Organization Improvisational Capability and Configurations of Firm Performance in a Highly Turbulent Environment

by

LeeAnn Kung

A dissertation submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Doctor of Philosophy

Auburn, Alabama
May 09, 2015

Keywords: organization improvisational capability,
configurations, fsQCA

Approved by

Terry Byrd, Chair, Professor of Management Information Systems
Casey Cegislski, Professor of Management Information Systems
Kelly Rainer, Professor of Management Information Systems
Shashank Rao, Assistant Professor of Supply Chain Management

Abstract

This dissertation intends to examine 1) nature of organization improvisational capabilities and 2) some possible configurations for firm performance in a highly turbulent environment, i.e., e-commerce.

Motivated by the observation of the dynamics of digital business ecosystem and to answer calls from IS, strategy and management fields, the first research question is to examine an organizational level capability that organizations use to respond to unexpected problems and turbulences. To gain understanding of organization improvisational capabilities, a scale development project was conducted. An essential goal of scale development is to create a valid measure of an underlying construct. A thorough literature review of improvisation and organization improvisational capabilities was completed. A definition of organization improvisational capabilities is formed to provide some basic and direct information for scholars and managers. One of the results of this review was the discovery of dimensions of improvisational capabilities that helped drive the development of a measurement scale for this latent construct. A robust measure of improvisational capabilities is developed and empirically tested.

The result from the OIC scale development plays an important part for the second research question, which is to explore some possible combinations of elements for firm performance. Based on empirical field data, this dissertation sets out to investigate possible

configurations for high firm financial performance involving organizational improvisational capabilities, IT infrastructure flexibility, particular organizational characteristics, and environmental factors and their relationships with innovation performance using the configurational approach and used fsQCA as the analysis tool. Instead of testing individual independent variable's effect like in linear path model, this dissertation applied configuration theory as the inquiring systems to show a more holistic view of the increasingly complex inter-relationships of elements of digital ecodynamics. Four different configurations for high financial performance of different firm sizes and IT department sizes were identified and discussed.

This dissertation is one of the earliest IS studies applying configuration logic and set-theoretic methods, like fsQCA, in organization research and responds to calls in the innovation literature. This dissertation also makes a broader methodological contribution to organization and IS strategy researches in general. Existing theories that are based on linear, additive relationships between elements and assume equilibrium status cannot effectively explain such dynamically changing punctuated disequilibrium in digital ecodynamics (Meyer et al., 2005). A configurational approach accompanied by strong methods such as fsQCA can be used to build new theories that can effectively explain such nonlinear discontinuous changes driven by dynamic interactions of digital technologies, organizational and social factors.

Acknowledgments

My deepest gratitude goes to God and my husband, Hsiang- Jui, whose loving support was essential to my completing the doctoral program. I could not have done it without him. I also deeply appreciate our daughter, Ling-Yi, who provided love, support and editing. I thank God for my family and I dedicate this dissertation to them.

I would like to offer a very special thank you to my dissertation chair, Dr. Terry Anthony Byrd, for his encouragement, his guidance, and his abundant patience. Dr. Byrd's willingness to share his time and knowledge in numerous discussions with me was—in a word—priceless. I could not have asked for a better chairperson. I also wish to thank my committee members, Dr. Casey Cegielski and Dr. Shashank Rao, for their very helpful direction and support. A special thank you is extended to Dr. Kelly Rainer who agreed to serve on my committee at the last minute notice.

Table of Contents

List of Tables

List of Figures

CHAPTER 1: INTRODUCTION

Uncertainty and change are two main characteristics of today's business environment. Global financial turmoil, technology breakthroughs, rapid-changing customers' preferences and unexpected competitions make today's business environment more volatile than ever before. One catalyst that has accelerated environmental conditions has been the Internet. Even for mature industries, the introduction and growth of the Internet has brought some unexpected challenges and opportunities that traditional management, organization structures or business strategies have simply not been able to cope with them. This study is framed in e-commerce, a highly turbulent environment, in which firms' performance depends on a complex system of interdependent and mutual reinforcing factors.

To cope with such a messy, complex, and chaotic environment (El Sawy, Malhotra, & Pavlou, 2010), organizations seek to be agile in order to respond quickly to satisfy customers, meet market demands, and reconfigure resources to meet requirements. Such responses almost always consist of organizational change. A major challenge for managers in turbulent environments is to make sound decisions quickly (Pavlou & El Sawy, 2011). Firms can gain advantages by picking appropriate resources in stable environments, yet require dynamic capabilities to gain advantages when the environment becomes more unpredictable (Makadok, 2001). Dynamic capabilities is the planned ability to integrate, build, and reconfigure firm's daily operational capabilities (El Sawy & Pavlou, 2008; Teece, Pisano & Shuen, 1997). Pavlou and El Sawy (2010) show that while dynamic capabilities are the primary predictor of competitive advantage in *moderately* turbulent environments, another organizational ability - improvisational capabilities- dominate in *highly* turbulent environments.

Organization Improvisational Capabilities

Organization and management studies have in the past two decades increased their interest in the organization improvisation process (Leone, 2010) in dealing with environmental turbulence or unpredicted opportunities. In such a hypercompetitive environment, the traditional patterns of planning and implementation will be less effective. Managers typically have to utilize other strategies or invoke different capabilities other than planning and operation capabilities to take advantage of fast developing but unforeseen opportunities or challenges. Improvisation can be an effective choice when a firm faces environmental turbulence (Crossan et al, 1996) that requires action in a time frame that is much shorter than a regular planning cycle (Moorman & Miner, 1997, 1998a, 1998b; Eisenhardt & Tabrizi, 1995). Organizational researchers have analyzed improvisation in fast-moving and uncertain organizational settings such as new product development (Eisenhardt & Tabrizi, 1995; Moorman & Miner, 1998a, 1998b; El Sawy & Pavlou, 2008), emergencies such as a strike (Preston, 1991), a failed navigational system (Hutchins, 1991), a firestorm (Weick, 1993), and crisis management (the September 11 attacks). The importance of improvisation is often readily apparent in emergency or fast moving competitive business situations where expedient action is required. Improvisation enables organizations to quickly modify their behavior to changing circumstances. In rapidly changing environments, a plan developed some time ago may not fit the current situation (Rumelt, 1987). Despite the attention to organizational improvisation in recent decade – leading to the idea that improvisation can give organizations competitive advantage in turbulent environment (Pavlou & El Sawy, 2010) – a better conceptualization is still needed, as Crossan and Sorrenti (2002) have pointed out. “Improvisation is a part of daily organizational life. Sometimes it is done well; sometimes it is done poorly. However, we know very little about what characteristics separate

the two extremes (p.49)." One of the goals of this study is to build an overall understanding of organization improvisational capabilities. Another goal is to examine the relationship between agility and improvisation to fill a research gap, since such a relationship has not been theorized or established due to the fact that they are primarily studied separately. The next logical step would be finding what links agility and improvisational capabilities, i.e. what facilitates such a relationship.

Information Technology (IT)

In this digital era, information technology plays an important role in an organization's day-to-day operations and is deemed a major enhancer of organization performance (El Sawy et al, 2010). However, "less than 3% of research articles in leading management journals have directly studied the relationship between IT and organizations" (Orlikowski & Iacono, 2001; Zammuto et al, 2007). IT capability is critical for a firm to realize business value and sustain competitive advantage, as it is a firm's ability to acquire, deploy, combine, and reconfigure IT resources in support and enhancement of business strategies and work processes (Sambamurthy a& Zmud, 2000). Ignoring the role of IT systems is at best incomplete and even potentially misleading (El Sawy et al, 2010, p.836).

Researchers from different disciplines have independently studied the relationship between IT and performance. For example, management and agility researchers have studied the relationship between IT and business strategy and the relationship between IT and agility respectively. IS researchers have studied IT as an organizational resource (Bharadwaj, 2000; Bharadwaj, Sambamurthy, & Zmud, 1999; Melville, Kraemer, & Gurbaxani, 2004; Santhanam & Hartono, 2003; Wade & Hulland, 2004)). Although research has begun to link firm-wide IT

capability to competitive advantage (Bharadwaj, 2000; Bhatt & Grover, 2005; Mata, Fuerst, & Bareney, 1995; Ross et al. 1996), there is still limited understanding of IT capability and how it relates to agility in contemporary business environments (Kohli & Grover, 2008). El Sawy et al. (2010) propose that we should at first change our way of examining IT's effect on strategic advantage in turbulent environments. Lu and Ramamurthy (2011) and Tan et al. (2010) suggest that future research should further explore pathways to and underlying mechanisms for IT capability and agility across firms or business contexts empirically. Guillemette and Paré (2012) offer an explanation of the contribution of the IT functions with a typology of ideal profiles.

> *At the same time, researchers have reminded us that IT is not the only means in achieving agility. IT is only one piece of the puzzle in achieving agility (Bostrom and Heinen 1977), and future research should examine how other elements such as culture, structure, process, or people interact and couple with IT in enabling agility (Lu and Ramamurthy, 2011) and in turn, gain better organization performance.*

Environmental Factors

Firms can gain advantages by picking appropriate resources in stable environments, yet require dynamic capabilities to gain advantages when the environment becomes more unpredictable (Makadok, 2001). In turbulent, fast changing environments, many competitive advantages achieved by a firm are short-lived due to competitive and environmental pressures which tend to quickly erode any value attributable to the firm's IT capabilities. Pavlou and El Sawy (2010) show that while dynamic capabilities are the primary predictor of competitive advantage in *moderately* turbulent environments, improvisational capabilities fully dominate in *highly* turbulent environments. The management and IS literature also show that environmental dynamism leads to substantial uncertainties that require firms to rely on IT capabilities to stay

competitive (Pavlou, & El Sawy, 2006; Sirmon, Hitt & Ireland, 2007). It is in such turbulent environments that the traits of improvisational capabilities become most important, by allowing firms to reassemble resources to create revised and/or new IT capabilities that provide a better match to the environment.

IT, Environmental Factor, Improvisation Capability and Agility for Firm Performance

Organizations are not only dynamic, evolving entities, but are also interdependent-complex systems (Thompson, 1967). Increased complexity and interdependence of systems have increased the levels of uncertainty in predicting business outcomes. The evolution from a present state to a future state may be a result of a number of interactions between events that are emergent and unpredictable in nature, creating a dynamic that is not susceptible to rational control. Researchers agree that routines often fail and that solutions need to be improvised when facing high turbulence. Researchers seem to agree and call for *new organizing logic* in this digital era (Sambamurthy & Zmud, 2000; Yoo, Henfridsson, & Lyytinen, 2010). Organization **i**mprovisational capabilities are especially important in confronting unique situations that need to be resolved very quickly (Cunha, Cunha & Chia, 2007; Hutchins, 1991) with the help of IT. El Sawy, Malhotra and Pavlou (2010) named this phenomenon "*digital ecodynamics"*, defined as the holistic confluence among environmental turbulence, dynamic capabilities, and IT systems – and their fused dynamic interactions unfolding as an ecosystem.

When dealing with complex relationships, previous literature is mostly conceptual (often untestable) or use quadrants or nomological network for empirical testing. For example, Overby, Bharadwaj and Sambamurthy (2006) use the two characteristics of organization agility to illustrate the different two-way combinations: sensing capability as the x-axis and responding

capability as the y-axis. El Sawy et al. claim that "… it is incomplete to treat their (environmental turbulence, dynamic capabilities, and IT systems) two-way interaction effects independently because of the ***fused interdependencies*** of their triadic interaction. Rather, there is a need to capture the complex patterns of the dynamic interdependencies among these three elements ***simultaneously*** in a holistic way" (El Sawy et al., 2010, p.836-837). To follow this call, we turn to configuration theories to attempt to present such complex combinations. According to complexity theory (Benbya, & McKelvery, 2006; Tanriverdi, Rai, & Venkatraman, 2010), I posit that the "paths" between these factors are neither linear nor uni-directional.

Given the unprecedented scope of changes that organizations face and the need for members at all levels to be able to think, plan, innovate, and process information, new models and metaphors are needed for organizing (Barrett, 2002). Elements in this study's research models have been studied either separately or in a linear causal relationships while struggling to understand and present the complex relationships among them. My literature search has not shown either studies of the interdependent relationships between organization improvisational capabilities, IT, and environment factors or different combinations of these elements for enabling organization agility. I seek to pursue this research opportunity by focusing on the understudied context of organization improvisational capabilities, IT, environmental factors effects and their relationships toward organization agility. Configuration theory is proposed as a framework to move away from examining the myriad of individual variables and toward a consideration of the relationships between antecedents and organization performance.

PROPOSED STUDY STRUCTURE

This study is intended to be exploratory in nature. The objectives are to 1) understand the nature of organization improvisational capabilities, 2) understand the evolving dynamic relationships among environment, IT, organization improvisational capabilities, and organization performance, especially the different "path" combinations, and 3) to help generate a theory to inform efforts to better support these relationships. In the next chapter, I will examine previous work on all the aforementioned elements, with a focus on organization improvisational capabilities. I will develop theoretical foundations and research constructs around the concepts of organization improvisational capabilities to inform the exploration. Chapter three will cover the research methodology, which consists of utilizing a set-theoretic approach (Fiss, 2007) of configuration theory. Instead of using interaction effects, clustering algorithms, or deviation scores, a set-theoretic approach uses boolean algebra to determine which combinations of organizational characteristics combine to result in the outcome in question (Boswell & Brown, 1999; Ragin, 2000). At the center of set-theoretic approaches lies the idea that relationships among different variables are often best understood in terms of *set* membership (Fiss, 2007). I will use fsQCA as the tool to uncover and describe the agility configurations. Results and the similarities and/or differences between these two methods will be discussed in the following chapter. Following the discussion, implications for research and practice will be presented and future research identified.

POTENTIAL CONTRIBUTIONS

First, I will synthesize concepts of organization improvisational capabilities. This study will extend the strategic management literature that has mainly focused on two-way interactions between environmental turbulence and dynamic capabilities.

Second, there is a call to have IT artifact in IS research (Guillemette & Paré, 2012; Lu & Ramamurthy 2011; Orlikowski & Lacono, 2001; Sambamurthy & Zmud, 2000). I will use one of the emerging IT architectures, namely Service-Oriented-Architecture, to demonstrate the IT flexibility options for the configurations. IT systems should be one of the central elements in the configurations consists of strong mutual interdependences – while also stressing the emerging role of IT systems in triggering environmental turbulence and shaping improvisational capabilities and organization agility to build a strategic advantage.

Third, to the best of my knowledge, this will be among the first studies to link IT, organization improvisational capabilities, environmental factor and firm performance. Furthermore, I will be using a newly advanced technique to study the "messy" dynamic, interdependent and nonlinearly co-evolved system to gain better understanding. This new method offers many potential contributions, three of which listed below.

a. Fuzzy sets are able to bridge quantitative and qualitative approaches to measurement because they are simultaneously qualitative and quantitative (Ragin, 2007, p.10) and present "cause-effect" better than the traditional methods.
b. By using a different paradigmatic lens, i.e., configuration theories, as an appropriate inquiring system, we can better understand the complexity of digital eco-dynamics. Key aspects of configuration theories as inquiring systems comparing with the more common

variance theories and process theories will be discussed. This should be a pioneering effort to take advantage of the power of recent advances in configuration methods applied in the IS field.

c. Using configuration theories affords us to better examine digital ecodynamics using novel structural properties such as mutual causality, discontinuity, punctuated equilibria, and nonlinear change. This creates a preliminary roadmap for IS researchers and practitioners to follow.

This dissertation also makes a broader methodological contribution to organization and IS strategy researches in general. Existing theories that are based on linear, additive relationships between elements and assume equilibrium status cannot effectively explain such dynamically changing punctuated disequilibrium in digital ecodynamics (Meyer et al., 2005). A configurational approach accompanied by strong methods such as fsQCA is one of the best ways to build new theories that can effectively explain such nonlinear discontinuous changes driven by dynamic interactions of digital technologies, organizational and social factors. Further, this study practically contributes to managerial knowledge by showing how organizations transform to the IT-enabled agile organization with the most affordable costs and risks through multiple alternative paths.

CHAPTER 2: LITERATURE REVIEW

A business environment which faces increasing uncertainty due to the rapidly changing rate of technology, market, and customer preference has been termed "turbulent" (Pavlou & El Sawy, 2010). This phenomenon of environmental turbulence has been widely acknowledged in the strategic management and information systems (IS) literature (e.g., Chakravarthy, 1997; Conner, 1998; D'Aveni, 1994; Day, 1997; Eisenhardt & Brown, 1999; Eisenhardt & Sull, 2001). One catalyst that has accelerated environmental conditions has been the Internet. Even for mature industries, the introduction and growth of the Internet has brought some unexpected challenges and opportunities that traditional management, organization structures or business strategies have simply not been able to cope with.

A major challenge for managers in turbulent environments is to make sound decisions quickly (Pavlou & El Sawy, 2010). Firms can gain advantages by picking appropriate resources in stable environments, yet require dynamic capabilities to gain advantages when the environment becomes more unpredictable (Makadok, 2001). Dynamic capabilities is the planned ability to integrate, build, and reconfigure firm's daily operational capabilities (El Sawy & Pavlou, 2008; Teece et al, 1997). Pavlou and El Sawy (2010) show that while dynamic capabilities are the primary predictor of competitive advantage in *moderately* turbulent environments, another special ability - improvisational capabilities- dominate in *highly* turbulent environments. Improvisational capabilities are defined in this study as "*An organization's learned ability to respond to environmental turbulence quickly by simultaneously creating and executing novel solutions attained through recombining available resources."* Improvisational capabilities are especially important for firms in highly turbulent environments because there is usually not much time for planning to react to the unexpected disturbances in this type of environment. When an unpredictable event happens, firms in such environments have to react

quickly to either solve a problem or take advantage of an opportunity as to gain competitive advantages.

Although a few studies have provided evidence that improvisational capabilities are linked to better organizational performance, much more need to be discovered about these capabilities (Pavlou & El Sawy, 2010). As Crossan and Sorrenti (2002, p.49) have pointed out that "Improvisation is a part of daily organizational life. Sometimes it is done well; sometimes it is done poorly. However, we know very little about what characteristics separate the two extremes." One of the main goals of this study is to help to fill this research gap by building on past research to gain a better understanding of organizational improvisational capabilities (OIC). This will be accomplished by first completing a thorough review of the literature on improvisation and improvisational capabilities, then developing a measurement scale of OIC accordingly, and finally, to consider OIC complementarities with other organizational resources, primarily those related to IT resources. If successful, theory will be advanced and practical applications can be attained for firms in highly turbulent environment. To frame this work, I chose the highly turbulent e-commerce environment as the context to examine the OIC complementarities and organizational performance.

As the environment becomes increasingly more turbulent, organizations have sought IT to help them become nimble and responsive to environmental changes and competitive actions (Pavlou & El Sawy, 2010, p.444). Bharadwaj (2000) defines IT capabilities as the ability to mobilize and deploy IT-based resources in combination with other resources and capabilities. IT-based resources consists of IT infrastructure, human IT resources (technical and managerial IT skills), and intangible IT-enabled resources. Among these, IT infrastructure flexibility is now being viewed as an organizational capability that is necessary for organizations to survive and

prosper in highly turbulent business environments (Byrd & Turner, 2001; Chung, Rainer, & Lewis, 2003). Flexible IT infrastructures provide the technical platform, services and specialist resources required to deal quickly with unpredictable changes in the business environment (Bocij et al., 2008, p.557). Enhancement of business agility is not possible unless IT infrastructures are flexible (Furukawa, 2004; Tallon, 2008).

Although there is always a call for firms to be flexible, agile, and nimble, it is less obvious how to specify the exact capabilities that organizations must develop and exercise with IT to address turbulent environments (Pavlou & El Sawy, 2010, p.444). In other words, it is critical to explore the components of competence a firm must build to be competitive in highly turbulent environment. A competence is a firm's idiosyncratic goal-reaching ability, formed by its resources and firm-specific capabilities such as OIC and IT infrastructure flexibility. To examine e-commerce performance, competence-based theory (CBT) is employed. Established as a theory in the early 1990s (e.g., Sanchez & Heene, 1996, 1997), CBT encompasses resource-based view, knowledge-based view of the firm, dynamic capabilities, and other theories to explain how organizations can develop sustainable competitive advantage based on its core competencies, in a systematic and structural way (Freilling, 2004, p.33).

In addition, it is also imperative to examine the interdependences that exist among OIC, IT infrastructure flexibility and environmental factors (El Sawy & Pavlou, 2008; Park & El Sawy, 2013; Fichman et al, 2013**)** when studying firm performance. Past performance research usually has one single focus from internal, external, or contingencies for a study. Internal organizational factors such as slack, external influences such as environmental uncertainty, or contingencies such as size and top management support are examined separately. To evaluate the effects, traditional quantitative methods examines unidirectional correlational relationships

between independent variables and the outcome variable, or test moderation (interaction) effect using contingencies, which certainly contribute to the understanding of the phenomenon to a certain extent. However, the increasing complexity of business environments make it harder to get a holistic view of the relationships between internal and external elements using such methods. Strategic management scholars have been using configuration theory in different areas such as human resource strategy (Delery & Doty, 1996), manufacturing strategy and business strategy (Ward, Bickford & Leong, 1996), and business relationships strategies (Zaefarian, Naudé, & Henneberg, 2010) to move away from examining the myriad of individual variables (Walker, 2008, p.591) and to identify unique patterns of factors, i.e., configurations that are more effective (Delery & Doty, 1996). Information systems researchers (e.g., Park & El Sawy, 2013; Fichman et al, 2013) have just begun to pay attention to this method to examine the complementarities of organizational resources and their relationships with firm performance.

To carry out this study, configurational method will be used to explore the different combination of factors for firm performance in highly turbulent environment. Justification is two-fold. First, configurational approach views organizations as "composed of tightly interdependent and mutually supportive elements such that the importance of each element can best be understood by making reference to the whole configuration" (Miller & Friesen, 1984, p. 1). This offers the premise to examine the interdependent and complementary network-wise relationships among OIC, IT, organizational factors and environmental factors. Second, configurational approaches also facilitate insights into equifinality, that the same end state may be achieved via many different paths. In business, equifinality implies that firms may establish similar competitive advantages based on substantially different capabilities (Fiss, 2007).

This chapter is organized as follows. In the next section, theoretical backgrounds of configuration theory and competence-based theory are provided; followed by the presenting of the conceptual model with the descriptions of the configurational elements (organization improvisational capabilities, IT flexibility, environmental factors, and organizational contingencies). A literature review of organization improvisational capabilities is conducted and conceptualization for this study is offered. Flexible IT is also defined and discussed in detail. The relationships among configurational elements are discussed after elements description. Finally, a short conclusion is provided and leads to Chapter 3, methodology.

Theoretical Background

Configuration Theory

Configurational approaches have a long tradition in the strategy literature (Miller, 1987; 1997). Scholars in organization theory and strategic management have used configuration theory based approaches (e.g., Meyer, Tsui, & Hinings, 1993; Vorhies & Morgan, 2003; Ward, Bicklord, & Leong, 1996; Zaefarian, Naudé, & Henneberg, 2010) to find out how to best leverage or enforce organizational characteristics of a firm and to assess the impact on firm's performance. Information system researchers have just begun to embrace this method.

A configuration denotes a multidimensional arrangement of the strategic and organizational characteristics of a business (Dess & Newport, 1993; Miller, 1987). This implies that configuration theory simultaneously considers multiple organizational characteristics (Doty et al, 1993) and represents common alignments among the elements of interest (Miller, 1997). The holistic relationships among these interdependent and yet mutually reinforcing organizational characteristics are the main focus of configuration theory (Drazin &Van de Ven 1985; Venkatraman, 1989). Configuration approach advocators have argued that this approach

goes beyond testing linear relationship between individual factors to outcome (Miller, 1987). Fiss (2007) also suggests that configurational approaches facilitate insights into the equifinality[1] of different configurations. In business, equifinality implies that firms may establish similar competitive advantages based on substantially different capabilities.

The basic question addressed by configuration theory is how an organization should be structured to be effective. The theory has three core assumptions. First, organizational performance is affected by formal organizational arrangements used to coordinate activities and exercise control over employee effort. Second, there is no "one best way" of organizing. This assumption distinguishes configuration theory from much of the previous work on organizations. Third, the appropriateness of organizational design is partly dependent upon contingencies, such as an organization's size, its technology, and the rate and predictability of its environment. An organization's performance is thus a function of the degree of "fit" achieved between its strategy, organizational design, functional contingencies, and institutional processes.

As Fiss (2007, p. 1180) notes,

> *In essence, a configurational approach suggests that organizations are best understood as clusters of interconnected structures and practices, rather than as modular or loosely coupled entities whose components can be understood in isolation. Proponents of a configurational approach take a systemic and holistic view of organizations, where patterns or profiles - rather than individual independent variables - are related to an outcome such as performance.*

[1] **Equifinality** is the principle that in open systems a given end state can be reached by many potential means. The term is due to Ludwig von Bertalanffy, the founder of General Systems Theory. He prefers this term, in contrast to "goal", in describing complex systems' similar or convergent behavior. It emphasizes that the same end state may be achieved via many different paths or trajectories.

There are different paths to a preferred outcome. Traditional linear unidirectional methodology does not demonstrate the complex network of relationship an organization has internally and externally. Configuration theory provides a means that would afford researchers to examine the different combinations for a firm's performances. Many concepts such as assets, resources, and capabilities have been used to demonstrate how firms gain competitive advantage or perform better. Some researchers use these terms interchangeably and hence create confusion. I posit that it is important to understand and distinguish these terms. Therefore, in the next section, backgrounds and definitions of these concepts are provided to pave the way for the discussion of competence-based theory that is also applied for this study.

Assets, Resources, Capabilities and Competence

A firm is characterized as an open system of asset stocks and flows (Dierickx & Cool, I989), including tangible assets like production equipment and buildings, and intangible assets like patents, trademarks and brand recognition. To investigate the causal factors of performance, researchers have used different terms such as assets, resources, capabilities and competences. Although these terms and concepts have been used throughout strategic management and IS literature for firm competition, they sometimes create confusion. A hierarchy of assets that was suggested by Vernhout (2007) is: assets, resources, capabilities, competences, and then core competence. This list implies a progressive "building on" prior level property. It is crucial to get a clear view of what they are by defining them and differentiate them from other concepts in the hierarchy.

Assets are homogeneous external or internal factors that can usually be procured in markets, serving as input for value-added or upgrading processes (Freiling, Gersch, & Goeke,

2008). There are tangible assets such as buildings and equipments and intangible assets such as skills and knowledge a firm's personnel possess. *Resources* are assets that have undergone a firm-specific upgrading process (Freiling, Gersch, & Goeke, 2008). Therefore they should contribute to the actual and future competitiveness of a firm and thus account for the firm's heterogeneity (Freiling, Gersch, & Goeke, 2008). According to the definitions, assets are homogeneous while resources are firm-specific. Wernerfelt (1984) suggests that resources are the raw materials to build capabilities and that resource availability determines a firm's ability to develop capabilities. Capabilities are "a firm's capacity to deploy resources, usually in combination, using organizational processes, to effect a desired end" (Amit & Schoemaker 1993, p.35). They usually are "organizationally embedded non-transferable firm-specific resource whose purpose is to improve the productivity of the other resources possessed by the firm" (Makadok .2001, p389). The presence of capabilities enables resources to begin to be utilized, and the potential for the creation of output arises. Capabilities are the outcomes of integration of several organizational processes (Freiling, Gersch, & Goeke, 2008). For example, IT capabilities are a combination of tangible assets (hardware, software, physical network, architecture, etc.), intangible resources like IT personnel knowledge and skills, and governance process. Competitors can buy some tangible IT assets or imitate some products or services, but the firm-specific process of combining and deploying its resources is usually hard to imitate and is what makes the difference in performance. For example, Apple's iPad series leads and is still leading the tablet market due to its patent, design, platform, and marketing channels, all of which are Apple's specific capabilities. Other companies promote similar products but have not broken Apple's domination.

By combining physical, human, and technological resources, a firm builds its capabilities to perform day-to-day operations (operational capabilities, coordinated deployment of assets and resources), recombine resources to build new operation capabilities (dynamic capabilities), and to react to turbulences quickly (improvisational capabilities); these in turn form its competences.

Competence is a repeatable, non-random ability to render competitive output. This ability is based on knowledge, channelled by rules and patterns. (Freiling, Gersch, & Goeke, 2008, p.1151). Competences direct goal-oriented processes (Freiling, Gersch, & Goeke, 2008, p.1151). A firm reaches and defends its competitiveness with its competence that is "organizational, repeatable, learning-based" (Freiling, 2004) capabilities (Sanchez & Heene, 1997). Competence will be presented in more detail in the next section where competence-based theory is discussed.

Competence-Based Theory

Competence-based theory (CBT) is a relatively new way of thinking about how organizations maintain high performance. CBT is an integrative strategy theory that incorporates economic, organizational and behavioral concerns in a framework that is dynamic, systemic, cognitive and holistic (Figure 1, Sanchez & Heene, 1997, 2004). Established as a theory in the early 1990s (e.g., Sanchez & Heene, 1996, 1997), it encompasses resource-based view, knowledge-based view of the firm, dynamic capabilities, and other theories to explain how organizations can develop sustainable competitive advantage based on its core competencies, in a systematic and structural way (Freilling, 2004, p.33).

