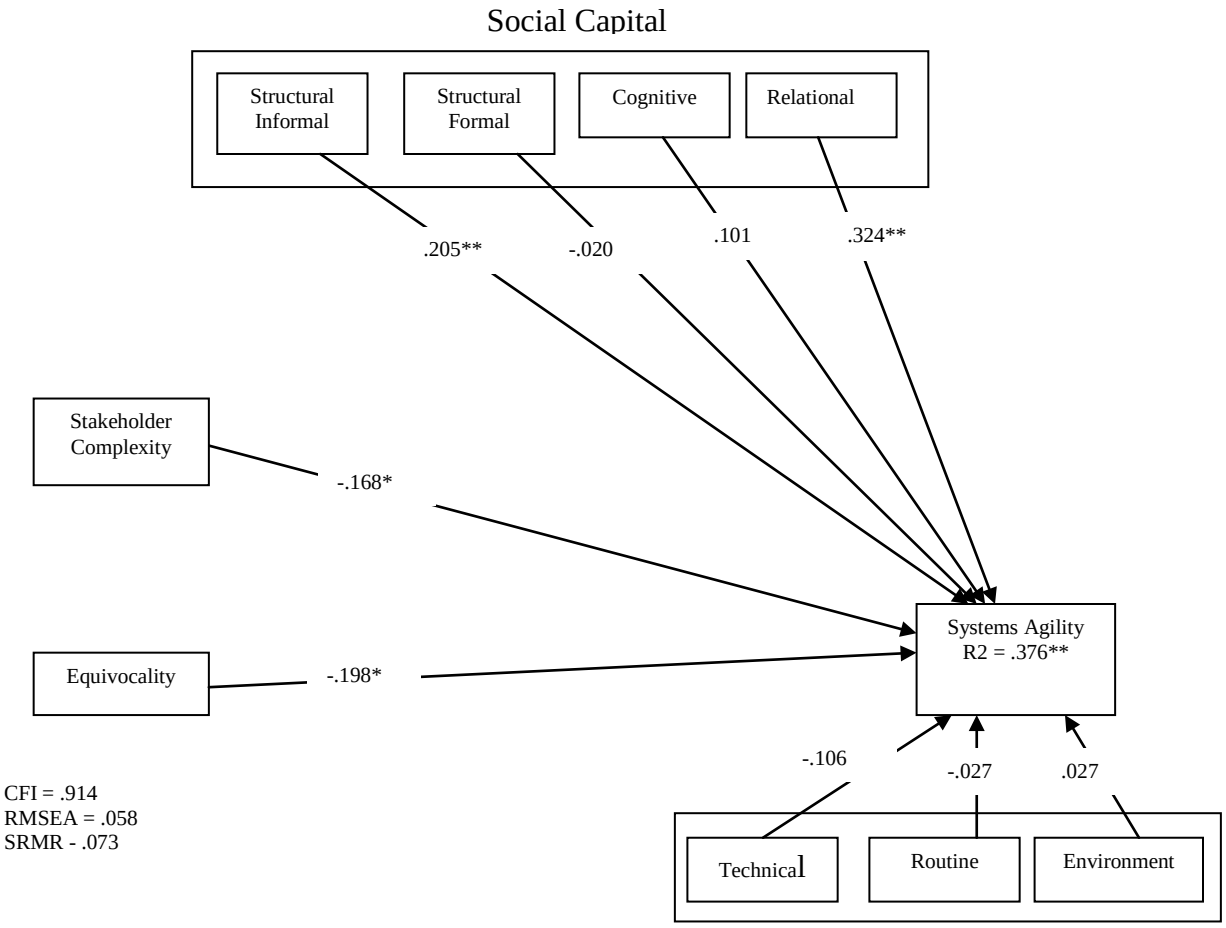


Figure 8: Best Main Effects Model - Original Model Corrected for Skewness and Kurtosis without StrucI_A or Equiv (MLM)

5.3.2 Original Hypothesized Interaction Effects Tests

Since Mplus limited the number of interactions that could be tested simultaneously, the interactions were tested in regression as well as in SEM. The regressions were run individually and stepwise until all of the interactions were in the model. Table 30 displays the full results of the regression run for the model without StrucI_A.

Table 30 – Original Model without StrucI_A Regression Results

Independent Variable	Step 1 - Controls Beta	Step 2 - Main Effects Beta	Step 3 - Interaction Effects added Individually Beta	Step 3 - Interaction Effects added Individually Beta	Step 3 - Interaction Effects added Individually Beta	Step 3 - Interaction Effects added Individually Beta
Technical Difficulty	-.204*	-0.147	-0.144	-.137	-0.153	-0.151
Routine	0.038	0.014	0.021	0.026	0.016	0.017
Environment	0.006	-0.013	-0.002	-0.009	-0.016	-0.008
Structural Informal		.207*	0.221	.241**	0.204*	0.422
Structural Formal		0.03	0.024	0.034	-0.168	0.021
Cognitive		0.106	0.415	0.124	0.102	0.116
Relational		.301**	0.304	.871**	0.303**	.309**
Stakeholder Complexity		-0.112	-0.103	-0.119	-0.099	-0.103
Equivocality		-0.035	0.188	0.489	-0.183	0.153
Equivocality X Cognitive Capital			-0.367(.40)			
Equivocality X Relational Capital				-0.739(0.07)		
Equivocality X Structural Capital (Formal)					0.24(.53)	
Equivocality X Structural Capital (Informal)						-0.287(.54)
Stakeholder Complexity X Cognitive Capital						
Stakeholder Complexity X Relational Capital						
Stakeholder Complexity X Structural Capital (Formal)						
Stakeholder Complexity X Structural Capital (Informal)						
R2	0.043	0.288	0.292	0.308	0.29	0.29
Adjusted R2	0.021	0.235	0.233	0.25	0.231	0.231

Table 30 – Original Model without StrucI_A Regression Results (cont'd)

Independent Variable	Step 3 - Interaction Effects added Individually Beta	Step 3 - Interaction Effects added Individually Beta	Step 3 - Interaction Effects added Individually Beta	Step 3 - Interaction Effects added Individually Beta	Step 4 - 2 Interaction Effects	Step 4a - 2 Interaction Effects
Technical Difficulty	-0.15	-0.147	-0.139	-0.149	-0.137	-0.153
Routine	0.032	0.029	0.015	0.024	0.026	0.041
Environment	0.014	0.008	-0.013	-0.002	0.009	-0.018
Structural Informal	.204*	.195*	.205*	0.44	0.247	.255**
Structural Formal	0.019	0.036	0.256	0.029	0.034	-.700(.067)
Cognitive	0.796	0.089	0.1	0.106	0.125	0.123
Relational	.288*	.787(.088)	.309**	0.300**	0.869*	1.284**
Stakeholder Complexity	0.373	0.277	0.041	0.07	-0.119	-0.077
Equivocality	-0.009	-0.028	-0.043	-0.257	0.493	0.311
Equivocality X Cognitive Capital						
Equivocality X Relational Capital					-.736(.09)	-1.264**
Equivocality X Structural Capital (Formal)						.892*
Equivocality X Structural Capital (Informal)					-0.008(0.99)	
Stakeholder Complexity X Cognitive Capital	-0.864(0.09)					
Stakeholder Complexity X Relational Capital		-.644(.28)				
Stakeholder Complexity X Structural Capital (Formal)			-0.322(0.51)			
Stakeholder Complexity X Structural Capital (Informal)				-.594(.55)		
R2	0.305	0.295	0.291	0.29	0.308	.330
Adjusted R2	0.248	0.236	0.231	0.231	0.244	.268

Table 30 – Original Model without StrucI_A Regression Results (cont'd)

Independent Variable	Step 5 - 3 Interaction Effects	Step 6- 4 Interaction Effects	Step 7 - 5 Interaction Effects	Step 8 - 6 Interaction Effects	Step 9 - 7 Interaction Effects	Step 10 - 8 Interaction Effects
Technical Difficulty	-0.155	-0.155	-0.155	-0.155	-0.15	-0.149
Routine	0.041	0.041	0.05	0.054	0.052	0.048
Environment	-0.016	-0.018	-0.001	0.004	0	-0.003
Structural Informal	0.33	0.327	0.251	0.258	0.268	0.1
Structural Formal	-0.711	-0.714	-0.646	-0.652	-0.526	-0.53
Cognitive	0.126	0.088	0.513	0.388	0.359	0.408
Relational	1.269**	1.284**	1.226**	1.462*	1.404(.055)	1.497
Stakeholder Complexity	-0.073	-0.074	0.275	0.375	0.396	0.348
Equivocality	0.355	0.337	0.25	0.258	0.252	0.272
Equivocality X Cognitive Capital		.046(.923)	.142(.767)	.154(.750)	.131(.787)	.097(.845)
Equivocality X Relational Capital	-1.240*	-1.260*	-1.203*	-1.221*	-1.241*	-1.232*
Equivocality X Structural Capital (Formal)	.901*	.906*	.819(.077)	.831(.074)	.883(.068)	.897(.066)
Equivocality X Structural Capital (Informal)	-0.102	-.099(.840)	-.007(.989)	-.045(.964)	-.034(.946)	-.068(.895)
Stakeholder Complexity X Cognitive Capital			-638(.220)	-.502(.415)	-.445(.707)	-.473(.458)
Stakeholder Complexity X Relational Capital				-.291(.678)	-.183(.806)	-.312(.713)
Stakeholder Complexity X Structural Capital (Formal)					-.241(.675)	-.253(.662)
Stakeholder Complexity X Structural Capital (Informal)						.273(.697)
R2	0.33	0.33	0.339	0.34	0.341	0.342
Adjusted R2	0.262	0.256	0.259	0.254	0.249	0.243

F-tests were run for comparison of the Main Effects Model to the model with the pair of interactions that were first significant in the test: Relational Capital and Equivocality; Formal Capital and Equivocality. The F-test revealed that the model with the interactions was not significant. It was close: 3.74 actual vs. 3.80 needed at .05 significance, n=120. This led us to

believe there might be a problem with our measurement model. Based on these results, selected Regressions were re-run with the Equiv item taken out (table 31).

Table 31 – Original Model without StrucI_A or Equiv Regression Results

	Original Main effects Equiv3	1 Interaction	2 Interactions	4 Interactions
Controls				
Technical Difficulty	-0.134	-0.118	-0.139	-0.14
Routine	0.004	0.02	0.041	0.041
Environment	-0.013	-0.01	-0.014	-0.012
Critical Hypothesized Constructs				
Structural Informal	.200*	.233**	.246**	0.273
Structural Formal	0.025	0.034	-0.7(0.054)	-0.703(0.057)
Cognitive	0.103	0.117	0.117	0.156
Relational	.296**	0.9**	1.324**	1.304**
Stakeholder Complexity	-0.098	-0.112	-0.064	-0.061
Equivocality	-0.094	0.5	0.321	0.354
Interactions				
Equivocality X Cognitive Capital				-0.047
Equivocality X Relational Capital		-.796*	-1.348**	-1.321**
Equivocality X Structural Capital (Formal)			.916*	.917**
Equivocality X Structural Capital (Informal)				-0.035
Stakeholder Complexity X Cognitive Capital				
Stakeholder Complexity X Relational Capital				
Stakeholder Complexity X Structural Capital (Formal)				
Stakeholder Complexity X Structural Capital (Informal)				
R2	0.294	0.321	0.345	0.345
Adjusted R2	0.242	0.264	0.285	0.273

F-tests revealed that the regression model with the interactions between relational capital and equivocality and formal capital and equivocality was significantly different from the main effects model utilizing just 3 indicators for equivocality (f=4.64; needed f=3.80, n=120, .05 significance). However, the model with the four equivocality interactions was not significantly different from the main effects model.

Then the interactions were tested individually and in pairs in SEM (table 32). The pairs in the original model tested in SEM were based on the type of social capital, as you can see the interactions of relational capital to equivocality and of relational capital to stakeholder complexity were tested together, etc. We also ran the pair that was interesting in the regression runs of relational capital to equivocality and formal capital to equivocality.

Table 32 – Individual SEM tests of Interaction Effects in Original Model without StrucI_A

	Model 4	Model 5	Model 6	Model 7
	Interactions	Interactions	Interactions	Interactions
Endogenous Variable for Controls:	Agility	Agility		
Controls			-0.1	-0.097
Technical Difficutly	-0.098	-0.1	0.041	0.035
Routine	0.026	0.027	0.003	0.009
Environment	-0.004	-0.004		
Critical Hypothesized Constructs				
Structural Informal	.161*	.159*	.187*	.165*
Structural Formal	-0.041	-0.045	-0.041	-0.05
Cognitive	0.09	0.089	0.098	0.095
Relational	.421*	.425*	.446**	.444*
Stakeholder Complexity	-0.262	-0.257	-0.285	-0.247
Equivocality	-0.223	-0.212	-0.133	-0.183
Interactions				
Equivocality X Cognitive Capital				0.14
Equivocality X Relational Capital			0.304	
Equivocality X Structural Capital (Formal)		0.017		
Equivocality X Structural Capital (Informal)	0.027			
Stakeholder Complexity X Cognitive Capital				
Stakeholder Complexity X Relational Capital				
Stakeholder Complexity X Structural Capital (Formal)				
Stakeholder Complexity X Structural Capital (Informal)				

Table 32 – Individual SEM tests of Interaction Effects in Original Model without StrucI_A (cont'd)

	Model 8 Interactions	Model 9 Interactions	Model 10 Interactions	Model 11 Interactions
Controls				
Technical Difficutly	-0.102	-0.092	-0.097	-0.104
Routine	0.035	0.028	0.034	0.037
Environment	0.006	0.001	0.009	0.017
Critical Hypothesized Constructs				
Structural Informal	.159*	0.16	.155*	.157*
Structural Formal	-0.049	-0.057	-0.046	-0.055
Cognitive	0.089	0.082	0.078	0.09
Relational	.438*	.445*	.445*	.436**
Stakeholder Complexity	-0.279	-0.286	-0.272	-0.257
Equivocality	-0.156	-0.2	-0.169	-0.137
Interactions				
Equivocality X Cognitive Capital				
Equivocality X Relational Capital				
Equivocality X Structural Capital (Formal)				
Equivocality X Structural Capital (Informal)				
Stakeholder Complexity X Cognitive Capital				-0.126
Stakeholder Complexity X Relational Capital			0.116	
Stakeholder Complexity X Structural Capital (Formal)		0.089		
Stakeholder Complexity X Structural Capital (Informal)	0.06			

None of the interactions were significant when entered individually into the SEM model. When running them in pairs (table 32), only relational capital to equivocality was a significant interaction, and this was only when entered into the model with the formal to equivocality interaction (which was not significant).