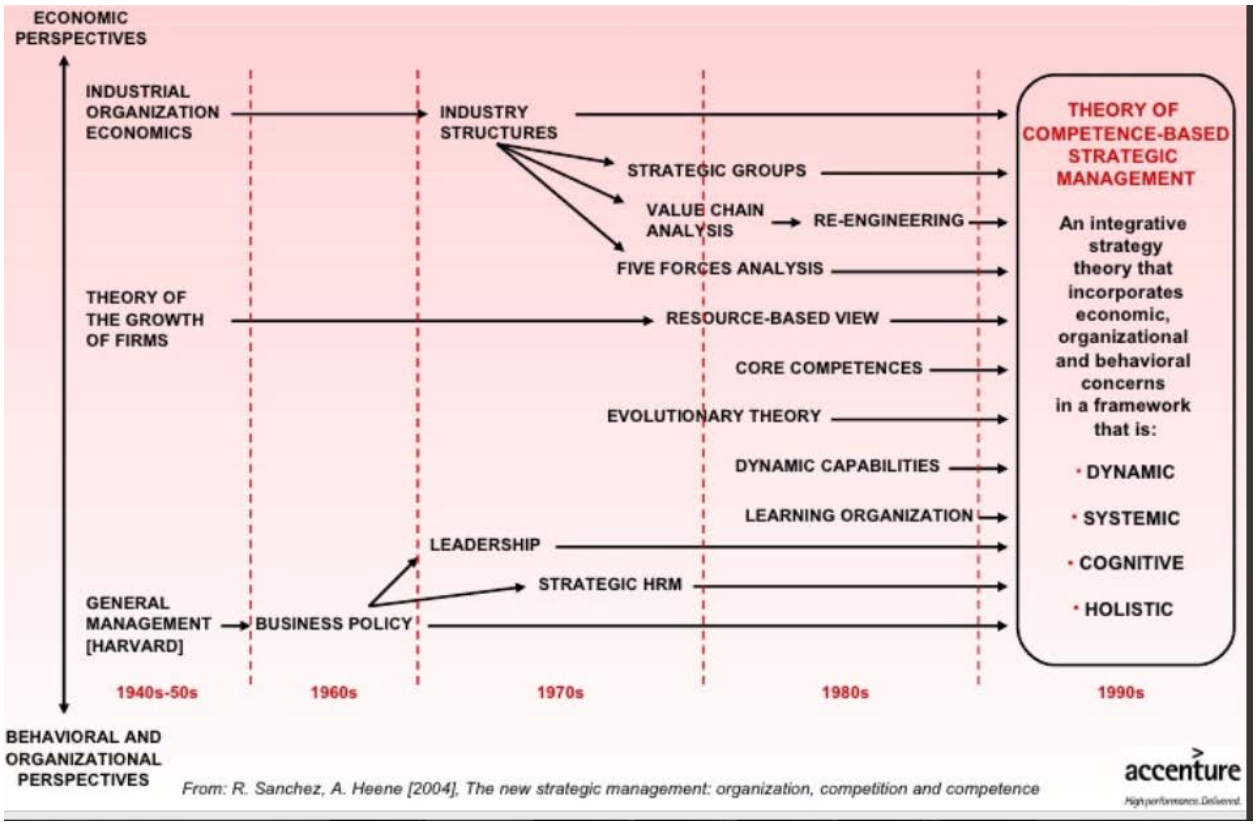


Figure 1. CBT. (from Sanchez & Heene, 2004)

CBT defines competence as the ability to sustain the coordinated deployment of resources, i.e., capabilities, in ways that helps an organization achieve its goals (Sanchez & Heene, 1997, p.306). Competences are organizational, repeatable, learning-based and therefore non-random abilities of the firm to defend its competitiveness (Freiling, 2004). According to this definition, four conditions of the CBT framework have to be set (Sanchez, 2004). First, competence must include the ability to respond to the dynamic nature of an organization's external environment and of its own internal processes (Sanchez & Heene, 2004). This dimension of competence is related to the requirement of being "sustainable" both internally and externally. In organizations as systems, managers must provide continuous inputs of energy and attention to maintain or improve the order and structure in an organization's value-creation

processes (Sanchez & Heene, 2004). A competence must be able to overcome internal negative states such as gradual loss of focus or satisfaction with status quo. To be sustainable, a competence also have to respond to external environmental turbulences such as customers' taste changes, competitors' new product launches and government's new legislations while still be able to continue creating value. For example, in 2011 Internet retailers reacted to potential legislation requiring them to collect sales tax that they did not have to do before and was one of the advantages for e-retailers to attract customers. Although there's no telling when, or even if the legislation would pass, retailers like L.L Bean launched free shipping on all items and others like Macy's launched free shipping on purchases of $99 or more (Forbes, 2011), responding with a new strategy and using their improvisational capabilities enabled competence to keep current customers happy and to attract new ones.

Second, competence must include an ability to manage the systemic nature of organizations and of their interactions with other organizations. The requirement of coordination of resources addresses this dimension of competence. This dimension is also two-fold: the coordination of resources internally and externally on the value chain. A competence requires an ability to coordinate the resources within the boundaries of the organization, i.e., firm-specific resources. In addition, competence engages accessing and coordinating important resources outside the boundaries of the organization, i.e., firm-addressable resources. Competence-based theory has incorporated this relational view in considering networks and dyads of firms as the unit of analysis to explain relational rents, i.e., superior individual firm performance generated within that network (Dyer & Singh, 1998). Amazon, ranked as the top e-retailer in the world, owns an incomparable competence in its value creation by coordinating different components on its network which consists of suppliers, distributors, customers and the firm itself.

Third, competence must include an ability to manage the cognitive processes of an organization (learning and absorptive capabilities). This dimension of competence is about the ability to learn and to deploy resources to specific value-creating activities accordingly. To achieve this, two cognitive challenges of top management are posed. Firstly, top management is responsible in providing vision, i.e., the strategic vision of the firm's value-creating activities in its targeted market. They must be able to define and select strategies that have the potential to create value in targeted markets when they are carried out efficiently. Then, managers must be able to ascertain and assure that their organization's operations meet at least the minimum efficiency requirements needed to carry out the strategies of the organization (Sanchez, 2004). In other words, managers are responsible for both efficient and effective use of an organization's resources.

Fourth, competence must include the ability to manage the holistic nature of an organization as an open system (Sanchez & Heene, 2004). In system theory, an open system is a system which continuously interacts with its environment or surroundings. In the social sciences an open system is a process that exchanges material, energy, people, capital and information with its environment. Competence enables an organization to interact with its environment. To lead an organization in achieving goals requires that managers be able to define organizational goals that promise a satisfactory level of goal achievement for all individual and institutional providers of the essential resources the organization needs. The definition of organizational competence recognizes the existence of multiple stakeholders and the importance of meeting the expectations of all providers of essential resources in sustaining the value-creating processes of an organization (Sanchez & Heene, 2004).

Competence-Based Theory vs Resource-based Theory

The resource-based theory (RBT) is perhaps the most dominated theory in strategy in explaining a firm's competitiveness for the last two decades. The resource-based theory proposes that a firm's competitive advantage lies primarily in the application of a bundle of valuable tangible or intangible resources at the firm's disposal. As aforementioned, competence-based theory (CBT) was established as a theory in the early 1990s. Although scholars propose that CBT is "a promising theory of sustaining competitive advantage..." (Freiling, 2004, p.28), the competence movement has not gained as much popularity as RBT. Moreover, RBT is regarded as the origin of CBT (Freiling, 2004) and inherently creates confusion because they both rely to a large extent on the same antecedents (Freiling, 2004). It is imperative to distinguish these two theoretical perspectives for this study because the competence perspective offers better fit in the e-retailing domain and provides new conceptual dimensions which capture more aspects of the complex and dynamic interplay of assets, resources, competences (Sanchez, 2004), and interactions with a firm's environment.

Earlier criticism of RBT such as the tautological nature (Collis, 1994; Priem & Butler, 2001), ignorance of the same outcome of different resource configurations as well as the product market, and limited prescriptive implications (Priem & Butler, 2001) were proposed and counter-argued by Barney (2001). Further criticisms that are related to this discussion are listed below.

- It is perhaps difficult (if not impossible) to find a resource which satisfies all of the VRIN (valuable, rare, in-imitable, non-substitutable) criteria.
- There is the assumption that a firm can be profitable in a highly competitive market as long as it can exploit advantageous resources, but this may not necessarily be the case. It ignores external factors concerning the industry as a whole.

- The concept of rarity is obsolete (Hoopes, Madsen & Walker, 2003, p. 890). Because of the implications of the other concepts (e.g. valuable, inimitable and nonsubstitutability), any resource that follows from the previous characteristics is inherently rare.
- The lack of an exact definition of sustainability makes its premise difficult to test empirically.

The RBT suggests that a firm's resources underlie its ability to achieve competitive advantage. Much of the extant work in this stream has examined the characteristics such as rarity and inimitability that resources must have in order to obtain competitive advantage (Barney, 1991). However, efforts to specify the crucial link between resources and value creation have been sparse (Gruber, Heinemann, Brettel, & Hungeling, 2010). As a consequence, current RBT is not sufficiently clear on how different kinds of resources and capabilities contribute to performance, nor does it clarify how firms can combine different resources and capabilities to achieve superior performance outcomes (Gruber et al., 2010).

A key difference between the resource-and competence-based theory is the chain of causality. RBT concludes that superior resources will cause a performance difference among firms. RBT suggests that the competitive advantage of a firm lies primarily in the application of a bundle of valuable tangible or intangible resources at the firm's disposal (Barney 1991; Hunt 2000; Wernerfelt, 1984). To transform a short-run competitive advantage into a sustained competitive advantage requires that these resources are heterogeneous in nature and not perfectly mobile (Peteraf, 1993, p180). Effectively, this translates into valuable resources that are neither perfectly imitable nor substitutable without great effort (Barney, 1991, p. 117). If these conditions hold, the bundle of resources can produce superior performance.

In contrast to RBT, CBT states that the value creation process of firms is strictly related to the capabilities of managers of acquiring and developing critical, not imitable, resources (Rumelt, 1987; Grant, 1991; Barney, 1991; Prahalad & Hamel, 1990; Freiling, 2004). Ownership of certain resources does not guarantee success. Within this perspective, the competitive advantage of a firm depends on the availability of specific and critical capabilities. Resource endowment is not enough to explain performance differences. The firm itself has to be in a position to make use of these resources in a goal-and market-oriented way. This is only possible in case of available action-related competences. For example, the recent (Nov, 2013) failure of the HealthCare.gov website (in compliance with the Patient Protection and Affordable Care Act, commonly known as "Obamacare") demonstrates that possession of resources does not guarantee success. The failure is not insomuch as lacking IT assets, but rather the lack of competence to handle the complexity of the law and to coordinate resources. Competence-based theory posits that it is the management of IT that creates more value, not the IT resources themselves, per se. Competences then fill the explanatory gap between idiosyncratic resources and performance by considering both asset flows (Dierickx & Cool, 1989) and activities.

This goes along with the availability and the usage of competence which cannot quickly be imitated by rivals (Teece et al., 1997, p.524). Competence-based theory makes it clear that the strategic value of an asset depends on the way it is used by a firm, which in turn is fundamentally determined by the firm's current knowledge and capabilities (Sanchez & Heene, 1997, p.313), i.e., its competences. Competences are drivers of a firm's heterogeneity and are heterogenous by themselves (Freiling, 2004, p.29). Table 2.1 compares CBT and RBT.

Table 1. Competence-based theory vs Resource-based Theory

	Competence-based Theory	Resource-based theory
Source of competitive advantage	competitive advantage may be obtained through a superior ability to coordinate flows of intellectual assets and other resources within and between firms that function like open systems (Sanchez & Heene 1996)	differences in performance by individual firms in terms of their distinctive resource endowments, the VRIN, valuable, rare, in-imitable, non-substitutable
Premises	the competitive advantage of a firm depends on the availability of specific and critical capabilities	superior resources will cause performance difference among firms
Boundary	Network of firms within and between firms open systems	focused on single firm
Sustainability	Sustainability is in the definition: condition 1, dynamic	in order to sustain the competitive advantage, it is crucial to develop resources that will strengthen the firm's ability to continue the superior performance.
Focus	theory of competitive advantage	theory of the firm heterogeneity of the firm
Framework	economic, organization and behavioral	VRIN resource
Application	Dynamic environment	static (equilibrium) environment

Justifications of Applying CBT

In this dissertation, the purposes of applying CBT instead of RBT to be integrated with configuration theory are manifold: First, this study focuses on the configuration of competence for performance (how firms can combine different capabilities to achieve superior performance

outcomes as mentioned by Gruber et al., 2010). Second, to avoid the pitfalls of RBT such as its limitation of focus on a single firm and the ambiguous definition of sustainability; Third, most importantly, RBT applies to a static (equilibrium) environment (Barney, 2001), not to the dynamic environment examined in this study. As e-commerce is clearly not static but dynamic and characterized by high velocity and rapid change, RBT is not suitable for this study. Forth, CBT requires organizations be treated as open systems and posits that the sustainable competitive advantage comes not only from within the organization but also from outside sources like suppliers and partners (i.e., its value chain). CBT is thus better suited for this research. And fifth, the goal of the competence movement is to build new strategy theory that will 'work' in practice (Sanchez & Heene, 1997) which is also a goal of this study, to provide insights for managers of the different paths to high performance.

In the next section, the conceptual model is presented by reviewing the configurational elements, their complimentary and interdependent relationships to each other, and the performance outcome.

Conceptual Model

The configurational approach was chosen because it yields a systematic, detailed, and holistic image of reality (Ward, Bickford & Leong, 1996) without attributing causation to any of the individual parts of the model. The configurational elements for this study consist of different types of environmental factors, flexible IT architecture dimensions, and organization improvisational capabilities. I propose that there are underlying configurations among environmental uncertainty, IT, and organization improvisational capabilities (OIC) without implying that it is always, for example, environment that determines the appropriate IT and OIC.

The configurations are composed of "tight constellations of mutually supportive elements" (Miller, 1986, p.236) which will be discussed in this section.

Configuration theory posits that an ideal set of organizational characteristics exists that leads to superior performance (e.g., Drazin & Van de Ven, 1985). These configurations are ideal because they represent complex formation of multiple, interdependent, and mutually reinforcing organizational characteristics that enable businesses to achieve their strategic goals (e.g., Ketchen, Thomas, & Snow 1993; Miller, 1997). My research question pertains to the combinations and relationships among the IT architecture, the organization improvisational capabilities along with environmental influences for performance. Configuration theory is applied as the overall framework of this study.

For the configurational elements, this study focuses on an e-commerce firm's IT infrastructure, its improvisational capabilities, and its environmental uncertainty. To maintain a holistic view of the firm, competence theory is integrated with the overall framework for this dissertation. As discussed earlier in this chapter, capabilities are the "building blocks" of competence. In discussing capabilities, IT alone is not considered a capability because IT is generally available to any company. However, IT architecture design, strategy and management are distinctive to the firm (Pavlou & El Sawy, 2006), which qualify them as the firm's capabilities that could build and enable competence (Sanchez, Heene, & Thomas, 1996; Sanchez & Heene, 1997). Assessing whether a business's IT architecture is designed in ways that co-evolve with its improvisational capabilities and the impact this relationship has on performance requires the simultaneous consideration of multiple characteristics of the business (Doty, Glick, & Huber, 1993). In Figure 2, a conceptual model is presented by combining insights from CBT, configuration theory and the IS literature to illustrate the complex relationship networks.

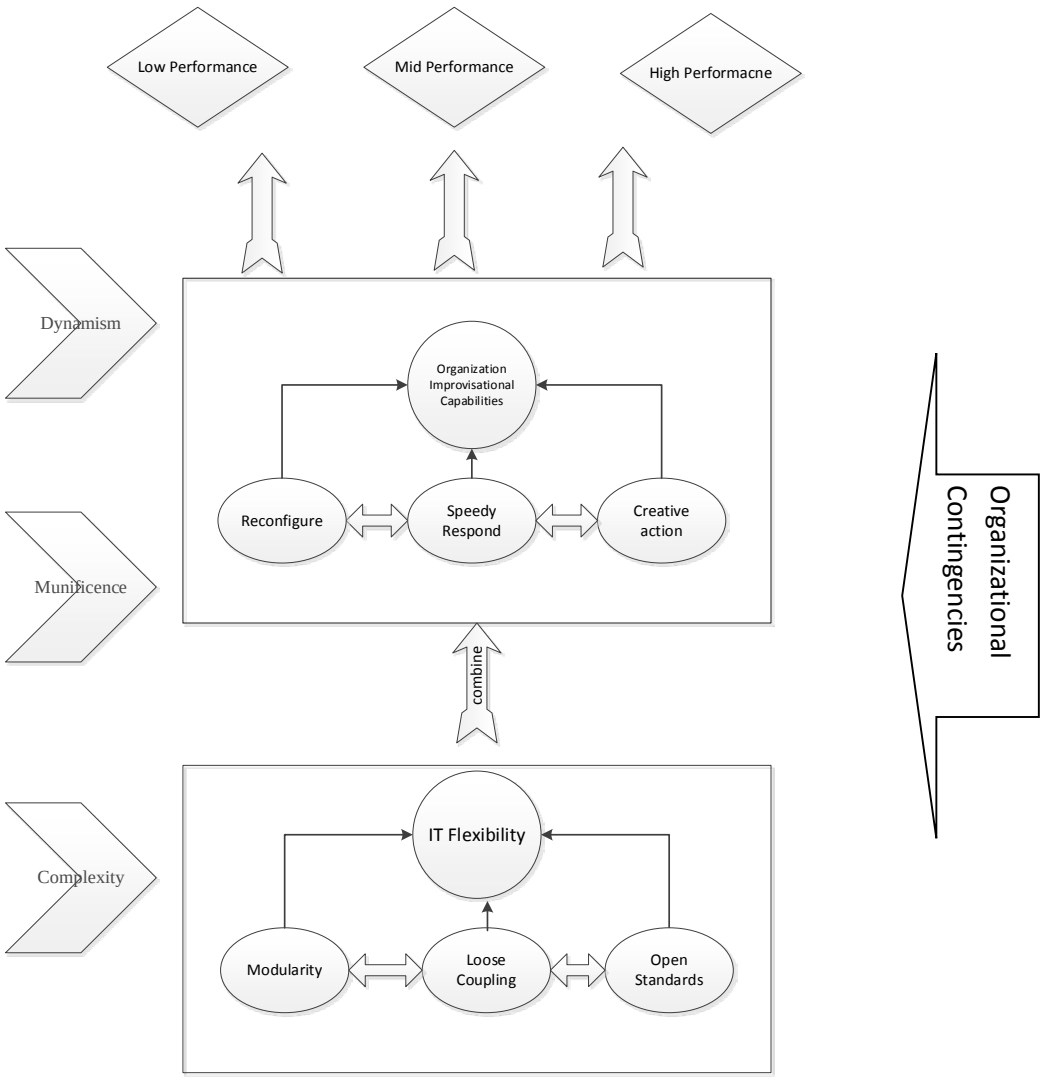


Figure 2. Conceptual Model

Configurational Elements

Improvisational Capabilities as a type of Dynamic Capabilities

As the business landscape changes, companies need new strategies to stay competitive. In order to embrace new elements of competition, the Dynamic Capabilities Framework has emerged. In the last decade, a growing number of scholars consider dynamic capabilities to be at the heart of firm strategy, value creation and competitive advantage (e.g., Eisenhardt & Martin,

2000; Helfat & Peteraf, 2009; Teece, 2007; Winter, 2003). The concept of dynamic capabilities arose from a key shortcoming of the resource-based theory of the firm (Wade & Hulland, 2004). The RBT has been criticized for ignoring factors surrounding resources such as how resources are developed, how they are integrated within the firm and how they are released. Dynamic capabilities attempt to bridge these gaps by adopting a process approach: they act as a buffer between firm resources and the changing business environment. Dynamic capabilities help a firm adjust its resource mix and thereby maintain the sustainability of the firm's competitive advantage, which otherwise might be quickly eroded. While the RBV emphasizes resource choice, or the selecting of appropriate resources, dynamic capabilities emphasize resource development and renewal.

Teece and his colleagues (1997) define dynamic capabilities as the ability to integrate, build, and reconfigure internal and external competencies to address rapidly-changing environments. In an effort to better understand the nature of dynamic capabilities, several scholars suggest to differentiate between dynamic and operational capabilities (e.g., Collis, 1994; Teece, 2007; Zollo & Winter, 2002; Winter, 2003). Operational capabilities, which are described as lower-order constructs, are the purposive combinations of resources that enable an organization to perform functional activities, such as logistics, marketing and sales or manufacturing. Operational capabilities enable firms to perform their everyday operations. Higher-order dynamic capabilities are those that enable a firm to constantly renew its operational capabilities and therefore achieve long-term competitive advantage.

Dynamic capabilities have a positive role in competitive advantage in stable environments with relatively predictable patterns of change (Eisenhardt & Martin, 2000), but they may not be appropriate for reconfiguring existing operational capabilities in stormy

environments with unpredictable change (Winter 2003), such as the e-commerce landscape. Pavlou and El Sawy (2010) introduce improvisational capabilities as an alternative means for managing highly turbulent environments (p.443). They define improvisational capabilities as the ability to spontaneously reconfigure existing resources to build new operational capabilities to address urgent, unpredictable, and novel environmental situations. Improvisational capabilities are proposed to facilitate reconfiguration and change in highly turbulent environments, which is prominent to this current study.

Adopted from Pavlou and El Sawy (2010), Table 2 lists the major differences between improvisational capabilities and dynamic capabilities to demonstrate the relevance of improvisational capabilities of this study.

Organization Improvisational Capabilities

The word improvisation is from the word "proviso", meaning to provide for something in advance. The prefix "im" gives it the opposite meaning: without prior planning or stipulation (Weick 1998). Rooted from this concept, improvisation has been defined as the absence of a plan in the action (Moorman & Miner, 1998a), "*a spontaneous process, improvisation is extemporaneous, unpremeditated, and unplanned"* (Vera & Crossan, 2004, p.733), "*an extemporaneous process leading to impromptu or "spur of the moment" action*" (Ciborra, 1999, p.78), "intuition guiding action in a spontaneous way" (Crossan & Sorrenti, 1997, p. 156), and where "ideas emerge in new and creative ways not planned by the performer" (Crossan et al., 1996).

Table 2. Major Differences between Improvisational Capabilities and Dynamic Capabilities (from Pavlou and El Sawy, 2010, p.452)

	Improvisational capabilities	Dynamic capabilities
Dealing with the environment ("storms" versus "waves")	Unanticipated environmental events, storms, surprising events, failures, and crises	Predicted and anticipated waves and opportunities in the environment
Nature of prior planning	Planned spontaneity	Disciplined flexibility
Nature of activities	Highly unstructured, urgent, emergent, intuitive, and impromptu activities	Judicious, systematic, stable, and disciplined activities
Logic of competitive action	Logic of "spontaneous responsiveness"	Logic of "planned opportunity"
Time gap between planning and execution	Small gap between planning and execution, narrow "window of opportunity," and inadequate time for formal planning	Sufficient time gap between planning and execution that allows adequate time for formal planning and execution
Limits of action	Acting outside of existing formal plans	Preplanned range of contingencies
Nature of reconfiguration of operational capabilities	Spontaneous and intuitive reconfiguration of new operational capabilities using available existing resources to respond to an urgent, unanticipated, and novel situation	Planned and deliberate reconfiguration of new operational capabilities using predetermined existing resources that related to an anticipated opportunity
Major vulnerabilities	Extreme caution, unwillingness to take risk, extreme confidence in acting without plans	Unwillingness to deal with rigidities, extreme confidence in formal planning
Common misconceptions	Chaotic activities that are completely different from other organizational capabilities, not repeatable, and cannot be enhanced with practice	All capabilities that reconfigure operational capabilities fall into the realm of dynamic capabilities
Déjà vu versus novelty	Novel situations cannot be readily dealt with using existing resources and require creative leveraging for the novel situation	Novel opportunities can be largely addressed with existing resources that are programmed for specific situation
Reliance on individuals	Individual initiatives have a substantial impact on improvisational capabilities	Individual initiatives have a lesser impact on dynamic capabilities
Desirable people qualities	Resilience and recovery skills, creativity, spontaneity, and intuition	Disciplined flexibility, ability to learn and act quickly and judiciously
Analogies	Jazz, improvisational theater, rugby	Race car driving, football

Following Webster and Watson (2002), I did a literature search from 2000 to 2012. I compiled a concept matrix as Table 3 after coding the forty-six articles. In my review of literature, I found some recurrent factors related to improvisation or being mentioned by researchers. In particular, improvisation is a creative process, characterized by spontaneity and extemporaneity, peculiar features that have been often emphasized by literature (Moorman &

Miner, 1997; Crossan, 1998; Weick, 1998). Improvisation is guided by intuition (Crossan & Sorrenti, 1997) and characterized both by real time and deliberate nature of the action (Cunha, Cunha & Kamoche, 1999; Vera & Crossan, 2004, 2007). In this regard, despite that improvisation might arise as a consequence of serendipitous events, it is most likely an intentional process involving consciousness of action or a mindful deviation of routine/standard (Chelariu, Johnston & Young 2002; Garud & Karnoe, 2003). Improvisation is a process of thinking and doing almost simultaneously (Baker et al., 2003). Acting by improvisation means that the design, planning and execution phases of action are perfectly converging (Moorman & Miner, 1998b) in an ongoing process to obtain a novel outcome (Miner, Bassoff & Moorman, 2001; Gong, Baker & Miner, 2006; Cunha et al., 2003), where novel means the generation of new solutions, products or behaviors. Improvisation involves the use of resources at hand (i.e., bricolage) and not waiting for optimal resources, especially in cases of high time pressure, when resource seeking becomes unfeasible (Baker & Nelson, 2005).

In their review of history of organizational improvisation, Cunha, Cunha and Kamoche (1999) categorize the study of improvisation into two generations and three stages. The first-generation authors grounded their study in the arts, especially in jazz music (p.300). Parallel to the jazz performance, the process of improvisation is described as a 4-stage continuum that ranges from "interpretation through "embellishment" and "variation" ending in "full spectrum improvisation", differing in increasing degrees of imagination and concentration (Weick 1998). To judge the degree of improvisation, one can check whether radical alterations and new creations exist (Weick 1998). For example, one can use Cunha et al's (1999) low/moderate/high level of improvisation model (Cuhna et al, 1999) or the two categories conceptualized by Vera and Rodriguez-Lopez (2007), i.e., incremental improvisation and radical improvisation.

Moorman and Miner (1998b) argue that there are different degrees of "innovativeness" in different stages of improvisation.

Crossan, Cunha, Vera and Cunha (2005) combined levels of time pressure and uncertainty into a 4-dimension model from low/low to high/high respectively: planning (no time pressure), "ornamented improvisation" (there is an urgency to respond to an unexpected event but a low level of uncertainty), "discovery improvisation," in which uncertainty, not time, is the problem, "full-scale improvisation" makes planning impossible, because time is scarce and the environment is undecipherable. These circumstances characterize crisis situations and rapidly changing environments.

The generalizability of this improvisation continuum is confirmed in the context of IS research by Orlikowski's study (1996) on improvising organizational change. Levels of improvisation in IS implementation as identified by Orlikowski range from ad hoc "situated changes (equivalent to "embellishments" on Weick's continuum), to resulting long-term changes, "metamorphoses" (equivalent to Weick's full-spectrum improvisation). One important concept to draw attention to is that this continuum is not about the time lag between stages but about the magnitude of improvisation.

Other Related Concepts

In the earlier studies (Cunha et al's first generation/first stage), metaphors from Jazz and theatre were often used. In this area, improvisation was often interchangeable with other similar concepts, e.g., adaption (Eisenhardt & Tabrizi, 1995; Hutchins E, 1991), bricolage (Weick, 1998), or intuition. However, in later studies, scholars started to distinguish improvisation from

Table 3. Improvisation Concept Matrix: 2000-2012

Author	Year	strategy	response	converge	spontaneous	bricolage	learning	novelty	structure	IT-enabled	creativity	culture	uncertainty	environmental	change
Miner, Bassoff & Moorman	2001			x	x		x	x							
Kamoche & Cunha	2001								x						
Akgun &Lynn	2002			x											
McKnight & Bontis	2002				x	x		x							
Chelariu, Johnston & Young	2002		x	x			x	x							
Baker, Miner & Eesley	2003	x		x		x									
Pinnington, Morris & Pinnington	2003								x	x					
Cunha, Kamoche & Cunha	2003		*x*			x			x			x		x	
Cunha & Cunha	2003														x
Montuori	2003					x			x	x	x		x		
Cunha	2004	x	*x*												
Mendonca, cunha, Kaivo-oja & Ruff	2004		*x*										x	x	x
Vera & Crossan	2004		x		x	x		x			x	x	x		
Konsynski & Tiwana	2004		x	x	x				x	x					
Crossan, Cunha, Vera & Cunha	2005			x											
Elbanna	2006			x		x				x					x
Leybourne	2006	x	x	x			x		x			x			x
Pham & Jordan	2006	x					x			x					
Leybourne & Sadler-Smith	2006					x					x				
Akgu¨n, Byrne, Lynn &Keskin	2007		x	x			x							x	
Jambekar & Pelc	2007		x				x				x		x	x	
Dennis & Macaulay	2007		x	x				x						x	
Knox, O'Doherty, Vurdubakis, Westrup	2007			x					x	x					
Mendonça, D	2007		x	x	x					x	x		x	x	
Bergh & Lim	2008		x	x			x	x	x				x		
El Sawy & Pavlou	2008				x			x							
Vendelo	2009						x								
Arshad & Hughes	2009	x		x	x										
Leybourne	2009											x			
Cunha & Cunha	2010														x
Duymedjian & Rüling	2010					x									
Paulou & El Sawy	2010		x		x			x							
Tjornehoj, G & Lars, M	2010										x	x			
Doll & Deng 2011	2011		x				x		x	x					
Zheng, Venters & Cornford	2011						x		x						
Kyriakopoulos	2011		**x**	x	x		x				x				
Cunha, Clegg & Kamoche	2012	x	x	x		x			x						

Note: Converge= compositions and execution converge in time

other related concepts. For example, Moorman and Miner (1998b) discuss how improvisation is "distinct" from adaptation, learning, creativity and innovation. Leone (2010) **c**ompares improvisation and bricolage and concludes that they are different. Although improvisation may build upon elements from adaptation, learning, opportunism, creativity, and innovation, various authors have shown that improvisation can be and should be distinguished from other constructs (e.g., Cunha et al. 1999; Moorman and Miner 1998b). Intent to provide a clearer view, improvisation and other similar constructs are presented in Table 4.

The first characteristic that distinguishes improvisation from other similar concepts is its temporal dimension. Improvisation has a short temporal gap between the planning and implementation (Doll & Deng, 2011). Through the evolution process of the organizational improvisation concept, only one main theme is not debated, i.e., the temporal dimension of improvisation, that it is a near "real-time" response to the unexpected trigger; and the reason for improvisation is that there is no time for planning. This concept is highlighted in Cunha et al's (1999) classification as the second stage of the theory development of organizational improvisation that this stage is "focusing on the temporal distance between conception and execution" (Cunha et al., 1999, p.301) and this notion is shared by all major authors (e.g., Ancona et al., 2001; Ciborra, 1999; Moorman & Miner, 1998b; Orlikowski, 1996; Weick, 1998). Unlike routines or planned operation capabilities, improvisation is applied to specific situation (Crossan, et al. 2005) and is idiosyncratic (Baker & Nelson, 2005; Miner et al., 2001; Vera & Crossan, 2005). The actions, decisions and outcomes of improvisation are novel, or they are deviations from standard practices (Doll & Deng, 2012). It is a conscious choice, not an ad hoc decision. It draws upon available social, technical and cognitive resources. (McKnight & Bontis, 2002; Moorman & Mines 1998b; Pavlou & El Sawy, 2010; Say Yen Teoh & Wickramasinghe,

2011; Weick, 1998). It facilitates changes (Brown & Eisenhardt, 1997; Galbraith, 1990; Orlikowski, 1996) and is interdependent with organizational structure, strategy, culture and flexibility. Later studies present improvisation as a learning process that most likely happens in near "real time" and with circular feedback loop.

Table 4. Improvisation and Related Constructs

Construct Definition	Contrasts
Improvisation temporal dimension: The convergence of design and execution (Moorman & Miner, 1998b; Miner et al., 2001).	
Adaptation: Adjustment of a system to external conditions (Campbell, 1969; Stein, 1989). *Adaptation* refers to the ability to change work processes and the ability to change the organization. (Holsapple & Li, 2008)	Adaptation can occur without the convergence of design and execution; adaptation may involve planning, or invoking routines. Adaptation does not necessarily involve temporal or action convergence. It can be achieved through planning or deploying existing routines appropriately. Some improvisations may involve adaptation.
Bricolage: Making do with the means or resources at hand (Levi-Strauss, 1966). " Making do by applying combinations of the resources at hand to new problems and opportunities" (Baker & Nelson, 2005: 333)	Bricolage may often occur during improvisation (Weick, 1998). However, it may also occur in the implementation of pre-existing plans. " while improvisation may imply bricolage, bricolage also occurs in the absence of improvisation, and that it is therefore important to recognize that they are separate constructs"…" it is entirely possible to plan to do something by combining the materials that will be at hand at a later time"…"bricolage may be a cause of improvisation" (Baker, 2007: 698)
Creativity: Novelty or deviation from existing practices (Amabile, 1983). The generation of new and useful ideas (Amabile, 1996)	Work is creative if it is original, purposeful and felicitous (Gruber, 1988). Improvisation involves some degree of creation (composition) but of a special sort. Many forms of creativity do not involve combining creation with performance (e.g. an author may write a play or a composer may write a symphony that is not performed). Creativity may involve absolutely no improvisation as when a plan or design is itself creative. A creative idea might never be executed. Improvisation however implies creativity, while creativity may occur for instance also through trial and error experimentations or planning (Cunha et al, 1999)

Innovation: Deviation from existing practices or knowledge (Van de Ven & Polley, 1992; Zaltman et al., 1973). "The adoption of any device, system, process, problem, program, product or service that is new to the organization." (Dougherty, 1996:424) *Innovation* refers to the ability to do new things and the ability to do old things in new ways (Holsapple & Li, 2008)	Improvisation implies some degree of innovation. However, innovation need not imply improvisation: much innovation is planned. This construct shares with improvisation its focus on relative novelty, but innovation may be planned and scheduled (Cunha et al., 1999). Improvisation may be a process leading or not to innovative outcomes and products. Moorman and Miner (1998a) argue that there are different degrees of "innovativeness" in different stages of improvisation.
Intuition: Choices are made without formal analysis (Crossan & Sorrenti, 1997).	Some improvisation may involve intuition. However, the design which converges with execution may include formal analysis. In addition, what appears to be intuitive may be the novel deployment of pre-existing routines or procedural memory, similar to other forms of creation (Simon, 1979; Gruber, 1989). Moreover, organizational improvisation may involve several people, whereas intuition is primarily an individual-level phenomenon.
Experimental learning: The author deliberately creates contrasting situations in order to generate systematic experience (Cook & Campbell ,1979)	In experimenting, people deliberately varied activities and conditions. The nature and degree of this variation is typically planned in advance and designed to elicit general, explicit knowledge about causal factors. When improving people typically seek no more variation than was needed to address the immediate situation (Miner et al., 2001).
Serendipity: Serendipity can be thought as a lucky and sagacious discovery of valid results that you did not foresee to find before (Merton, 2002)	Serendipity does not imply convergence of design, planning and execution.

From Abstract Concept to Organization Capabilities

With today's increasing pace of change, managers seek means that would help give organization sustained competitive capabilities. Daft and Weick (1984) suggest that when managers deem an environment to be unanalyzable, they seek information by means of strategies that are "more personal, less linear, more ad hoc and improvisational" (p. 287). As Cunha et al. (2003) described as the third stage of organizational improvisation theory development,

organizational improvisation studies came back to use metaphors like in the first stage to help explain the concept. As early as in 1990, Galbraith and other scholars defined improvisation as a type of ability. However, since there are different levels of improvisation (individual, group, entire organization), it can include different proportions of unscripted action, different degrees of radical innovation, and different levels of irreversibility (Miner et al., 2001).

In addition to describing organization improvisation as a process, researchers in strategy, IT, and management started to see improvisation as a "new" management technique and orientation for organizational strategic renewal (Crossan, 1998; Crossan, White, et al., 1996), and proposed that organizations can develop improvisation capabilities "through practice" (Crossan, 1998). Improvisation was transformed from an abstract concept to an observable and measurable ability and its three characteristics qualify it as a capabilities (cf. Pavlou & El Sawy, 2010): collective, repeatable and purposeful (Winter, 2003). In discussion of the three capabilities organizations use to gain sustainable competitive advantages, El Sawy and Pavlou (2008) propose improvisation capabilities as one of the IT-enabled business capabilities.

Throughout the years, researchers have seen organization improvisational capabilities as a type of ability to bring change in the organization. (See Appendix A for the list of definitions.) Pavlou and El Sawy (2010) focus on improvisation as a key capability for realization of competitive advantage in high turbulence environment, and the role of digital systems in facilitating these capabilities. Organization improvisational capabilities (OIC) in this study is defined as:

> *An organization's learned ability to respond to unexpected environmental turbulence quickly by simultaneously creating and executing novel solutions attained through unplanned recombination of available resources*

Organization Improvisational Capabilities (OIC) Dimensions

After defining the OIC, I examined its dimensions first from the definition itself and also draw support from the literature. Unlike routines or planned operation capabilities, organization improvisational capabilities is applied to specific unexpected situation (Crossan, et al., 2005) and is idiosyncratic (Baker & Nelson, 2005; Miner et al., 2001; Vera & Crossan, 2005). According to the theory of dynamic capabilities, an organization's capabilities for enabling change-responsive actions lie with their distinctive ways of accomplishing coordination, learning, and reconfiguration (Teece et al., 1997). Coordination refers to the ability to manage dependencies among activities and resources (Malone & Crowston, 1994). Learning includes the generation of new insights that have a potential to reshape behavior (Huber, 1991), and – more broadly – alterations in the state of knowledge assets. Reconfiguration refers to the ability to adjust an asset structure, and to accomplish the necessary internal and external transformations (Teece et al., 1997). From the discussion, I propose three dimensions for organization improvisational capabilities:

1. Near "Real time" responsive action
2. Unplanned reconfiguration and reuse of available resources
3. Virtuosic creativity for novel solution

Near "real time" responsive action

The first dimension of organization improvisational capabilities is its unique characteristic that portraits the converging of planning and execution in a short time (Doll & Deng, 2012; Moorman & Miner, 1998b). e Cunha (2004) put this impromptu action in an organizational context. As discussed in the previous section: the first characteristic that distinguishes improvisation from other similar concepts is its temporal dimension. This is the

only main theme that is not debated and is supported by all prominent researchers (e.g., Ancona et al., 2001; Ciborra, 1999; Moorman & Miner, 1998b; Orlikowski, 1996; Weick, 1998).

Improvisation is a near "real-time" response to an unexpected trigger; and the reason for improvisation is that there is no time for planning (Chelariu et al., 2002). Responsiveness refers to the ability to react to a change in the environment in a timely manner (Holsapple & Li, 2008). If there is no action (responsiveness) there is no improvisation. People improvise because there is no routine to handle a certain new issue and because action is required, not optional (e Cunha, 2004). In some circumstances, people may decide not to react. This absence of action may suit the situation but does not correspond to improvisation (e Cunha, 2004). The ability to respond quickly or near real-time is crucial for modern organizations that face highly turbulent environment.

Improvisation has been identified as a frequent response to continuously changing internal and external environmental forces that cause organizations to look for alternative solutions other than well-planned strategies. There is little disagreement that the current environment is marked by emergent and unplanned change (Purser & Petranker, 2005). When change comes too rapidly, there is no time available to refer to a plan and determine its impact, and how it can be applied. An organization's survival depends on its ability to learn and adapt quickly; in practice, this means that plans often must be altered at the very time they are being implemented (Moorman & Miner, 1998b). It is this improvisation in response to continuous change that is at the center of the organizational competitive advantage. In this continuous change environment, a repertoire of responses is enlarged and correspondingly strengthened or reduced through the reaction to ongoing organizational variations with everyday activities of simultaneous composition and execution (Purser & Petranker, 2005).

Improvisational capabilities are often regarded as path breaking capacities to react to external and extemporaneous stimuli differently (Crossan, Lane, & White, 1999). For example, Hurricane Sandy in 2012 pushed companies to improvise people management practice. A number of advertising companies like Horizon Media Inc. in New York took the unusual step of renting hotel spaces to ensure their people had power and a place to collaborate at the InterContinental Hotel.

Unplanned reconfiguration and reuse of available resources

Improvisation relates to explorations and exploitation of resources such as organizational experience and knowledge (Cunha et al, 2009) and makes sense of those challenges in providing prompt decisions under uncertainty (Brown & Eisenhardt, 1995; Vera & Crossan, 2005). At the heart of the improvisational performance is the ability to execute action while relying on available materials and resources (Kamoche, e Cunha & e Cunha, 2003). This is captured in Eisenberg's view of improvisation as "making do with minimal commonalities and elaborating simple structures in complex ways" (Eisenberg 1990, p. 154). I posit emphasizing both "*spontaneously"* and the "*reconfiguration and recombination of existing available resources"* from my OIC definition as the second dimension. This dimension of OIC is captured by Ciborra's (1999) description that organization improvisational capabilities generates new combinations of resources, or the ability to make-do, i.e., some kind of bricolage.

Following Levi-Strauss (1966), researchers have no discrepancy on describing bricolage as "making do with the means or resources at hand" (e.g., Baker & Nelson, 2005; Eisenberg, 1990; Harper, 1987; Hmieleski, 2009; Weick, 1993). Based on a review of Claude Lévi-Strauss's original writing, Duymedjian and Rüling (2010) propose that bricolage involves an ideal-typical

configuration of acting (practice), knowing (epistemology) and an underlying world view (metaphysics). Researchers also agree on the purpose of bricolage as to cope with environmental problems, e.g., resource constraints (Baker & Nelson, 2005; Weick, 1993) or customer demand or market change. However, they differ in the perspective of whether bricolage is the same as improvisation. Earlier studies do not distinguish between these two constructs and claim that bricolage is one aspect of improvisation (Weick, 1993), that bricolage is an integral part of improvisation (Cunha, Cunha & Kamoche, 1999), and that at the heart of the improvisational performance is bricolage (Kamoche, e Cunha & e Cunha, 2003). More recently, researchers recognize that bricolage and improvisation are different (Leone, 2010) and that they "are separate constructs" (Baker, 2007, p. 698).

Bricolage may often occur during improvisation (Weick, 1998). However, it may also occur in the implementation of pre-existing plans (Hmieleski, 2009). Baker (2007, p.698) argues that " while improvisation may imply bricolage, bricolage also occurs in the absence of improvisation, and that it is therefore important to recognize that they are separate constructs…it is entirely possible to plan to do something by combining the materials that will be at hand at a later time". Bricolage may be a cause of improvisation (Baker, 2007, p.698) but is not improvisation per se.

Capabilities to make do (bricolage) with available resources is an important part of organization improvisation process. The primary difference between these two forms of action is that in bricolage composition can precede execution, whereas for improvisation composition and execution occur extemporaneously (Vera & Crossan 2004; Baker & Nelson, 2005).

At the heart of the improvisational performance is the ability to execute action while relying on available materials and resources (Kamoche, e Cunha & e Cunha, 2003), e.g., social,

knowledge and skills. “Available” means they already have these skills in their “repertoires” (which are related to the next dimension of OIC, virtuosic creativity); otherwise, they won’t be able to “use” those skills in real time to reconfigure or recombine resources to solve problem or to perform. It could be obtained through training, and practice and it must be fostered via organizational structure and culture.

Virtuosic creativity for novel solution

In music, a *cadenza* is, generically, an improvised or written-out ornamental passage played or sung by a soloist or soloists, usually in a "free" rhythmic style, and often allowing for virtuosic display. The cadenza is usually the most elaborate and virtuosic part that the solo instrument plays during the whole piece. *Music in the Western civilization* by Piero Weiss and Richard Taruskin (1984) gives the following definition of virtuoso:

> *"...a virtuoso was, originally, a highly accomplished musician, but by the nineteenth century the term had become restricted to performers, both vocal and instrumental, whose technical accomplishments were so pronounced as to dazzle the public." (p.430)*

The defining element of virtuosity is the performance ability of the musician in question, who is capable of displaying feats of skill well above the average performers. Drawing from music, this metaphor illuminates one dimension of OIC: create something new through skillful recombination of resources and knowledge, just like musician performs a cadenza through virtuosic display of his/her skills. Amabile (1983) describes creativity as a novelty or deviation from existing practices and the generation of new and useful ideas. Wallace and Gruber (1989) considers a work being creative if it is original, purposeful and felicitous. Improvisation involves some degree of creation (composition) but of a special sort. Many forms of creativity do not involve combining creation with performance. Improvisation however implies creativity, while

creativity may occur also through trial and error experimentations or planning (Cunha et al, 1999).

The purpose of OIC is *to solve problem in a creative way that better match novel environmental situations and is grounded in the realities of the moment* (from definition). OIC usually is applied to come up something new through a creative process (Vera & Crossan, 2004) to solve a problem or to take advantage of transforming it into an opportunity through previous knowledge**,** i.e., repertories (Alvaretz & Barney, 2007; Eckhardt & Shane, 2003; Shane, 2000). Improvisation is therefore in part a cognitive activity that requires creativity under time constraint in order to meet performance objectives (Mendonca, Jefferson & Harrald, 2007). It is a deeper competence than whimsically winging it (Boyer, 2009).

Flexible Information Technology

Information technology (IT) has become indispensable to modern organizations **(**Wang, Liang, Zhong, el al., 2012, p.326). To date, most researchers have agreed that IT does create business value, and such value manifests in many different ways (Kohli & Grover, 2008). Over the last decade, information systems (IS) scholars have successfully examined the impacts of digital technology on firms' strategies, structures, and processes (Sambamurthy, Bharadwaj, Grover, 2003; Sambamurthy & Zmud, 2000). Similar advances have been made to understand the role of IT in creating business value and building sustainable competitive advantage (Kohli & Grover, 2008, Nevo & Wade, 2010). One fundamental part of competence-based theory, the resource-based theory, has been adopted by researchers to investigate IT's contribution to the firm. (e.g., Bharadwaj, 2000; Bharadwaj et al., 1999; Melville, Kraemer, & Gurbaxani, 2004; Santhanam & Hartono, 2003; Wade & Hulland, 2004). The resource-based theory distinguishes

between resource and capabilities. Resources are easier for competitions to imitate while in comparison, capabilities are more difficult to copy. Capabilities do not develop overnight. Firm culture, history and experience influence the development of firm-specific capabilities.

Bharadwaj (2000) defines IT capabilities as the ability to mobilize and deploy IT-based resources in combination with other resources and capabilities. IT-based resources consists of IT infrastructure, human IT resources (technical and managerial IT skills), and intangible IT-enabled resources. There is substantial literature on the use of information technology for competitive advantage and for organizational transformation. Although according to the resource-based view, IT itself is not a scarce resource at its basic commodity level (Carr, 2003), research has shown that the management of IT is the key to deliver sustainable advantage (Bharadwaj, 2000; Dvorak et al., 1997; Mata et al. 1995; Ross et al., 1996).

Ciborra (1994) concludes that the achievement of competitive advantage from the deployment of IT is due more to serendipity and improvisation than from formal planning. IT flexibility enables business agility, because enhancement of business agility is not possible unless IT infrastructures are flexible (Furukawa, 2004, p.780). Flexible IT infrastructures deliver the technical platform, services and specialist resources required to deal quickly with unpredictable changes in the business environment (Bocij et al., 2008, p.557). This also enhances improvisation. We use one contemporary IT architectures, Service-Oriented Architecture (SOA) to demonstrate the characteristics of flexible IT.

Service-Oriented Architecture. In recent years, SOA has been portrayed as a solution to achieve alignment between firm strategy and IS, and bring agility to organizations (Luthria & Rabhi, 2009). SOA is an evolution of distributed computing designed to allow the interaction of

software components, called “services”, across a network. Applications are created from a composition of these services — and importantly, the services can be shared among multiple applications. SOA is an approach to designing, implementing, and deploying information systems such that the system is created from components implementing discrete business functions which can be distributed across geography, across enterprises, and can be reconfigured into new business processes as needed.

For example, an insurance quote could be implemented by combining the following services that reside on different locations such as headquarter’s mainframe or local networks:

- A Customer Information Service, which process customer information
- A Type Matching Service, which provides different requirements of information to obtain and to process
- A Location Pricing Service, which handles the pricing
- A Comparison to Competitor Service, which collects information of competitors’ offers and provides instant comparison

Many organizations have started SOA initiatives to respond to the “on demand” environment (Bieberstein, Bose, Walker, & Lynch, 2005). From the business point of view, SOA is about analyzing the business to identify business areas and business processes. From the resource-based terms, SOA is a system for linking resources on demand. In an SOA, resources are made available to other participants in the network as independent services that are accessed in a standardized way. This allows for flexible loose coupling of resources than is possible in traditional architectures (see www.looselycoupled.com).

Dimensions of IT Infrastructure Flexibility from SOA Design Principles

SOA is a multi-layered, distributed architecture paradigm encapsulating parts of the IS landscape as services. In this dissertation, SOA dimensions are defined from its design principles as:

- Modularity
- Loose coupling
- Open Standards

Modularity

SOA is a way of designing applications using components or services, in other words, an application built in a modular fashion. This modular approach is not new. In contemporary programming, such as in Object-Oriented Programming, a modular approach has been put forward in the development application. Generally speaking, modularity is a continuum describing the degree to which a system's components can be separated and recombined. Each module maintains complete independence while the interdependence between modules is moved to the interface which is standardized. Modularity is hence the ability to easily reconfigure (add, modify, or remove) technology components by minimizing interdependencies among modules (Schilling, 2000). This forces thinking in terms of organizing around processes rather than hierarchies or functional structure.

Modularity permits for reusable pieces as a consequence of breaking down complexity (Heutschi, 2007). For example, people use "lego-like" analogy to describe modularity. Modularity also builds the foundation of reusability, which has been seen as an important approach for improving software productivity (Bassett, 1996; Davis, 1993; Hsu, Lee & Lim,

1998; Lynex & Layzell, 1998), shortening the development cycle (Due, 2000), and reduce development costs (Poulin, 2006). Modularization reduces complexity by dividing existing applications into reusable parts (Fritz, 2004). Adherence to this principle allows a quick and easy composing of services that will optimally meet current requirements (Hagel & Brown, 2001) which promotes the reuse and responsiveness dimensions of OIC.

Research on dynamic capabilities suggests that modularity increases the set of recombinant opportunities, which helps to match organizational resources with emerging competitive needs (Da Cunha et al., 2005; Eisenhardt & Martin, 2000; Galunic & Eisenhardt, 2001), and is considered one of the most important dimensions in IS flexibility (Duncan, 1995). A higher degree of modularity consequently means a greater speed in developing new, or modifying existing, applications (Tiwana, Konsynski & Bush, 2010).

Loose coupling

In software engineering, *coupling* or *dependency* is the degree to which each program module relies on each one of the other modules. a loosely coupled system is one in which each of its components has, or makes use of, little or no knowledge of the definitions of other separate components. In other words, loose coupling means that the logical and run-time dependencies between services are as low as possible (Papazoglou & Heuvel, 2007). Loose coupling creates a specific type of relationship within and outside of service boundaries, emphasizing the reduction of dependencies (loosening) between the service contract, its implementation, and its service consumers (Erl, 2008, p.71). Loose coupling permits composing compatible business services (Mueller et al., 2007, p.1611), allowing organizations to replace or change business components without changing other components in the IT architecture, which in turn leads to IT flexibility and agility compared to tightly coupled IT architectures (Linthicum, 2007). Hirschheim et al. (2010)

use HousingMaps.com as an example to illustrate the benefits and advantages to have Web service and loose coupling principles of SOA. HousingMap.com combines data from Craigslist and Google Maps to create a new service that clients can see a spatial view of available houses. Before SOA, this service would have required developers from HousingMaps.com to have close ties (tightly coupled) with both Google and Craigslist to program, integrate, and manage data between these applications. Because Google and Craigslist expose their functionality in the form of web services, it is possible to have a loose coupling of two discoverable services allowing the creation of an entirely new and valuable service.

An organization can adapt and respond to unanticipated events (Kaye, 2003, p.2) if its system is loosely coupled. Loose coupling is critical to SOA (flexible IT) as they can invoke a service by another service at run-time. As aforementioned, SOA is an application built in a modular fashion that has been applied to software development. What makes SOA different is that a component or a service is built and interacts with each other freely and loosely. With the loose coupled nature, a service can be called by the program or other service without needing to pay attention to the location of the service or the platform.

Echoing Weick (1976), Orton and Weick (1990) note that more loosely-coupled organizations offer advantages in complex environments. More autonomous groups may be more sensitive to environmental change and offer more simultaneous adaptation to conflicting demands at the organizational level. If problems develop in one part of the system, it can be sealed off from the rest of the system. The resulting total system may be more stable when loosely-coupled. Allowing local organizations to adapt to local environments can reduce coordination costs for the whole system.

Open standards

The ITU-T (Telecommunication Standardization Sector) defines open standards as "standards made available to the general public and are developed (or approved) and maintained via a collaborative and consensus driven process." They also posit that "Open standards facilitate interoperability and data exchange among different products or services and are intended for widespread adoption". Open standards breaking down proprietary barriers between software programs (Bieberstein et al., 2006, p.19) enabling heterogeneous IT infrastructures to interoperate, so that internal and external business services are easily connected via interfaces (Mueller et al., 2007, p.1615). Each service component is defined and documented by a well-defined, network-addressable public interface and a formal contract (Erl, 2005; Fritz, 2004; McGovern et al., 2003; Newcomer & Lomow, 2004). Consequently, a SOA supports standardized information exchange between provider and requester agents (W3C, 2004).

SOA fosters *interoperability* in heterogeneous environments vertically and horizontally through standardized components. The adoption of standards enhances business agility, makes it easier to communicate with suppliers and partners. When IT architectures are similar, it is much easier to make changes. Agility favors standardization, and standardization enables IT flexibility (Bloomberg & Schmelzer, 2006, pp.86-87). The most immediate benefits of open standards lie in their ability to extract more value from existing applications. Amazon and eBay are high-profile examples of corporations which have made their core applications accessible over the Internet as Web services. The collective power lies in allowing trading partners to interact in unprecedented ways, but without imposing the rigid precondition of having to make irrecoverable dedicated investments or scrapping existing systems. (Vervest, 2005, p.86).

By means of standardized connectivity, services can be readily integrated and flexibly composed to support entire business processes and scenarios (Baskerville et al., 2005; Fritz, 2004). Open standards plays a key role in architecting modularity into improvisational networks. Collectively agreed-upon but closed (non-public) standards tend to shrink the size of collaborative networks. Together, open-standards and loose coupling enhance the modularity of the collaborative network architecture (Vervest, 2005, P.86). In this dissertation, SOAness is used as a representation of the overall magnitude of the combination of modularity, reusability, openness, and degree of loose coupling of a firm's IT infrastructure and the degree of its orientation towards SOA principles.

Environmental Uncertainty

Although organizational environment is a fundamental concept in management theory, there is little consensus regarding its conceptualization and measurement. (Mar Fuentes-Fuentes, Albacete-Sáez, & Lloréns-Montes, 2004). Duncan (1972) defines environment as the "totality of physical and social factors that are taken directly into consideration in the decision-making behavior" of a decision unit (p.313). Technology-Organization-Environment (TOE) defines environmental context as: "the arena in which a firm conducts its business – its industry, competitors, access to resources supplied by others, and dealings with government" (Tornatzky & Fleisscher, 1990). Two environments make up an organization's habitat: internal and external (Duncan, 1972). In the TOE model, *organization* context represents the internal environment and is connected through "boundary-spanning" *technology* to the *external task environment*.

Duncan (1972) lists five external environment components: the customer, supplier, competitor, social-political effects, and technological effects. Each component has various

factors. External factors include the "global" factors which are beyond an organization's control but still affect the organization's behavior and decision making (Quaddus & Hofmeyer, 2007). Damanpour and Schneider (2006) state that the external environment provides both opportunities and constraints (p.217). Other researchers conceptualize environment using its characteristics, i.e., identifying its dimensions to test its relationship to organizational structures, processes, technologies and outcomes (Child, 1972; Mintzberg, 1979).

Research in industrial economics, strategic management, and information systems argues that industry environment has significant impact on a firm's strategic actions (Dess & Beard, 1984; Keats & Hitt, 1988; Kung et al., 2013; Milliken, 1987; Scherer & Ross, 1990). Institutional theorists assert that the institutional environment can strongly influence the development of formal structures in an organization. Environmental uncertainty, the degree of change and instability in the firm's operating context, has an impact on business-IT alignment (Tallon & Pinsonneault, 20011). There are different types of uncertainty: technical uncertainty, market uncertainty and some general unknown nature of the external environment.

Prior research identifies multiple environmental factors, using multiple labels and operationalizations (Aldrich, 1979; Dess & Beard, 1984). Three constructs are common to most environmental and IS research which I will focus and present in the next section: industry turbulence (Pavlou & El Sawy, 2006; Wade & Hulland, 2004), industry competition (Melville et al. 2007; Ray et al., 2005), and industry growth (Wade & Hulland, 2004). These three industry factors map to three salient industry dimensions: dynamism (reflecting industry turbulence in this study), competition (measured by industry concentration), and munificence (measured by industry growth). These three dimensions reflect competitive opportunities and pressures. Following Xue and his colleagues' (2011) argument that dynamism can be viewed as the

uncertainty on the demand (customer) side, complexity as the uncertainty on the supply (competition) side, and munificence as the uncertainty that is driven by the longer-term trends in the industry, I posit that these three dimensions form the overall environmental uncertainty. Table 5 illustrates the definitions and characteristics of these three dimensions.

Table 5. Environmental Uncertainty Dimensions

Environmental Dimension	Similar term	Definition	Measurement	Characteristics
dynamism	turbulence volatility instability	the degree of novelty in the changes or to their speed	degree of predictability of competitors' actions	frequent entries, exits, and structural instability
munificence	growth stability resource abundance	the extent to which a business environment can support sustained growth	measured by industry growth	competitive actions are more predictable
complexity	heterogeneity	the range and the differences (heterogeneity) that exist across an industry and/or across an organization's activities	measured by industry concentration	high environmental complexity = a large number of suppliers, competitors, and customers

Dynamism: Industry Turbulence

Dynamism or turbulence reflects the unpredictable rate of environmental change in an industry (Fuentes-Fuentes et al, 2004; Lu & Ramamurthy, 2011; Melville et al., 2007). Industry turbulence is the rate at which firms enter and exit an industry normalized by the number of firms in the industry, with higher ratios indicating greater industry turbulence (Griliches &

Regev, 1995). According to the information uncertainty perspective, increasing level of environmental dynamism will lead to greater environmental uncertainty. Turbulent industries are characterized by competitive opportunities arising from an ongoing stream of innovations and competitive actions by others in the industry (D'Aveni, 1994; Eisenhardt & Sull, 2001).

Turbulent industries are also characterized by frequent entries, exits, and structural instability, which should encourage firms to act more independently and to diverge from the industry norm. This is because the industry norm may be perceived as a less reliable guide for future success. Under high environmental turbulence, organizations are required to exchange information frequently and rapidly throughout the supply chain in order to stay competitive (Wu & Lee, 2005). Firms that perceive high uncertainty of customer behavior or competitors tend to adopt a more aggressive technology policy, which in turn correlates to the adoption of more radical innovation (Tornatzky & Fleisscher, 1990). In a highly turbulent industry, the dominant position of incumbents may be destroyed by competitors or new entrants who own superior knowledge about the market and or firm resource configuration (Sambamurthy et al., 2003).

Munificence: Industry Growth

Munificence, as the term implies, is the extent to which an environment can provide sufficient resources for the firms operating in it (Mar Fuentes-Fuentes et al., 2004). There are two facets of munificence: availability of and competition for resources (Mintzberg, 1979; Mar Fuentes-Fuentes et al., 2004). A market that has little growth may be extremely munificent if it contains few competitors. On the same token, a rapid growing market may have little capacity for a given firm if there are many competitors. Low levels of munificence are generally associated with environments that are mature or shrinking. High levels of munificence are

normally associated with rapidly growing markets that are relatively forgiving (Dess & Beard, 1984; Wade & Hulland, 2004). In munificent environments, firms tend to adopt strategies and structures that can help them to capture growth opportunities.

The opposite of environmental munificence is environmental hostility or scarcity of resources. Under conditions of environmental scarcity, firms experience greater duress and thus have greater incentive to take risks associated with differentiation in digital business strategy (Castrogiovanni, 1991). Performance tends to be lower in less munificent environments (Caves, 1977; Pennings, 1975). Relative scarcity of resources in existing markets increases the risk of remaining in those markets and increases the need to expand operations into new markets to reduce dependencies on existing domains (Hannan & Freeman, 1977). Thus, firms direct diversification efforts into markets with more munificent environments in order to balance overall risk (Bettis, 1981; Thompson, 1967). For example, IBM diversified from being a hardware giant to now offering different platforms, consulting and business analytic products to reduce risks and to take advantages of abundant sources such as people and technologies.

When munificence is high, competition tends to be less intense and profitability is often higher (Smith et al., 1991). In turn, growth and environmental munificence helps incumbents maintain superior performance even though entrants take some market share (McDougall et al., 1994). Balancing or reducing overall risk through operation in munificent environments should enhance organizational performance. Thus, both strategy and performance may directly and indirectly be a function of environmental munificence. Munificence may also affect organizational size. Growth is easier to achieve in resource-rich environments, as they provide opportunities for expansion in existing markets and development of new markets (Tushman, 1977; Keats & Hitt, 1988).

Complexity: Industry Concentration

Complexity was defined as the number, heterogeneity and concentration of environmental elements that a firm has to deal with (Dess & Beard, 1984; Keats & Hitt, 1988). It reflects the level of complex knowledge that the environment required to be understood (Mar Fuentes-Fuentes et al., 2004, p.427). The larger the number and the greater the heterogeneity of the entities (e.g., competitors), the more complex the environment is. (Xue et al., 2011). Environmental complexity exerts its primary influence on organizational structure. Organizational decision makers deal with environmental complexity by structural divisionalization (MacCrimmon & Taylor, 1976; Bobbitt & Ford, 1980).

Fewer dominant firms in an industry means it is more concentrated (Mithas, Tafti, & Mitchell, 2013). Firms in more concentrated industries earn lower returns, even after controlling for size, book-to-market, momentum, and other return determinants (Hou & Robinson, 2006). Firm's actions in less competitive industries are more likely to be noticed and mimicked by rival firms in a less crowded market (Bain, 1951). Since it is easy to learn and anticipate the consequences of actions in more concentrated industries, firms are more likely to imitate actions taken by competitors and are more likely to converge to the industry norm (Derfus et al. 2008). The more visible a strategic move is to competitors, the more likely it is to be detected and imitated (Miller & Chen, 1994). In contrast, when industry concentration is lower (i.e., there are more firms), firms can act in distinct and unique ways with less danger of being noticed and, hence, they can avoid a quick retaliatory or imitative response by competitors. The need for improvisational capabilities is higher in this type of environment.

Organizational Contingencies

In this section, other possible influencing variables are briefly discussed (right-hand side of the conceptual model), specifically top management support and dynamic capabilities.

Top Management Support

Jeyaraj, Rottman and Lacity (2006) did a review article of the predictors, linkages, and bias in IT innovation adoption, and concluded that top management support, external pressure, professionalism of the IS unit, and external information sources are the top predictors of IT innovation adoptions. When relate to IT, top management support or commitment usually is portrayed as receiving the commitment of senior management for IT programs and projects (Powell & Dent-Micallef, 1997). Drawing from Purvis et al (2001), the top management championship is seen as a significant metastructuring enabler of IT assimilation (Chatterjee, Grewal, & Sambamurthy, 2002).