Table 33 – Paired SEM tests of Interaction Effects in Original Model without StrucI_A

	Cognitive Interactions	Informal Interactions	Relational Interactions	Formal Interactions	Relational and Formal Equiv
Controls					
Technical Difficulty	-0.099	-0.093	-0.096	-0.09	-0.109
Routine	0.037	0.028	0.044	0.025	0.062
Environment	0.018	-0.011	0.009	-0.004	-0.016
Critical Hypothesized Constructs					
Structural Informal	0.163*	.160*	.184*	.161*	.185*
Structural Formal	-0.054	-0.03	-0.038	-0.051	-0.049
Cognitive	0.096	0.085	0.091	0.083	0.095
Relational	.439*	.385*	.451**	.432*	.449**
Stakeholder Complexity	-0.246	-0.285	-0.296(.066)	-.285(.088)	-0.226
Equivocality	-0.159	-0.25	-0.127	-0.235	-0.07
Interactions					
Equivocality X Cognitive Capital	0.108				
Equivocality X Relational Capital			.299(.091)		-.542*
Equivocality X Structural Capital (Formal)				0.007	0.275
Equivocality X Structural Capital (Informal)		0.089			
Stakeholder Complexity X Cognitive Capital	0.09				
Stakeholder Complexity X Relational Capital			0.091		
Stakeholder Complexity X Structural Capital (Formal)				0.089	
Stakeholder Complexity X Structural Capital (Informal)		-0.072			

So, in the original model, the interaction of relational capital to equivocality is significant only in the presence of the formal capital to equivocality interaction. The F-test for comparison of the main effects model to the model with the interactions for relational capital to equivocality and formal capital to equivocality shows that the models are significantly different (Calculated f= 4.64; F-test at .05, n=120, 2, f=3.8). So, we re-ran the SEM without the Equiv item (Table 33).

Table 34 – Paired SEM Tests of Interaction Effects in Original Model without StrucI_A or Equiv

	Original Equiv3 Interaction Relational	Original Equiv3 Interaction Formal	Original Equiv3 Interactions Pair
Controls			
Technical Difficulty - Agility	-0.088	-0.093	-0.09
Routine - Agility	0.02	0.021	0.028
Environment - Agility	-0.023	-0.022	-0.021
Critical Hypothesized Constructs			
Structural Informal	.167*	.158*	0.167*
Structural Formal	-0.015	-0.017	-0.022
Cognitive	0.094	0.094	0.086
Relational	.379*	.369*	.400*
Stakeholder Complexity	-0.254	-0.249	-0.234
Equivocality	-0.363	-.384	-0.288
Interactions			
Equivocality X Cognitive Capital			
Equivocality X Relational Capital	-0.217(.347)		-0.377(.294)
Equivocality X Structural Capital (Formal)		-0.036	0.162(.512)
Equivocality X Structural Capital (Informal)			
Stakeholder Complexity X Cognitive Capital			
Stakeholder Complexity X Relational Capital			
Stakeholder Complexity X Structural Capital (Formal)			
Stakeholder Complexity X Structural Capital (Informal)			

None of the interaction effects is significant (either alone or in the pair) in the SEM runs without Equiv or StrucI_A (Table 33). The only place where the interaction effect is significant in an SEM run, is in the SEM run in pairs (without StrucI_A) including relational to equivocality and formal to equivocality interactions, and the regression results (without StrucI_A) do not support that this model is significantly different from the main effects model. So, we none of the interaction effects were significant in the SEM runs (Table 35). However, as mentioned earlier, the interactions of relational capital to equivocality and formal capital to equivocality were significant in the regression (without StrucI_A or Equiv) and this finding is supported by an F-test (Table 31).

Table 35: Original Model Interaction Effects Results from SEM

Hypothesis	Results in Original Model
H4a: Structural Capital moderates the relationship between Equivocal Challenges and Systems Agility	Not Supported
H4b: Cognitive Capital moderates the relationship between Equivocal Challenges and Systems Agility	Not Supported
H4c: Relational Capital moderates the relationship between Equivocal Challenges and Systems Agility	Not Supported
H5a: Structural Capital moderates the relationship between Stakeholder Complex Challenges and Systems Agility	Not Supported
H5b: Cognitive Capital moderates the relationship between Stakeholder Complex Challenges and Systems Agility	Not Supported
Hc: Relational Capital moderates the relationship between Stakholder Complex Challenges and Systems Agility	Not Supported

A power analysis (Cohen 1988) based on our regression results reveals that we only have 58.48% power of predicting an the relational capital to equivocality interaction. We only have slightly better than a 50/50 chance of detecting an interaction effect if there is one present, given our sample size. The effect size of .04 is indicative of a small effect (Cohen 1988) for the interaction effect if there is one present. Multicollinearity may play a role in the interaction findings.

5.3.2.1 Nomological Validity

Nomological validity is the extent to which predictions from an accepted network of theory are born out in new findings (Bagozzi 1979). Our findings agree with existing well-understood and generally accepted explanations. Since there is not existing research on some of the topics contained in this dissertation, it is not possible to do truly test nomological validity. In this case, predictive validity will be utilized. A generally accepted practice is to conclude predictive validity is found if the theoretically defended predictions are supported (Sethi et al. 1991; Venkatraman et al. 1986). In this case, some of our predictions are supported; therefore there is some nomological validity.

5.3.3 Exploratory analysis

In light of our findings from the hypothesized model, we re-evaluated the placement of two of our controls: Difficulty and Routineness. Difficulty, as defined as technical constraints, would seem to have a more direct effect with equivocality. Similarly, Routineness would also have a direct negative effect on the equivocality of the challenge. Technical constraints could add to the equivocality of a challenge. If certain solutions are not implementable because of technical challenges this could cause the challenge to be perceived as more equivocal. Likewise, if the challenge is not routine, it has more mystery about it and is perhaps perceived as more equivocal. The only change to the model is how we include two controls: Difficulty and Routineness. In the first exploratory model, the control variables Routine and Difficult were given direct paths to only Equivocality. In the second exploratory model, the control variables Routine and Difficult were given paths to both Equivocality and Systems Agility. We reformulated the model as follows:

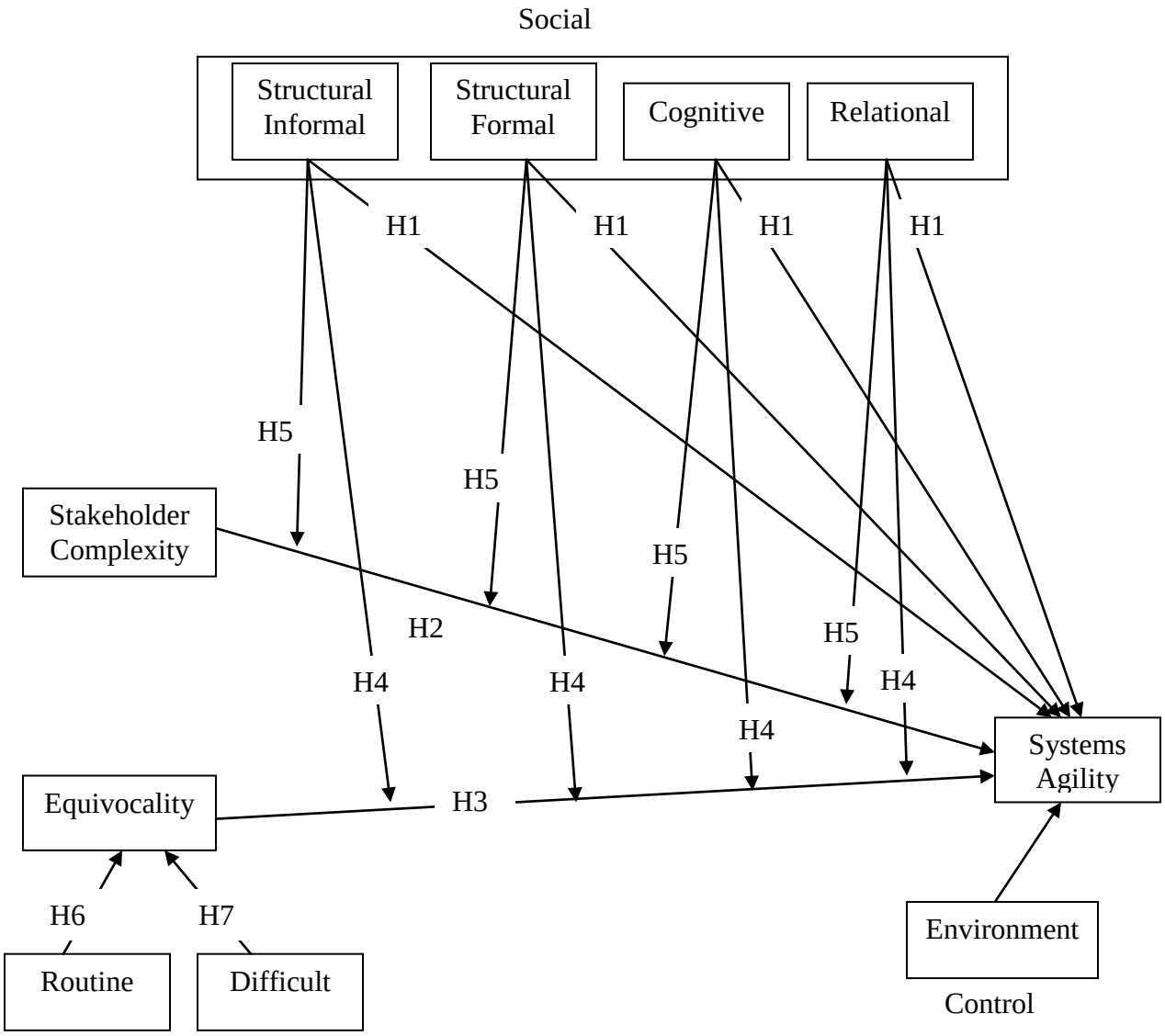


Figure 9: Complete New Exploratory Model

Following the same process as utilized for the hypothesized model, two exploratory models were analyzed. The main effects model was run utilizing both the ML and MLM estimator, for a model without StrucI_A and a model without StrucI_A and Equiv. The results of these runs are summarized in Table 35. The significant relationships in the exploratory model are the same (where applicable) as the significant relationships in our original model with the exception of the equivocality to agility link. It is very near significant in all the runs, but only becomes significant in the first exploratory model without StrucI_A.

Table 36 – Results of Exploratory Main Effects Models

	Expl1 ML No StrucI_A	**Expl1 MLM No StrucI_A**	**Expl1 ML No StrucI_A or Equiv**	**Expl1 MLM No StrucI_A or Equiv**
Controls				
Technical Difficulty - Equivocality	.320**	.320**	.344**	.344**
Routine – Equivocality	-.247**	-.247**	-.239**	-.238*
Environment – Agility	0.010	0.010	.009	.009
Technical Difficulty – Agility	N/A	N/A	N/A	N/A
Routine – Agility	N/A	N/A	N/A	N/A
Critical Hypothesized Constructs				
Structural Informal - Agility	.187*	.187*	.185*	.185
Structural Formal - Agility	-.071	-.071	-.070	-.07
Cognitive – Agility	.103	.103	.101	.101
Relational – Agility	.431**	.431**	.423**	.423**
Stakeholder Complexity - Agility	-.210*	-.210**	-.195*	-.195*
Equivocality – Agility	-.154	-.154*	-.205*	-.205**
R-Square				
R Squared Systems Agility	.338**	.338**	.345**	.345**
R squared Equivocality	.161*	.161*	.172*	.172*
Fit Statistics				
CFI	.91	.91	.91	.92
TLI	.90	.90	.90	.90
RMSEA	.06	.06	.06	.06
SRMR	.09	.07	.09	.08

Table 36 – Results of Exploratory Main Effects Models (cont'd)

	Expl2 ML No StrucI_A	Expl2 MLM No StrucI_A	Expl2 ML No StrucI_A or Equiv	Expl2 MLM No StrucI_A or Equiv
Controls				
Technical Difficulty - Equivocality	.310**	.310**	.233**	.233*
Routine – Equivocality	-.244**	-.244*	-0.330**	-0.330**
Environment – Agility	.019	.019	0.017	0.017
Technical Difficulty – Agility	-.124	-.124	-.107	-.107
Routine – Agility	.046	.046	.034	.034
Critical Hypothesized Constructs				
Structural Informal - Agility	.209*	.209**	.204*	.204**
Structural Formal - Agility	-.069	-.069	-0.069	-0.069
Cognitive – Agility	.097	.097	0.097	0.097
Relational – Agility	.418**	.418**	.413**	.413**
Stakeholder Complexity - Agility	-.191*	-.191**	-.182*	-.182*
Equivocality – Agility	-.082	-.082	-.136	-.136
R-Square				
R Squared Systems Agility	.348**	.348**	0.349**	0.349**
R squared Equivocality	.153*	.153*	0.160*	0.160*
Fit Statistics				
CFI	.91	.92	.91	.92
TLI	.89	.90	.90	.90
RMSEA	.06	.06	.06	.06
SRMR	.09	.08	.09	.08

5.3.1.2 Exploratory Model 1 Results

The interactions were tested individually and stepwise in regressions without StrucI_A or Equiv (Table 37).

Table 37 – Exploratory Model 1 Regression Results (without StrucI_A or Equiv)

Independent Variable	Step 1 - Controls Beta	Step 2 - Main Effects Beta	Step 3 - Interaction Effects added Individually Beta	Step 3 - Interaction Effects added Individually Beta	Step 3 - Interaction Effects added Individually Beta	Step 3 - Interaction Effects added Individually Beta
Technical Difficulty						
Routine						
Environment	-0.02	-0.027	-0.01	-0.021	-0.027	-0.024
Structural Informal		0.185*	.204*	0.22*	.184*	0.28
Structural Formal		0.023	0.014	0.033	-0.027	0.019
Cognitive		0.107	0.533	0.123	0.106	0.112
Relational		.312**	.313**	.939**	.312**	.315**
Stakeholder Complexity		-0.13	-0.115	-0.14	-0.127	-0.128
Equivocality		-0.124	0.203	0.495	-0.164	-0.033
Equivocality X Cognitive Capital			-0.513			
Equivocality X Relational Capital				-.830*		
Equivocality X Structural Capital (Formal)					0.062	
Equivocality X Structural Capital (Informal)						-0.017
Stakeholder Complexity X Cognitive Capital						
Stakeholder Complexity X Relational Capital						
Stakeholder Complexity X Structural Capital (Formal)						
Stakeholder Complexity X Structural Capital (Informal)						
R2	0	0.28	0.289	0.309	0.28	0.28
Adjusted R2	-0.007	0.239	0.242	0.264	0.233	0.233

Table 37 – Exploratory Model 1 Regression Results without StrucI_A or Equiv (cont'd)

Independent Variable	Step 3 - Interaction Effects added Individually Beta	Step 3 - Interaction Effects added Individually Beta	Step 3 - Interaction Effects added Individually Beta	Step 3 - Interaction Effects added Individually Beta	Step 4 - 2 Interaction Effects	Step 4a - 2 Interaction Effects
Technical Difficulty						
Routine						
Environment	-0.002	-0.005	-0.025	-0.019	-0.025	-0.018
Structural Informal	0.182*	.172(.052)	.182*	0.337	.229**	.222*
Structural Formal	0.014	0.03	0.374	0.023	-0.609	0.031
Cognitive	0.732	0.091	0.097	0.107	0.124	0.207
Relational	0.300**	.791(.080)	.323**	0.31**	1.310**	.906**
Stakeholder Complexity	0.305	0.481	0.112	-0.012	-0.101	-0.137
Equivocality	-0.106	0.123	-0.137	-0.118	0.329	0.528
Equivocality X Cognitive Capital						-0.102
Equivocality X Relational Capital					-1.313**	-.787(.060)
Equivocality X Structural Capital (Formal)					.804(.064)	
Equivocality X Structural Capital (Informal)						
Stakeholder Complexity X Cognitive Capital	-0.779					
Stakeholder Complexity X Relational Capital		-0.637				
Stakeholder Complexity X Structural Capital (Formal)			-0.501			
Stakeholder Complexity X Structural Capital (Informal)				-0.217		
R2	0.294	0.286	0.286	0.281	0.328	0.309
Adjusted R2	0.248	0.239	0.239	0.233	0.278	0.258

Table 37 – Exploratory Model 1 Regression Results without StrucI_A or Equiv (cont'd)

Independent Variable	Step 5 - 3 Interaction Effects	Step 6- 4 Interaction Effects	Step 7 - 5 Interaction Effects	Step 8 - 6 Interaction Effects	Step 9 - 7 Interaction Effects	Step 10 - 8 Interaction Effects
Technical Difficulty						
Routine						
Environment	-0.024	-0.025	-0.013	-0.009	-0.021	-0.024
Structural Informal	.230**	0.171	0.095	0.098	0.126	-0.149
Structural Formal	-0.608	-0.602	-0.553	-0.55	-0.243	-0.257
Cognitive	0.169	.162*	0.499	0.419	0.326	0.414
Relational	1.291**	1.303**	1.267**	1.411*	1.294(.055)	1.457*
Stakeholder Complexity	-0.1	-0.102	0.199	0.263	0.332	0.252
Equivocality	0.347	0.304	0.188	0.19	0.171	0.226
Equivocality X Cognitive Capital	-0.054	-0.49	0.076	0.081	0.033	-0.052
Equivocality X Relational Capital	-1.289**	-1.307*	-1.275*	-1.276*	-1.381**	-1.358**
Equivocality X Structural Capital (Formal)	.801(.066)	.795(.070)	0.733	0.733	.928(.051)	.962*
Equivocality X Structural Capital (Informal)		0.08	0.175	0.166	0.137	0.06
Stakeholder Complexity X Cognitive Capital			-0.555	-0.465	-0.304	-0.334
Stakeholder Complexity X Relational Capital				-0.188	0.099	-0.134
Stakeholder Complexity X Structural Capital (Formal)					-0.664	-0.686
Stakeholder Complexity X Structural Capital (Informal)						0.467
R2	0.329	0.329	0.335	0.335	0.343	0.345
Adjusted R2	0.272	0.267	0.267	0.262	0.264	0.26

F-tests of the regression model for the individual interaction of relational capital to equivocality showed that there was a significant difference between the interaction model and the original

model. The interactions were also tested individually in SEM without StrucI_A (Table 38). As Table 38 shows, the interaction between relational capital and equivocality is significant.

Table 38 – Exploratory Model SEM Tests of Interactions Individually without StrucI_A

	Expl 4 Interactions	**Expl 5 Interactions**	**Expl 6 Interactions**	**Expl 7 Interactions**
Controls				
Technical Difficulty - Equivocality	0.220**	.216**	.229**	.221**
Routine - Equivocality	-0.163**	-.165**	-0.170**	-.168**
Environment - Agility	0.012	0.011	0.003	0.020
Critical Hypothesized Constructs				
Structural Informal - Agility	0.158	.146*	.179*	.154*
Structural Formal - Agility	-0.069	-0.049	-0.047	-0.068
Cognitive - Agility	.097	.094	.110	.149
Relational - Agility	.499**	.484**	.564**	.491**
Stakeholder Complexity - Agility	-0.296	-.311(.051)	-0.311*	-0.288
Equivocality - Agility	-0.189	-0.203	-0.209	0.202
Interactions				
Equivocality X Cognitive Capital				0.155
Equivocality X Relational Capital			0.343*	
Equivocality X Structural Capital (Formal)		0.039		
Equivocality X Structural Capital (Informal)	0.045			
Stakeholder Complexity X Cognitive Capital				
Stakeholder Complexity X Relational Capital				
Stakeholder Complexity X Structural Capital (Formal)				
Stakeholder Complexity X Structural Capital (Informal)				

Table 38 – Exploratory Model SEM Tests of Interactions Individually without StrucI_A (cont'd)

	Expl 8 Interactions	Expl 9 Interactions	Expl 10 Interactions	Expl 11 Interactions
Controls				
Technical Difficulty - Equivocality	.223**	.222**	.222**	.223**
Routine - Equivocality	-.161**	-.161**	-.161**	-.162**
Environment - Agility	0.012	0.011	0.017	0.021
Critical Hypothesized Constructs				
Structural Informal - Agility	0.141	.146*	0.139	0.141
Structural Formal - Agility	-0.061	-0.076	-0.059	-0.065
Cognitive - Agility	.094	.084	.083	.095
Relational - Agility	.481**	.501**	.491**	.473**
Stakeholder Complexity - Agility	-0.320*	-0.336*	-.316*	-0.298
Equivocality - Agility	-0.184	-0.205	-0.187	-0.178
Interactions				
Equivocality X Cognitive Capital				
Equivocality X Relational Capital				
Equivocality X Structural Capital (Formal)				
Equivocality X Structural Capital (Informal)				
Stakeholder Complexity X Cognitive Capital				0.131
Stakeholder Complexity X Relational Capital			0.120	
Stakeholder Complexity X Structural Capital (Formal)		0.115		
Stakeholder Complexity X Structural Capital (Informal)	0.067			

The individual SEM confirmed the regression finding that the interaction of relational capital to equivocality was significant. The SEM was run in pairs (Table 39). The interaction between relational capital and equivocality is significant in 3 of 4 runs where it was included in the pair.

Table 39 – Exploratory Model SEM Test Run in Pairs without StrucI_A

Controls	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5	Pair 6
Technical Difficutly - Equivocality	.229**	.220**	.229**	.229**	.216**	.231**
Routine - Equivocality	-.169**	-.162**	-.170**	-.168**	-.165**	-.167**
Environment - Agility	0.012	0.014	0.001	0.007	0.024	-0.019
Critical Hypothesized Constructs						
Structural Informal	.177*	.149(.074)	.179*	.183*	.145(.052)	.526*
Structural Formal	-0.042	-0.064	-0.045	-0.057	-0.049	-0.131
Cognitive	0.103	0.097	0.101	0.103	0.097	0.11
Relational	.565**	.490**	.565**	.557**	.469**	.617**
Stakeholder Complexity	-.325*	-.314(.052)	-0.314	-.347*	-.306(.058)	-0.261
Equivocality	-0.201	-0.18	-0.209	-.219(.085)	-0.184	-0.185
Interactions						
Equivocality X Cognitive Capital			0.025			
Equivocality X Relational Capital	.044*		-.357(.070)	-.338*		-.540*
Equivocality X Structural Capital (Formal)					-0.039	0.239
Equivocality X Structural Capital (Informal)		-0.028				
Stakeholder Complexity X Cognitive Capital					-0.133	
Stakeholder Complexity X Relational Capital	0.105					
Stakeholder Complexity X Structural Capital (Formal)				-0.11		
Stakeholder Complexity X Structural Capital (Informal)		-0.059				

The SEM was then re-run without the Equiv item or the StrucI_A item (Table 40). The results are similar in that the relational to equivocality interaction is the only interaction that is significant. It is significant alone or in a pair.

Table 40 – Exploratory Model SEM Run in Pairs without Equiv or StrucI_A

	New Equiv3 Interaction Relational	New Equiv3 Interaction Formal	New Equiv3 Interactions Pair
Controls			
Environment - Agility	0.004	0.01	-0.015
Technical Difficulty - Equivocality	.165**	0.233	.250**
Routine - Equivocality	-.254**	-0.158	-0.164**
Critical Hypothesized Constructs			
Structural Informal	.175*	.146*	.169*
Structural Formal	-0.042	-0.03	-0.136
Cognitive	0.102	0.092	0.103
Relational	.601**	.469**	.662**
Stakeholder Complexity	-.294(.052)	-.295(.063)	-0.246
Equivocality	-.262*	-.275(.066)	-.233(.071)
Interactions			
Equivocality X Cognitive Capital			
Equivocality X Relational Capital	-.365*		-.556*
Equivocality X Structural Capital (Formal)		-0.07	0.233
Equivocality X Structural Capital (Informal)			
Stakeholder Complexity X Cognitive Capital			
Stakeholder Complexity X Relational Capital			
Stakeholder Complexity X Structural Capital (Formal)			
Stakeholder Complexity X Structural Capital (Informal)			

The interaction of relational capital to equivocality is significant in these models as well. As there are no significant differences between the findings for the second exploratory model, the tables with that analysis are included in an Appendix G.

Given our findings of a significant interaction of relational capital to systems agility in the exploratory models, we plotted the interaction to see what might be happening. Figures 10-14 show the results of theses plots.