Past research suggests that top management needs to recognize and assume the responsibility for both the technical and organizational changes (Leonard-Barton, 1988). "Top management commitment has been clearly identified in the IS literature as affecting the relationship between IS resources and firm-level competitive advantage" (Wade & Hulland, 2004, p.126). In this dissertation, top management role is not only applied to IT assimilation but also to the inclination of building organization improvisational capabilities. Literature on innovation assimilation largely views top management as the agency responsible for changing the norms, values, and culture within an organization (Liang, Saraf, Hu, & Xue, 2007). The norms, values, and culture engendered by the top management permeate to the individual level in the form of procedures, rules, regulations, and routines, which serve as powerful templates that

guide individual behavior (Purvis et al., 2001). The idea is simply that when the senior management team of the organization supports, guides, promotes, and is committed to the firm's IT function, the impact of IT capabilities on firm performance is perceived to be enhanced (Armstrong & Sambamurthy, 1999; Ross et al., 1996). Through their beliefs, top management can offer visions and guidelines, and promote building certain types of capabilities such as IT capabilities and organization improvisational capabilities.

Dynamic Capabilities

Dynamic capabilities are a firm's organizational ability to integrate, reconfigure, gain and renew resources to match rapidly-changing market environments (Eisenhardt & Martin, 2000; Teece et al., 1997; Winter, 2003; Helfat & Peteraf, 2003) and to enhance a firm's agility (Roberts & Grover, 2012). Dynamic capabilities are conducive not only to reconfiguring a firm's resources and routines (Zahra, Sapienza & Davidsson, 2006), but also to improving effectiveness for operating routines (Zollo& Winter, 2002). Dynamic capabilities lead inherent operational capabilities into new fields by reconfiguring resources in changing business circumstances. Teece (2007) and Barreto (2010) propose that dynamic capabilities should be considered as the ability to sense and shape opportunities and threats, to seize market opportunities and to maintain competitiveness.

After discussing the possible factors for e-retailers performance, the attention is now turned to the combined effects of IT and organization improvisational capabilities which is presented in the next section to further demonstrate the center part of the conceptual model.

The Complementarities of IT and Organization Improvisational Capabilities on Performance

Complementarities arises when the benefits of doing two activities together are greater than the combined benefits of doing the two separately (Milgrom & Roberts, 1995). Complementarity most generally involves benefits that arise from making joint decisions about multiple goods and activities. This definition of complementarity encompasses the concept of synergy as well as the idea of system effects that arise when the whole is greater than the sum of its parts (Parmigiani & Mitchell, 2009, p.1068). This study proposes that IT capabilities and organization improvisational capabilities are complementary in bringing value to the firm.

In the highly turbulent environment, (e)-businesses need to have capabilities that are flexible and agile (Byrd, 2001; Byrd & Turner, 2000; Ren & Lyytinen, 2008; Rotem-Gal-Oz, 2007) because of the fast changing and increasing customer demands and more serious competition, and to respond to changes quickly and efficiently (Bieberstein et al., 2005; Sherif & Vinze, 2003). To gain flexibility and competitive capabilities, business actions are becoming increasingly inseparable from IT (Ferrier, Holsapple & Sabherwal, 2010). Consequently, IT capabilities is becoming ever more integral to the creation and delivery of many goods and services for organizations to stay competitive (Ferrier, Holsapple & Sabherwal, 2010). Researchers (e.g., Benbya & McKelvey, 2006; Markus & Robey, 1988; Orilowski, 1996) suggest that there is much potential in seeing technologies and organizations as mutually dependent and dynamically emergent. E-commerce firms need improvisational capabilities to react to environmental turbulences and combine such capabilities with IT capabilities to build their competences and in turn gain better performance.

SOA IT Flexibility and Organization Improvisational Capabilities

Mueller, Viering, Legner and Riempp (2010) claim that the three SOA dimensions result in three main benefits: IT infrastructure, operational, and strategic benefits (p.162). SOA is also thought to reduce redundant functionality and to foster reusability. Although SOA is not tied to a specific technology, open Web service standards are an increasingly applied approach to overcome platform and vendor-dependency. In addition, the loose coupling of independent, standardized software components promotes interoperability across programming languages and platforms, as well as business processes' dynamic choreography (Demirkan et al., 2009; McGovern et al., 2003; W3C, 2004). Besides its beneficial effects in terms of interoperability a SOA, which consists of loosely-coupled, stateless, and autonomous services, is considered to be more agile regarding meeting new business requirements and adapting to changes (Erl, 2005; McGovern et al., 2003). This portrays organization dynamic and improvisational capabilities.

SOA offers a valuable response to the need for flexibility in business operations by providing the core structure of an on demand business (Bieberstein et al., 2006) and providing the ability "to cope with unexpected changes, to survive unprecedented threats of business environment, and to take advantage of changes as opportunities" (Sharifi & Zhang, 1999, p.9). These characteristic of SOA help to build the organization improvisational capabilities. Some enterprise architects believe that SOA can help businesses respond more quickly and more cost-effectively to changing market conditions (Koch, 2005). SOA provides an instrument to be cheaper, better, and faster, thus more profitable in a dynamic sea of change (Goranson, 1999, p.69). Modularity, loose coupling, and open standards facilitate the reconstruction of a business process if business requirements change by changing only the interconnection of business

services (Kano et al., 2005, p.680), which, in turn, complements organization improvisational capabilities.

In discussion of the three capabilities organizations use to gain sustainable competitive advantages, El Sawy and Pavlou (2008) propose that improvisational capabilities is one of the IT-enabled business capabilities. IT leveraging capabilities such as OIC has a significant impact on performance. OIC strengthens firm performance as the environments become more turbulent (Pavlou & El Sawy, 2006). Throughout the years, researchers have seen organization improvisational capabilities as a type of ability to bring changes in the organization. Pavlou and El Sawy (2010) focus on improvisation as a key ability for realization of competitive advantage in highly turbulent environment and the role of digital systems in facilitating this ability. The combined effects of IT and OIC yield a competence that is expected to create more value than the sum of the two individually.

CHAPTER 3: METHODOLOGY

One major goal for this dissertation is to gain a more complete understanding of organization improvisational capabilities (OIC) by conducting a literature review and developing a scale. Details of the procedure is provided in the *Measurement development* section.

Another goal is to explore the configurations of firm performance operating in highly turbulent environment. E-commerce is chosen as the premise because of its representative characteristics of highly turbulent environment, i.e., its high complexity, dynamism and munificence. As presented in Chapter 2, configurational approach is applied to investigate the different configurations for performance in such environment by examining the combination of IT infrastructure flexibility, organization improvisational capabilities (OIC), and environmental factors.

Research Domain and Sampling Frame

To accomplish this study's goals, both primary data and secondary data will be used. The population of interest is the top 1000 e-retailers (top 500 and 2nd top 500) ranked by Internet Retailer. These companies represent a broad spectrum of product, size, IT, strategy and competence which offers plentiful selection of various elements pertaining to this study. Internet retailer Top500 guide online database is chosen as the source of the e-retailers that would comprise the sample frame of this study.

Identifying Senior IT Executives. Recognizing the inherent difficulties in obtaining responses from CIOs, this study will follow the general methods and suggestions as outlined by Dillman (2000) for obtaining better response rates when soliciting survey responses from businesses. One such suggestion is to identify the most appropriate respondent for a business

survey and address the letter to that individual by name. To accomplish this task, it was necessary to discover the names and mailing addresses for each of the most senior IT executives currently employed with each of the firms in the sample frame. These data are available from the online database.

Research Model and Measurement Instruments

Research Model

As previously explained, this study assesses the configuration of performance of e-retailers. The assessment is operationalized by examining the complementary effects of IT infrastructure flexibility and organization improvisational capabilities on performance as well as the interdependent relationship of organization characteristics and its environment. Figure 2 is an illustration of the underlying research model.

Measurement Instruments

The model contains six constructs: (1) dimensions of SOAness (IT infrastructure), (2) dimensions of organization improvisational capabilities (OIC), (3) dimensions of environmental factors, (4) top management support (i.e., organizational contingency-a), (5) dynamic capabilities (i.e., organizational contingency-b), and (6) performance.

Outcome*: performance*

Firm performance has been defined by Rai et al. (2006) as a function of operational excellence, customer relationships, and revenue growth. This definition encompasses tangible and intangible dimensions. Most prior studies use financial measures such as ROI or other ratio (e.g., operating income to number of employees ratio in McKeen and Smith, 1993) as evidences

of performance. Since e-commerce is considered a “new” type of business, the traditional measurements of performance might not be the best choices to fully capture the distinctness of e-commerce. I am going to measure e-commerce firms’ performance by web sale growth of the last three years and customer satisfaction, to capture both tangible and intangible dimensions respectively.

There are also questions on the survey asking participant's evaluation of his firm's financial performance and market performance as follows:

Perceived financial performance

- PFP1: Over the past 3 years, our financial performance has been outstanding.
- PFP2: Over the past 3 years, we have been more profitable than our competitors.
- PFP3: Over the past 3 years, our sales growth had been outstanding.

Market Performance

- MP1: We have entered new market more quickly than our competitors.
- MP2: We have introduced new products or services to the market faster than our competitors.
- MP3: Our success rate of new products or services has been higher than our competitors.
- MP4: Our market share has exceeded that of our competitors.

Configurational Elements *(Independent Variables)*

Although the nature of the constructs (reflective or formative) is not critical for the set-theoretical method used in this study, a brief discussion is provided. There is increasing discussion and requirement in IS research to examine the relationship between the measures and constructs more closely when modeling them. A general collection of decision rule has been established by researchers (cf, Jarvis et al., 2003; Petter et al., 2007) in determining whether a multi-item constructs as reflective or formative. Following these four rules: (1) theoretical causal direction between the construct and indicator (i.e., a change in construct brings a change

in indicator or vice versa), (2) whether the indicators are interchangeable, (3) whether indicators covary, and (4) whether indicators have the same antecedents and consequences, all the first-order constructs and two second-order constructs, IT flexibility, and environmental uncertainty are modeled as reflective while OIC is modeled as a second-order formative construct. Unless otherwise stated, items used to assess constructs are measured on a five-point Likert scale, rating their agreement of statements using 1 as "strongly disagree" to 5 as "strongly agree".

Flexible IT infrastructures provide the technical platform, services and specialist resources required to deal quickly with unpredictable changes in the business environment (Bocij et al., 2008, p.557). Three dimensions of SOA are conceptualized to represent the degree of the IT flexibility: modularity, loose coupling and open standard.

Modularity is a continuum describing the degree to which a system's components can be separated and recombined. Modularity is hence the ability to easily reconfigure (add, modify, or remove) technology components by minimizing interdependencies among modules (Schilling, 2000) which increases reusability and interoperability. Modularity is represented by reusability and is operationalized by four items as a first order reflective construct:

- RUS1: Reusable software modules are widely used throughout our systems development unit.
- RUS2: Modular design principles are widely used throughout our system development unit
- RUS3: New components can be easily added or removed in IT applications and processes.

Loose Coupling. a *loosely coupled* system is one in which each of its components has, or makes use of, little or no knowledge of the definitions of other separate components. In other

words, loose coupling means that the logical and run-time dependencies between services are as low as possible. This facilitates flexibility and agility,

- LC1: My firm's IT modules do not rely on other modules to function.
- LC2: It is easy to change components of our IT applications and processes without having to change other components.
- LC3: Our IT applications and process can call other services regardless of its location.
- LC4: There is a very low run-time dependence of our IT modules.

Open standards are standards made available to the general public and are developed (or approved) and maintained via a collaborative and consensus driven process (The ITU-T). Open standards facilitate interoperability and data exchange among different products or services and are intended for widespread adoption. This principle and the interaction with other two dimensions aid organizational agility.

- OS1: Please indicate the degree of using open standard for applications and processes in your organization (1= not at all, 3= about 50%, 5= for all applications and processes)

Please indicate your agreement of this statement (1= strongly disagree, 5= strongly agree)

- OS2. Open standards are widely used throughout our system development unit

Environmental Uncertainty

Following the existing literature (e.g., Dess & Beard, 1984, Keats & Hitt, 1988; Wade & Hulland, 2004; Xue et al., 2011) this dissertation characterizes environmental uncertainty in terms of dynamism, munificence, and complexity of the environment.

Dynamism or turbulence reflects the unpredictable rate of environmental change in an industry (Fuentes-Fuentes et al, 2004; Karimi, Somers, & Gupta, 2004; Lu and Ramamurthy 2011; Melville et al., 2007). Industry turbulence is the rate at which firms enter and exit an

industry normalized by the number of firms in the industry, with higher ratios indicating greater industry turbulence (Griliches & Regev, 1995). Following Karimi, Somers and Gupta (2004), dynamism is operationlized using 3 items.

Please rate the dynamism of your industry in the following areas over the past five years (1= have become far more predictable, 3= no change, 5= have become far less redictable)

- DYM1: Market activities change of your key competitors over the past five years
- DYM2: The tastes and preferences change of your customers in your principal industry over the past five years
- DYM3: Rate of innovation of new operating processes and new products or services in your principle industry over the past five years

Munificence refers to the opportunities for growth within an industry (Dess & Beard, 1984). Following Keats and Hitt (1988), I use the growth in industry sales and the growth in industry operating income to measure munificence.

- M1. Demand for the products and services of our industry have been growing rapidly
- M2. The investment or marketing opportunities for firms of our industry have been extremely favorable
- M3. The marketing opportunities for firms of our industry have been extremely favorable

Complexity: the range and the differences (heterogeneity) that exist across an industry and or across an organization's activities. Herfindahl-Hirschman Index is used to represent environmental complexity. It is operationalized by three items (Fuentes-Fuentes et al., 2004).

- C1. We have a great diversity in our marketing tactics to attract different types of customers.
- C2. Customers in our industry demand wide variety in products and services.
- C3. Our competitors use many different tactics to attract customers.

Organization Contingencies

Top Management Support. When relate to IT, top management support or commitment usually is portrayed as receiving the commitment of senior management for IT programs and projects (Powell & Dent-Micallef, 1997). Managers as most people can have a great influence on implementing SOA. Since the SOA project is very costly, it is essential in all phases to gain intellectual and financial support from top management. Top management support for flexible IT infrastructure is operationalized by 2 item.

- The top management of my company believes that flexible IT resources can provide significant business benefits to the company.
- The top management of my company thinks that having flexibility in IT resources is very important.

Top management support for organization improvisational capabilities is operationalized by 2 item.

- Our top management encourages creating fast solutions to rapidly developing challenges.
- Our top management support training of reacting to novel situations with creative solutions quickly.

Dynamic Capabilities. A major challenge for managers in turbulent environments is to make sound decisions quickly (Pavlou & El Sawy, 2011). Dynamic capabilities have been proposed as a means for addressing turbulent environments by helping managers extend, modify, and reconfigure existing operational capabilities into new ones that better match the environment (Eisenhardt & Martin, 2000; Helfat & Peteraf, 2003; Pavlou & El Sawy, 2011; Teece et al., 1997; Winter, 2003). Following Pavlou and El Sawy (2008), this study uses three items to measure dynamic capabilities.

- We can successfully reconfigure our resources to come up with new productive assets.
- We can effectively integrate and combine existing resources into new combinations.

- We often engage in resource recombinations to better match our product-market areas and our assets.

Organization Improvisational capabilities. Since there are no robust measures for OIC in the context of this study, new OIC scale is developed for this dissertation. OIC is formed by three dimensions: speedy responding, reconfigurability, and novel solution. Each of these first-order constructs is reflective and has 3 indicator items. Speedy responding is defined as the time lag between planning and execution in responding to environment turbulence. Reconfigurability is the ability to recombine and reuse available resources. Novel solution is the new idea or process built for a specific circumstance to solve a problem or to react to an environmental turbulence.

- SPD1: We respond to customers' demands immediately versus following a pre-defined script.
- SPD2: We are able to deal with changes quickly without having to go through formal planning.
- SPD3: We can respond in the moment to unexpected problems.
- RCG1: We can successfully reconfigure our resources to react to customers' demand.
- RCG2: We can quickly recombine available resources to solve problems.
- RCG3: We are skillful in reusing existing resources to serve our customers.
- NOS1: We can come up with new ideas with existing resources to serve our customers very quickly.
- NOS2: We are creative in the ways to solve problems at the moment.
- NOS3: We can come up with creative solutions for any unexpected situation.

Efforts were made to use existing validated measurements that have good psychometric properties and are up-to-date. Modifications of the existing items were made to suit the context of this study. Since there is no validated scale for organization improvisational capabilities in the e-commerce context, a new scale is developed for this study. The measurement development process is described in the next section.

Measurement Development

MIS scholars such as Byrd, Hinkin, and Lewis, and methodology scholars such as MacKenzie and Podsakoff have proposed scale development processes. Although they posit different number of stages (see Table 6 for brief comparison), the essence is the same. Start with setting the domain (defining the construct and its dimensions), then developing items and designing a survey accordingly, evaluating and refining items, then collect data, and finally validating. Lewis, Templeton and Byrd (2005) provide a framework to guide the development of a psychometrically sound survey instrument (Figure 3) which is followed in this study.

Stage I: domain

In this stage, three things are delivered: premise, definition of the construct, and its dimensions. To accomplish this, Lewis, Templeton and Byrd (2005) suggest that content analysis is an appropriate venue to establish the domain, and they also list literature review, interview transcript and case studies as proper techniques for content analysis (p.391). Following Webster and Watson (2002), a literature review was conducted to gain understanding of the theoretical foundation for organization improvisational capabilities (OIC).

The theoretical foundation provides enough information to define OIC in highly turbulent environment for this study. Organization improvisational capabilities (OIC) in this study is defined as: *An organization's learned ability to respond to environmental turbulence quickly by simultaneously creating and executing novel solutions attained through recombining available resources.* The definition is then used as a guide for the development of dimensions and items (Lewis, Templeton, & Byrd, 2005; Schwab, 1980). Three dimensions of OIC are proposed, which are speedy responding, reconfigurability, and novel solution.

Table 6. Measurement Development Process Comparison

Hinkin (1998)	Lewis, Templeton, & Byrd (2005)	MacKenzie, Podsakoff, & Podsakoff (2011)
(1) operationalization of research constructs	(1) domain definition	(1) Conceptualization
(2) item development	(2) instrument construction	(2) Development of Measures
(3) expert review	(3) evaluation	(3) Model Specification
(4) validity tests		(4) Scale Evaluation and Refinement
		(5) Validation
		(6) Norm Development

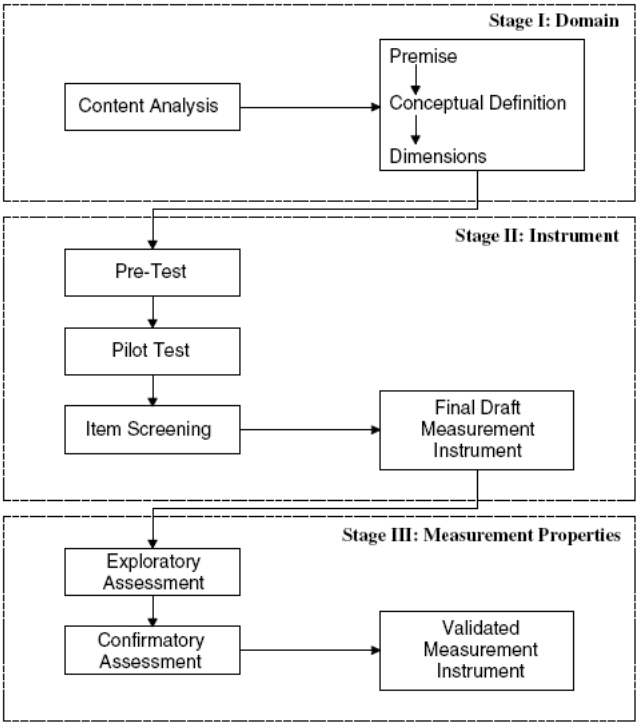


Figure 3. Construct development Methodology Adopted from Lewis, Templeton, & Byrd (2005).

Stage II: instrument construction

In the second stage, an instrument with items that represent the construct is produced and improved through multiple iterations. Each item statement in the domain was converted into an item on the instrument. Then the content validity of the items is assessed.

Pre-Test

Five scholars and five practitioners will be invited to assess the instrument for the pre-test. They will be asked to complete the instrument first and then critique important matters for initial instrument design, such as format, content, understandability, terminology, and ease and speed of completion (Lewis, Templeton, & Byrd, 2005). Respondents will be asked to identify specific items that should be added or deleted from the instrument, as well as to make suggestions for enhancements. Necessary adjustment will be made based on the feedbacks.

Pre-test format: definitions of different aspects of the construct domain are listed at the top of the columns and the items are listed in the rows (see Appendix B). Raters are asked to rate the extent to which each item captures each aspect of the construct domain using a five point Likert-type scale ranging from 1 (not at all) to 5 (completely). (cf. MacKenzie, Podsakoff & Fetter, 1991).

The ratings will then be converted into a data array. Face validity and content validity will be checked. Items in varying order will be used to maximize the efficacy of the sorting process (Hinkin, 1998, p.109). A minimum of 75% agreement index must be achieved to obtain the items (Hinkin, 1998, p.109). Items will be modified, deleted or added according to results, comments and suggestions if available.

Pilot test

Following revisions from the pre-test, a pilot test will be undertaken to further appraise and purify the instrument. Using the items that are deemed appropriate from the pre-test, a questionnaire will be developed that includes OIC, IT infrastructure flexibility, and other constructs of interest such as structure and culture for future study. A small sample of 50 CIOs or CTOs or IT managers will be invited to pilot test the research instrument. This sample is chosen for their role as the IT decision makers. The list of names and email addresses of CIOs or IT decision makers is obtained from Applied Computer Research, Inc.

Pilot test respondents will be asked to fill out the instrument, and then comment on difficulties in completing the instrument and offer suggestions for improvement, including specifying any additional item statements they felt were missing or items that should be deleted.

Stage III: evaluation of measurement properties

Exploratory factor analysis (EFA) will be conducted using the pilot study data. Before conducting the exploratory factor analysis, the Kaiser–Meyer–Olkin test and the Bartlett sphericity test will be used to verify that the data are amenable to factor analysis. The interitem correlations of the variables will also be checked. Any variable that correlates at less than .4 with all other variables may be deleted from the analysis (Kim & Mueller, 1978).

Exploratory factor analysis. Item loadings (greater than .4), eigenvalues of greater than 1 and a scree test of the percentage of variance will be used along with the theory to determine how many factors to retain. Communalities will be checked, retaining items with higher communalities. The percentage of the total item variance that is explained will also be checked; and 60% will be used as the minimum acceptable target.

Internal Consistency Assessment. Reliability will be assessed using Cronbach's alpha (Price & Mueller, 1986). A large coefficient alpha (.70) provides an indication of strong item covariance and suggests that the sampling domain has been captured adequately (Churchill, 1979).

The finalized questionnaire will be sent to c-level managers such as CEOs, CIOs and IT managers in e-retailer companies. IT decision makers' names and email addresses of each e-retailer are being collected along with the company's mailing address for survey administration After 1 weeks, a reminder will be sent to solicit more responses. After another week, a third and final reminder will be sent. After closing this round of data collection, response rate, statistical power, and non-response bias will be calculated. A one-sample $\chi 2$ test (Byrd & Turner, 2000) will be used to test the non-response bias.

Confirmatory factor analysis. If adjustments (e.g., drop items) made according to the results of EFA or reliability assessment, an updated version of the measurement instrument will be administrated to a different random sample. CFA will be conducted using the item variance-covariance matrix from the second round of data collection. CFA allows for quantitatively assess the quality of the factor structure providing further evidence of the construct validity of the new measure (Hinkin, 1998). Chi-square statistic, degrees of freedom, and the recommended goodness-of-fit indices will be reported.

Convergent and discriminant validity. The data from the additional measures obtained during the original questionnaire administration are used at this stage. A matrix will be obtained by correlating the newly developed scales with the other measures and the magnitudes of correlations that are similar and dissimilar will be examined.

The above section lay out the process of developing and validating the OIC scale developed for this study.

Procedure

To conduct this study, a cross-sectional field survey involving e-retailers IT decision makers such as CIOs, CTOs, or IT managers will be employed as the key informant from each company to gather data for use with the configurational elements. Although using key respondents is not an ideal means for eliciting highly reliable perceptions, it is nonetheless a commonly accepted practice in survey research that proved an adequate opportunity to examine the relationship suggested in this study (Liu et al, 2010).

The primary data will be matched to objective data obtained from the e-commerce databases; and the secondary data will be used with the outcome, i.e., performance using ranking, website availability, and user satisfaction. The combination of primary data and the matched performance data are transferred into proper format to be used in fsQCA, a tool that employed fuzzy set theory (more detail in the data analysis section) to find the configurations.

Survey Preparation and Mailings. Following guidelines offered by Dillman (2000), it is important that the survey packets mailed to the CIOs included a one-page cover letter that is personalized by using the name of the CIO, is carefully worded, respectful, and thank the CIO in advance for their participation. Other such survey recommendations included the use of a questionnaire designed to be respondent-friendly, the inclusion of self-addressed and pre-stamped return envelopes, alternative methods of responding to the survey (e.g., this study provides both a paper questionnaire and a computer-based web questionnaire), and the possible use of a carefully considered incentive that would be appropriate for CIOs. As to incentives, past

studies and experience showed that the most effective incentive for a senior IT executive would be an executive summary of the results of the investigation when they are interested in the study.

Prior to mailing the surveys, a web-based version of the questionnaire will be established using Qualtrics. The cover letters and questionnaire instructions will offer the CIOs the option of responding to the survey by using either the paper-based questionnaire along with the provided pre-addressed, pre-paid return envelope, or the web-based questionnaire. The web address for the online questionnaire was provided in all mailings and in the instructions provided on the front of the paper questionnaire. Qualtrics can generate unique URL for each response.

Following guidelines offered in the Dillman (2000) method, three to four mailings are planned in advance. First two mailings will include cover letters and paper questionnaires, while the final two mailings are follow-up postcards with questionnaire URL on them. The necessity of the final reminder (the 4th mailing) will be determined by the response rate.

Main Analysis

Data collected will be analyzed using set-theoretic application, specifically the Fuzzy Set Qualitative Comparative Analysis (fsQCA) program developed by Charles C. Ragin. To fulfill the goal of this study, survey data will be transformed and then input into the fsQCA to find the configurations for e-retailer performance.

Configurational Methods

Fundamental premise of configurational approaches is that "patterns of attributes will exhibit different features and lead to different outcomes depending on how they are arranged" (Fiss, 2007 p.1181). A configurational approach assumes complex causality and nonlinear relationships (Meyer et al., 1993). Configurational analysis stresses the concept of *equifinality*,

which refers to "a system can reach the same final state, from different initial conditions and by a variety of different paths" (Katz &Kahn, 1978, p.30). Comparing to more dominant quantitative methods, configurational approach provides the opportunities to model the complex and nonlinear relationships among casual factors and the outcome. For example, the classic linear regression model treats variables as competing in explaining variation in outcomes rather than showing how variables combine to create outcomes other than model interactions. Using cluster analysis and deviation scores to detect distinct groups of firms may often not allow the researcher to examine just ***how*** different elements work together (Fiss, 2007). The best method fit for this study is thus evaluated to be the configurational approach, using a set-theoretic method. Set-theoretic methods "operate on membership scores of elements on sets" and can be "useful for concept formation, the creation of typologies and causal analysis" (Schneider & Wagemann, 2012, p.8). Among different methods for set theory, qualitative comparative analysis is "perhaps most directly associated with set theory" (Schneider & Wagemann, 2012, p.8) and the most formalized and complete set-theoretic method (Schneider & Wagemann, 2012, p.9).

Qualitative Comparative Analysis (QCA)

QCA was developed in political science to evaluate case studies with too few cases for standard statistical analysis and where the available data are often qualitative or a combination of qualitative and quantitative (Rihoux & Ragin, 2009). From its inception, QCA was aimed at the "middle ground" between quantitative and qualitative methodologies (Ragin 2000, p.22). There are some features of QCA such as its aims at a causal interpretation, its use of truth tables, and its

principles of logical minimization[2], that separate it from other set-theoretic approaches. Simply put by Cress and Snow (2000, p.1079) that "QCA, ... is conjunctural in its logic, examining the various ways in which specified factors interact and combine with one another to yield particular outcomes."

QCA vs Regression

In contrast to statistical regression-based methods, QCA is based on set theory and logic and is designed to evaluate social systems characterized by causal complexity. QCA investigates the specific conditions under which an outcome occurs while statistical regression estimates the "average effects of independent variables" (Mahoney, 2010, p.132). Causal relations are expressed in terms of necessary and sufficient conditions in QCA. This view of causation has gained increased attention in the social sciences (Brady & Collier, 2010; Collier & Gerring, 2009).

QCA assumes each causal pathway can contain different combinations of explanatory characteristics. Therefore, the method looks for the effect of combinations—configurations—of necessary and sufficient explanatory characteristics, rather than for the effect of each individual characteristic while holding the other characteristics constant (equal). Although traditional regression approaches may appear to be able to do this using interaction terms, they are not well suited to separately identifying necessary or sufficient characteristics (Schneider & Wagemann, 2012) and it is usually very difficult to interpret interactions that consists of 3 variables or more .

[2] Logical minimization is a process by which the empirical information is expressed in a more parsimonious yet logically equivalent manner by looking for commonalities and differences among cases that share the same outcome.

A particular strength of QCA is the ability to account for equifinality and conjunctural causation. The first concept relates to the potential presence of alternate pathways toward an outcome, while the second concerns the idea that configurations of conditions can be jointly necessary and/or sufficient, whereas their constituent parts might be neither necessary nor sufficient for an outcome.

QCA method requires the investigator to carefully convert data into measures of set membership using theoretical or substantive knowledge external to the empirical data—a process called calibration. Calibration requires that the investigator to conceptually ground the empirical data and reflect meaningful variation. These differences make QCA especially useful for explaining complex phenomena examined in this study.

Fuzzy set QCA

QCA belongs to a class of analytic techniques based on set theory called Configurational Comparative Methods (CCMs). QCA is configurational because it allows investigators to identify combinations of configurations associated with an outcome of interest. There are three types of QCA: (1) crisp-set QCA (csQCA), (2) multi-valued QCA (mvQCA), and (3) fuzzy-set QCA (fsQCA). These types differ in how the characteristics are coded. csQCA codes characteristics in binary (0 and 1). mvQCA require characteristics to be coded as multi-valued (more than two discrete values, usually three) variables. fsQCA allows a characteristic to have any continuous value from 0 to 1.

Crisp set only permits dichotomous membership, 0 and 1, which represent either fully in the set or not. Such dichotomous categorization does not allow more granulated view thus is not the best fit for this study. A fuzzy logic conclusion is not "stated as either true or false, but as

being possibly true to a certain degree" (Treadwell, 1995, p.93). Fuzzy set offers an outlet that using the different degrees of membership in a set, researcher can study and can have more complete view of the phenomenon (Ragin, 2007).

There are three qualitative anchors in fuzzy set: full membership, full nonmembership, and the corss-over point. Fuzzy sets complement QCA as a methodological tool to translate categorical concepts into measurable conditions, drawing on the notion that cases can hold degrees of membership in a given set (Ragin, 2008a). The building block of fuzzy-set QCA is "fuzzy" membership of cases in a set of cases with a given characteristic. A practice can be fully out of a set (membership = 0), a full member of the set (membership = 1), or a partial member of the set (membership between 0 and 1). In other words, practices can have continuously varying degrees of membership in a given set. The fuzzy set approach provides flexibility for modeling the "fuzziness" implicit in concepts.

fsQCA Advantages

1. Acknowledges and identifies multiple pathways to success. It is likely that there are multiple pathways or combinations of characteristics that generate successful outcomes.
2. fsQCA is case-oriented and set-theoretic. It is well suited to exploring and identifying important causal and constitutive relationships.
3. Allows analysis with small samples.
4. Provides a formal method for conceptualizing and analyzing qualitative information.
5. fsQCA analytic process is iterative.

Operationalizing an fsQCA Study

Step 1: Calibrate and convert each metric into a measure of set membership.

After data collection, the first step in fsQCA is to construct the variables to be used in the analysis. Calibration is a process of transforming interval scale values to fuzzy set membership scores based on three qualitative anchors: full membership, full non-membership, and the crossover point of maximum ambiguity regarding membership in the set of interest (Ragin & Fiss, 2008).

The set membership score represents the extent to which each case is a member of, for example, a high level of organizational improvisational capabilities. This study uses a 7-point Likert scale: 1= lowest, 4= ambiguous (crossover), 7= highest level. Following Park and El Sawy (2013), this study defines the interval scale 2 as the anchor for full nonmembership, 4 as the crossover point, and 6 for the full membership anchor for the set of high level of constructs, including organization improvisational capabilities, IT capability, environmental turbulence, and firm performance.

Step 2: use the Fuzzy Truth Table algorithm

The core of the fsQCA method is fuzzy-set truth table analysis (FSTTA). This process clarifies any relationships between combinations of potentially causal or descriptive characteristics and the outcome of interest. The output of FSTTA is one or more combinations of characteristics associated with an outcome, reflecting that more than one combination can be linked to a given outcome.

Step 3: Interpret Results

The configurations are expressed by the notation systems from Ragin and Fiss (2008). The dark shaded circles indicate the presence of an element, crossed-out circles indicate the absence of an element, large circles indicate core elements, and small circles indicate peripheral

elements. Blank spaces indicate a ‘‘don’t care situation,’’ in which the causal element may be either present or absent. For example, the dark shaded circle of IT capability means that a high level of IT capability should exist, while the crossed-out circle of IT capability means that a high level of IT capability should not exist in order for the configuration to result in the outcome of interest.

The fsQCA tool also outputs consistency and coverage scores. Consistency measures the degree to which solution terms and the solution as a whole are subsets of the outcome. Coverage measures how much of the outcome is covered (or explained) by each solution term and by the solution as a whole (Ragin, 2008b, p.85). *Raw coverage* measures the proportion of memberships in the outcome explained by each term of the solution (Ragin, 2008b, p.86). *Unique coverage* measures the proportion of memberships in the outcome explained solely by each individual solution term (memberships that are not covered by other solution terms). *Solution coverage* measures the proportion of memberships in the outcome that is explained by the complete solution. *Consistency* “measures the degree to which membership in each solution term is a subset of the outcome” (Ragin, 2008b, p.86). For any solution term, a case is consistent if membership in the solution term is less than or equal to membership in the outcome. *Solution consistency* measures the degree to which membership in the solution is a subset of membership in the outcome (Ragin, 2008b, p.86).

In addition to outlining the procedures and methodology used in the current study, I discussed the structure of the questionnaires and the targeted respondents for the instrument, the questionnaire. I also provided a discussion of the items that reflect the first-order and make up second-order factors in the research model. I then discussed the configurational method that will be employed for this study and provided justifications for doing so. A sample of results is offered

to show types of results that can be expected and will be reported. By doing so, I illustrate the differences of results presentations between fsQCA and traditional statistical analysis, and to show the "fit" between the method and the goal of this study. The results for this study are presented in Chapter 4.

Chapter 4: RESULTS

There are two research questions for this dissertation: 1) What is organization improvisational capabilities (OIC) and how do we measure it, and 2) what are some possible combinations of elements for firm performance. In section I of this chapter, I present the results of the first research question. In other words, I will present the process and results of the OIC scale development. In section II, I present the results of the second research question.

Section I: Organization Improvisational capabilities Measurement Development

MIS scholars such as Byrd, Hinkin, and Lewis and methodology scholars such as MacKenzie and Podsakoff have all proposed scale development processes. Although they posit different number of stages the essence is the same. The process starts with setting the domain (defining the construct and its dimensions), then developing items and designing a survey accordingly, evaluating and refining items, collecting data, and finally, validating. In 2005, Lewis, Templeton and Byrd proposed a framework to guide the development of a psychometrically sound survey instrument which is followed in this study.

Stage I: Domain Specification

In the first stage, three things are delivered: premise, definition of the construct, and the dimensions of the construct. To accomplish this, Lewis, Templeton and Byrd (2005) suggest using content analysis to establish the domain, and listing literature review, interview transcript and case studies as proper techniques for content analysis (p.391). Following Webster and Watson (2002), I conducted a literature review to gain understanding of the theoretical foundation for organization improvisational capabilities (OIC).

The theoretical foundation provides enough information to define OIC in highly turbulent environments for this study. OIC in this dissertation is defined as: *An organization's learned ability to respond to unexpected environmental turbulence quickly by simultaneously creating and executing novel solutions attained through unplanned recombination of available resources.* This definition is used as a guide for the development of dimensions and items (Lewis, Templeton, & Byrd, 2005; Schwab, 1980). Improvisational capabilities are especially important for firms in highly turbulent environments because there is usually not much time for planning how to react to ~~the~~ unexpected disturbances. When an unpredictable event happens, firms in such environments have to react quickly to either solve the problem or take advantage of an opportunity in order to gain competitive advantages.

Organization Improvisational Capabilities (OIC) Dimensions

After defining the OIC, I examined its dimensions from the definition itself, and also drew support from the literature. Unlike routines or planned operation capabilities, organization improvisational capabilities are applied to specific unexpected situations (Crossan, et al., 2005) and are idiosyncratic (Baker & Nelson, 2005; Miner et al., 2001; Vera & Crossan, 2005). According to the theory of dynamic capabilities, an organization's capabilities for enabling change-responsive actions lie in their distinctive ways of accomplishing coordination, learning, and reconfiguration (Teece et al., 1997). Coordination refers to the ability to manage dependencies among activities and resources (Malone & Crowston, 1994). Learning includes the generation of new insights that have a potential to reshape behavior (Huber, 1991). Reconfiguration refers to the ability to adjust an asset structure and accomplish necessary internal and external transformations (Teece et al., 1997). From the definition, I propose three dimensions for organization improvisational capabilities.

Near "real time" responsive action

The first dimension of organization improvisational capabilities is its unique characteristic – its temporal dimension portrays the convergence of planning and execution in a short period of time (Doll & Deng, 2012; Moorman & Miner, 1998b), which distinguishes improvisation from other similar concepts. This is the only main theme regarding OIC that is unchallenged and subsequently supported by all prominent researchers (e.g., Ancona et al, 2001; Ciborra, 1999; Moorman & Miner, 1998b; Orlikowski, 1996; Weick, 1998).

Improvisation is a near "real-time" response to an unexpected trigger; the reason for improvisation is that there is no time for planning (Chelariu et al., 2002). Responsiveness refers to the ability to react to a change in the environment in a timely manner (Holsapple & Li, 2008). If there is no action (responsiveness), there is no improvisation. People improvise because there is no routine to handle a certain new issue and because action is required, not optional (e Cunha, 2004). In some circumstances, people may decide not to react. This absence of action may suit the situation but does not correspond to improvisation (e Cunha, 2004). The ability to respond quickly or near real-time is crucial for modern organizations that face a highly turbulent environment.

Unplanned reconfiguration and reuse of available resources

Improvisation relates to explorations and exploitation of resources such as organizational experience and knowledge (Cunha et al, 2009) and makes sense of the challenges in providing prompt decisions under uncertainty (Brown & Eisenhardt, 1995; Vera & Crossan, 2005). At the heart of the improvisational performance is the ability to execute action while relying on available materials and resources (Kamoche, e Cunha & e Cunha, 2003). This is captured in

Eisenberg's view of improvisation as "making do with minimal commonalities and elaborating simple structures in complex ways" (Eisenberg 1990, p. 154). I posit emphasizing both "*spontaneously"* and the "*reconfiguration and recombination of existing available resources"* from my OIC definition as the second dimension.

At the heart of the improvisational performance is the ability to execute action while relying on available materials and resources (Kamoche, e Cunha & e Cunha, 2003). "Available" means they already have these skills in their "repertoires" (which are related to the next dimension of OIC, virtuosic creativity); otherwise, they will not be able to "use" those skills in real time to reconfigure or recombine resources to solve the problem or to perform well. The skills could be obtained through training and practice and ~~it~~ must be fostered via organizational structure and culture.

Virtuosic creativity for novel solutions

The purpose of OIC is *to solve a problem in a creative way that better matches novel environmental situations and is grounded in the realities of the moment*. OIC is usually applied to come up with something new through a creative process (Vera & Crossan, 2004) in order to solve a problem or ~~to~~ take advantage of a problem by transforming it into an opportunity through previous knowledge**,** i.e. using their repertoires (Alvaretz & Barney, 2007; Eckhardt & Shane, 2003; Shane, 2000). Improvisation is therefore in part a cognitive activity that requires creativity under time constraint in order to meet performance objectives (Mendonca, Jefferson & Harrald, 2007). It is a deeper competence than "whimsically" winging it (Boyer, 2009). Wallace and Gruber (1989) considers a work being creative if it is original, purposeful and felicitous. Improvisation involves some degree of creation (composition), but of a special sort.

Stage II: Instrument Construction

In the second stage, an instrument with items that represent the construct is produced and improved through multiple iterations. Each item statement in the domain was converted into an item on the instrument; then the content validity of the items is assessed. OIC dimension definitions and items are listed below.

1. ***Speedy Responding (SPD)*** is defined as the time lag between planning and execution to react. SPD is operationalized by 3 items:

    - SPD1: We respond to customers' demands immediately.
    - SPD2: We are able to deal with changes quickly without having to go through formal planning.
    - SPD3: We can respond in the moment to unexpected problems.

2. ***Reconfigurability*** (RCG) is the ability to recombine and reuse available resources in a short amount of time. RCG is operationalized by 3 items:

    - RCG1: We can successfully reconfigure our resources to react to customer demand.
    - RCG2: We can quickly recombine available resources to solve problems.
    - RCG3: We are skillful in reusing existing resources to serve our customers.

3. ***Novel Solution*** (NOS) is the appropriateness of a new idea or process built for a specific circumstance to solve a problem or to react to an environmental turbulence. NOS is operationalized by 3 items:

    - NOS1: We can come up with new ideas with existing resources to serve our customers very quickly.
    - NOS2: We can come up with creative solutions to solve problems in the moment.
    - NOS3: We can come up with creative solutions for any unexpected situation.

All the questions use a Likert scale from 1- 5, with 1 being "strongly disagree" and 5 being “strongly agree".

Pre-Test

The objective of the pre-test was to assess the appropriateness of the original instrument. It was done through obtaining feedback for each item of the instrument. The pre-test was done in two waves. I solicited two expert panels: an academic panel consisting of five IS faculty members from two universities, and an industry expert panel consists of seven CIOs.

The first wave was done with the academic panel. I asked IS faculty members to evaluate the items developed for this study and to match each item with one of the three dimensions that are defined and listed on the top of the page. The pre-test instrument is listed as Appendix B.

The first validity indicator I calculated is the item placement ratio (the "Hit Ratio"), which is an indicator of how many items were placed in the intended, or target, category by the judges. All items for organization improvisational capabilities exceeded the cutoff point of 60% being correctly matching into the dimensions. The correct percentage ranged from 60% to 100% (.6, .8, 1). All but two items for IT infrastructure flexibility met the criteria; those two items had the lowest correct percentage of 40%. One was about modularity and the other one was for loose coupling. According to the comments, the wordings were confusing due to the similarity of the two concepts.

A second overall measure of both the reliability of the classification scheme and the validity of the items was developed by Moore and Benbasat (1991). The method required analysis of how many items were placed by the panel of judges for each round within the target construct. In other words, because each item was included in the pool explicitly to measure a particular underlying construct, a measurement was taken of the overall frequency with which the judges placed items within the intended theoretical construct. The higher the percentage of

items placed in the target construct, the higher the degree of inter-judge agreement across the panel which must have occurred (p.115). To assess the reliability of agreement between raters, Fleiss' kappa is calculated instead of Cohen's Kappa since there were more than 2 judges. Fleiss' kappa is a statistical method of evaluating agreement among three or more raters rating any number of items. The measure calculates the degree of agreement in classification over that which would be expected by chance. There is no generally agreed-upon measure of significance, although guidelines have been given (see Table 7). The Fleiss Kappa for OIC is 0.53, which falls into the "moderate agreement" category. P-value is less than .001 (7.85285E-09), which indicates statistical significance. The Fleiss Kappa for IT infrastructure flexibility is 0.26, which falls into the “Fair agreement" category. P-value is 0.000242, which indicates statistical significance.

Table 7. Guideline for Fleiss' kappa

K	**Interpretation**
< 0	Poor agreement
0.01 – 0.20	Slight agreement
0.21 – 0.40	Fair agreement
0.41 – 0.60	Moderate agreement
0.61 – 0.80	Substantial agreement
0.81 – 1.00	Almost perfect agreement

The second wave of pre-test was done with the industry expert panel. Seven CIOs were recommended by SIMS VP to participate. Overall comments were that the wordings are too “academicy”, i.e. “we don’t say it this way in the field”. The industry expert panel was asked to do the same tasks as the academic panel.

The “Hit Ratio” for the CIO panel: all items for organization improvisational capabilities exceeded the cutoff point of 60% being correctly matching into the dimensions. However, there were problems of placing two items: “We use standardized interfaces to minimize the inter-dependencies among our IT modules” and “Our infrastructure is vendor neutral”.) These two items were not used in the pilot study. Other than these two items, all other items either met or exceeded the cutoff point (from .6 to 1).

To assess the reliability of agreement between raters, Fleiss' kappa is calculated. The Fleiss Kappa for OIC is 0.31, which falls into the "Fair agreement" category. P-value is less than .001 (4.53E-08), which indicates statistical significance. The Fleiss Kappa for IT infrastructure flexibility is 0.27, which also falls into the "Fair agreement" category. P-value is less than .001 (4.07E-07), which indicates statistical significance.

According to the results of the pre-test, some items were modified and a final version of items were used for the pilot study:

- We respond to new demands from customers immediately.
- We can respond at the moment to unexpected problems.
- We are able to respond to changes quickly without having to go through formal planning.
- We can successfully reconfigure our resources to react to customers' demands.
- We can come up with new ideas with existing resources to address unforeseen events.
- We can quickly recombine available resources to solve problems.
- We are skillful in reusing existing resources to serve our customers.
- We can develop creative solutions for unperceived situations.
- We are able to provide novel solutions to unanticipated problems.

Stage III: Evaluation of Measurement Properties

Pilot Study

A pilot study was undertaken to further appraise and purify the instrument. Since the primary purpose of this study was to develop an instrument to measure organization improvisational capabilities, the sample frame chosen for my pilot study was CIOs and IT managers in different industries as they are representative to my study's population. After the pre-test, an instrument of 9 items for OIC was created. All items were measured using a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). An e-questionnaire (Appendix C) with the 9 items for organization improvisational capabilities, 9 items for IT infrastructure flexibility, 9 items for environmental factors, 6 items for organization characteristics, and the outcome variables was created.

Data collection started in May 2014. To get a representative sample, this study administered survey questionnaires with items deemed "valid" from the pre-test to CIOs, IT managers and firm executives in US and Taiwan companies in diverse industries that are considered highly turbulent environments. A total of 83 valid responses were received. Since Taiwan participants were approached by invitation only, the response rate was 100%. A faculty member distributed the survey at three industry conferences and received 52 valid responses.

Factor Analysis

Before I performed factor analysis, I first verified that the data was appropriate for factor analysis using two tests: the Kaiser–Meyer–Olkin (KMO) test and the Bartlett sphericity test. A value of .6 is a suggested minimum for Kaiser-Meyer-Olkin Measure of Sampling Adequacy. Bartlett's Test of Sphericity tests the null hypothesis that the correlation matrix is an identity matrix. An identity matrix is a matrix in which all of the diagonal elements are 1 and all off-diagonal elements are 0. The goal is to reject the null hypothesis. Taken together, these tests

provide a minimum standard which should be passed before a factor analysis (or a principal components analysis) should be conducted. The result of both tests (.911 for KMO; and p-val = .000 for Bartlett's Test of Sphericity, which rejects the null hypothesis) indicated that a factor analysis is appropriate with my data.

Exploratory Factor Analysis

After verifying that my data is appropriate for factor analysis, I performed an exploratory factory analysis (EFA). The initial factor analysis using principal components analysis extracted two factors. Three items (SP1, SP2 and NS3) that either had low loadings or had cross-loadings were removed from final analysis. A total of 6 items for organization improvisational capabilities were therefore obtained.

The measurement model analyzes the relationships between the latent constructs and their associated items. The first analysis is to examine the adequacy of the measures, determined by examining the individual item reliabilities, represented by the loadings to their respective construct (Table 8). Tabachnick and Fidell (2001) cite .32 as a good rule of thumb for the minimum loading of an item, which equates to approximately 10% overlapping variance with the other items in that factor. All retained items have loadings above .8 (Table 8). All of the items met the 0.707 criteria (Chin, 1998) for their relevant construct.

All communalities are above .4 (Table 9). The interitem correlations of the variables are listed in Table 9. No correlation is less than .4 which indicates no variables should be deleted from the analysis (Kim & Mueller, 1978). Total variance explained by these two factors is 75.68% which is above the acceptable percentage of 60%.

Table 8. Items and factor loadings for OIC

Items	Factors	
	1	2
Speedy Novel Solution		
RC2	0.832	
NS2	0.825	
SP3	0.820	
NS1	0.801	
Unplanned Reconfiguration		
RC1		0.842
RC3		0.818
Cronbach's alpha	0.924	0.802

Note: Extraction method: principal component analysis. Rotation method: Varimax with Kaiser Normalization
Cronbach's alpha was calculated with final items (excluding items eliminated)

Table 9. Pilot Test Construct Descriptive Statistics (N=83)

Dimension	Item	Mean	S.D.	Communalities	RC2	NS2	SP3	NS1	RC1	RC3
Speedy Novel Solution	RC2	3.53	1.153	0.803		0.787	0.767	0.754	0.613	0.635
	NS2	3.35	0.948	0.803			0.736	0.811	0.676	0.605
	SP3	3.59	0.913	0.707				0.679	0.545	0.587
	NS1	4.36	0.524	0.728					0.640	0.556
Unplanned Reconfiguration	RC1	3.52	0.814	0.654						0.676
	RC3	3.58	0.956	0.595						

Internal Consistency Assessment. Reliability is assessed using Cronbach's alpha (Price & Mueller, 1986). A large coefficient alpha (.70) provides an indication of strong item covariance and suggests that the sampling domain has been captured adequately (Churchill, 1979). Both Cronbach's alphas are high (.924, .802, see Table 8) indicates internal consistency.

Confirmatory factor analysis (CFA)

The measurement model analyzes the relationships between the latent constructs and their associated items. CFA allows for quantitatively assess the quality of the factor structure providing further evidence of the construct validity of the new measure (Hinkin, 1998). I first tested a measurement model using the structural equation modeling (SEM) approach on IBM Amos 20 (Arbuckle, 2011).

Model Fit

The model chi-square is not statistically significant (χ^2 (8) = 9.578, p=.296), which indicates that the exact fit hypothesis is not rejected. The goodness-of-fit indexes for both models are shown in Table 4.5. These indexes are above the recommended levels (Kline, 2005). The first-order measurement model showed an excellent model fit.

Table 10. Goodness-of-fit Indexes

Measure	Threshold	Study Statistics
CFI	> .95 great fit	0.996
RMSEA	< 0.05 good fit	0.049
GFI	> .95 great	0.958
AGFI	> .80	0.890
SRMR	< .09	0.020

CFI and RMSEA are alternative measures of fit. For these measures goodness of fit is based on various cutoff criteria (Bynre 2001; Hu and Bentler 1999). It is important to be aware that there is no distinction made in terms of degree of fit for differences in fit indexes beyond the cutoff points. One can think of this as a kind of grading scheme, where say an "A" is given for any score above 93 percent and, in terms of a grade, scores above this cutoff value are indistinguishable from each such that they will all be a grade of "A" (Chin et al., 2008). For RMSEA, values less than 0.05 indicate a good fit (Byrne, 2001, p. 85), and higher values, up to 0.10 can indicate average fit (Browne & Cudeck 1993;Chen et al., 2008). Therefore, on the basis of RMSEA, model is borderline good. CFI ranges from zero to one (Bryne 2001). The cutoff value that is said to indicate a superior fit is 0.95 (Byrne, 2001; Hu & Bentler, 1999). On the basis of these statistics, both the original scale and the fast form result in acceptable fit.

Reliability and validity tests

To estimate the reliability of the scales, I tested internal consistency reliability by calculating Cronbach's alpha and composite reliability (CR) for each factor. Cronbach's alphas with coefficient alpha over 0.70 provide an indication of strong item covariance and suggest that the sampling domain has been captured adequately (Churchill, 1979). The Cronbach's alpha for each OIC factor is .924 and .802, which indicate a satisfactory degree of internal consistency reliability of the measures (Bollen & Lennox, 1991). In addition, CR for each factor was checked to cross-check the results of Cronbach's alpha. CR has advantages over Cronbach's alpha, because Cronbach's alpha is a lower-bound estimate of reliability and is designed for essentially tau-equivalent model (Graham, 2006). The CR for each factor was computed with the formula: $\rho = (\Sigma\lambda_i)\ 2 / ((\Sigma\lambda_i)\ 2+\Sigma\theta i)$, where λ_i refers to the ith factor loading and θ_i refers to the ith error variance

(Hair Jr. et al., 2010, p. 687). Composite reliabilities were .932 and .828 for factor 1 (Speedy novel response) and factor 2 (Unplanned reconfiguration) respectively. Thus the reliability of the scales was deemed acceptable.

The assessment of convergent and discriminant validity were used to establish validity of the scales. Convergent validity determines whether an item is highly correlated with other items designed to measure theoretically similar meaning of a construct (Kerlinger, 1986). This validity can be estimated using an assessment on average variances extracted (AVE) for each construct. The AVEs for Speedy novel response and Unplanned reconfiguration were .773 and .707 respectively, both exceeded the recommended minimum level of 0.5 (Fornell & Larcker, 1981), thus supporting the convergent validity of the OIC scale. Additionally, discriminant validity was assessed by examining the factor correlations. Although there is no firm rules, inter-construct correlations below |.7| provide evidence of measure distinctness, and thus discriminant validity. The correlation between the two factors is .865 which is higher than the conventional value. Another way to examine discriminant validity is to compare the average variance extracted (AVE) to the squared inter-construct correlation. When the AVE is larger than the corresponding squared inter-construct correlation estimates, it suggests that the indicators have more in common with the construct they are associated with than they do with other constructs, which again provides evidence of discriminant validity. The squared inter-construct correlation is .748. Factor 1 AVE is .773 which exceeded the squared inter-construct correlation. However, factor 2 AVE is .707 and it is less than the squared inter-construct correlation. Discriminant validity is therefore inclusive.

Due to the aforementioned validity problem and to further distinguish OIC from dynamic capability emphasizing the "predictability" of the events, two new items for Unplanned Reconfiguration were added to the instrument:

- When unexpected technology breakthrough directly affects us, we can respond quickly by recombining existing resources.
- When unplanned for events happen, we are able to resolve the problems using available resources.

Final Survey Administration

The final survey instrument is listed as Appendix D. I hired a market research company to distribute my survey to its panel of CIOs, CTOs and IT managers for companies in e-commerce defined as doing business online. The sample included both pure click and click-and-mortar companies. Data collection initiated on Nov.7, 2014 and concluded on Nov.14, 2014, one week duration. One hundred and five valid responses were received and used in final analysis. The response rate is 40%.

Measurement Model

CFA allows for quantitatively assess the quality of the factor structure providing further evidence of the construct validity of the new measure (Hinkin, 1998). I first tested a measurement model using the structural equation modeling (SEM) approach on IBM Amos 20 (Arbuckle, 2011). The model chi-square is not statistically significant (χ^2 (19) = 18.987, p=.458), which indicates that the exact fit hypothesis is not rejected. The first-order measurement model showed an excellent model fit, with CMIN/DF = .999, CFI = 1, GFI = .958, AGFI =.920, RMSEA = 0.000, PCLOSE = .724, and SRMR = 0.0485.

Reliability and validity tests

Reliability is assessed using Cronbach's alpha (Price & Mueller, 1986). Both Cronbach's alphas are adequate: .761 for Unplanned Reconfiguration and .737 for Speedy Novel Solution, indicate internal consistency. In addition, CR for each factor was checked to cross-check the results of Cronbach's alpha. Composite reliabilities for factor 1 (Speedy novel response) is .743 and for factor 2 (Unplanned reconfiguration) is .760. Thus the reliability of the scales was deemed acceptable.

Discriminant validity was assessed by examining the factor correlations. Although there is no firm rules, inter-construct correlations below |.7| provide evidence of measure distinctness, and thus discriminant validity. The correlation between the two factors is .691 which met the criteria. Another way to examine discriminant validity is to compare the average variance extracted (AVE) to the squared inter-construct correlation. When the AVE is larger than the corresponding squared inter-construct correlation estimates, it suggests that the indicators have more in common with the construct they are associated with than they do with other constructs, which again provides evidence of discriminant validity. The average variance extracted (AVE) of SNS is 0.422 and UPR is 0.446, which are greater than the corresponding squared inter-construct correlations so discriminant validity is therefore established. Table 11 provides the descriptive statistics and correlations of the items.

In the next section of this chapter, results for the second research question analysis is presented. Discussion and conclusion are provided in Chapter 5.

Table 11. OIC Descriptive Statistics and Correlations

Dimension	Item	Mean	S.D.	SNS1	SNS2	SNS3	SNS4	UPR1	UPR2	UPR3	UPR4
Speedy Novel Solution	SNS1	4.029	0.7267	1	.449**	.527**	.396**	.193*	.249*	.289**	.375**
	SNS2	4.152	0.7818		1	.470**	.380**	.182	.263**	.383**	.445**
	SNS3	4.171	0.7398			1	.245*	.206*	.250*	.316**	.352**
	SNS4	4.267	0.5418				1	.324**	.229*	.352**	.317**
Unplanned Reconfigur-ation	UPR1	4.143	0.6567					1	.443**	.389**	.404**
	UPR2	4.248	0.7041						1	.443**	.420**
	UPR3	3.99	0.8715							1	.569**
	UPR4	4.133	0.7974								1

Section II - Configurations for Firm Performance

Recently, qualitative comparative analysis (QCA), a set-theoretic configurational method, is drawing increasing attention of researchers to its capability to investigate the holistic aspects of complex phenomena. QCA developed by Charles Ragin (1994) integrates the strengths of both case-oriented qualitative methods and variable-oriented quantitative methods. Fundamental premise of configurational approaches is that "patterns of attributes will exhibit different features and lead to different outcomes depending on how they are arranged" (Fiss, 2007 p.1181). A configurational approach assumes complex causality and nonlinear relationships (Meyer et al., 1993). Configurational analysis stresses the concept of *equifinality*, which refers to "a system can reach the same final state, from different initial conditions and by a variety of different paths" (Katz &Kahn, 1978, p.30). Comparing to more dominant quantitative methods, configurational approach provides the opportunities to model the complex and nonlinear relationships among casual factors and the outcome. For example, the classic linear regression model treats variables as competing in explaining variation in outcomes rather than showing how variables combine to create outcomes other than model interactions. Scholars (Schneider & Wagemann, 2012)

advocate to use "correct" terminology for studies using QCA based on: 1) different theory base and logic, and 2) not to confuse with other analysis method descriptions. QCA is based on the principles of set theory, formal logic, and Boolean and fuzzy algebra; as a result, QCA has developed a terminology of its own. Compare to standard statistical techniques, QCA uses set membership scores rather than values on variables; set relations rather than correlations; and Boolean algebra rather than linear.

In order to highlight the distinct logic underling QCA, the following terminology has been followed in this dissertation:

- The term “condition” is used, not “independent variable”
- The phenomenon to be explained is called “outcome,” not “dependent variable;” and
- The results of a QCA are called “solution formula” or “solution term” or "recipes," not “equation.”

QCA scholars suggest descriptive statistics should still be presented even though this is not a linear regression method. Table 12 lists all the mean, standard deviation, minimum and maximum of all the conditions and outcomes. Table 13 presents the correlations. Table 13 shows the expected negative correlations of dynamism and other conditions except for UPR (unplanned reconfiguration), and also between dynamism and outcomes (financial performance and market growth). Structure has negative correlations with UPR and SNS (speedy novel solution), which indicates that the flatter the structure (less number of levels of decision making) the higher the organization improvisational capabilities.

Analysis Procedure

As stated in Chapter 3 “Operationalizing an fsQCA Study” section, the first step for QCA data analysis is to calibrate and convert each survey metric into a measure of set membership. In natural sciences and other fields, researchers calibrate their measuring devices and the readings these instruments produce by adjusting them so that they match or conform to dependably known standards. These standards make measurements directly interpretable (Byrne, 2002). However, in social science, most variables used are not calibrated, i.e., not adhere to any external standard, which makes comparison or evaluation difficult.

Table 12. Condition Descriptive Statistics

Condition	Mean	Standard Deviation	Minimum	Maximum
UPR	4.13	0.58	1.00	5.00
SNS	4.15	0.53	2.50	5.00
OS	4.01	0.69	2.00	5.00
Lcouple	3.77	0.66	2.00	5.00
Modularity	3.76	0.58	2.33	5.00
Dynamism	2.78	0.76	1.00	4.33
Munificence	4.13	0.55	2.67	5.00
Complexity	4.15	0.65	1.67	5.00
TMIF	4.28	0.60	2.50	5.00
TMIV	4.17	0.69	1.50	5.00
DyCap	4.10	0.54	2.67	5.00
Structure	2.80	0.89	1.00	5.00
InnCulture	3.83	0.67	2.00	5.00
FinPer	3.91	0.81	1.67	5.00
MRG	3.81	0.77	1.33	5.00
Revenue	$ 407,498,953.66	$ 1,788,123,734.99	$ 50,000.00	$ 16,000,000,000.00
FirmSize	2958	8213	14	70000
ITSize	578	1932	2	15000

Note: UPR: unplanned reconfiguration; SNS: speedy novel solution; Lcouple: loose coupling; TMIF: top management support of IT flexibility; TMIV: : top management support of innovation; DyCap: dynamic capability; InnCulture: innovation culture; FinPer: financial performance; MRG: market growth

Step 1: Calibrate and convert each metric into a measure of set membership.

QCA method requires the investigator to carefully convert data into measures of set membership using theoretical or substantive knowledge external to the empirical data—a process

called calibration. Calibration requires that the investigator to conceptually ground the empirical data and reflect meaningful variation. Calibration is a process of transforming interval scale values to fuzzy set membership scores based on three qualitative anchors: full membership, full non-membership, and the crossover point of maximum ambiguity regarding membership in the set of interest (Ragin & Fiss, 2008). There are three qualitative anchors in fuzzy set: full membership, full non-membership, and the cross-over point. Fuzzy sets complement QCA as a methodological tool to translate categorical concepts into measurable conditions, drawing on the notion that cases can hold degrees of membership in a given set.