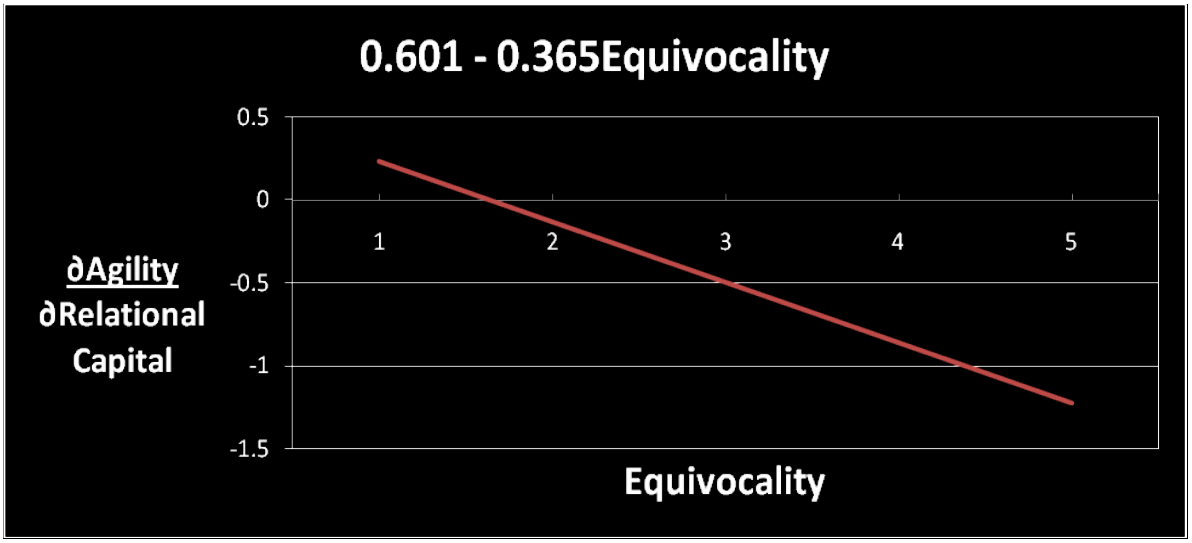


Figure 10 – Plot of the Partial Derivative of Agility with Respect to Relational Capital as Equivocality Varies

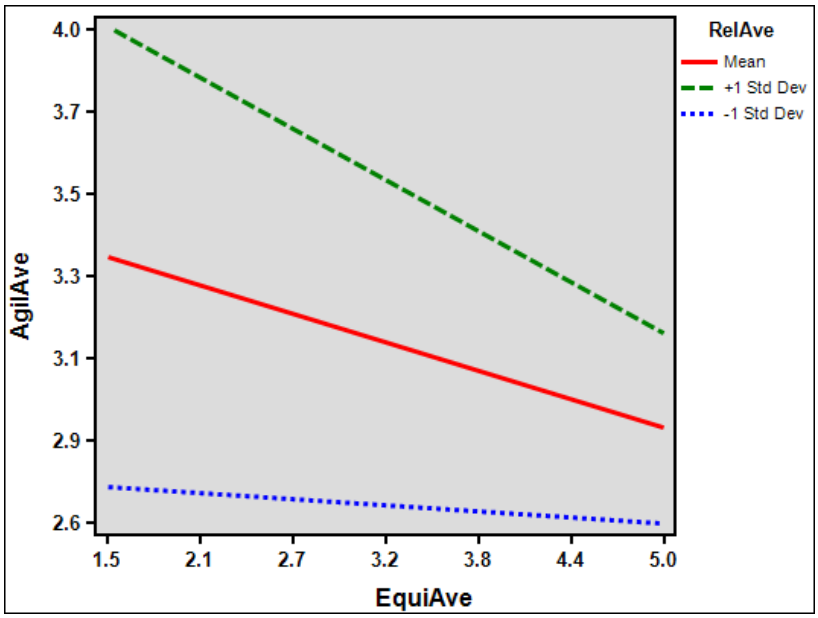


Figure 11 – Plot of Relational Capital to Equivocality Interaction in the Plus or Minus One Standard Deviation Range

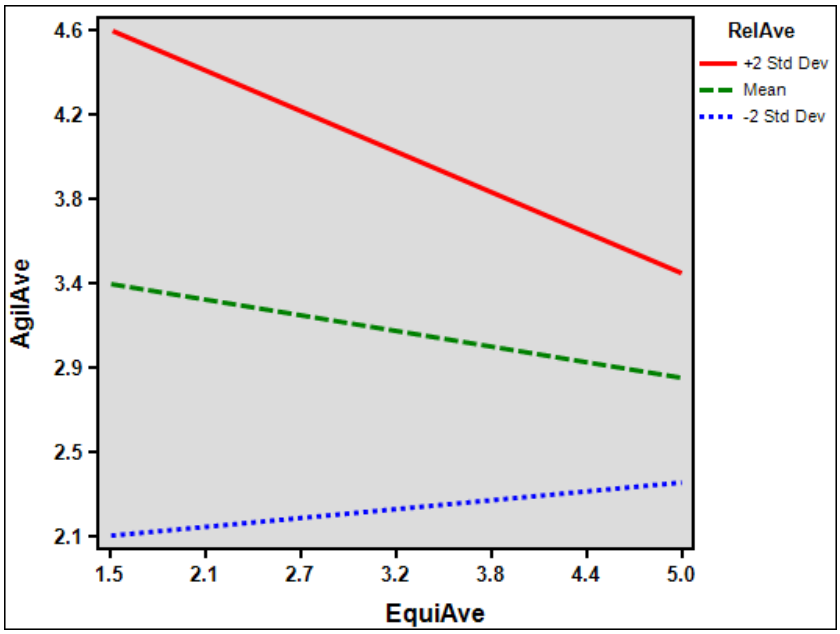


Figure 12 – Plot of Relational Capital to Equivocality Interaction in the Plus or Minus Two Standard Deviation Range

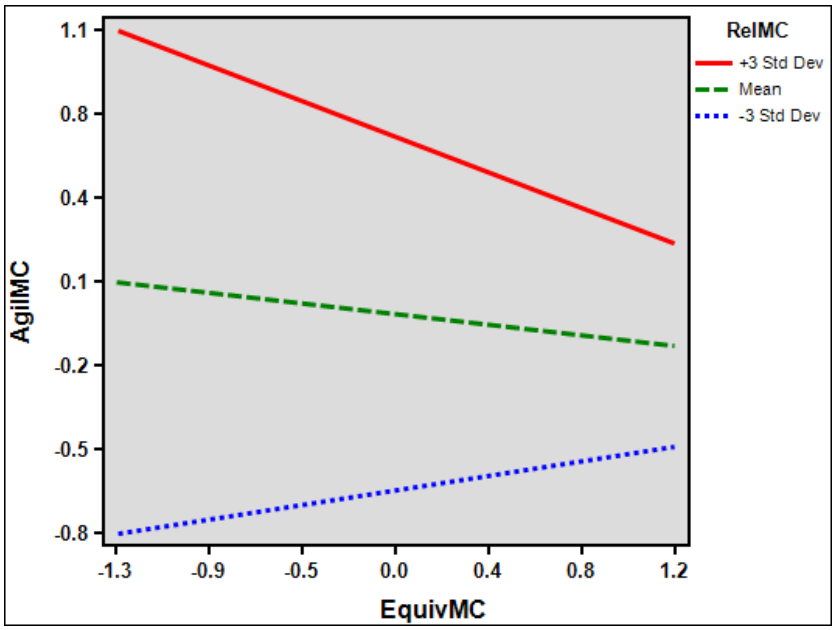


Figure 13 – Plot of Relational Capital to Equivocality Interaction in the Plus or Minus Three Standard Deviation Range

5.3.3.1 Summary of Exploratory Model 2 Results

The exploratory main effects models mirror our originally hypothesized model in significant hypothesized links. The interesting part of the exploratory analysis is the behavior of the interactions. In both exploratory models the interaction of relational capital with equivocality was significant in most tests. The empirical exploratory results strongly support a model where the controls are modeled as direct effects to equivocality. Since technical difficulty is a new measure with no history in the literature, and in many tests the link to equivocality is significant at better than .01 significance, any future models should utilize this new relationship. Interpretation of the interaction is surprising and will be discussed in more detail in Section 6.0. Table 41 and Figure 14 summarize these findings.

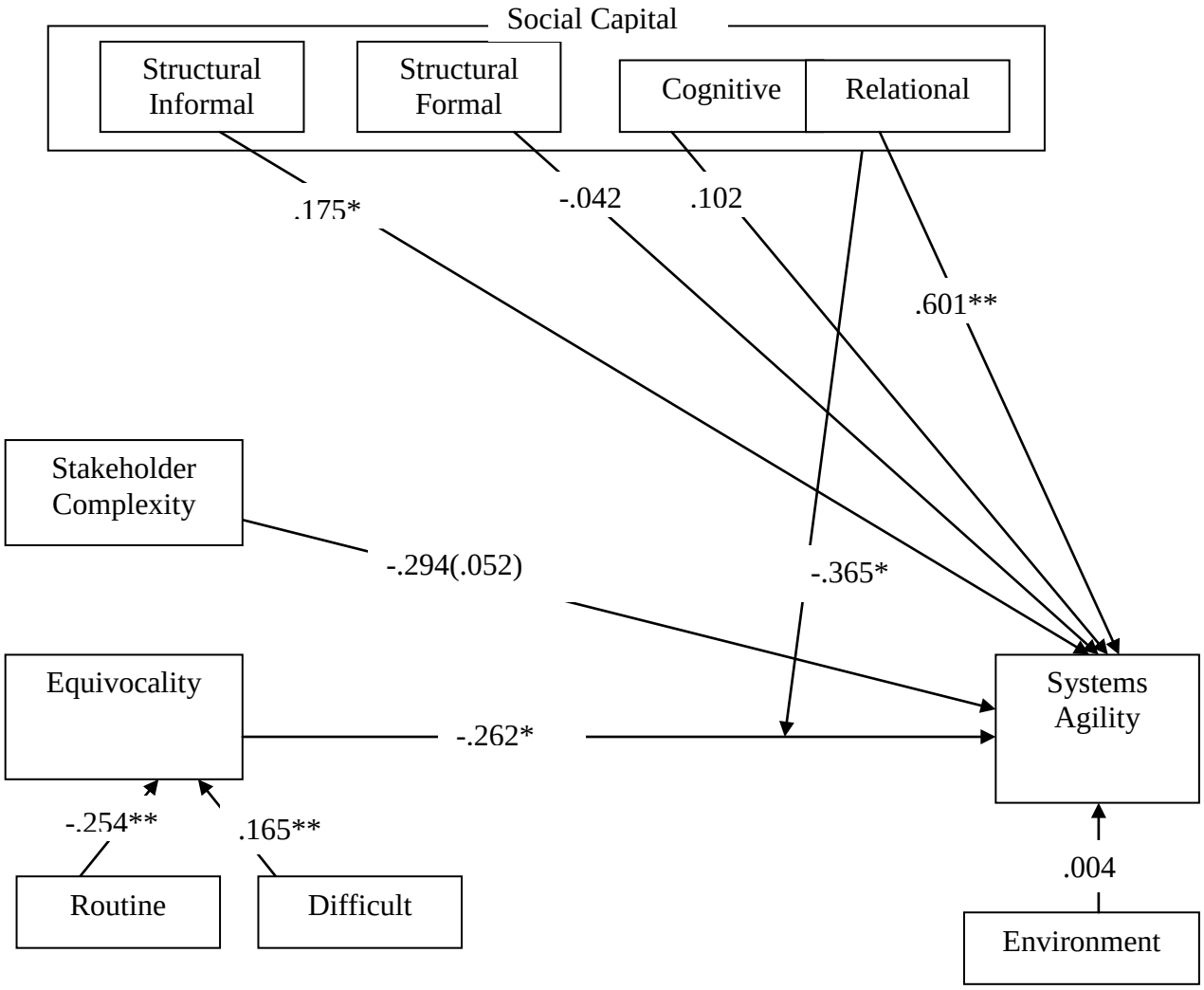


Figure 14: Exploratory Model with Interaction without StrucI_A or Equiv (ML)

Asterisk notes significance: *.05, **.01
Fit statistics reported for Main effects models are not produced by Mplus for interaction models

Table 41: Summary of Exploratory Model with Interactions (ML)

Hypothesis	Results in New Model
H1: Social Capital → Systems Agility	Partially Supported
Structural Informal Capital → Systems Agility	Supported
Structural Formal Capital → Systems Agility	Not Supported
Cognitive Capital as Language → Systems Agility	Not Supported
Relational Capital → Systems Agility	Supported
H2: Stakeholder Complexity → Systems Agility	Supported
H3: Equivocality → Systems Agility	Supported
H4a: Structural Capital moderates the relationship between Equivocal Challenges and Systems Agility	Not Supported
H4b: Cognitive Capital moderates the relationship between Equivocal Challenges and Systems Agility	Not Supported
H4c: Relational Capital moderates the relationship between Equivocal Challenges and Systems Agility	Supported
H5a: Structural Capital moderates the relationship between Stakeholder Complex Challenges and Systems Agility	Not Supported
H5b: Cognitive Capital moderates the relationship between Stakeholder Complex Challenges and Systems Agility	Not Supported
H5c: Relational Capital moderates the relationship between Stakholder Complex Challenges and Systems Agility	Not Supported
H6: Routineness → Equivocality	Found Link
H7: Difficulty → Equivocality	Found Link

6.0 Discussion of Results

This chapter discusses the implications of the results presented in section 5. First, a summary of the results is provided followed by a discussion section in which we provide an interpretation of the results. Implications for theory and practice as well as suggestions for future research are provided.

6.1 Summary of Results

In the original research model, analysis of the data found that certain types of social capital influence systems agility. However, not all types of social capital influence agility. Both characteristics of a challenge were found to influence systems agility: stakeholder complexity and equivocality. The findings about the moderating effects of social capital on the relationship between the type of challenge and systems agility were ambiguous. When the measurement model was cleaned up to exclude both StrucI_A and Equiv, the regression F-test indicates that there are significant interaction effects, though not in the hypothesized direction.

Additional exploratory data analysis provided further insight into the interaction effects of social capital. Logically, two of the variables we had included as controls were actually antecedents of equivocality. When modeled this way, relational capital moderates the relationship between systems agility and equivocality, again not in the hypothesized direction.

6.2 Discussion of the Results

This section presents a discussion of the results using the following research questions described from Chapter 1:

1: What is the relationship between the type of challenge and systems agility?

2: How does social capital impact systems agility?

3: What are the moderating effects of social capital on the relationship between the type of challenge and systems agility?

6.2.1 Research Question One: Type of Challenge and Systems Agility

In the research model we examined the influence of both equivocality and stakeholder complexity on systems agility. The findings from the original hypotheses presented in Section 5 suggest that stakeholder complexity has a negative relationship with systems agility. Thus, when a challenge has more stakeholders involved it is more difficult to be agile. Similarly, equivocality is found to have a negative relationship with systems agility. These are as hypothesized, and are new findings for academia. Previous research has examined the "change factors requiring agility" (Oosterhout et al 2006), but did not look at such basic characteristics of the challenge as equivocality and stakeholder complexity. So, this dissertation adds to our knowledge of the types of challenges that impact agility and finds that large numbers of stakeholders will negatively impact systems agility.