Table 13. Condition Correlations

Condition	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1.UPR													
2. SNS	0.51												
3. OS	0.18	0.27											
4. Lcouple	0.33	0.36	0.17										
5. Modularity	0.31	0.29	0.31	0.34									
6. Dynamism	0.03	-0.04	-0.13	-0.17	-0.21								
7. Munificence	0.29	0.36	0.22	0.32	0.24	-0.11							
8. Complexity	0.17	0.20	0.16	0.20	0.21	-0.03	0.55						
9. Structure	-0.05	-0.04	0.03	0.13	0.20	-0.09	0.02	0.08					
10. InnCulture	0.31	0.42	0.31	0.22	0.32	-0.13	0.45	0.24	0.13				
11. TMIF	0.33	0.47	0.29	0.25	0.29	-0.02	0.47	0.50	0.11	0.35			
12. TMIV	0.36	0.42	0.15	0.20	0.25	-0.03	0.41	0.37	0.07	0.33	0.57		
13. FinPer	0.26	0.40	0.38	0.25	0.38	-0.12	0.63	0.45	0.10	0.49	0.45	0.36	
14. MRG	0.29	0.41	0.30	0.27	0.45	-0.13	0.58	0.41	0.14	0.51	0.43	0.45	0.73

Data preparation and Calibration

The set membership score represents the extent to which each case is a member of, for example, a high level of organizational improvisational capabilities. This study uses a 5-point Likert scale: 1= lowest, 3= ambiguous (crossover), 5= highest level. This study defines the

interval scale 1 as the anchor for full non-membership, 3 as the crossover point, and 5 for the full membership anchor for this study's conditions and outcome. A "large enterprise" set is built by calibrating firm size, using combined EU and US standards, 100 as full non-membership, 1000 as the crossover point, and 10000 for the full membership. A "large IT size" set is built by calibrating IT department size, 10 as full non-membership, 30 as the crossover point, and 100 for the full membership.

Step 2: the Fuzzy Truth Table algorithm

The core of the fsQCA method is fuzzy-set truth table analysis (FSTTA). This process clarifies any relationships between combinations of potentially causal or descriptive characteristics and the outcome of interest. The goal of QCA is to identify conditions or combinations of conditions that are necessary or sufficient for the outcome (Legewie, 2013). Output of FSTTA is one or more combinations of characteristics associated with an outcome, reflecting that more than one combination can be linked to a given outcome. A first central element of QCA is the analysis of necessary and sufficient conditions and the set-theoretic perspective on causality.

Parameters of fit in QCA: Consistency and coverage

The general goal of a QCA analysis is to support the researcher in his/her attempt to arrive at a meaningful interpretation of the patterns displayed by the cases under examination. The main principle dominating the technical aspect of QCA is the examination of set-theoretic relationships between causally relevant conditions and a clearly specified outcome.
These set-theoretic relationships are then interpreted in terms of necessity and/or sufficiency.

More precisely, if also theoretical arguments at hand, then a condition can be interpreted as sufficient, if always when the condition is present, the outcome is also present. Consequently, the sufficient condition is sub-set of the outcome. By contrast, a condition is necessary, if always when the outcome is present, the condition is also present. The necessary condition is a super-set of the outcome (Ragin, 2000). QCA takes causal complexity into account by performing separate analyses for necessary and sufficient conditions in which conjunctural causal conditions are explicitly permitted and examined, and which allows for equifinal causal structures. This is achieved through a direct application of the rules of formal logic to the data which are conceptualized as set memberships. Schneider and Wagemann (2007) call this a 'Bottom-up procedure'.

"Consistency" measures the degree to which a relation of necessity or sufficiency between a causal condition (or combination of conditions) and an outcome is met within a given data set (Ragin, 2006). It resembles the notion of significance in statistical models (Thiem, 2010, p.6). Consistency values range from "0" to "1," with "0" indicating no consistency and "1" indicating perfect consistency. Once it has been established that a condition or combination of conditions is consistent with necessity or sufficiency, coverage provides a measure of empirical relevance. The analogous measure in statistical models would be R^2, the explained variance contribution of a variable (Thiem, 2010, p.6). Coverage values range between "0" and "1."

Necessary condition analysis

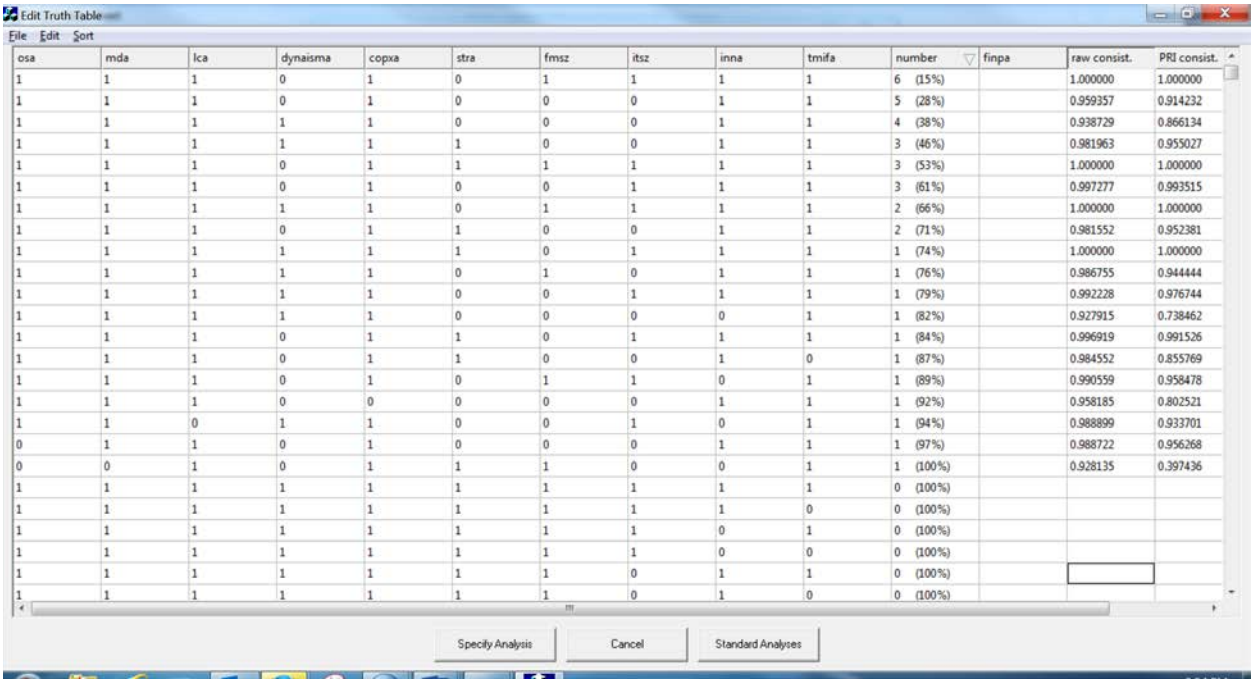
I tested necessary conditions using financial performance as the outcome. There is no agreed upon standard to argue for necessity (as closer to 1 as possible). Configuration scholars (Fiss, 2011; Schneider & Wagemann, 2012) suggest consistency score above .90 to be considered necessary condition. The two dimensions of organization improvisational

capabilities, i.e., unplanned reconfiguration and speedy novel solutions (consistency scores 0.95 and 0.95 respectively), open standard (0.92) and munificence (0.97) meet this criteria. To follow a more constraint standard proposed by Schneider & Wagemann (2012) that conditions that pass the consistency (> 0.9) test as a necessary condition should not be deemed to be relevant necessary conditions unless they also obtain a high value (> 0.75) in the relevance measure (Schneider & Wagemann, 2012, p. 147). Unplanned reconfiguration has a 0.87 coverage score, speedy novel solutions 0.87, open standard 0.89 and munificence 0.89. All four conditions meet both requirements and thus deemed to be necessary conditions of the outcome which means when the outcome (high financial performance) happens, these four conditions are almost always present. According to the results of necessary condition test, these four necessary conditions were not included in the truth table algorithm analysis but will be included in the interpretation and discussion of the configuration results.

Fuzzy Truth Table

This study set the minimum acceptable frequency of cases for solutions at 2, and the lowest acceptable consistency cutoff at 0.96, which is above the minimum recommended threshold of 0.75 (Ragin, 2008). Overall, 28 cases fell into configurations exceeding the minimum solution frequency. Of these cases, 27 also exceeded the minimum consistency threshold of 0.9 for higher performance. Figure 4 shows the fuzzy truth table. Four different configurations were found to result in high financial performance, which means that that there are four different possible paths to the same outcome (i.e., equifinality). Table 14 shows the results of my fuzzy set analysis of high performance. The configurations are expressed by the notation systems presented by Ragin and Fiss (2008). The circles indicate the presence of an element, crossed-out circles indicate the absence of an element, large dark circles indicate core

elements, and small circles indicate peripheral elements. Blank spaces indicate a ‘‘don’t care situation,’’ in which the causal element may be either present or absent. Using solution 1 as an example, the dark shaded circle of unplanned reconfiguration means that a high level of unplanned reconfiguration should exist, while the crossed-out circle of dynamism and firm size means that high level of dynamism and a large firm size should not exist in order for the configuration to result in the outcome of interest.



osa	mda	lca	dynaisma	copxa	stra	fmsz	itsz	inna	tmifa	number	finpa	raw consist.	PRI consist.
1	1	1	0	1	0	1	1	1	1	6 (15%)		1.000000	1.000000
1	1	1	0	1	0	0	0	1	1	5 (28%)		0.959357	0.914232
1	1	1	1	1	0	0	0	1	1	4 (38%)		0.938729	0.866134
1	1	1	1	1	1	0	0	1	1	3 (46%)		0.981963	0.955027
1	1	1	0	1	1	1	1	1	1	3 (53%)		1.000000	1.000000
1	1	1	0	1	0	0	1	1	1	3 (61%)		0.997277	0.993515
1	1	1	1	1	0	1	1	1	1	2 (66%)		1.000000	1.000000
1	1	1	0	1	1	0	0	1	1	2 (71%)		0.981552	0.952381
1	1	1	1	1	1	0	1	1	1	1 (74%)		1.000000	1.000000
1	1	1	1	1	0	1	0	1	1	1 (76%)		0.986755	0.944444
1	1	1	1	1	0	0	1	1	1	1 (79%)		0.992228	0.976744
1	1	1	1	1	0	0	0	0	1	1 (82%)		0.927915	0.738462
1	1	1	0	1	1	0	1	1	1	1 (84%)		0.996919	0.991526
1	1	1	0	1	1	0	0	1	0	1 (87%)		0.984552	0.855769
1	1	1	0	1	0	1	1	0	1	1 (89%)		0.990559	0.958478
1	1	1	0	0	0	0	0	1	1	1 (92%)		0.958185	0.802521
1	1	0	1	1	0	0	1	0	1	1 (94%)		0.988899	0.933701
0	1	1	0	1	0	0	0	1	1	1 (97%)		0.988722	0.956268
0	0	1	0	1	1	1	0	0	1	1 (100%)		0.928135	0.397436
1	1	1	1	1	1	1	1	1	1	0 (100%)			
1	1	1	1	1	1	1	1	1	0	0 (100%)			
1	1	1	1	1	1	1	1	0	1	0 (100%)			
1	1	1	1	1	1	1	1	0	0	0 (100%)			
1	1	1	1	1	1	1	0	1	1	0 (100%)			
1	1	1	1	1	1	1	0	1	0	0 (100%)			

Figure 4. Fuzzy Truth Table

The fsQCA tool also outputs consistency and coverage scores. Consistency measures the degree to which solution terms and the solution as a whole are subsets of the outcome. Coverage measures how much of the outcome is covered (or explained) by each solution term and by the solution as a whole (Ragin, 2008, p.85). *Raw coverage* measures the proportion of memberships in the outcome explained by each term of the solution (Ragin, 2008, p.86). *Unique coverage* measures the proportion of memberships in the outcome explained solely by each individual

solution term (memberships that are not covered by other solution terms). *Solution coverage* measures the proportion of memberships in the outcome that is explained by the complete solution. *Solution consistency* measures the degree to which membership in the solution is a subset of membership in the outcome (Ragin, 2008, p.86).

Table 14. Configurations for Achieving High Performance

	Solution			
	1	**2**	**3**	**4**
OIC				
Unplanned Reconfiguration	●	●	●	●
Speedy Novel Solutions	●	●	●	●
IT Flexibility				
Open Standard	●	●	●	●
Modularity	○	○	○	○
Loose Coupling	○	○	○	○
Internal Characteristics				
Structure	⊗	○		○
Innovative culture	○	○	○	○
TMIF	○	○	○	○
TMIV				
Firm Size	⊗	⊗	○	○
IT size		⊗	○	○
Environment				
Dynamism			⊗	
Complexity	⊗	○	○	○
Munificence	●	●	●	●
Consistency	0.97	0.98	1	1
Raw Coverage	0.41	0.27	0.28	0.25
Unique Coverage	0.12	0.07	0.04	0.02
Overall Solution Consistency		**0.98**		
Overall Solution Coverage		**0.61**		

Consistency roughly means that the degree to which a configuration of conditions consistently result in the outcome of interest (Park & El Sawy, 2013). Consistency for the four configurations ranges from 0.97 to 1, which exceeds acceptable level (Ragin, 2008). Solutions 3 and 4 have consistency of 1, the highest possible score. Solution1 has the highest raw and unique coverage (0.41 and 0.12), followed by solution 3 (0.28, 0.04), solution 2 (0.27, 0.07) and solution 4 (0.25, 0.02).

Raw coverage roughly means the extent to which each configuration covers the cases of outcome, in other words, the proportion of cases having outcome to the total cases (Ragin, 2008). Therefore, it shows what percent of cases having the outcome follow the path. For example, in Table 14, the first configuration covers 41 percent of high financial performance, in other words, 41 percent of high financial performance cases have this configuration. Unique coverage means the part of the coverage of a configuration for the outcome that does not overlap with other configurations. Generally, raw coverage implies the importance of each path to the outcome (Park & El Sawy, 2014, p.5209). For example, 12 percent of the high financial performance cases (i.e., the outcome) have the first configuration that do not overlap with other configurations. Judging by unique coverage alone would result in a conclusion that solution 1 is the most significant path followed by solution 2, 3, 4 with unique coverage of 12%, 7%, 4% and 2% respectively.

However, without an acceptable level of consistency, high coverage is meaningless. Therefore, configurations with high consistency need to be found first, and then coverage needs to be considered (Ragin, 2008, p.55). In this study, all four configurations consistency scores are very high, so the above conclusions could stand.

In this chapter I have presented the results of OIC scale development and validation, as well as the configurations of firm performance. Discussion of the fuzzy set qualitative analysis will be presented in Chapter 5.

Chapter 5: DISCUSSION AND CONCLUSION

Fuzzy set QCA uses (fuzzy) set theory and Boolean algebra to analyze formally to what degree certain factors or combinations of factors are present or absent when a phenomenon of interest occurs or fails to occur. In QCA terms, factors that are thought to be causes of a phenomenon are called "conditions," while the phenomenon itself is called "outcome." Factors can be causally linked to an outcome as necessary or sufficient conditions, either by themselves or in combination with one another. In order to formalize the analysis of such conditions, QCA uses the corresponding set-theoretic relations of supersets and subsets, respectively, and Boolean algebra to operate with different sets (Legewie, 2013).

The goal of QCA is to identify conditions or combinations of conditions that are necessary or sufficient for the outcome. Necessary conditions are conditions that are required to produce the outcome. Sufficient conditions are conditions that always lead to the outcome. Following QCA scholars' suggestions, I analyzed necessary conditions before using the truth table algorithm.

Necessary Conditions

A necessary condition has to occur for outcome to occur; the outcome cannot happen without the condition. The absence of the necessary condition would lead in every case to the absence of outcome. However, according to the logic of conjunctural combinations, this does not imply that when there is the necessary condition, there is always the outcome. A necessary condition might have to be accompanied by another condition to be effective. Thus, in set theory language, the outcome is a subset of the necessary condition (Figure 5).

Figure 5. Venn diagram of necessary condition

Necessary conditions for high financial performance

Three conditions are considered "necessary" according to the analysis: speedy novel solution, open standards and munificence. Speedy novel solution is a dimension of organization improvisational capabilities which is one of the major components proposed in this dissertation for organization performance. Open standards is one dimension of IT infrastructure flexibility. IT infrastructure flexibility is another major components proposed in this dissertation for organization performance. Munificence refers to the opportunities for growth within an industry. Munificence is considered a facet of environmental factor.

At least one dimension of organization improvisational capabilities is required for e-commerce firms to achieve high financial performance. This means that organization improvisational capabilities is necessary (a "must have" requirement) for e-commerce companies, regardless of their firm or IT department sizes, to achieve high financial performance. E-commerce firms need improvisational capabilities to react to unexpected turbulences quickly, be it new technology breakthrough or natural disaster, to realize high financial performance.

One dimension of IT infrastructure flexibility, open standards, is evaluated to be a necessary condition also. The other two dimensions, modularity and loose coupling, are considered sufficient conditions. This means that under different situations, the level of different IT infrastructure flexibility nature is either required or sufficient for e-commerce firms to achieve high financial performance. This indicates the plausibility of the proposed relationship between IT infrastructure flexibility and organization improvisational capabilities as mutually reinforcing and interdependent.

From the environment, high level of munificence is considered to be a necessary condition. For an e-commerce firm to have high financial performance, the resources from the environment for growth need to be abundant and that demand for the products and services been growing rapidly, the investment opportunities been extremely favorable and the marketing opportunities been extremely favorable.

These aforementioned conditions cover three major components proposed by this dissertation for firm performance in e-commerce.

Sufficient Conditions for high financial performance

The presence of a sufficient condition always leads to the outcome. Thus, whenever we observe a sufficient condition, we observe outcome. This means that the sufficient condition is a subset of outcome (Figure 6). However, according to the logic of multiple causation, outcome could also be the result of another condition or configurations, without the presence of condition certain sufficient condition. In empirical reality, one will usually find combinations of conditions being sufficient for an outcome rather than single ones (Goertz & Levy, 2007, p.22). In such cases, the single conditions that form part of the combination are neither necessary nor sufficient

by themselves, but part of one or more of the combinations of conditions that are sufficient for the outcome. (Marx 2006). Only if a condition is both necessary and sufficient will it always be observed in every case of the result and vice versa (Blatter, Janning, & Wagemann, 2007).

Figure 6. Venn diagram of sufficient condition

Configuration of high financial performance

Four different configurations with various combinations of sufficient conditions were found to result in high financial performance, which means that there are four different possible paths to the same outcome. According to the analysis, the overall solution consistency is 0.973 which means that we can roughly say that these four solutions can consistently result in high financial performance with 97.3 percent occurrence (Table 14). Overall solution coverage roughly means that the extent to which these configurations cover high financial performance cases (Ragin, 2008). In a fuzzy set relation, it explains what percent of membership for the outcome set can be captured by the configurations of conditions. Thus, these four configurations can explain 61.7 percent of high financial performance (Table 14).

fsQCA scholars suggest to reveal analytic similarities and differences between cases (e.g., Legewie, 2013; Schneider & Wagemann, 2012). By comparing the four configurations, I present the similarities and differences in the next sections.

Similarities Among Solutions

Besides the necessary conditions, the four configurations share some sufficient conditions: unplanned reconfiguration, modularity, innovative culture, and complexity.

Unplanned reconfiguration represents one facet of organization improvisational capabilities. Modularity is a major component of IT infrastructure flexibility proposed in this dissertation. High level of innovative culture encourages innovative actions and treating mistakes as a part of learning. Innovative culture and organization improvisational capabilities reinforce each other. IT flexibility supports building organization improvisational capabilities and innovative culture. These internal organization characteristics/capabilities are interdependent and co-exist according to the fsQCA analysis, which validate my proposition of such complex interconnected system.

Environmental complexity measures the range and the differences (heterogeneity) that exist across an industry and or across an organization's activities. High complexity means that the target firm 1) has a great diversity in its marketing tactics to attract different types of customers, 2) customers in its industry demand wide variety in products and services, and 3) its competitors use many different tactics to attract customers. All four configurations have high complexity in the solution combing with other conditions to achieve high financial performance (the outcome). This is one good validation because the environment of this study, i.e., e-commerce, is considered a highly turbulent environment which means the level of complexity is high.

Differences Among Solutions

Core condition for S1 is the absence of high dynamism, very flat structure for S2, large firm size for S3, and large IT department for S4.

S1 and S2 both are for small firm with small IT department, however, for such firms that either has flat structure or not, it is important to not have high level of dynamism to achieve high financial performance (S1). For small firms with less than 10 IT full time employees, when they have flat structures, dynamism from the environment does not make a difference for them to gain high financial performance.

For a large firm (S3), absence of dynamism, high level of unplanned configuration, modularity, innovative culture and complexity, and a large IT department all contribute to its ability to achieve high performance.

I proposed three conditions to assess the external environment: dynamism, complexity and munificence. Munificence refers to the opportunities for growth within an industry. High degree of munificence is required for e-Commerce firms to gain high financial performance. The complexity condition is shared by all four solutions.

Dynamism reflects the unpredictable rate of environmental change in an industry. High dynamism is demonstrated by high rate of key competitors' market activities change and customers' tastes and preferences , and the rate of innovation of new operating processes and new products or services. When there is low level of dynamism in the environment, there are different solutions for different firm size firms, IT size and structure (S1 and S3); and there are some situations that either presence or absence of high dynamism contributes to the outcome of high performance (S2 and S4).

Conclusion

This dissertation intends to examine 1) nature of organization improvisational capabilities and 2) some possible configurations for firm performance in a highly turbulent environment, i.e., e-commerce.

Motivated by the observation of the dynamics of digital business ecosystem and to answer calls from IS, strategy and management fields, the first research question is to examine an organizational level capability that organizations use to respond to unexpected problems and turbulences. Scholars such as Moorman, El Sawy and Pavlou advocate for deeper understanding of this capability which they termed the "third hand" of enhancing organization performance - "organization improvisational capabilities" (OIC).

To gain understanding of OIC, a scale development project was conducted. Following the process of conceptualization, definition, items development, testing and validation, I started by studying the concept of improvisation. The word improvisation is from the word "proviso", meaning to provide for something in advance. The prefix "im" gives it the opposite meaning: without prior planning or stipulation (Weick, 1998). Rooted from this concept, improvisation has been defined as the absence of a plan in the action (Moorman & Miner, 1998a), "*a spontaneous process, improvisation is extemporaneous, unpremeditated, and unplanned"* (Vera & Crossan, 2004, p.733), "*an extemporaneous process leading to impromptu or "spur of the moment" action*" (Ciborra, 1999, p.78), "intuition guiding action in a spontaneous way" (Crossan & Sorrenti, 1997: 156), and where "ideas emerge in new and creative ways not planned by the performer" (Crossan, White, Lane & Klus, 1996).

Following Webster and Watson (2002), I did a literature search from 2000 to 2012. In my review of literature, I found some recurrent factors related to improvisation or being mentioned by researchers. In particular, improvisation is a creative process, characterized by spontaneity and extemporaneity, peculiar features that have been often emphasized by literature (Moorman & Miner, 1997; Crossan, 1998; Weick, 1998). Improvisation is guided by intuition (Crossan & Sorrenti, 1997) and characterized both by real time and deliberate nature of the action (Cunha, Cunha & Kamoche, 1999; Vera & Crossan, 2004, 2007). In this regard, despite that improvisation might arise as a consequence of serendipitous events, it is most likely an intentional process involving consciousness of action or a mindful deviation of routine/standard (Chelariu, Johnston & Young, 2002; Garud & Karnoe, 2003). Improvisation involves the use of resources at hand (i.e., bricolage) and not waiting for optimal resources, especially in cases of high time pressure, when resource seeking becomes unfeasible (Baker & Nelson, 2005). In addition to describing organization improvisation as a process, researchers in strategy, IT, and management started to see improvisation as a "new" management technique and orientation for organizational strategic renewal (Crossan, 1998; Crossan, White, et al. 1996), and proposed that organizations can develop improvisation capabilities "through practice" (Crossan, 1998). Improvisation was transformed from an abstract concept to an observable and measurable ability and its three characteristics qualify it as a capabilities (cf. Pavlou & El Sawy, 2010): collective, repeatable and purposeful (Winter, 2003).

Throughout the years, researchers have seen organization improvisational capabilities as a type of ability to bring change in the organization. Pavlou and El Sawy (2010) focus on improvisation as a key capability for realization of competitive advantage in high turbulence

environment, and the role of digital systems in facilitating these capabilities. Organization improvisational capabilities (OIC) in this study is defined as:

> *An organization's learned ability to respond to unexpected environmental turbulence quickly by simultaneously creating and executing novel solutions attained through unplanned recombination of available resources*

After defining OIC, three dimensions of OIC were proposed: near "Real time" responsive action, unplanned reconfiguration and reuse of available resources, and virtuosic creativity for novel solution. Items were created for the pre-test. Modified according to feedbacks and analysis results, items were modified or removed from the list and organized for the pilot test. Eighty three CIOs and IT managers from different industries in Taiwan and US participated in the pilot study. More refinement of items were carried out and final version of the scale was compiled for the real roll out of survey for e-commerce companies. Empirically tested and validated scale of OIC shows two dimensions, unplanned reconfiguration and speedy novel solution. There are 4 items for each dimension.

The result from the OIC scale development plays an important part for the second research question, which is to explore some possible combinations of elements for firm performance. Digital business ecosystem consists of interactions of organization improvisational capabilities, IT flexibility, internal organizational characteristics and environmental factors for firm performance. Based on empirical field data, this dissertation sets out to identify multiple configurations that produce equally high organizational performance using the configurational approach and used fsQCA as the analysis tool.

Four different configurations for high financial performance were identified and discussed. Overall, speedy novel solution of organization improvisational capabilities, open

standard of IT flexibility and munificence from the environment were identified as necessary conditions for high financial performance. In other words, for e-commerce firms that achieve high financial performance in such high complex environment, these three conditions are almost always present. E-commerce firms need to build up their organization improvisational capabilities and their IT flexibility, while finding a segment on e-commerce environment that is abundant of resources, to have high financial performance. For different firm size and IT department size, different configurations were found.

Implications for Research and Practice

A primary goal of scale development is to create a valid measure of an underlying construct. A thorough literature review of improvisation and organization improvisational capabilities was completed. A definition of organization improvisational capabilities is formed to provide some basic and direct information for scholars and managers. A definition of OIC better describes the capability than an abstract concept. One of the results of this review was the discovery of dimensions of improvisational capabilities that helped drive the development of a measurement scale for this construct. A robust measure of improvisational capabilities is developed and empirically tested. The tested and validated scale contributes to theoretical understanding. Managers have some items to ask and to measure about their firm's OIC. This responds to a call to have deeper understanding of organization improvisational capabilities because it plays a crucial role in digital ecodynamics.

This dissertation then further investigated possible configurations for high firm financial performance involving organizational improvisational capabilities, IT infrastructure flexibility, particular organizational characteristics, and environmental factors and their relationships with innovation performance. Instead of testing individual independent variable's effect like in linear

path model, this dissertation applied configuration theory as the inquiring systems to show a more holistic view of the increasingly complex inter-relationships of elements of digital ecodynamics.

This dissertation is one of the earliest studies applying configuration logic and set-theoretic methods, like fsQCA, in organization research and responds to calls in the innovation literature. “Future research may therefore focus more on interdependencies among innovation characteristics and how these affect innovation adoption" (Arts, Frambach & Bijmolt 2011, p.143). My fsQCA findings confirm that high financial performance indeed depends on the combined effects - not the net or additive effects - of its characteristics. QCA is considered to be an "inherently mixed" technique (Teddlie & Tashakkori 2009, p.273), because it combines within one analysis qualitative inductive reasoning, since data are analyzed "by case" and not by "variable" (Ragin, 2000), and quantitative empirical testing, since sufficient and necessary conditions can be derived through statistical methods (Longest & Vaisey, 2008). For analyzing phenomena characterized by complex and interlinked elements, the use of such mixed-method techniques is beneficial, because the plurality of perspectives embedded in them leads to more robust and interesting findings (Venkatesh, Brown & Bala, 2013). The use of mixed-method techniques such as QCA is still at its infancy in most business domains. This, coupled with the inherent complexity of many ecodynamics phenomena, offers IS strategy scholars a unique opportunity to stimulate more widespread use of this potentially powerful technique.

In recent decades, information and digital technologies have become tightly interconnected with organizational and environmental elements. This has created a complex system that often exhibits nonlinear, discontinuous changes. The findings from fsQCA analysis furthermore demonstrate the formation of multiple, interdependent, and mutually reinforcing

organizational characteristics into sets that can be evaluated in their effects on innovation and financial performance. The results, by no means, imply that the individual elements are irrelevant, on the contrary, they do play a significant role but only meaningful within proper configurations. This study contributes to the literature on strategic advantage in high turbulent environments by suggesting a new holistic configurational way of thinking. In frequently punctuated nonlinear change, configurational theories can better explain how a system shifts from one state to another state (El Sawy et al, 2010; Fiss, 2011). The results of fsQCA describe how multiple confugrations could achieve a similar level of performance. This might also impact organization strategy of IS and business model.

Practical Implication

Four configurations were found to show different paths to high financial performance for different types of firms. E-commerce firm managers can check the different conditions that play into various organization performances and follow the “recipes”. For example, for a "not-large” firm (less than 100 full time employees), there are different paths (S1 and S2), depends on its structure, IT size and dynamism, to high financial performance.

Results from this dissertation show how configurational approaches create new practical insights in the context of digital ecodynamics. Taking advantage of such properties as quifinality and causal asymmetry, a configurational approach provides organizations with multiple strategic options from which they can choose the best solution to gain competitive advantage that fits their unique contexts. Organizations can choose the best solution among the multiple configurations by considering their own organizational characteristics and environment (e.g., size and environmental dynamism).

This dissertation also makes a broader methodological contribution to organization and IS strategy researches in general. Existing theories that are based on linear, additive relationships between elements and assume equilibrium status cannot effectively explain such dynamically changing punctuated disequilibrium in digital ecodynamics (Meyer et al., 2005). A configurational approach accompanied by strong methods such as fsQCA is one of the best ways to build new theories that can effectively explain such nonlinear discontinuous changes driven by dynamic interactions of digital technologies, organizational and social factors.

REFERENCES

Aldrich, H. E. (1979). *Organizations and Environments*. Englewood Cliffs, NJ: Prentice-Hall.

Alvarez, S. A., & Barney, J. B. (2007). The entrepreneurial theory of the firm. *Journal of Management Studies*, *44*(7), 1057-1063.

Amabile, T. M. (1983). The social psychology of creativity: A componential conceptualization. *Journal of personality and social psychology*, *45*(2), 357.

Amabile, T. (1996). *Creativity in context*. Westview press.

Amit, R. P., & Schoemaker, J. H. (1993). Strategic assets and organizational rent. *Strategic Management Journal*, *14*(1), 33-46.

Ancona, D., Goodman, P., Lawrence, B. & Tushman, M. (2001). Time: A New Research Lens, *Academy of Management Review*, 26(4), 645-663.

Arbuckle, J. L. (2011). Amos (Version 20.0) [Computer Program]. Chicago: SPSS

Armstrong, C. P., & Sambamurthy, V. (1999). Information technology assimilation in firms: The influence of senior leadership and IT infrastructures. *Information Systems Research*, *10*(4), 304-327.

Arts, J. W., Frambach, R. T., & Bijmolt, T. H. (2011). Generalizations on consumer innovation adoption: A meta-analysis on drivers of intention and behavior. *International Journal of Research in Marketing*, *28*(2), 134-144.

Bain, J. S. (1951), Relation of Profit Rate to Industry Concentration: American Manufacturing, 1936-1940, *Quarterly Journal of Economics* 65(293), 293-324.

Baker, T. (2007). Resources in play: Bricolage in the Toy Store (y). *Journal of Business Venturing*, *22*(5), 694-711.

Baker, T., Miner, A. S. & Eesley, D. T. (2003). Improvising Firms: Bricolage, Account Giving and Improvisational Competencies in the Founding Process. *Research Policy,* 32**,** 255-276.
Baker, T. (2007). Resources in play: Bricolage in the Toy Store (y). *Journal of Business Venturing*, *22*(5), 694-711.

Baker, T. & Nelson, R. E. (2005) Creating Something from Nothing: Resource Construction through Entrepreneurial Bricolage. Administrative Science Quarterly, 50:329-366.

Barney, J.B. (1991). Firm resources and sustained competitive advantage, *Journal of Management*, 17 (1), 99-120.

Barney, J.B. (2001), Is the Resource-Based Theory a Useful Perspective for Strategic Management Research? Yes. Academy of Management Review; 26, (1), pp. 41–56.

Barreto, I. (2010). Dynamic capabilities: a review of past research and an agenda for the future. *Journal of Management*, 36(1), 256-280.

Barrett, F. J. (2002). Creativity and improvisation in jazz and organizations. *Organizational improvisation*, 138.

Baskerville, R., Cavallari, M., Hjort-Madsen, K., Pries-Heje, J., Sorrentino, M. and Virili, F. (2005). Extensible architectures: The strategic value of service-oriented architecture in banking. In Proceedings of European Conference on Information Systems (ECIS) (Bartmann, D. and Rajola, F. and Kallinikos, J. and Avison, D. and Winter, R. and Ein-Dor, P. and Becker, J. and Bodendorf, F. and Weinhardt, C., Eds).

Bassett, P. G. (1996). *Framing software reuse: lessons from the real world*: Prentice-Hall, Inc.

Benbya, H., & McKelvey, B. (2006). Using coevolutionary and complexity theories to improve IS alignment: a multi-level approach. *Journal of Information Technology, 21*(4), 284-298.

Bettis, R. A. (1981). Performance differences in related and unrelated diversified firms. *Strategic Management Journal, 2*, 379-393.

Bharadwaj, A. S. (2000). A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation. *MIS Quarterly, 24*(1), 169-196.

Bharadwaj, A. S., Sambamurthy, V., & Zmud, R.W. (1999). IT Capabilities: Theoretical Perspective and Empirical Operationalization.Paper presented at the Proceedings of the 20th International Conference on Information Systems, Charlotte, NC.

Bhatt, G. D., & Grover, V. (2005). Types of information technology capabilities and their role in competitive advantage: An empirical study. *Journal of Management Information Systems, 22*(2), 253-277.

Bieberstein, N., Bose, S., Walker, L., & Lynch, A. (2005). Impact of service-oriented architecture on enterprise systems, organizational structures, and individuals. *IBM Systems Journal, 44*(4), 691-708.

Bieberstein, N., Fiammante, M., Jones, K. & Shah, R. (2006), *Service-Oriented Architecture (SOA) Compass: Business Value, Planning, and Enterprise Roadmap*. 1st ed. New Jersey: IBM Press.

Blatter, J. K., Janning, F., & Wagemann, C. (2007). Qualitative Politikanalyse. *Eine Einführung in Forschungsansätze und Methoden, Wiesbaden, 1*.

Bloomberg, J. & Schmelzer, R. (2006). *Service Orient or Be Doomed!: How Service Orientation Will Change Your Business*. New Jersey: John Wiley & Sons.

Bobhitt, H. R., Jr., & Ford, J. (1980). Decision maker choice as a determinant of organizational structure. *Academy of Management Review,* 5: 13-23.

Bocij, P., Chaffey, D., Greasley, A., & Hickie, S. (2008). Business information systems. *Technology, Development & Management. 4th Edition. Englanti: Pearson Education Limited.*

Bollen, K., & Lennox, R. (1991). Conventional wisdom on measurement: A structural equation perspective. *Psychological bulletin*, *110*(2), 305.

Boswell, T., & Brown, C. (1999). The Scope of General Theory Methods for Linking Deductive and Inductive Comparative History. *Sociological methods & research*, *28*(2), 154-185.

Boyer, M. D. (2009). *Organizational improvisation within an episodic planning model: A systems perspective.* Capella University.

Brady, H., & Collier, D. (2010). *Rethinking Social Inquiry: Diverse Tools, Shared Standards* (Second ed.): Rowman & Littlefield Publishers.

Brown, S. L. & Eisenhardt, K. M. (1995). Product development: past research, present findings, and future directions. *Academy of Management Review, 20*(2), 343-378.

Brown, S.L. & Eisenhardt, K. M. (1997), The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations, *Administrative Science Quarterly*, 42 (1), 1-34.

Browne, M. W., & Cudeck, R. (1993). "Alternative Ways of Assessing Model Fit," in Testing Structural Equation Models, K.A. Bollen and J. S. Long (eds.), Newbury Park, CA: Sage Publications, pp. 136-162.

Byrd, T. A. (2001). Information technology, core competencies and sustained competitive advantage. *Information Resources Management Journal (IRMJ), 14*(2), 27-36.

Byrd, T. A., & Turner, D. E. (2000). Measuring the flexibility of information technology infrastructure: Exploratory analysis of a construct. *Journal of Management Information Systems 17*(1), 167-208.

Byrd, T. A., & Turner, D. E. (2001). An exploratory examination of the relationship between flexible IT infrastructure and competitive advantage. *Information & Management*, *39*(1), 41-52.

Byrne, B. M. (2001). Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming, Mahwah, NJ: Lawrence Erlbaum Associates, Inc

Byrne, D. (2002). *Interpreting Quantitative Data*. London: Sage.

Carr, N. G. (2003). IT doesn't matter. *Educause Review, 38*, 24-38.

Castrogiovanni, G. J. (1991). Environmental Munihcence; A Theoretical Assessment. *Academy of Management Review, 16*(3), 542-565.

Caves. R. (1977), *American industry: Structure, conduct, and performance.* Englewood Giiffs, N.: Prentice-Hall.

Chackravarthy (1997). A new strategic framework for coping with turbulence. *Sloan Management Review*, p 69-82.

Chatterjee, D., Grewal, R., & Sambamurthy, V. (2002). Shaping up for e-commerce: institutional enablers of the organizational assimilation of web technologies. *MIS Quarterly, 26*(2), 65-89.

Chelariu, Johnston & Young. (2002). Learning to improvise, improvising to learn A process of responding to complex environment, *Journal of Business Research*, 55, 141-147.

Child, J. (1972). Organizational structure, environment and performance: the role of strategic choice. *Sociology, 6*, 2-22.

Chin, W. W., Johnson, N., & Schwarz, A. (2008). A Fast Form Approach to Measuring Technology Acceptance and Other Constructs. *MIS Quarterly, 32*(4), 687-703.

Chung, S. H., Rainer, R. K., & Lewis, B. R. (2003). The Impact of Information Technology Infrastructure Flexibility on Strategic Alignment and Applications Implementation. *Communications of the Association for Information Systems, 11*(11), 191-206.

Churchill, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research 16*, 64-73.

Ciborra, C. U. (1994). *The grassroots of IT and strategy.* Paper presented at the Strategic information systems.

Ciborra, C. U. (1999). Notes on improvisation and time in organizations. *Accounting, management and information technologies, 9*(2), 77-94.

Collier, D., & Gerring, J. (Eds.) (2009). Concepts and Method in Social Science: The Tradition of Giovanni Sartori . New York and London: Routledge.

Collis, D. J. (1994), Research note: How Valuable Are Organizational Capabilities?, Strategic Management Journal, Winter 1994, pp. 143–152

Conner (1998). *Leading at the Edge of Chaos: How to Create the Nimble Organization*. Wiley

Cook, T. D., Campbell, D. T., & Day, A. (1979). *Quasi-experimentation: Design & analysis issues for field settings* (Vol. 351). Boston: Houghton Mifflin.

Cress, D. M., & Snow, D. A. (2000). The outcomes of homeless mobilization: The influence of organization, disruption, political mediation, and framing. *American Journal of Sociology*, 1063-1104.

Crossan, M. (1998). Improvisation in Action.*Organization Science*, 9(5): 593-599.

Crossan, M., Cunha, M.P., Vera, D. & Cunha, J. (2005). Time and Organizational Improvisation. Academy of Management Review, 30(1):129-145.

Crossan, M., Lane, H. & R. White (1999), An Organizational Learning Framework: From Intuition to Institution, Academy of Management Review, 24(3) 522-537.

Crossan, M., & Sorrenti, M. (1997). Making sense of improvisation. *Advances in strategic management, 14*, 155-180.

Crossan, M., & Sorrenti, M. (2002). Making sense of improvisation. *Organizational improvisation*, 29-51.

Crossan, M., White, R., Lane, H. & Klus, L. (1996). The Improvising Organization: Where Planning Meets Opportunity, *Organizational Dynamic*, 24(4), 20-35.

Cunha, M. P., & Cunha, J. V. (2007). Bricolage in organizations: concept and forms. *Current topics in management*, *12*, 51-70.

Cunha, M.P., Cunha, J. & Kamoche, K. (1999). Organizational Improvisation: What, When, How And Why, *International Journal Of Management Review*, 1(3), 299-341.

Cunha, P, Kamoche, K., & Campos e Cunha, R. (2003). Organizational Improvisation and Leadership. *International Studies of Management & Organization*, *33*(1), 34-57.

Da Cunha, C., Agard, B., & Kusiak, A. (2005). *Improving manufacturing quality by resequencing assembly operations: a data-mining approach.* Paper presented at the Proc. 18th International Conference on Production Research–ICPR.

Daft, R. L., & Weick, K. E. (1984). Toward a model of organizations as interpretation systems. *Academy of Management Review, 9*(2), 284-295.

Damanpour, F., & Schneider, M. (2006). Phases of the Adoption of Innovation in Organizations: Effects of Environment, Organizaiton and Top Managers. *British Journal of Management, 17*, 215-236.

Davis, A. M., (1993), *Software requirements: objects, functions and states*. Prentice-Hall.

D'Aveni, R. A. (1994). Hypercompetition. Managing the Dynamics of Strategic Maneuvering. The Free Press, New York

Day (1997). Assessing Competitive Arenas: Who are your Competitors? from Wharton on

Dynamic Competitive Advantage, edited by G. Day and D. Reibstein. New York, etc: John Wiley & Sons Inc.

Delery, J. E., & Doty, D. H. (1996). Modes of theorizing in strategic human resource management: Tests of universalistic, contingency, and configurational performance predictions. *Academy of management Journal, 39*(4), 802-835.

DeLone, W. H. & McLean, E. R. (2004). Measuring e-Commerce Success: Applying the DeLone & McLean Information Systems Success Model. *International Journal of Electronic Commerce,* **9**(1), 31-47.

Demirkan, H., Kauffman, R. J., Vayghan, J. A., Fill, H.-G., Karagiannis, D., & Maglio, P. P. (2009). Service-oriented technology and management: Perspectives on research and practice for the coming decade. *Electronic Commerce Research and Applications, 7*(4), 356-376.

Derfus, P., Maggitti, P. G., Grimm, C. M., & Smith, K. G. (2008). The Red Queen Effect: Competitive Actions and Firm Performance, *Academy of Management Journal* (51:1), pp. 61-80.

Dess, G. G., & Beard, D. W. (1984). Dimensions of Organizational Task Environments. *Administrative Science Quarterly, 29*(1), 52-73.

Dess, G. G., & Newport, S. (1993). Configuration Research in strategic Management: Key Issues and Suggestions. *Journal of Management, 19*(4), 775-795.

Dillman, D. A. (2000). *Mail and Internet Surveys: The Tailored Design Method* (2nd ed.). New York: John Wiley & Sons, Inc.

Dierickx, I., & Cool, K. (1989). Asset Stock Accumulation and Sustainability of Competitive Advantage. *Management Science, 35*(12), 1504-1512.

Doll, W.J. & Deng, X. (2011), Antecedents of improvisation in IT-enabled engineering work, *Journal of Organizational and End User computing*, 23(3), 26-47.

Doty, D. H., Glick, W.H. & Huber, G.P. (1993), Fit, Equitlnality, and Organizational Effectiveness: A Test of Two Configurational Theories, *Academy of Management Journal,* 30 (December), 1196-1250.

Dougherty, D. (1996). Organizing for innovation. In S.R. Clegg, C. Hardy, & W.R. Nord (Eds.) *Handbook of Organization Studies*, pp.424-439. Thousand Oaks, CA: Sage.

Drazin, R., & Van de Ven, A. H. (1985). Alternative forms of fit in contingency theory. *Administrative Science Quarterly,* 514-539.

Due, R. (2000). The Economics of Component-based Development *Information Systems Management, 17*(1), 92-95.

Duncan, R. B. (1972). Characteristics of organizational environments and perceived environmental uncertainty. *Administrative Science Quarterly, 17*(3), 313.

Duncan, N.B. (1995), Capturing flexibility of information technology infrastructure: A study of resource characteristics and their measure. *Journal of Management Information Systems,* 12(2), pp.37-58.

Duymedjian, R. & RÜLING, C-C. (2010), Towards a Foundation of Bricolage in Organization and Management Theory. *Organization Studies,* 31**,** 133-151.

Dvorak, R. E., Holen, E., Mark, D. & Meehan, W. F. (1997). Six Principles of High-Performance IT, *McKinsey Quarterly*, 3, 164–177.

Dyer, J.H., & Singh, H. (1998): The relational view: Cooperative strategy and sources of interorganizational competitive advantage. Academy of Management Review, Vol. 23, pp. 660–679.

e Cunha, M. P. (2004). Organizational time: a dialectical view. *Organization, 11*(2), 271-296.

Eckhardt, J. T. & Shane, S. A. (2003). Opportunities and entrepreneurship. *Journal of Management, 29*(3), 333-349.

Eisenberg, E. (1990). Jamming: Transcendence through organizing. *Communication Research 17*, 139-164.

Eisenhardt , K.M. & Brown, S.L. (1999). Patching. Restitching Business Portfolios in Dynamic Markets. *Harvard Business Review*, 77(3), 72-82.

Eisenhardt, K. M. & Martin, J.A. (2000). Dynamic capabilities: what are they? *Strategic Management Journal*, 21, 1105-1121.

Eisenhardt, K.M. & Sull, D. N. (2001). Strategy as Simple Rules. *Harvard Business Review*, Jan-Feb 2001.

Eisenhardt, K. M. & Tabrizi, B.N. (1995). Accelerating Adaptive Processes: Product Innovation in the Global Computer Industry, *Administrative Science Quarterly*, 40, 84-110.

El Sawy, O. A., Malhotra, A., Park, Y., & Pavlou, P.A. (2010). Seeking the Configurations of Digital Ecodynamics: it Takes Three to Tango, *Information Systems Research* (21:4), pp. 835-848.

El Sawy, O. A., & Pavlou, P. A. (2008). IT-Enabled Business Capabilities for Turbulent Environments. *MIS Quarterly Executive, 7*(3).

Erl, T. (2005). *Service-oriented architecture: concepts, technology, and design*. Pearson Education India.

Erl, T. (2008). *Soa: principles of service design* (Vol. 1). Upper Saddle River: Prentice Hall.

Ferrier, W. J., Holsapple, C. W., & Sabherwal, R. (2007). Call for papers- I*nformation Systems Research* Special Issue: Digital systems and competition. *Information Systems Research, 18*(2), 228-230.

Ferrier, W. J., Holsapple, C. W., & Sabherwal, R. (2010). Editorial Commentary-Digital Systems and Competition. *Information Systems Research, 21*(3), 413-422.

Fichman, R., Nambisan, S., and Halpern, M. (2013). Configurational Thinking and Value Creation from Digital Innovation: The Case of Product Lifecycle Management, in *Innovation and IT in an International Context*, F. Rowe and D. Te'eni (eds.), London: Palgrave Macmillan.

Fiss, P. C. (2007). A set-theoretic approach to organizational configurations. *Academy of Management Review, 32*(4), 1180-1198. doi: 10.5465/amr.2007.26586092

Fiss, P. C. (2011). Building Better Casual Theories: A Fuzzy Set Approach To Typologies In Organizational Research. *Academy of Management Journal, 54*(2), 393-420. doi: 10.5465/amj.2011.60263120

Forbes (2011). The Future of Online Shopping: 10 Trends to Watch, by Laura Heller, 4/20/2011, http://www.forbes.com/sites/lauraheller/2011/04/20/the-future-of-online-shopping-10-trends-to-watch/

Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of marketing research*, 382-388.

Freiling, J. (2004). A Competence-based Theory of the Firm (pp. 27-52). Mering: Rainer Hampp Verlag.

Freiling, J., Gersch, M., & Goeke, C. (2008). On the Path towards a Competence-based Theory of the Firm. *Organization Studies (01708406), 29*(8/9), 1143-1164. doi: 10.1177/0170840608094774

Fritz, F.-J. (2004): An Introduction to the Principles of Enterprise Services Architecture (ESA), Retrieved from http://www.sapinsideronline.com/spijsp/article.jsp?article_id=37906&volume_id=5147.

Fuentes-Fuentes, M. A., Albacete-Saez, C. A., & Llorens-Montes, F. J. (2004). The impact of environmental characteristics on TQM principles and organizational performance. *OMEGA, 32*, 425-442.

Furukawa, M. (2004), Renovation of an IT Infrastructure and its POC Analysis. In H.R. Nemati & C.D. Barko, (EDs). *Organizational Data Mining: Leveraging Enterprise Data Resources for Optimal Performance*. Idea Group Inc. pp.780-783.

Galbraith, C. S. (1990). Transferring Core Manufacturing Technologies in High-Technology Firms. *California Management Review, 32 (summer)*, 56-70.

Galunic, D. C. & Eisenhardt, K. M. (2001), Architectural innovation and modular corporate forms. *Academy of Management Journal*, *44*(6), 1229-1249.

Garud, R., & Karnøe, P. (2003). Bricolage versus breakthrough: distributed and embedded agency in technology entrepreneurship. *Research Policy, 32*(2), 277-300.

Goertz, G., & Levy, J. S. (2007). Causal explanation, necessary conditions, and case studies. *Explaining war and peace: Case studies and necessary condition counterfactuals*, 9-45.

Gong, Y., Baker, T., & Miner, A. S. (2006). Failures of Entreprneurial Learning in Knowledge-Based Startups. *Frontiers of Entrepreneurship Research, 26*(15), 2.

Goranson, H. T. (1999). *The Agile Virtual Enterprise: Cases, Metrics, Tools*. Westport, CT: Quorum Books.

Graham, J. M. (2006). Congeneric and (essentially) tau-equivalent estimates of score reliability what they are and how to use them. *Educational and Psychological Measurement, 66*(6), 930-944.

Grant R.M., (1991), The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation', California Management Review, Spring.

Griliches, Z., & Regev, H. (1995). Firm productivity in Israeli industry 1979–1988. *Journal of Econometrics, 65*(1), 175-203. doi: http://dx.doi.org/10.1016/0304-4076(94)01601-U

Gruber, H. E. (1988). The evolving systems approach to creative work. *Creativity Research Journal*, *1*(1), 27-51.

Gruber, M., Heinemann, F., Brettel, M., & Hungeling, S. (2010). Configurations of resources and capabilities and their performance implications: an exploratory study on technology ventures. *Strategic Management Journal*, *31*(12), 1337-1356. doi: 10.1002/smj.865

Guillemette, M. G., & Paré, G. (2012). Toward a new theory of the contribution of the IT function in organizations. *MIS Quarterly*, *36*(2), 529-551.

Hagel, J. & Brown, J.S. (2001), Your next IT strategy. Harvard Business Review, 79(9), 105-113.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E., (2010). Multivariate Data Analysis, seventh ed. Prentice Hall, Englewood Cliffs

Hannan, M. T. & Freeman, J. (1977). The population ecology of organizations. *American foumal of Sociology***.** 82: 929-963.

Harper, D. (1987). *Working knowledge: Skill and community in a small shop*: University of Chicago Press.

Helfat, C.E., Peteraf, M. A. (2003). The dynamic resource-based view: Capabilities lifecycles. *Strategic Management Journal*, 24(10), 997-1010.

Helfat, C. E. & Peteraf, M. A. (2009). Understanding dynamic capabilities: progress along a developmental path. *Strategic organization, 7*(1), 91.

Heutschi, R. (2007): Service-Oriented Architecture - Architecture principles and practical implementation, Springer, Berlin.

Hinkin, T. R. (1998). A brief tutorial on the development of measures for use in survey questionnaires. *Organizational Research Methods, 1*, 104-121.

Hirschheim, R., Welke, R., & Schwarz, A. (Mar 2010). Service-Oriented Architecture: Myths, Realities, and a Maturity Model. *MIS Quarterly Executive 9*(1), 37-46.

Hmieleski, K. (2009). Entrepreneur Improvisational Behavior and New Venture Performance: A Social Cognitive Perspective, Frontiers of Entrepreneurship Research, 29(5), article 1

Holsapple, C. W. & Li, X. (2008). Understanding Organizational Agility: A Work-Design Perspective, DTIC Conference Paper.

Hoopes, D.G., Madsen, T.L., & Walker, G. (2003). Guest Editors' Introduction to the Special Issue: Why is There a Resource-Based View? Toward a Theory of Competitive Heterogeneity. *Strategic Management Journal*, 24, pp. 889–902.

Hou, K., & Robinson, D. T. (2006). Industry Concentration and Average Stock Returns. *The Journal of Finance, 61*(4), 1927-1956. doi: 10.1111/j.1540-6261.2006.00893.x

Hsu, W., Lee, C., & Lim, A. (1998). A computer-aided product redesign system for robotic assembly. *Robotica, 16*(3), 239-249.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal, 6* (1), 1-55.

Huber, G. P. (1991). Organizational learning: The contributing processes and the literatures. *Organization Science, 2*(1), 88-115.

Hunt, S.D. (2000). *A General Theory of Competition*. Thousand Oaks: Sage.

Hutchins, E. (1991) Organizing Work by Adaptation. Organization Science, 2 (1), 14-39.

Jarvis, C. B., Mackenzie, S. B., & Podsakoff, P. M. (2003). A critical review of construct indicators and measurement model misspecificaiton in marketing and consumer research. *Journal of Consumer Research, 30*, 199-218.

Jeyaraj, A., Rottman, J. W., & Lacity, M. C. (2006). A review of the predictors, linkages, and biases in IT innovation adoption research. *Journal of Information Technology, 21*(1), 1-23.

Kamoche, K., Pina e Cunha, M., & Campos e Cunha, R. (2003). Improvisation in Organizations. *International Studies of Management & Organization, 33*(1), 3-9.

Kano, M., Koide, A., Liu, T.-K., & Ramachandran, B. (2005). Analysis and simulation of business solutions in a service-oriented architecture. *IBM Systems Journal, 44*(4), 669-690.

Karimi, J., Somers, T.M., & Gupta, Y.P. (2004) Impact of environmental uncertainty and task characteristics on use satisfaction with data, Information Systems Research, 15(2), 175-193.

Katz, D., & Kahn, R. L. (1978). *The social psychology of organizations* (2nd ed.), New York: Wiley.

Kaye, D. (2003). *Loosely Coupled: The Missing Pieces of Web Services*. 1st ed. RDS Press.

Keats, B. W., & Hitt, M. A. (1988). A causal model of linkages among environmental dimensions, macro organizational characteristics, and performance. *Academy Of Management Journal, 31*(3), 570-598. Doi: 10.2307/256460

Kerlinger, F. N. (1986). Foundations of behavioral research. Forth Worth: Holt, Rinehart and Winston.

Ketchen, D. J., Thomas, J. B. and Snow, C. C. (1993), Organizational Configurations and Performance: A Comparison of Theoretical Approaches," *Academy of Management Journal,* 36 (6), 1278-1313.

Kim, J., & Mueller, C. W. (1978). *Introduction to factor analysis: What it is and how to do it.* Beverly Hills, CA: Sage.

Kline, R.B. (2005). Principles and practices of structural equation modeling. New York: Guilford

Koch, C. (2005). A New Blueprint for The Enterprise, *CIO Magazine,* March 1, 2005

Kohli, R., & Grover, V. (2008). Business value of IT: An essay on expanding research directions to keep up with the times. *Journal of the Association for Information Systems, 9*(1), 23-39.

Kung, L., Cegielski, C., & Kung, H., (2013). *Environmental Pressure on Software as a Service Adoption: An Integrated Perspective.* Paper presented at the Nineteenth Americas Conference on Information Systems, Chicago, Illinois.

Legewie, N. (2013, September). An Introduction to Applied Data Analysis with Qualitative Comparative Analysis. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research* (Vol. 14, No. 3).

Leonard-Barton, D. (1988). Implementation as mutual adaptation of technology and organization. *Research Policy, 17*(5), 251-267.

Leone, L. (2010). A Critical Review of Improvisation in Organizations: Open Issues and Future Research Directions. Imperial College London Business School, Summer Conference on "Opening Up Innovation: Strategy, Organization and Technology", June, 2010.

Lévi-Strauss, C. (1966). *The savage mind*: University of Chicago Press.

Lewis, B. R., Templeton, G. F., & Byrd, T. A. (2005). A methodology for construct development in MIS research. *European Journal of Information Systems, 14*(4), 388-400. doi: http://dx.doi.org/10.1057/palgrave.ejis.3000552

Liang, H., Saraf, N., Hu, Q., & Xue, Y. (2007). Assimilation of enterprise systems: the effect of institutional pressures and the mediating role of top management. *MIS Quarterly, 31*(1), 59-87.

Linthicum, D. (2007), *SOA - Loosely Coupled. What?* [Online] Available at: http://soa.sys-con.com/node/439723 [Accessed 29 Oct. 2012].

Liu, H., Ke, W., Wei, K. K., Gu, J., & Chen, H. (2010). The role of institutional pressures and organizational culture in the firm's intention to adopt Internet-enabled supply chain management systems. *Journal of Operations Management, 28*(5), 372-384.

Longest, K. C., & Vaisey, S. (2008). fuzzy: A program for performing qualitative comparative analyses (QCA) in Stata. *Stata Journal, 8*(1), 79.

Lu, Y., & Ramamurthy, K. (2011). Understanding the Link Between Information Technology Capabilities And Organizational Agility: An Empirical Examination. *MIS Quarterly, 35*(4), 931-954.

Luthria, H., & Rabhi, F. (2009). Service oriented computing in practice: an agenda for research into the factors influencing the organizational adoption of service oriented architectures. *Journal of theoretical and applied electronic commerce research, 4*(1), 39-56.

Lynex, A., & Layzell, P. J. (1998). Organisational considerations for software reuse. *Annals of Software Engineering, 5*(1), 105-124.

MacCrimmon. K, R,. & Taylor. D. N. (1976). Decision making and problem solving. In M, D. Dunnette (Ed.), *Handhaok of industrial and organizational psychology:* 1397-1453. Chicago: Rand McNally & Co.

MacKenzie, S.B., Podsakoff, P.M. & Fetter, R. (1991). Organizational citizenship behavior and objective productivity as determinants of managerial evaluations of salespersons' performance. *Organizational Behavior and Human Decision Processes*, 50, 123-150.

Mackenzie, S. B., Podsakoff, P. M., & Podsakoff, N. P. (2011). Construct Measurement And Validation Procedures in MIS and Behavioral Research: Integrating New And Existing Techniques. *MIS Quarterly*, *35*(2), 293-A295.

Mahoney, J. (2010). After KKV: The new methodology of qualitative research. *World Politics*, *62*(1), 120-147.

Makadok, R. (2001). Toward a Synthesis of the Resource-Based View and Dynamic-Capabilities Views of Rent Creation. Strategic Management Journal; 22, (5), pp. 387–401

Malone, T. W. & Crowston, K. (1994). The interdisciplinary study of coordination. *Computing Surveys*, *26*(1), 87–119.

Mar Fuentes-Fuentes, M., Albacete-Sáez, C. A., & Lloréns-Montes, F. J. (2004). The impact of environmental characteristics on TQM principles and organizational performance. *OMEGA*, *32*(6), 425-442. doi: http://dx.doi.org/10.1016/j.omega.2004.02.005.

Markus, M. L., & Robey, D. (1988). Information technology and organizational change: causal structure in theory and research. *Management science*, *34*(5), 583-598.

Marx, A. (2006). Towards more robust model specification in QCA: Results from a methodological experiment. *American Sociological Association, Philadelphia, PA*.

Mata, F. J., Fuerst, W. L., & Bareney, J. (1995). Information technology and sustained competitive advantage: a resource-based analysis. *MIS Quarterly, 19 (4)*, 487-505.

McDougall, P. P., Shane, S., & Oviatt, B. M. (1994). Explaining the formation of international new ventures: The limits of theories from international business research. *Journal of Business Venturing*, *9*, 469–487.

McKeen, J. D., & Smith, H. A. (1993). The Relationship Between Information Technology Use and Organizational Performance. In R. Banker, R. Kauffman & M. A. Mahmood (Eds.), *Strategic Information Technology Management: Perspectives on Organizational Growth and Competitive Advantage* (pp. 405-444). Harrisburg, PA: Idea Group Publishing.

McKnight, B. & Bontis, N. (2002). E-improvisation; Collaborative Groupware Technology Expands the Reach and Effectiveness of Organizational Improvisation. *Knowledge and Process Management*, 9(4), 219-227.

McGovern, J., Tyagi, S., Stevens, M., & Mathew, S. (2003): Service-Oriented Architecture, "Java Web Services Architecture (The Morgan Kaufmann Series in Data Management Systems)", pp. 35-63, J. McGovern, S. Tyagi, M. Stevens & S. Mathew, Morgan Kaufmann, San Francisco.

Melville, N., Gurbaxani, V., & Kraemer, K. (2007). IT Business Value and Industry Effects: The Role of the Competitive Environment. *Decision Support Systems 43*(1), 229-242.

Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Review: Information Technology and Organizational Performance: An Integrative Model of IT Business Value. MIS Quarterly, 28(2), 283-322.

Mendonça, S., Pina e Cunha, M., Kaivo-Oja, J., & Ruff, F. (2004). Wild cards, weak signals and organizational improvisation. *Futures, 36*(2), 201-218.

Merton, R. K., & Barber, E. G. (2002). The Travels and Adventures of Serendipity. A Study in Historical Semantics and the Sociology of Science.

Meyer, A. D., Gaba, V., & Colwell, K.A. (2005). Organizing far from equilibrium: Nonlinear change in organizational fields. *Organization Science,* 16(5):456–473

Meyer, A. D., Tsui, A. S., & Hinings, C. R. (1993). Configurational Approaches to Organizational Analysis. *Academy of Management Journal*, *36*(6), 1175-1195. Doi: 10.2307/256809

Milgrom, P. & Roberts, J. (1995). Complementarities and fit: strategy, structure, and organizational change in manufacturing. *Journal of Accounting and Economics, 19*, 179–208.