The exploratory study main effects model suggests that the way that technical constraints impacts systems agility is through equivocality. Perhaps this dissertation's findings suggest that the way in which inflexible legacy systems affect systems agility (and in turn affect business agility) is through the equivocality that is created by technical constraints. Oosterhout et al (2006) was able to establish that IT can have a positive or negative effect on business agility, though they did not look specifically at systems agility.

6.2.2 Research Question Two: Social Capital Impacts on Systems Agility

In the research model we examined the influence of informal structural capital, formal structural capital, cognitive capital (shared language) and relational capital on systems agility. Relational Capital and Informal Structural Capital in particular were found to influence systems agility, while there is no evidence that other types of social capital do. As a reminder, the questions that were used to measure Relational and Informal Structural Capital are listed in Table 42.

Table 42: Measures of Relational and Informal Structural Capital

Relational Capital	The IS people and business people involved in the selected agility challenge got along well together.
Relational Capital	There was an atmosphere of trust between the business and IS people involved in the selected agility challenge.
Relational Capital	For the selected agility challenge, both the business and IS people involved could be counted on to do their part.
Relational Capital	There was a norm of collaboration between IS people and business people involved in the selected agility challenge.
Informal Structural Capital	There was a good amount of interaction on an informal basis (e.g. chatting about non-work related issues, joking, non-work related phone conversations, etc.) between the business and IS people involved in this selected agility challenge.
Informal Structural Capital	The business people involved in this selected agility challenge were quite accessible (on an informal basis) to the IS people.
Informal Structural Capital	There was a good amount of "hall talk" among business and IS people.

Formal Structural Capital and Cognitive Capital (shared language) did not have significant links to systems agility.

Table 43: Measures of Formal Structural Capital and Cognitive Capital

Formal Structural Capital	People in the business department interacted a lot with people in the IS department on a formal basis while resolving this selected agility challenge (e.g. official meetings, work-related phone calls, etc.)
Formal Structural Capital	IS people attended many regular meetings and/or conference calls with business people working on this selected agility challenge.
Formal Structural Capital	The IS and business people regularly attended conference calls or meetings together to discuss the selected agility challenge.
Cognitive Capital (shared language)	When business people came to IS with the selected agility challenge, both were able to use a common vocabulary for communicating the issues.

Cognitive Capital (shared language)	The language used by business people when describing the agility challenge was easily understood by the IS people.
Cognitive Capital (shared language)	The IS and business people used common terms for describing the selected agility challenge.

These findings suggest that in situations where the expectations and obligations of the relationship are clear, and people enjoy working together to the extent that they talk about non-work related issues, the ability of the organization to respond quickly and effectively to challenges is enhanced. Formal structural capital (more meetings, more conference calls) does not seem to enhance the ability of the organization to react quickly and effectively, contrary to our hypothesis. One explanation may be that formal structural capital is useful in getting relational capital, but is not useful without relational capital. Informal structural capital probably helps to tear down the wall between IS and the business so that when a problem arises, they feel comfortable bringing up with their counterpart in the other group. Relational capital suggests that an IS person knows what to expect from a business person and trusts the business person to do their part. Knowing what to expect would lower the barrier to asking a person a question. Perhaps when people have relational capital, they more quickly approach the people that are required to solve the problem, rather than waiting on management to schedule a meeting. An alternate explanation is that scheduling meetings and/or conference calls slows down the process of solving the problem or responding to the challenge.

Cognitive capital in the form of shared language does not have a significant impact on systems agility. Again, much like an explanation for the lack of finding for formal structural capital, cognitive capital may be effective in making possible an increase in relational capital, but may be ineffective to helping resolve agility challenges on its own. This explanation is supported by

previous empirical research (Tsai et al. 1998). Sharing language (measure of cognitive capital) enables communication. This ability to communicate may allow for building relational capital, which ultimately impacts the ability to resolve agility challenges.

An alternate explanation for this finding could be that a large number of people responding to this survey identified as liaisons. People in the role of liason have the responsibility of making sure that both IS and business communicate well. It could be that although the business people feel that IS and business do not speak the same language (average of 56 business respondents = 2.87 on a 5 point scale), liaisons offset this by responding that they were in fact doing their job and that a common language did exist (average of 37 liasons = 3.33 on a 5 point scale). Thus liaisons may have introduced bias into their answers. For other concepts like formal structural capital, informal structural capital, or relational capital, the liaisons could have felt less personal responsibility for making sure this existed, and thus did not bias their answers.

6.2.3 Research Question Three: Moderating Effects of Social Capital

In the research model we examined the moderating effects of informal structural capital, formal structural capital, cognitive capital (shared language) and relational capital on the relationship between the type of challenge and systems agility. In the hypothesized original model, the interaction between relational capital and equivocality and the interaction between formal structural capital and equivocality was significant in the regression F-test when the measurement model did not include StrucI_A or Equiv.

The exploratory study presented in Section 5 suggests that only relational capital might have a negative moderating effect on the relationship between equivocal challenges and systems agility and future studies should explore this. The plots presented in Section 5, seem to indicate that

relational capital can actually make equivocal situations worse. However, the effect size of the interaction is small, so the interaction effect does not override the general positive effects of relational capital.

However, our exploratory results suggest that in equivocal situations, there are negative consequences of having too much relational capital. Several explanations might explain this finding. One part of relational capital is trust. Too much trust in relationships can have negative consequences. In equivocal situations, trust may overshadow a person's desire to really understand the issue by exchanging ideas about the issue. They simply assume that their trusted colleague understands the issue in the same way. This trust hinders their exchange of ideas and thus has a negative effect on resolving issues in equivocal situations. This is consistent with findings about structural social capital consequences. Strong structural social capital limits search scope and increases the selective perception of alternatives (Jansen et al. 2006; Uzzi 1997). Perhaps strong relational capital has similar effects, which would be detrimental to resolving equivocal challenges. Further explanation for this finding may be that our measure does not capture whether there was much exchange of ideas on this issue, but does measure trust.

There is no indication in our analysis of the original hypothesized model or in the exploratory model that stakeholder complexity is moderated by relational capital. This finding suggests that a large number of stakeholders decreases your systems agility regardless of the social capital in your organization. In retrospect, this makes sense. One explanation for this finding is that our questionnaire did not look at the business stakeholder to business stakeholder social capital. Perhaps the moderating variable would be social capital among all of the business stakeholders

instead of IS to business social capital. In this case, it's reasonable to guess that great relationships among the IS and business groups can do little to overcome lousy relationships throughout the organization that are influencing systems agility. Another possibility is that many stakeholders makes it more difficult to agree on a solution no matter what.

7.0 Contributions and Limitations

This research was partly motivated by anecdotal evidence from years of IS consulting by the author, suggesting that the relationship between IS and business matters when trying to achieve goals in the organization by systems changes, namely systems agility. To this end, we developed a theoretical model that breaks down this relationship into different types of social capital and hypothesized in what types of situations social capital might be more relevant. We have empirically tested this model.

The overarching goal in this paper was to enrich our knowledge about the role of social capital in influencing systems agility. Dimensions of social capital (Formal Structural Capital, Informal Structural Capital, Cognitive Capital, and Relational Capital) were operationalized in the context of the relationship between IS and business. We empirically tested the relationship between the dimensions of social capital with systems agility, and as a moderating effect between the type of challenge (equivocal or stakeholder complexity) and systems agility. In existing literature, understanding how the relationship between IS and the business affects organizational outcomes has been noted as important. Here we focus on the impact of that relationship on the ability of firms to successfully address the need for system changes. We expect greater systems agility will lead to organizational performance, but that relationship is not tested. The following sections discuss this research study's contribution to theory and academia first, followed by its contributions to practice, and concludes with limitations.

7.1 Contributions to Theory and Academia

This research attempts to help academics better understand the role of the relationship between IS and business (in the form of social capital) and its impacts on systems agility. From the perspective of academics, several important implications exist. The results suggest depending

upon the types of challenges facing organizations, the state of the relationship between IS and the business might be quite important in achieving agility. Existing agility studies do not focus on the importance of this relationship.

This research contributes to additional knowledge about an under-developed concept: systems agility. Previous research looks at the "role of IS" in organizational agility in a very general way, or focuses on some aspects of the technical IS infrastructure, like data integration. We suggest that the role of IS in organizational agility is better explained through a concept like systems agility (the ability to rapidly change IS to meet business needs), which is logically linked to organizational agility. This study builds a measure of systems agility that future empirical work might utilize to explore business agility.

This study also brings forward the notion that equivocality and stakeholder complexity influence systems agility. Previous research has hypothesized some very complex ways of categorizing challenges that did not yield consistent results in predicting systems agility. This dissertation looks at a more basic way of categorizing challenges. This simpler perspective contributes to academia's understanding of what matters in terms of impacting systems agility.

Finally the role of the relationship between IS and the business in systems agility and in certain types of challenges is explored in this research. We show that the relationship between IS and the business is important in systems agility. The moderating effect of the IS to business relationship has not been previously studied. Ambiguous hypothesized results and exploratory analysis suggest that there is a negative moderating effect of relational capital in equivocal situations. This dissertation raises some interesting questions about the role of the relationship

between IS and the business. The strong main effects findings suggest that the relationship between business and IS is important to systems agility, though the ambiguous negative interaction effect is intriguing. The relationship needs to be nurtured in informal ways, like providing opportunities for "hall talk". Of the different types of capital examined, relational capital has the strongest impact on systems agility. A good relationship can help organizations have better systems agility.

7.2 Contributions to Practice

Practitioners talk in vague terms about having good relationships. This research gives more concrete ways for practitioners to think about their relationships and ways they might go about improving them, which will pay off in terms of systems agility. This research also provides evidence to practitioners that good relationships will yield better outcomes. However, certain practices that are commonly employeed, in particular scheduled meetings might be over-rated when it comes to influencing systems agility. If these meetings do not encourage the exchange of ideas, they are likely to not be helpful. Formal structural capital was not found to have an impact on systems agility.

This research also encourages practitioners to think about the challenges that are facing them in terms of equivocality and to recognize that until the equivocality is reduced, systems agility will be hampered. It is hard to resolve equivocal challenges, and thus equivocal challenges hinder systems agility. There is not evidence that relational capital helps more in highly equivocal situations. We speculated on reasons for this. However, the extra variance explained by the interaction term is tiny, so our overall finding that relationships help in agility holds.

In terms of challenges that have large numbers of stakeholders, practitioners must recognize this challenge and find ways to quickly bring these large numbers of stakeholders to agreement. One way to do this might be to identify key decision makers for certain functions early on in a project, rather than relying on a more time consuming consensus oriented model of decision making. Providing key decision makers with early decision making power will better enable them to make the tough decisions and provide better direction later in the project. Providing opportunities for these decision makers to make decisions early on, and dealing with the fallout early on, will make later, more critical decisions less disruptive to the group. In essence, there will be a shared experience of working with decisions made by the key decision makers that contributes to accepting their decisions.

Practical guidelines:

1. Build a relationship between IS and the business that entails trust.
2. Help IS and the business feel comfortable approaching each other with non-work talk, this will lead to better functioning teams that achieve better systems agility.
3. Work on reducing equivocality in challenges facing your organization. Recognize that when there is equivocality in a challenge that systems agility will be more difficult.
4. Better relationships in general will help in systems agility. Recognizing the challenge associated with stakeholder complexity up front will help project managers to more effectively manage projects.

7.3 Limitations

This study has many limitations, as is the case with all research. First, this research doesn't look at sensing as part of systems agility. This decision is based on interviews conducted for another project. From our interviews we found that the overwhelming majority of the agility challenges

that were described to us were responding rather than sensing. Using that as a guide, we felt that responding to challenges would be a more visible phenomenon, and that the IS group's role in this might be much easier studied.

Second, we assumed that the managers filling out the questionnaire had sufficient knowledge of the both the business problem that was presented to him/her and the information system implications. We have therefore relied on one respondent either from IS, business or consulting vantage points. We were able to get a large number of business respondents, giving us a more balanced perspective than if we had only IS managers respondents. Nevertheless, when researching agility, generally matched pairs of business and IS people would be preferred. However, given our focus on a specific agility challenge, this would be almost impossible to achieve. To combat this potential shortcoming, we have defined our study and constructs in terms that both the IS and business managers should be knowledgeable enough to give insight.

Third, the sampling frame was not random because organizational access constraints precluded full randomization (Boynton et al. 1994). However, beyond the researcher's immediate network (those the researcher or someone close to the research had worked with) at least 51 respondents were obtained via conference or professional meeting attendance by the researcher. These respondents increased the number of random respondents with which the researcher had no relationship.

Fourth, we did not take into account the possibility that structural social capital may have an inverted U relationship with systems agility. As Adler and Kwon (Adler et al. 2002) note, in

general social capital can be a constraint on an organization and "…even when social capital is beneficial to a focal actor, it can have negative consequences for the broader aggregates of which that actor is a part…"(p28). More specifically, "Beyond a moderate level, however, the density of social networks may limit access to divergent perspectives and to alternative ways of doing things" (Nahapiet and Ghoshal 1998, p. 245). As highly dense networks diffuse strong norms and establish shared behavioral expectations, they reduce deviant behavior, limit search scope, and increase selective perception of alternatives (Jansen et al. 2006; Uzzi 1997).

7.4 Conclusions and Future research

This research has found evidence that social capital indeed impacts systems agility. Future research could contribute to this stream of research by examining the antecedents to social capital. Categorizing challenges using a simpler method (like equivocality and stakeholder complexity) might provide more opportunities for future empirical studies on agility, systems agility or project management. Future agility studies might utilize systems agility as a concept that covers the role of IS in business agility. Further, future research might look at the financial implications to organizations that have systems agility. In addition, IS infrastructure could be studied in relation to systems agility and particular agility challenges to assess the impact of certain infrastructure characteristics on systems agility.

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Appendix A – Source of Operationalization

Construct	Items
Relational Capital	
Previous Items (Brown et al. 1986; Chatman et al. 2001; Goodman et al. 1998; Robert et al. 2008; Simons et al. 2000)	1. I know I can count on the other team members 2. There is an atmosphere of trust around this team 3. Most, if not all, members of this team feel a sense of responsibility to do their part to help the team succeed 4. Most, if not all, members of this team feel obligated to do their part to help the team succeed 5. There is a norm of teamwork in this team 6. In this team, there is a high level of sharing between team members 7. I am happy to be a member of this team 8. I find it easy to identify myself with this team
Structural Capital	
Social Systems of Knowing (Preston 2004)	1. SocSK1: I have informal contact with TMT members; 2. SocSK2: I socialize with the TMT members (e.g. social gatherings, golf, tennis, etc.); 3. SocSK3: I have informal exchanges with TMT members
Structural Systems of Knowing (Preston 2004)	1. StrSK1 (TMT participation): Which of the following best describes your involvement with the TMT? [scale: formal member (5) to never involved (1)]; 2. StrSK2: I interact with TMT members on a formal basis (e.g. official meetings, work-related phone calls, etc.) [5-point scale ranging from "strongly agree" (5) to "strongly disagree" (1)]; 3. StrSK3: How many reporting levels are between you and the CEO? [scale: "direct report" (3) to "two or more levels" (1)]
Connectedness (Jansen et al. 2006; Jaworski et al. 1993)	1. In our organizational unit, there is ample opportunity for informal "hall talk" among employees 2. In this unit, employees from different departments feel comfortable calling each other when the need arises. 3. Managers discourage employees discussing work-related matters with those who are not immediate superiors 4. People around here are quite accessible to each other
Cognitive Capital	
Shared vision (Cohen et al. 2006; Lederer et al. 1996; Reich et al. 1996)	1. Business and IS executives share a common vision for the long term role of IS within the organization. 2. Business and IS executives agree on priorities for the organizational use of IS. 3. Business and IS executives agree on the key IS management issues affecting the organization.
Shared understanding (Preston 2004)	1. Top Management Team (TMT) members and I have a shared understanding of how IS can be used to increase productivity of our organization's operations. 2. TMT members and I have a common view regarding the prioritization of

	IS investments. 3. TMT members and I have a shared view of the role of IS as a competitive weapon for our organization.
Shared Language (Preston 2004)	1. TMT members and I share a common language in our conversations. 2. I primarily use business terminology when interacting with TMT members. 3. I avoid using IS jargon when interacting with TMT members.
Systems Agility	
(Chen 2004)	1. The current information systems have hampered our capability to make critical business process changes in the Target Area 2. We have been successful in changing the information systems used in the Target Area in response to the need for better business processes
Stakeholder Complexity	
Inspired by interdependence measure (Goodhue 1995)	1. The problems I deal with frequently involve more than one business function. 2. The business problems I deal with frequently involve more than one organization group.
Agility Challenge Equivocality	
(Neill et al. 2007)	1. Generally when engaged in strategic marketing decision-making: a. There are multiple interpretations of market feedback b. The issues are open to multiple interpretations c. Individuals focus on different issues d. The situation is viewed from different perspectives

Controls

Considering the IT infrastructure relevant to the aforementioned agility challenge:

Turbulence	
(Dill 1958; Jansen et al. 2006; Volberda et al. 1997)	Environmental Dynamism 1. Environmental changes in our local market are intense 2. Our clients regularly ask for new products and services 3. In our local market, changes are taking place continuously 4. In our market, the volumes of products and services to be delivered change fast and often. 5. In a year, nothing has changed in our market Environmental Competitiveness 1. Competition in our local market is intense 2. Our organizational unit has relatively strong competitors 3. Competition in our local market is extremely high 4. Price competition is a hallmark of our local market
Routine	
(Goodhue 1995)	1. I frequently deal with ad hoc nonroutine business problems. 2. Frequently the business problems I work on involve questions that have never been asked in quite that form before.

Appendix B – Final Version of Questions on Questionnaire

The questions in this table are grouped for convenience. The questions on the original survey were randomized. The IS version of the survey is used as the baseline version, and the differences in the business version and the consultant version are noted.

Relational Capital	
Rel_C	The IS people and the business people involved in the selected agility challenge got along well together. • **Consultant Survey Question:** The client's IS and business people involved in the selected agility challenge got along well together.
Rel_B	There was an atmosphere of trust between the business and IS people involved in the selected agility challenge. • **Consultant Survey Question**: There was an atmosphere of trust between the client's business and IS people involved in the selected agility challenge.
Rel_A	For the selected agility challenge, both the business and IS people involved could be counted on to do their part. • **Consultant Survey Question**: For the selected agility challenge, both the client's business and IS people involved could be counted on to do their part.
Rel	There was a norm of collaboration between the IS people and the business people involved in the selected agility challenge. • **Consultant Survey Question**: There was a norm of collaboration between the client's IS and business people involved in the selected agility challenge.
Cognitive Capital	
Cog_E	When business people came to IS with the selected agility challenge, both were able to use a common vocabulary for communication the issues. • **Consultant Survey Question**: When the client's business people came to there is people with the selected agility challenge, both were able to use a common vocabulary for communicating the issues.
Cog_D	The language used by business people when describing the agility challenge was easily understood by the IS people • **Business Survey Question**: The language used by IS people when describing the agility challenge was easily understood by business people. • **Consultant Survey Question**: The language used by the client's business people when describing the agility challenge was easily understood by the client's IS people.
Cog_C	In the context of this agility challenge, business and IS people saw the priorities in the same way. • **Consultant Survey Question**: In the context of this agility challenge, the client's business and IS people saw the priorities in the same way.
Cog_B	In the context of this agility challenge, business and IS people shared a common vision for the role of IS. • **Consultant Survey Question**: In the context of this agility challenge, the client's business and IS people shared a common vision for the role of IS.
Cog_A	The IS and business people used common terms for describing the selected agility challenge.

	• **Consultant Survey Question**: The client's IS and business people used common terms for describing the selected agility challenge.
Cog	In the context of this agility challenge, business and IS people agreed on the key IS management issues affecting the challenge.
	Consultant Survey Question: In the context of this agility challenge, the client's business and IS people agreed on the key IS management issues affecting the challenge.
Equivocality	
Equiv_D	When this selected challenge was presented to the IS group, it was not clear which solution was best overall. • **Consultant Survey Question**: When this selected challenge was presented to the client's IS group, it was not clear which solution was best overall.
Equiv_C	The IS group had a clear understanding of how to get to the solution when first presented with this selected agility challenge. • **Consultant Survey Question**: The client's IS group had a clear understanding of how to get to the solution when first presented with this selected agility challenge.
Equiv_B	When the IS group was presented with the selected agility challenge, the criteria for choosing the solution was not clear. • **Consultant Survey Question**: When the client's IS group was presented with the selected agility challenge, the criteria for choosing the solution was not clear.
Equiv_A	When first presented with this challenge, clarifying the true needs and possible solutions required a lot of interaction between the business and IS people. • **Consultant Survey Question**: When first presented with this challenge, clarifying the true needs and possible solutions required a lot of interaction between the client's business and IS people.
Equiv	It was not immediately clear how to define the selected agility challenge when the IS group was first presented with it. • **Consultant Survey Question**: It was not immediately clear how to define the selected agility challenge when the client's IS group was first presented with it.
Formal Structural Capital	
StrucF_B	People in the business department interacted a lot with people in the IS department on a formal basis while resolving this selected agility challenge (e.g. official meetings, work-related phone calls, etc.) • **Consultant Survey Question:** People in the client's business department interacted a lot with people in the client's IS department on a formal basis while resolving this while resolving this selected agility challenge (e.g. official meetings, work-related phone calls, etc.)
StrucF_A	IS people attended many regular meetings and/or conference calls with business people working on this selected agility challenge. • **Business Survey Question**: Business people attended many regular meetings and/or conference calls with IS people working on this selected agility challenge. • **Consultant Survey Question**: The client's IS people attended many regular meetings and/or conference calls with the client's business people working on this selected agility challenge.
StrucF	The IS and business people regularly attended conference calls or meetings together to discuss the selected agility challenge.

	• **Consultant Survey Question**: The client's IS and business people regularly attended conference calls or meetings together to discuss the selected agility challenge.
Informal Structural Capital	
StrucI_B	There was a good amount of interaction on an informal basis (e.g. chatting about non-work related issues, joking, non-work related phone conversations, etc.) between the business and IS people involved in this selected agility challenge. • **Consultant Survey Question:** There was a good amount of interaction on an informal basis (e.g. chatting about non-work related issues, joking, non-work related phone conversations, etc.) between the client's business and IS people involved in this selected agility challenge.
StrucI_A	The business people involved in this selected agility challenge were quite accessible (on an informal basis) to the IS people. • **Business Survey Question**: The IS people involved in this selected agility challenge were quite accessible (on an informal basis) to the business people. • **Consultant Survey Question**: The client's business people involved in this selected agility challenge were quite accessible (on an informal basis) to the client's IS people.
StrucI	There was a good amount of informal "hall talk" among business and IS people involved with this selected agility challenge. • **Consultant Survey Question**: There was a good amount of informal "hall talk" among the client's business and IS people involved with this selected agility challenge.
Stakeholder Complexity	
Stake_B	A lot of different stakeholders had to interact to develop a good solution to this selected agility challenge.
Stake_A	This selected agility challenge affected many stakeholders in the organization. • **Consultant Survey Question**: This selected agility challenge affected many stakeholders in the client's organization.
Stake	The selected agility challenge necessitated the input of many stakeholders.
Technical Difficulty	
Dif_C	Technical constraints limited our options for implementing a solution to this selected agility challenge. • **Consultant Survey Question**: Technical constraints limited the client's options for implementing a solution to this selected agility challenge.
Dif_B	Our existing systems limited our ability to implement a solution to the selected agility challenge. • **Consultant Survey Question**: The client's existing systems limited our ability to implement a solution to the selected agility challenge.
Dif_A	Our existing systems hindered the implementation of the solution to the selected agility challenge. • **Consultant Survey Question**: The client's existing systems hindered the implementation of the solution to the selected agility challenge.
Dif	Our existing systems made it difficult to implement the solution to the selected agility challenge.

	• **Consultant Survey Question**: The client's existing systems made it difficult to implement the solution to the selected agility challenge.
Routine	
Rout_B	When originally presented with the selected agility challenge, we had previous experience with this type of challenge. • **Consultant Survey Question**: When originally presented with the selected agility challenge, the client had previous experience with this type of challenge.
Rout_A	When originally presented with the selected agility challenge, we had faced this type of challenge in the past.
	• **Consultant Survey Question**: When originally presented with the selected agility challenge, the client had faced this type of challenge in the past.
Rout	When originally presented with the selected agility challenge, this was a familiar challenge for us.
	• **Consultant Survey Question**: When originally presented with the selected agility challenge, this was a familiar challenge for the client.
Environment	
Env_B	In the last year, there have not been a lot of significant changes in our business environment. • **Consultant Survey Question**: In the last year, there have not been a lot of significant changes in the client's business environment.
Env_A	There are frequent changes needed by our suppliers, clients or regulators in our business market. • **Consultant Survey Question**: There are frequent changes needed by the client's suppliers, clients or regulators in our business market.
Env	In our business market, changes are taking place continuously. • **Consultant Survey Question**: In the client's business market, changes are taking place continuously.
EnvCo_B	Competition in our business market is intense. • **Consultant Survey Question**: Competition in the client's business market is intense.
EnvCo_A	Our business market is very competitive. • **Consultant Survey Question**: The client's business market is very competitive.
EnvCo	Our organization has relatively strong competitors. • **Consultant Survey Question**: The client's organization has relatively strong competitors.
Systems Agility	
SyAgil_D	For this selected agility challenge the IS group made the needed changes in adequate time. • **Consultant Survey Question**: For this selected agility challenge the client's IS group made the needed changes in adequate time.
SyAgil_C	We met the business requirements by changing the information systems in the time frame required. • **Consultant Survey Question**: The client met the business requirements by changing the information systems in the time frame required.

SyAgil_B	We were successful in changing the information systems rapidly enough to meet the business challenge in response to the selected agility challenge. • **Consultant Survey Question**: The client was successful in changing the information systems rapidly enough to meet the business challenge in response to the selected agility challenge.
SyAgil_A	The effort to meet the business challenge was not derailed by difficulties in changing the information systems rapidly enough.
SyAgil	We successfully made the needed changes to our information systems to respond to the selected agility challenge in a timely manner. • **Consultant Survey Question**: The client successfully made the needed changes to their information systems to respond to the selected agility challenge in a timely manner.

Appendix C – Sorting Exercise

Sorting Exercise Instructions

Thank you for agreeing to take part in this sorting exercise. It is part of research taking place at the University of Georgia on Information Systems and Agility under the direction of Dr. Marie Claude Boudreau and Dr. Dale Goodhue. My name is Ashley Davis and I'm a PhD student in the Management Information Systems Department at the University of Georgia. My dissertation explores the impact that social capital has on the ability of an organization to respond to challenges utilizing information systems or Systems Agility. The challenges that are important to systems agility are challenges that require prompt, successful response. We term these challenges as agility challenges. In an effort to validate the construct validity of the measures, we would like you to take part in a sorting exercise.

Your responses are anonymous and any published papers from this research will utilize anonymous data. Your participation is voluntary; you may refuse to participate or stop participating at any time without penalty or loss of benefits to which you are otherwise entitled. There are no known risks or discomforts associated with this research. There are no direct benefits to you for completing this exercise; however, this research may advance the knowledge of the role that systems play in organizational agility and provide a clear definition of systems agility. The findings of this research will available to you via e-mail.

Your participation will involve performing a sorting exercise. In this exercise the construct definitions are matched to the items. Please read the construct definitions and abbreviations on the next page (page 2) and then match the items (on pages 3-5) to the construct definitions by writing the appropriate abbreviation in the "Construct" column on page 3. This exercise should take approximately 20 minutes. Please return the packet to Dr. Elena Karahanna or Ashley Davis.

By completing this exercise, you are agreeing to participate in the above described research project. Please contact me with any other questions or if you would like a copy of the findings.
Ashley Davis, PhD Candidate; Management Information Systems Department,University of Georgia, 313 Brooks Hall; Athens, GA 30602-6273;
Email: davisash@uga.edu; Telephone: 706-614-9021

Thank you very much!!! Please keep this letter for your records!
Sincerely,

Ashley Davis

Additional questions or concerns regarding your rights as a research participant should be directed to The Chairperson, University of Georgia Institutional Review Board, 612 Boyd GSRC, Athens, Georgia 30602-7411; telephone (706) 542-3199; email address irb@uga.edu.

Construct Definitions

Construct	Definition	Abbreviation
Number of Stakeholders	The number of people representing different perspectives in the organization that will be affected by the agility challenge.	NumStak
Equivocality in Challenges	Challenges where uncertainty or ambiguity exists in: 1. the origin/nature of the challenge 2. which criteria is the best criteria for choosing a solution 3. which of multiple solutions is best	Equiv
Systems Agility	Systems agility is the organizational ability to successfully and swiftly change its information systems in response to agility challenges.	SysAgil
General Cognitive Social Capital	Refers to the existence of shared vision, language, terms between the IS group and the business groups subject to social exchange.	GenCogSC
General Structural Social Capital	The informal and formal ties between the IS and business group. Network ties provide access to resources. Network ties include the interaction or networking part of social capital.	GenStructSC
General Relational Social Capital	Refers to the assets that comprise the relationships or expectations and obligations of the relationship. These assets include trust, norms, obligations and expectations, and identification.	GenRelSC
Environmental Turbulence	The volatility of the environment and the competitiveness of the environment in which an organization operates.	EnvTurb
Consultant Involvement	The extent to which consultants were instrumental in resolving the agility challenge.	ConsInv
Routineness	Prior experience with a specific type of challenge.	Routine
Difficulty of Information Technology	Difficulty of the information technology (architecture, software, etc.).	Difficult
Challenge Specific Cognitive Social Capital	Refers to the existence of shared vision, language, terms between the IS group and the business groups subject to social exchange in the specific agility challenge.	CSCogSC
Challenge Specific Structural Social Capital	The informal and formal ties between the IS and business group that were important for the specific agility challenge.	CSStructSC
Challenge Specific General Relational Social Capital	The trust, norms, obligations and expectations, and identification of the parties involved in the specific agility challenge.	CSRelSC
Consultant Capital	The social capital of the consultants involved in the specific agility challenge	ConsCap

Measures

	Item	Construct
1	Both the business and the IS group can be counted on to do their part.	GenRelCap
2	In general, there is a good amount of informal "hall talk" among business and IS people.	GenStrucCap
3	Business and IS groups share a common overall vision for the role of IS within the organization.	GenCogCap
4	As a business, we regularly respond to changes needed by our suppliers, clients or regulators.	EnvTurb
5	We were successful in changing the information systems rapidly enough to meet the business challenge in response to the selected agility challenge	SysAgility
6	This selected agility challenge affected many stakeholders in the organization.	NumStake
7	When this selected challenge was presented to the IS group, it was not clear which solution was best overall.	Equiv
8	For the selected agility challenge, both the business and IS people involved could be counted on to do their part.	SpecRelCap
9	There was a good amount of informal "hall talk" among business and IS people involved with this selected agility challenge.	SpecStrucCap
10	In the context of this agility challenge, business and IS people shared a common vision for the role of IS.	SpecCogCap
11	When originally presented with the selected agility challenge, we had previous experience with this type of challenge.	Routineness
12	Our existing systems made it difficult to implement the solution to the selected agility challenge.	Difficult
13	We successfully made the needed changes to our information systems to response to the selected agility challenge	SystemsAgility
14	The business people are quite accessible (on an informal basis) to the IS people.	GenStrucCap
15	In our market, changes are taking place continuously.	Envturb
16	Business and IS groups agree on priorities for the organizational use of IS.	GenCogCap
17	The IS and business groups are able to use common terms for describing issues.	GenCogCap
18	The selected agility challenge necessitated the input of many stakeholders.	NumbStak
19	The IS group had a clear understanding of how to get to the solution when first presented with this selected agility challenge.	Equiv
20	There was a good amount of interaction on an informal basis (e.g. chatting about non-work related issues, joking, non-wo24rk-related phone conversations, etc.) between the business and IS people involved in this selected agility challenge.	SpecStrucCap

	Item	Construct
21	When originally presented with the selected agility challenge, we had faced this type of challenge in the past	Routine
22	Our existing systems hindered the implementation of the solution to the selected agility challenge	Difficult
23	For this selected agility challenge the IS group made the needed changes in a timely manner	SysAgility
24	There was a high level of sharing of information between the IS people and the business people involved in the selected agility challenge	SpecRelCap
25	People in the business department interacted a lot with people in the IS department on a formal basis while resolving this selected agility challenge(e.g. official meetings, work-related phone calls, etc.)	SpecStrucCap
26	In the context of this agility challenge, business and IS people agreed on priorities for the use of IS.	SpecCogCap
27	Our existing systems limited our ability to implement a solution to the selected agility challenge	Difficult
28	When business people came to IS with the selected agility challenge, both were able to use a common vocabulary for communicating the issues	SpecCogCap
29	To the extent that consultants were involved, did they have good relationships with IS	ConsCapital
30	When originally presented with the selected agility challenge, this was a familiar challenge for us	Routine
31	There was a norm of collaboration between the IS people and the business people involved in the selected agility challenge	SpecRelCap
32	There is a good amount of interaction on an informal basis (e.g. chatting about non-work related issues, joking, non-work-related phone conversations, etc.) between the IS people and the business people	GenStrucCap
33	IS people attended many regular meetings and/or conference calls with business people working on this selected agility challenge.	SpecStrucCap
34	When first presented with this challenge, clarifying the true needs and possible solutions required a lot of interaction between the business and IS	Equiv
35	There is a high level of sharing of information between the IS group and the business	GenRelCap
36	There was an atmosphere of trust between the business and IS people involved in the selected agility challenge	SpecRelCap
37	People in the business department interact a lot with people in the IS department on a formal basis (e.g. official meetings, work-related phone calls, etc.)	GenStrucCap
38	In the context of this agility challenge, business and IS people agreed on the key IS management issues affecting the challenge	SpecCogCap

	Item	Construct
49	Business and IS groups agree on the key IS management issues affecting the organization	GenCogCap
40	We were successful in changing the information systems to respond to the selected agility challenge in the time required	SysAgility
41	The business people involved in this selected agility challenge were quite accessible to IS people.	SpecStrucCap
42	IS people attend many regular meetings and/or conference calls with business people	GenStrucCap
43	The IS and business used common terms for describing the selected agility challenge	SpecCogCap
44	When the IS group was presented with the selected agility challenge, the criteria for choosing the solution was not clear	Equiv
45	To the extent that consultants were involved, did they have good relationships with the business?	ConsCap
46	There is a norm of collaboration between the IS group and the business	GenRelCap
47	When business people come to IS with a problem, both are able to use a common vocabulary for communicating the issues	GenCogCap
48	Our organization has relatively strong competitors	EnvTurb
49	A lot of different stakeholders had to interact to develop a good solution to this selected agility challenge	NumStakeh
50	IS people had no trouble understanding the selected agility challenge as described by business people	SpeCogCap
51	Competition in our market is intense	EnvTurb
52	There is an atmosphere of trust between the business and the IS group	GenRelCap
53	IS people have no trouble understanding challenges as described by business people	GenCogCap
54	It was not immediately clear how to define the selected agility challenge when the IS group was first presented with it	Equiv
55	Technical constraints limited our options for implementing a solution to this selected agility challenge	Difficult
56	The selected agility challenge was appropriately resolved in timely manner utilizing information systems.	SysAgility – **New Item**
57	Competition in our market is extremely high.	EnvTurb
58	The IS and business people regularly attend conference calls or meetings together.	GenStrucCap
59	In a year, nothing has changed in our market.	EnvTurb
60	The IS and business people regularly attended conference calls or meetings together to discuss the selected agility challenge.	SpeStrucCap

Appendix D – Sorting Exercise Results including Changes Due to Sorting Findings

Item	Correct Answer	% Correct	Confusing Constructs
To the extent that consultants were involved, did they have good relationships with the business?	ConsCap	100.00	
To the extent that consultants were involved, did they have good relationships with IS	ConsCapital	100.00	
Our existing systems made it difficult to implement the solution to the selected agility challenge.	Difficult	80.00	SystemsAgility (2)
Our existing systems hindered the implementation of the solution to the selected agility challenge	Difficult	70.00	SystemsAgility (2)
Our existing systems limited our ability to implement a solution to the selected agility challenge	Difficult	70.00	Systems Agility (3)
Technical constraints limited our options for implementing a solution to this selected agility challenge	Difficult	80.00	Systems Agility (2)
As a business, we regularly respond to changes needed by our suppliers, clients or regulators. There are frequent changes needed by our suppliers, clients or regulators in our business market.	EnvTurb	30.00	Number of Stakeholders, Routine, Consulting Capital, Systems Agility (2), Routine
In our market, changes are taking place continuously.	Envturb	90.00	Equivocality
Our organization has relatively strong competitors	EnvTurb	100.00	
Competition in our market is intense	EnvTurb	100.00	
Competition in our market is extremely high.	EnvTurb	100.00	
In a year, nothing has changed in our market.	EnvTurb	90.00	Routine
When this selected challenge was presented to the IS group, it was not clear which solution was best overall.	Equiv	100.00	
The IS group had a clear understanding of how to get to the solution when first presented with this selected agility challenge.	Equiv	70.00	Specific Relational Capital, Systems Agility, Routine

When first presented with this challenge, clarifying the true needs and possible solutions required a lot of interaction between the business and IS	Equiv	70.00	Specific Structural Capital (2), Difficulty
When the IS group was presented with the selected agility challenge, the criteria for choosing the solution was not clear	Equiv	100.00	
It was not immediately clear how to define the selected agility challenge when the IS group was first presented with it	Equiv	100.00	
Business and IS groups share a common overall vision for the role of IS within the organization.	GenCogCap	100.00	
Business and IS groups agree on priorities for the organizational use of IS. Business and IS people saw the priorities in the same way.	GenCogCap	80.00	General Relational Capital (2)
The IS and business groups are able to use common terms for describing issues.	GenCogCap	100.00	
When business people come to IS with a problem, both are able to use a common vocabulary for communicating the issues	GenCogCap	100.00	
Business and IS groups agree on the key IS management issues affecting the organization	GenCogCap	80.00	General Structural Capital
IS people have no trouble understanding challenges as described by business people. The language used by business people when descibing issues is easily understood by the IS people.	GenCogCap	60.00	Specific Cognitive Capital (2), Equivocality (2)
Both the business and the IS group can be counted on to do their part.	GenRelCap	100.00	
There is a high level of sharing of information between the IS group and the business. The IS people and the business people get along well together.	GenRelCap	30.00	General Cognitive Capital (4), General Structural Capital (3)
There is a norm of collaboration between the IS group and the business	GenRelCap	90.00	
There is an atmosphere of trust between the business and the IS group	GenRelCap	100.00	
In general, there is a good amount of informal “hall talk” among business and IS people.	GenStrucCap	90.00	General Cognitive Capital
The business people are quite accessible (on an informal basis) to the IS people.	GenStrucCap	100.00	

There is a good amount of interaction on an informal basis (e.g. chatting about non-work related issues, joking, non-work-related phone conversations, etc.) between the IS people and the business people	GenStrucCap	90.00	Specific Structural Capital
People in the business department interact a lot with people in the IS department on a formal basis (e.g. official meetings, work-related phone calls, etc.)	GenStrucCap	100.00	
IS people attend many regular meetings and/or conference calls with business people	GenStrucCap	80.00	General Cognitive Cap, General Relational Capital
The IS and business people regularly attend conference calls or meetings together.	GenStrucCap	90.00	General Cognitive Cap, General Relational Capital
The selected agility challenge necessitated the input of many stakeholders.	NumbStak	100.00	
This selected agility challenge affected many stakeholders in the organization.	NumStake	100.00	
A lot of different stakeholders had to interact to develop a good solution to this selected agility challenge	NumStakeh	100.00	
When originally presented with the selected agility challenge, we had faced this type of challenge in the past	Routine	100.00	
When originally presented with the selected agility challenge, this was a familiar challenge for us	Routine	90.00	Equivocality
When originally presented with the selected agility challenge, we had previous experience with this type of challenge.	Routineness	100.00	
In the context of this agility challenge, business and IS people shared a common vision for the role of IS.	SpecCogCap	100.00	
In the context of this agility challenge, business and IS people agreed on priorities for the use of IS. In the context of this agility challenge, business and IS people saw the priorities in the same way.	SpecCogCap	60.00	Systems Agility, Specific Relational Capital (3)

When business people came to IS with the selected agility challenge, both were able to use a common vocabulary for communicating the issues	SpecCogCap	100.00	
In the context of this agility challenge, business and IS people agreed on the key IS management issues affecting the challenge	SpecCogCap	80.00	
The IS and business used common terms for describing the selected agility challenge	SpecCogCap	80.00	General Cognitive Capital
IS people had no trouble understanding the selected agility challenge as described by business people. The language used by business people when describing the agility challenge was easily understood by the IS people.	SpeCogCap	60.00	Equivocality (2), Specific Cognitive Capital
For the selected agility challenge, both the business and IS people involved could be counted on to do their part.	SpecRelCap	90.00	Systems Agility
There was a high level of sharing of information between the IS people and the business people involved in the selected agility challenge. The IS people and the business people involved in the selected agility challenge got along well together.	SpecRelCap	30.00	Specific Cognitive Capital (3), Specific Structural Capital (4)
There was a norm of collaboration between the IS people and the business people involved in the selected agility challenge	SpecRelCap	90.00	
There was an atmosphere of trust between the business and IS people involved in the selected agility challenge	SpecRelCap	100.00	
There was a good amount of informal “hall talk” among business and IS people involved with this selected agility challenge.	SpecStrucCap	90.00	Specific Cognitive Capital
There was a good amount of interaction on an informal basis (e.g. chatting about non-work related issues, joking, non-wo24rk-related phone conversations, etc.) between the business and IS people involved in this selected agility challenge.	SpecStrucCap	100.00	

People in the business department interacted a lot with people in the IS department on a formal basis while resolving this selected agility challenge(e.g. official meetings, work-related phone calls, etc.)	SpecStrucCap	90.00	General Structural Capital
IS people attended many regular meetings and/or conference calls with business people working on this selected agility challenge.	SpecStrucCap	70.00	Specific Relational Capital (3), Specific Cognitive Capital
The business people involved in this selected agility challenge were quite accessible to IS people.	SpecStrucCap	70.00	Specific Relational Capital (3)
The IS and business people regularly attended conference calls or meetings together to discuss the selected agility challenge.	SpeStrucCap	90.00	General Cognitive Capital, General Relational Capital
We were successful in changing the information systems rapidly enough to meet the business challenge in response to the selected agility challenge	SysAgility	90.00	Routine
For this selected agility challenge the IS group made the needed changes in a timely manner	SysAgility	90.00	Routine
We were successful in changing the information systems to respond to the selected agility challenge in the time required	SysAgility	100.00	
The selected agility challenge was appropriately resolved in timely manner utilizing information systems.	SysAgility – **New Item**	100.00	
We successfully made the needed changes to our information systems to response to the selected agility challenge	SystemsAgility	100.00	

Appendix E – Sample Survey Page/Random Questions

Answer the following questions with the "selected agility challenge" in mind:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The IS people and the business people involved in the selected agility challenge got along well together.	☐	☐	☐	☐	☐
A lot of different stakeholders had to interact to develop a good solution to this selected agility challenge.	☐	☐	☐	☐	☐
People in the business department interacted a lot with people in the IS department on a formal basis while resolving this selected agility challenge(e.g. official meetings, work-related phone calls, etc.)	☐	☐	☐	☐	☐
When business people came to IS with the selected agility challenge, both were able to use a common vocabulary for communicating the issues.	☐	☐	☐	☐	☐
When originally presented with the selected agility challenge, we had previous experience with this type of challenge.	☐	☐	☐	☐	☐
The language used by business people when describing the agility challenge was easily understood by the IS people.	☐	☐	☐	☐	☐
For this selected agility challenge the IS group made the needed changes in adequate time.	☐	☐	☐	☐	☐
When this selected challenge was presented to the IS group, it was not clear which solution was best overall.	☐	☐	☐	☐	☐
IS people attended many regular meetings and/or conference calls with business people working on this selected agility challenge.	☐	☐	☐	☐	☐
Technical constraints limited our options for implementing a solution to this selected agility challenge.	☐	☐	☐	☐	☐
We met the business requirements by changing the information systems in the time frame required.	☐	☐	☐	☐	☐
In the context of this agility challenge, business and IS people saw the priorities in the same way.	☐	☐	☐	☐	☐
We were successful in changing the information systems rapidly enough to meet the business challenge in response to the selected agility challenge.	☐	☐	☐	☐	☐
When originally presented with the selected agility challenge, we had faced this type of challenge in the past.	☐	☐	☐	☐	☐
The effort to meet the business challenge was not derailed by difficulties in changing the information systems rapidly enough.	☐	☐	☐	☐	☐
Our existing systems limited our ability to implement a solution to the selected agility challenge.	☐	☐	☐	☐	☐
The IS group had a clear understanding of how to get to the solution when first presented with this selected agility challenge.	☐	☐	☐	☐	☐

Appendix F – Control Variables

Questions are from the IS version of the survey.

Which of the following most closely describes your current role?

- ☐ IS Person
- ☐ Liaison between IS and Business

Which of the following is closest to your title?

- ☐ CIO
- ☐ Director
- ☐ Sr. Manager
- ☐ Manager
- ☐ Project Manager
- ☐ Analyst
- ☐ Programmer
- ☐ Data Base Administrator

Which Industry is your employer (at the time of the selected agility challenge) a part of?

- ☐ Communications – Telecom
- ☐ Construction
- ☐ Consumer Packaged Goods
- ☐ Defense Contractors
- ☐ Distribution - Retail
- ☐ Distribution - Wholesale
- ☐ Education
- ☐ Federal Government
- ☐ Financial Services - Other
- ☐ Financial Services – Depository Institutions
- ☐ Financial Services - Insurance
- ☐ Healthcare – Hospitals/Healthcare Providers
- ☐ Information management/on line retrieval
- ☐ Information Technology
- ☐ Logistics
- ☐ Manufacturing – Discrete
- ☐ Manufacturing – Process
- ☐ Media
- ☐ Petroleum
- ☐ Pharmaceuticals
- ☐ Services - Professiona
- ☐ State and Local Government
- ☐ Transportation
- ☐ Utilities
- ☐ Other

About how many employees were part of your total organization (globally) at the time of the selected agility challenge?

1-100 ☐ 101-500 ☐ 501-1,000 ☐ 1,001-2,000 ☐ 2,001-10,000 ☐ 10,000 + ☐

About how many employees were part of your local IS group at the time of the selected agility challenge?

1-100 ☐ 101-500 ☐ 501-1,000 ☐ 1,001-2,000 ☐ 2,001-10,000 ☐ 10,000 + ☐

About how many employees were part of the business unit(s) that your IS group served at the time of the selected agility challenge?

1-100 ☐ 101-500 ☐ 501-1,000 ☐ 1,001-2,000 ☐ 2,001-10,000 ☐ 10,000 + ☐

How long have you worked for your employer (number of years) ?

Appendix G – Second Exploratory Model Results

SEM of Exploratory Model 2 Individually Tested

	Expl 1 Interactions		Expl 2 Interactions		Expl 3 Interactions	
Endogenous Variable for Controls:	Equivocality	Agility	Equivocality	Agility	Equivocality	Agility
Controls						
Technical Difficulty	.216**	-0.114	.214**	-0.111	.225**	-0.101
Routine	-.162*	0.041	-0.163*	0.037	-.168**	0.047
Environment	n/a	0.020	n/a	0.015		0.007
Critical Hypothesized Constructs						
Structural Informal		.180*		.160*		.193**
Structural Formal		-.068		-.065		-.048
Cognitive		.093		.089		.104
Relational		.489*		.476*		.552*
Stakeholder Complexity		-0.267		-0.267		-0.286
Equivocality		-.093		-.102		-.119
Interactions						
Equivocality X Cognitive Capital						
Equivocality X Relational Capital						.335*
Equivocality X Structural Capital (Formal)				0.034		
Equivocality X Structural Capital (Informal)		0.061				
Stakeholder Complexity X Cognitive Capital						
Stakeholder Complexity X Relational Capital						
Stakeholder Complexity X Structural Capital (Formal)						
Stakeholder Complexity X Structural Capital (Informal)						

	Expl 4 Interactions		Expl 5 Interactions		Expl 6 Interactions	
Endogenous Variable for Controls:	Equivocality	Agility	Equivocality	Agility	Equivocality	Agility
Controls						
Technical Difficulty	.217**	-.107	.218**	-0.110	.218**	-0.101
Routine	-.167**	0.047	-.161*	0.043	-.160*	0.036
Environment	n/a	0.025	n/a	0.018	n/a	0.016
Critical Hypothesized Constructs						
Structural Informal		.172*		.159*		.160*
Structural Formal		-.068		-.060		-.070
Cognitive		.140		.088		.082
Relational		.483*		.469*		.485*
Stakeholder Complexity		-0.265		-0.296		-0.299
Equivocality		-.104		-.089		-.116
Interactions						
Equivocality X Cognitive Capital		0.155				
Equivocality X Relational Capital						
Equivocality X Structural Capital (Formal)						
Equivocality X Structural Capital (Informal)						
Stakeholder Complexity X Cognitive Capital						
Stakeholder Complexity X Relational Capital						
Stakeholder Complexity X Structural Capital (Formal)						0.076
Stakeholder Complexity X Structural Capital (Informal)				0.068		

	Expl 7 Interactions		Expl 8 Interactions	
Endogenous Variable for Controls:	Equivocality	Agility	Equivocality	Agility
Controls				
Technical Difficulty	.218**	-0.105	.219**	-0.109
Routine	-.161*	0.041	-.161*	0.043
Environment	n/a	0.021	n/a	0.028
Critical Hypothesized Constructs				
Structural Informal		.156*		.157*
Structural Formal		-.060		-.064
Cognitive		.079		.090
Relational		.480*		.462*
Stakeholder Complexity		-0.286		-0.269
Equivocality		-.097		-.064
Interactions				
Equivocality X Cognitive Capital				
Equivocality X Relational Capital				
Equivocality X Structural Capital (Formal)				
Equivocality X Structural Capital (Informal)				
Stakeholder Complexity X Cognitive Capital				-0.134
Stakeholder Complexity X Relational Capital		0.094		
Stakeholder Complexity X Structural Capital (Formal)				
Stakeholder Complexity X Structural Capital (Informal)				

SEM Paired Tests for Exploratory Model 2

Controls							
Technical Difficulty - Agility	-0.101	-0.1	-0.101	-0.101	-0.093	-0.105	-0.101
Routine - Agility	0.047	0.05	0.046	0.047	0.045	0.064	0.049
Environment - Agility	0.007	0.017	0.006	0.004	0.009	-0.019	0.009
Technical Difficulty - Equivocality	.226**	.226**	.224**	.231**	.226**	.227**	.226**
Routine - Equivocality	-.167**	-.167**	-0.168**	-.166**	-.167**	-.165*	-.167**
Critical Hypothesized Constructs							
Structural Informal	.191*	.192*	.193**	.191*	.195*	.191**	.195*
Structural Formal	-0.046	-0.05	-0.047	-0.046	-0.055	-0.141	-0.047
Cognitive	0.098	0.106	0.098	0.101	0.099	0.099	0.104
Relational	.557*	.542*	.551*	.557*	.563**	.622*	.548*
Stakeholder Complexity	-.296	-0.282	-0.288	-0.291	-0.31	-0.225	-0.299
Equivocality	-0.114	-0.106	-0.119	-0.121	-0.132	-0.083	-0.111
Interactions							
Equivocality X Cognitive Capital			0.017				
Equivocality X Relational Capital	-.333*	-0.324*	-0.345(.112)	-.349(.058)	-.332*	-.552*	-.328*
Equivocality X Structural Capital (Formal)						0.263	
Equivocality X Structural Capital (Informal)				0.024			
Stakeholder Complexity X Cognitive Capital		-0.099					
Stakeholder Complexity X Relational Capital	-0.083						
Stakeholder Complexity X Structural Capital (Formal)					-0.071		
Stakeholder Complexity X Structural Capital (Informal)							-0.041

SEM for Exploratory Model 2 without Equiv3 or StrucI_A

	Full New Equiv3 ML	Full New Equiv3 MLM	Full New Equiv3 Interaction Relational	Full New Equiv3 Interaction Formal	Full New Equiv3 Interaction Pair
Controls					
Technical Difficulty - Agility	-0.107	-0.107	-0.085	-0.092	-0.093
Routine - Agility	0.034	0.034	0.04	0.026	0.059
Environment - Agility	0.017	0.017	0.007	0.016	-0.018
Technical Difficulty - Equivocality	.330**	.330**	.248**	.231**	.245**
Routine - Equivocality	-.233**	-.233*	-.163*	-.157*	-.161*
Critical Hypothesized Constructs					
Structural Informal	.204*	.204**	.188*	0.158*	.184**
Structural Formal	-0.069	-0.069	-0.044	-0.04	-0.15
Cognitive	0.097	0.097	0.098	0.089	0.094
Relational	.413*	.413**	.590*	.462*	.663*
Stakeholder Complexity	-.182(.075)	-.182*	-.278	-0.272	-0.219
Equivocality	-0.136	-0.136	-0.176	-0.183	-0.132
Interactions					
Equivocality X Cognitive Capital					
Equivocality X Relational Capital			-.357*		-.570**
Equivocality X Structural Capital (Formal)				-0.046	0.262
Equivocality X Structural Capital (Informal)					
Stakeholder Complexity X Cognitive Capital					
Stakeholder Complexity X Relational Capital					
Stakeholder Complexity X Structural Capital (Formal)					
Stakeholder Complexity X Structural Capital (Informal)					
R-Square					
R Squared Systems Agility	0.349	0.349			
R Squared Equivocality	0.16	0.16			