Miller, D. (1986). Configurations of strategy and structure: Towards a synthesis. *Strategic management journal*, *7*(3), 233-249.

Miller, D. (1987). The genesis of configuration. *Academy of Management Review*, *12*(4), 686-701.

Miller, D. (1997), Configurations Revisited, *Strategic Management Journal,* 13 (Summer), 111-125.

Miller, D., & Chen, M.-J. (1994). Sources and consequences of competitive inertia: A study of the US airline industry. *Administrative Science Quarterly*, 1-23.

Miller, D., & Friesen, P. H. (1984). *Organizations: A Quantum View*. Englewood-Cliffs, N.J.: Prentice-Hall.

Milliken, F. J. (1987). Three types of perceived uncertainty about the environment: State, effect, and response uncertainty. *Academy of Management review*, *12*(1), 133-143.

Miner, A.S., Bassoff, P. & Moorman, C. (2001) Organizational Improvisation and Learning: A Field Study, *Administrative Science Quarterly*, 46(2), 304- 337.

Mintzberg, H. (1979). *The structuring of organizations*. Englewood Cliffs, NJ: Prentice-Hall.

Mithas, S., Tafti, A., & Mitchell, W. (2013). How A Firm's Competitive Environment And Digital Strategic Posture Influence Digital Business Strategy. *MIS Quarterly, 37*(2), 511-536.

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information systems research*, *2*(3), 192-222.

Moorman, C., & Miner, A. S. (1997). The impact of organizational memory on new product performance and creativity. *Journal of Marketing Research, 34*, 91–106.

Moorman, C. & Miner, A.S. (1998a). Organizational improvisation and organizational memory. *Academy of Management Review*, 23(4), 698–723.

Moorman, C. & Miner, A.S. (1998b). The convergence of planning and execution: Improvisation in new product development. *Journal of Marketing, 61(3)*, 1–20.

Mueller, B., Viering, G., Ahlemann, F. & Riempp, G., (2007). Towards Understanding The Sources of the Ecnomic Potential of Service-Oriented Architecture: Findings From The Automotive And Banking Industry. In *European Conference on Information Systems*, 2007. University of St. Gallen.

Mueller, B., Viering, G., Legner, C., & Riempp, G. (2010). Understanding the economic potential of service-oriented architecture. *Journal of Management Information Systems*, *26*(4), 145-180.

Nevo, S. & Wade, M. R. (2010). The Formation and Value of IT-Enabled Resources: Antecedents and Consequences of Synergistic Relationships. *MIS Quarterly*, *34*(1), 163-183.

Newcomer, E., & Lomow, G. (2004). *Understanding SOA with web services (independent technology guides)*. Addison-Wesley Professional.

Orlikowski, W. (1996). Improvising Organizational Transformation Overtime: A Situated Change Perspective, *Information Systems Research*, 7(1), 63-92.

Orlikowski, W. J., & Iacono, C. S. (2001). Research commentary: Desperately seeking the "IT" in IT research—A call to theorizing the IT artifact. *Information systems research*, *12*(2), 121-134.

Orton, J. D., & Weick, K. E. (1990). Loosely coupled systems: A reconceptualization. *Academy of management review*, *15*(2), 203-223.

Overby, E., Bharadwaj, A., & Sambamurthy, V. (2006). Enterprise agility and the enabling role of information technology. *European Journal of Information Systems 15*, 120-131. doi: 10.1057/palgrave.ejis.3000600

Park, Y., & El Sawy, O. A. (2013). The Value of Configurational Approaches for Studying Digital Business Strategy in *Configurational Theory and Methods in Organizational Research in the Sociology of Organizations* (Vol. 38, pp. 205-224): Emerald Group Publishing Limited.

Parmigiani, A., & Mitchell, W. (2009). Complementarity, capabilities, and the boundaries of the firm: the impact of within-firm and interfirm expertise on concurrent sourcing of complementary components. *Strategic Management Journal, 30*(10), 1065-1091. doi: 10.1002/smj.769.

Papazoglou, M., & Heuvel, W.-J. (2007). Service oriented architectures: approaches, technologies and research issues. *The VLDB Journal, 16*(3), 389-415. doi: 10.1007/s00778-007-0044-3.

Pavlou, P. A. & El Sawy, O. A. (2006). From IT leveraging competence to competitive advantage in turbulent environments: The case of new product development. *Information Systems Research, 17*(3), 198-227.

Pavlou, P. & El Sawy, O. (2010). The "Third Hand": IT-enabled competitive advantage in turbulence through improvisational capabilities. *Information Systems Research, 21*(3), 443-471.

Pavlou, P. A., & El Sawy, O. A. (2011). Understanding the elusive black box of dynamic capabilities. *Decision Sciences, 42*(1), 239-273.

Pennings, J. M. (1975), The relevance of the structural contingency model of organizational effectiveness. *Administrative Science Quarterly,* 20: 393-410

Peteraf, M.A. (1993). The Cornerstones of Competitive Advantage: A Resource-Based View. Strategic Management Journal; 14, (3), pp. 179–191.

Petter, S., Straub, D., and Rai, A. (2007). Specifying formative constructs in information systems research. MIS Quarterly, 31(4), 623-656.

Poulin, J.S., (2006). The business case for software reuse: Reuse metrics, economic models, organizational issues, and case studies. Tutorial notes..

Powell, T. C., & Dent-Micallef, A. (1997). Information Technology as Competitive Advantage: The Role of Human, Business, and Technology Resources. *Strategic Management Journal, 18*(5), 375-405.

Prahalad, C. K., Hamel, G. (1990), “The Core Competence of the Corporation”, Harvard Business Review, 68.

Preston, A. 1991 "Improvising order." In I. L. Mangham (ed.), Organization Analysis and Development: 81-102. New York: Wiley.

Price, J., & Mueller, C. (1986). Handbook of organizational management. *Marshfield, Massachusetts: Pitman Publishing*.

Priem, R.L., & Butler, J.E. (2001). Is the Resource-Based Theory a Useful Perspective for Strategic Management Research? Academy of Management Review; 26, (1), pp. 22–40.

Purser, R. E., & Petranker, J. (2005). Unfreezing the future: Exploring the dynamic of time in organizational change. *Journal of Applied Behavioral Science, 41*(2), 182–203.

Purvis, R. L., Sambamurthy, V., & Zmud, R. W. (2001). The assimilation of knowledge platforms in organizations: An empirical investigation. *Organization Science, 12*(2), 117-135.

Quaddus, M., & Hofmeyer, G. (2007). An investigation into the factors influencing the adoption of B2B trading exchanges in small business. *European Journal of Information Systems, 16*, 202-215.

Ragin, C. C. (1994). Introduction to qualitative comparative analysis. *The comparative political economy of the welfare state*, *299*, 300-309.

Ragin, C. C. (2000). Fuzzy-set social science. Chicago; London, University of Chicago Press

Ragin, C. C. (2007). Making comparative analysis count. *Revista de História Comparada, 1*(1).

Ragin, C. C. (2006). *User's Guide to Fuzzy-Set/Qualitative Comparative Analysis 2.0*. Tucson, Arizona: Department of Sociology, University of Arizona

Ragin, C. C. (2008). *Redesigning social inquiry: Fuzzy sets and beyond* (pp. 190-212). Chicago: University of Chicago Press.

Ragin, C. C., & Fiss, P. (2008). Net effects versus configurations: An empirical demonstration. *Redesigning social inquiry: Fuzzy sets and beyond*, 190-212.

Rai, A., Patnayakuni, R., & Seth, N. (2006). Firm performance impacts of digitally enabled supply chain integration capabilities. *MIS quarterly*, *30*(2), 225-246.

Ren, M., & Lyytinen, K. (2008). Building Enterprise Architecture Agility and Sustenance with SOA. *Communications of the Association for Information Systems, 22*, 75-86.

Rihoux, B., and Ragin, C. C. (eds.). 2009. *Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques*, Thousand Oaks, CA: SAGE Publications

Roberts, N., & Grover, V. (2012). Leveraging information technology infrastructure to facilitate a firm's customer agility and competitive activity: An empirical investigation. *Journal of Management Information Systems*, 28(4), 231-269.

Ross, J., Beath, C. M., and Goodhue, D. L. (1996). Develop Long-Term Competitiveness through IT Assets, *Sloan Management Review*, 38(1), 31–42.

Rotem-Gal-Oz, A. (2007). What is SOA anyway. *Getting from hype to reality*.

Rumelt, R.P. (1987). Theory, strategy, and entrepreneurship', in Teece D.J. (ed.), *The Competitive Challenge*, Cambridge (MA): Ballinger, 137-158.

Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping Agility Through Digital Options: Reconceptualizing The Role Of Information Technology In Contemporary Firms. *MIS Quarterly, 27*(2), 237-263.

Sambamurthy, V. & Zmud, R. W. (2000). Research commentary: The organizing logic for an enterprise's IT activities in the digital era—A prognosis of practice and a call for research. *Information Systems Research, 11*(2), 105-114.

Sanchez, R. (2004). Understanding competence-based management: Identifying and managing five modes of competence. *Journal of Business Research, 57*(5), 518-532. doi: http://dx.doi.org/10.1016/S0148-2963(02)00318-1

Sanchez, R., & Heene, A. (1996). A systems view of the firm in competence-based competition. In A. H. R. Sanchez, H. Thomas (Ed.), *Dynamics of Competence-Based Competition: Theory and Practice in the New Strategic Management*: Elsevier, Oxford.

Sanchez, R., & Heene, A. (1997). Reinventing strategic management: New theory and practice for competence-based competition. *European Management Journal, 15*(3), 303-317. doi: http://dx.doi.org/10.1016/S0263-2373(97)00010-8

Sanchez, R., & Heene, A. (2004), The New Strategic Management: Organizations, Competition and Competence, John Wiley & Sons.

Sanchez, R., Heene, A., & Thomas, H. (1996). *Dynamics of competence-based competition: theory and practice in the new strategic management*: Pergamon Pr.

Santhanam,R., & Hartono, E. (2003). Issues in Linking Information Technology Capability to Firm Performance. MIS Quarterly, 27(1), 125-153.

Say Yen Teoh & Wickramasinghe, N. (2011). A Strategic Improvisation Model: A Case Study of Healthcare Information Systems Design, PACIS 2011.

Scherer, F. M., & Ross, D. (1990). *Industrial Market Structure and Economic Performance*, Dallas, TX: Houghton Mifflin.

Schilling, M. A. (2000.), Towards a general modular system theory and its application to inter-firm product modularity. *Academy of Management Review***,** 25: 312-334.

Schneider, C. Q., & Wagemann, C. (2007). *Qualitative Comparative Analysis (QCA) und Fuzzy Sets*. Barbara Budrich.

Schneider, C. Q., & Wagemann, C. (2012). *Set-theoretic methods for the social sciences: A guide to qualitative comparative analysis*: Cambridge University Press.

Schwab, D. P. (1980). Construct validity in organization behavior. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior* (Vol. 2, pp. 3-43). Greenwich, CT: JAI.

Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science, 11*(4), 448-469.

Sharifi, H., & Zhang, Z. (1999). A Methodology for achieving agility in manufacturing organizations. *International Journal of Production Economics, 62*, 7-22.

Sherif, K., & Vinze, A. (2003). Barriers to adoption of software reuse: a qualitative study. *Information & Management, 41*(2), 159-175.

Simon, H.A. (1979). Models of thought. Yale University Press, New Haven, CT.

Sirmon, D. G., Hitt, M. A., & Ireland, R. D. (2007). Managing firm resources in dynamic environments to create value: Looking inside the black box. *Academy of management review, 32*(1), 273-292.

Smith, K. G., Grimm, C. M., Gannon, M. J., & Chen, M.-J. (1991). Organizational Information Processing, Competitive Responses, And Performance In The U.S. Domestic Airline Industry. *Academy Of Management Journal, 34*(1), 60-85. Doi: 10.2307/256302

Tallon, P. P. (2008). Inside the adaptive enterprise: an information technology capabilities perspective on business process agility. *Information Technology and Management, 9*(1), 21-36.

Tallon, P. P., & Pinsonneault, A. (2011). Competing Perspectives on the Link Between Strategic Information Technology Alignment And Organizational Agility: Insights From A Mediation Model. *MIS Quarterly, 35*(2), 463-486.

Tan, B., Pan, S. L., Chou, T. C., & Huang, J. Y. (2010). Enabling Agility through Routinized Improvisation in IT Deployment: The Case of Chang Chun Petrochemicals. In *ICIS* (p. 225).

Tanriverdi, H., Rai, A., & Venkatraman, N. (2010). Research commentary-Reframing the dominant quests of information systems strategy research for complex adaptive business systems. *Information Systems Research*, *21*(4), 822-834.

Teddlie, C., & Tashakkori, A. (Eds.). (2009). *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences*. Sage Publications Inc.

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1219-1350.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509-533. doi: 10.1002/(sici)1097-0266(199708)18:7<509::aid-smj882>3.0.co;2-z

Thiem, A. (2010). *Set-relational fit and the formulation of transformational rules in fsQCA* (No. 61). COMPASSS working paper.

Thompson, J, D. (1967). *Organizations in action.* New York: McGraw-Hill Book Co.

Tiwana, A., Konsynski, B., & Bush, A. A. (2010). Research Commentary—Platform Evolution: Coevolution of Platform Architecture, Governance, and Environmental Dynamics. *Information Systems Research, 21*(4), 675-687. doi: 10.1287/isre.1100.0323

Tornatzky, L. G., & Fleischer, M. (1990). *The Processes of Technological Innovation*. Lexington, MS/Toronto: Lexington Books.

Treadwell, W. A. (1995). Fuzzy Set Theory Movement in the Social Sciences. *Public Administration Review, 55*(1), 91-98.

Tushman, M. L (1977). Special boundary roles in the innovation process. *Administrative Science Quarterly***.** 22: 587-605.

Van de Ven, A. H., & Polley, D. (1992). Learning while innovating. *Organization Science, 3*(1), 92-116.

Venkatesh, V., Brown, S. A., & Bala, H. (2013). Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems. *MIS quarterly*, *37*(1), 21-54.

Venkatraman, N. (1989). The concept of fit in strategy research: toward verbal and statistical correspondence. *Academy of Management Review, 14*(3), 423-444.

Vera, D. & Crossan, M. (2004), Theatrical Improvisation: Lessons for Organizations, *Organization Studies*, 25, 727-749.

Vera, D., & Crossan, M. (2005). Improvisation and innovative performance in teams. *Organization Science, 16*, 203–224.

Vera, D., & Crossan, M. (2007). Reconciling learning paradoxes through improvisation. *Proceedings of the OLKC on Learning Fusion*, 992.

Vera, D., & Rodriguez-Lopez, A. (2007). Leading Improvisation:: Lessons from the American Revolution. *Organizational dynamics*, *36*(3), 303-319.

Vernhout, A. (2007). Management challenges in the competence-based organization. *Competence-Based Management Website*.

Vervest, P. (2005). *Smart Business Networks*: Springer.

Vorhies, D. W., & Morgan, N. A. (2003). A Configuration Theory Assessment of Marketing Organization Fit with Business Strategy and Its Relationship with Marketing Performance. *Journal of Marketing, 67*(1), 100-115.

W3C (2004): Web Services Architecture Requirements, Retrieved 06.02.2009 from http://www.w3.org/TR/2004/NOTE-wsa-reqs-20040211/.

Wade, M., & Hulland, J. (2004). Review: The Resource-Based View and Information Systems Research: Review, Extension, and Suggestions for Future Research. MIS Quarterly, 28(1), 107-142.

Walker, R. M. (2008). An empirical evaluation of innovation types and organizational and environmental characteristics: towards a configuration framework. *Journal of Public Administration Research and Theory, 18*(4), 591-615.

Wallace, D. B., & Gruber, H. E. (Eds.). (1989). *Creative people at work: Twelve cognitive case studies*. Oxford University Press.

Wang, N., Liang, H., Zhong, W., Xue, Y., & Xiao, J. (2012). Resources Structuring or Capabilities Building? An Empirical Study of the Business Value of Information Technology. *Journal of Management Information Systems, 29*(2), 325-367.

Ward, P. T., Bicklord, D. J., & Leong, G. K. (1996). Configurations of Manufacturing Strategy, Business Strategy, Environment and Structure. *Journal of Management, 22*(4), 597-626.

Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare. *MIS Quarterly, 26*(2), 13-23.

Weick, K. E. (1976). Educational organizations as loosely coupled systems. *Administrative science quarterly*, 1-19.

Weick, K. E. (1993). The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster. *Administrative Science Quarterly, 38*(4), 628-652.

Weick, K. E. (1998). Improvisation as a mindset for organizational analysis, Organization Science, 9(5) 543-555.

Weiss, P., & Taruskin, R. (1984). comps. Music in the Western World: A History in Documents.

Wernerfelt, B. (1984) A Resource-based View of the Firm: Summary, Strategic Management Journal, 5(2), 171-180.

Winter, S.G. (2003). Understanding dynamic capabilities. *Strategic Management Journal*, 21(10-11), 991-995.

Wu, F., & Lee, Y. (2005). Determinants of e-communication adoption: The internal push versus external pull factor. *Marketing Theory, 5*(1), 7-31.

Xue, L., Ray, G., & Gu, B. (2011). Environmental Uncertainty and IT Infrastructure Governance: A Curvilinear Relationship. *Information Systems Research, 22*(2), 389-399. doi: 10.1287/isre.1090.0269

Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). Research commentary-The new organizing logic of digital innovation: An agenda for information systems research. *Information Systems Research, 21*(4), 724-735.

Zaefarian, G., Naudé, P., & Henneberg, S. C. (2010). Configuration theory assessment of business relationship strategies: conceptual model and hypothesis development. *Journal of Customer Behaviour, 9*(3), 299-316. doi: 10.1362/147539210X533205

Zahra, S.A., Sapienza, H.J., Davidsson, P. (2006). Entrepreneurship and dynamic capabilities: A review, model and research agenda. *Journal of Management Studies*, 43, 917-955.

Zaltman, G., Duncan, R., Holbek, J., (1973). Innovation and Organization. Wiley, New York.

Zammuto, R. F., Griffith, T. L., Majchrzak, A., Dougherty, D. J., & Faraj, S. (2007). Information technology and the changing fabric of organization. *Organization Science, 18*(5), 749-762.

Zollo, M. & Winter, S.G. (2002). Deliberate leaning and the evolution of dynamic capabilities. *Organization Science*, 13(3), 339-351.

Appendix A

Collection of Definitions of Organization Improvisation

Improvisation Definition	Author/year
A capability to strategically change daily operations to address new environmental situations	Galbraith 1990
the degree to which compositions and execution converge in time	Mangham and Pye1991:41
'improvisation involves reworking recomposed material and designs in relation to unanticipated ideas conceived, shaped, and transformed under the special conditions of performance, thereby adding unique features to every creation'	Berliner's (1994)
The ability to generate new combinations of resources to address turbulent environments	Ciborra 1996
"Making decisions and adapting to changing needs and conditions" "ideas emerge in new and creative ways not planned by the performer"	Crossan, White, Lane and Klus, 1996
Organizational change (= continuous improvisation)	Orlikowski 1996
A capability for frequent and endemic change	Brown and Eisenhardt 1997
"intuition guiding action in a spontaneous way"	Crossan & Sorrenti, 1997: 156
involves the reworking of pre-composed materials and designs in relation to unanticipated ideas conceived, shaped, and transformed under the special conditions of performance, thereby adding unique features to every creation	Weick, 1998
"the degree to which the composition and execution of an action converge in time"	Moorman and Miner 1998a
the conception of action as it unfolds. Drawing on available material, cognitive, affective, and social resources	Moorman and Mines 1998b: 698
"fabricating and inventing novel responses without a prescripted plan and without certainty of outcomes; discovering the future that action creates as it unfolds"	Barrett (1998)
An extemporaneous process leading to impromptu or "spur of the moment" action	Ciborra, 1999, p.78

"the conception of action as it unfolds, by an organization and/or its members, drawing on available material, cognitive, affective and social resources"	Cunha et al, 1999:302 Pham & Jordan 2006 adopt this definition
a distinct type of real-time, short-term learning; the deliberate and substantive fusion of the design and execution of a novel production Substantive rather than temporal convergence of planning and execution	Miner, Bassoff & Moorman, 2001
The ability to spontaneously recombine knowledge, processes and structure in real time, resulting in creative problem solving that is grounded in the realities of the moment.	McKnight & Bontis 2002
Improvisation occurs when the design and execution of novel activities converge.	Baker, Miner and Eesley, 2003
the spontaneous and creative process of attempting to achieve an objective in a new way As a spontaneous process, improvisation is extemporaneous, unpremeditated, and unplanned. As a creative process, improvisation attempts to develop something new and useful to the situation, although it does not always achieve this.	Vera and Crossan, 2004, p.733
"the convergence of conception and execution *	Mendonca, Cunha, Kaivo-oja and Ruff
is a conscious choice people make rather than a random behavior	Vera, D. and Crossan, M. 2005
improvisation is an organizational practice through which temporal synthesis can be achieved	Crossan, Cunha, Vera and Cunha, 2005: 142
Organizational improvisation is a type of short-term learning, where experience and related change occur at or near the same time.	Bergh and Lim, 2006, adopting Crossan, Cunha, Vera and Cunha, 2005
Improvisation may be seen as relating to how thoughts and action develop over time and in response to environmental cues and stimuli. "…improvisation is now seen as a positive skill in making meaningful decisions within a limited timescale, without the best information and resources." (p.14)	Leybourne, 2006

"…improvisation, i.e., the fusing of planning and execution …(p.15)"	
improvisational capabilities: the learned ability to spontaneously reconfigure operational capabilities	El Sawy & Pavlou, MISQ E, 7(3), Sep. 2008, 139-150
Organizational improvisation is defined as "conception as planning unfolds", meaning that thinking and doing happen simultaneously.	Gijs van Bilsen 2010 adopt definition from Cunha et al, 1999
"the deliberate and substantive fusion of the design and execution of a novel production"	Leone, 2010, following Miner, Bassoff & Moorman, 2001
the ability to spontaneously reconfigure existing resources to build new operational capabilities to address urgent, unpredictable, and novel environmental situations; not ad hoc or coincidental	Paulou & El Sawy, 2010. ISR 21(3)
Kind of planning (ad hoc, on-the-spot); a type of experiential learning	Doll & Deng 2011
improvisation is defined as an iterative process to transform ideas by the incorporation of the hospital's social and technical context to continue experimentation and treat mistakes as learning.	Say Yen Teoh & Nilmini Wickramasinghe 2011
the redefinition of the role of improvisation, which.., metaphorically, as a form of ''real time foresight''	Cunha, Clegg & Kamoche, 2012, P.265

APPENDIX B

Pre-test Instrument

Please rate the extent to which each item captures each aspect of the construct domain using a five point Likert scale from 1-5 where 1 = not at all; 5= completely

Rater Number: 001	***Speedy Responding*** is defined as the time lag between planning and execution.	***Reconfigurability*** is the ability to recombine and reuse available resources.	***Novel solution*** is the new idea or process built for a specific circumstance to solve a problem or to react to an environmental turbulence.	***Overall***
We respond to customers' demands immediately versus following a pre-defined script.				
We are able to deal with changes quickly without having to go through formal planning.				
We can respond in the moment to unexpected problems.				
We can successfully reconfigure our resources to react to customers' demand.				
We can quickly recombine available resources to solve problems.				

We are skillful in reusing existing resources to serve our customers.				
We can come up with new ideas with existing resources to serve our customers very quickly.				
We are creative in the ways to solve problems at the moment.				
We can come up with creative solutions for any unexpected situation.				

APPENDIX C

Pilot Test Instrument

You are invited to participate in a research study to examine a firm's improvisational capabilities, its IT architecture flexibility, and possible combinations of its performance.

This section is to get your evaluation of your organization's improvisational capabilities as in how fast and how well your organization respond to unexpected opportunities and threats such as new products on the market, customer's taste change, and maybe even natural disaster. Please indicate your agreement with the following statements.

Q2 We respond to new demands from customers immediately.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q3 We can successfully reconfigure our resources to react to customers' demands.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q4 We can come up with new ideas with existing resources to address unforeseen events.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q5 We are able to provide novel solutions to unanticipated problems.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q6 We are able to respond to changes quickly without having to go through formal planning.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q7 We can quickly recombine available resources to solve problems.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q8 We are skillful in reusing existing resources to serve our customers.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q9 We can respond at the moment to unexpected problems.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q10 We can develop creative solutions for unperceived situations.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

This section is to get your evaluation of your organization's IT architecture flexibility. Please indicate your agreement to the following statements.

Q12 There is very low simultaneous interdependence for our IT services.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q13 Reusable software modules are widely used throughout our systems development unit.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q14 Components can be easily added or removed in our IT applications and processes without changes to other components.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q15 Our IT applications and processes can call other services regardless of its location.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q16 My firm's IT modules do not rely on other modules to function.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q17 Our IT components can be easily separated and recombined for different arrangements.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q18 We use standards that are available to the general public.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q19 We use standards that are developed (or approved) and maintained by collaboration and consensus.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q20 We use open standards for our IT architecture.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

This section is to get your insight of the business environment your organization is in.

Dynamism reflects the unpredictable rate of environmental change in an industry. Please rate the dynamism of your industry in the following areas over the past five years.

Q23 Market activities change of your key competitors

- ❍ 1.have become far more predictable (1)
- ❍ 2. have become somewhat predictable (2)
- ❍ 3. no change (3)
- ❍ 4. have become less predictable (4)
- ❍ 5. have become far less predictable (5)

Q24 The tastes and preferences change of your customers in your principal industry

- ❍ 1. have become far more predictable (1)
- ❍ 2. have become somewhat predictable (2)
- ❍ 3. no change (3)
- ❍ 4. have become less predictable (4)
- ❍ 5. have become far less predictable (5)

Q25 The rate of innovation of new operating processes and new products or services in your industry

- ❍ 1. have become far more predictable (1)
- ❍ 2. have become somewhat predictable (2)
- ❍ 3. no change (3)
- ❍ 4. have become less predictable (4)
- ❍ 5. have become far less predictable (5)

Munificence refers to the opportunities for growth within an industry. Please rate the munificence of your industry.

Q27 Demand for the products and services of your industry have been growing rapidly.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q28 The investment opportunities for firms of your industry have been extremely favorable.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q29 The marketing opportunities for firms of your industry have been extremely favorable.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Complexity: the range and the differences (heterogeneity) that exist across an industry and or across an organization's activities. Please rate the complexity of your industry.

Q31 We have a great diversity in our marketing tactics to attract different types of customers.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q32 Customers in our industry demand wide variety in products and services.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q33 Our competitors use many different tactics to attract customers.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

This section is to get your insight of your internal organization factors. Please indicate your agreement of the following statements.

Q35 The top management of my company believes that flexible IT resources can provide significant business benefits to the company.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q36 The top management of my company thinks that having flexibility in IT resources is very important.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q37 Our top management encourages creating fast solutions to rapidly developing challenges.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q38 Our top management support training of reacting to novel situations with creative solutions quickly.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q39 We can successfully reconfigure our resources to come up with new productive assets.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q40 We can effectively integrate and combine existing resources into new combinations.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q41 We often engage in resource recombinations to better match our product-market areas and our assets.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree

The following section is to get some information about your organization.

Q43 Organizational size: how many full time employees in your firm?

Q44 IT department size: how many full time employees in your IT department?

Q45 your industry

Q46 The structure of my firm is flat.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q47 Our management decision making structure is informal.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q48 In my firm, errors are considered a source of learning.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q49 In my firm, there is room for initiative.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q50 In my firm, we are encouraged to take risks when trying new ideas.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q51 Over the past 3 years, our financial performance has been outstanding.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q52 Over the past 3 years, we have been more profitable than our competitors.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q53 Over the past 3 years, our sales growth had been outstanding.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q54 We have entered new market more quickly than our competitors.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q55 Our success rate of new products or services has been higher than our competitors.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q56 Our market share has exceeded that of our competitors.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

APPENDIX D

Final Survey Instrument

Are you a CIO, CTO or Director of IT?

Does your firm do business online (pure click (solely online), or hybrid- both online and has storefront (brick-and-click)?

You are invited to participate in a research study to examine a firm's *improvisational capabilities, its IT architecture flexibility*, and possible combinations for its performance.

This section is to get your evaluation of your organization's improvisational capabilities as in how fast and how well your organization respond to unexpected opportunities and threats, and maybe even natural disaster. Please indicate your agreement with the following statements.

Q1. We can successfully reconfigure our resources to react to unexpected customers' demands.

Q2. We are skillful in reusing existing resources to serve our customers.

Q3. When unexpected technology breakthrough directly affects us, we can respond quickly by recombining existing resources.

Q4. When unplanned for events happen, we are able to resolve the problems using available resources.

Q5 We are able to provide novel solutions to unanticipated problems.

Q6 We can respond at the moment to unexpected problems.

Q7 We can come up with new ideas with existing resources to address unforeseen events.

Q8 We can quickly recombine available resources to solve problems.

This section is to get your evaluation of your organization's IT architecture flexibility.

Q18 We use standards that are available to the general public. OS1

Q20 We use open standards for our IT architecture. OS3

Q15 Our IT applications and processes can call other services regardless of its location. LC2

Q16 My firm's IT modules do not rely on other modules to function. LC3

Q12 There is very low simultaneous interdependence for our IT services. LC1

Q13 Reusable software modules are widely used throughout our systems development unit. MD1

Q17 Our IT components can be easily separated and recombined for different arrangements. MD3

This section is to get your insight of the business environment your organization is in.

Dynamism reflects the unpredictable rate of environmental change in an industry.

Please rate the dynamism of your industry in the following areas over the past five years.

Q23 Market activities change of your key competitors

- 1.have become far more predictable (1)
- 2. have become somewhat predictable (2)
- 3. no change (3)
- 4. have become less predictable (4)
- 5. have become far less predictable (5)

Q24 The tastes and preferences change of your customers in your principal industry

- 1. have become far more predictable (1)
- 2. have become somewhat predictable (2)
- 3. no change (3)
- 4. have become less predictable (4)
- 5. have become far less predictable (5)

Q25 The rate of innovation of new operating processes and new products or services in your industry

- ❍ 1. have become far more predictable (1)
- ❍ 2. have become somewhat predictable (2)
- ❍ 3. no change (3)
- ❍ 4. have become less predictable (4)
- ❍ 5. have become far less predictable (5)

Munificence refers to the opportunities for growth within an industry.

Please rate the munificence of your industry.

Q27 Demand for the products and services of your industry have been growing rapidly.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q28 The investment opportunities for firms of your industry have been extremely favorable.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q29 The marketing opportunities for firms of your industry have been extremely favorable.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Complexity: the range and the differences (heterogeneity) that exist across an industry and or across an organization's activities.

Please rate the complexity of your industry.

Q31 We have a great diversity in our marketing tactics to attract different types of customers.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q32 Customers in our industry demand wide variety in products and services.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q33 Our competitors use many different tactics to attract customers.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

This section is to get your insight of your internal organization factors. Please indicate your agreement of the following statements.

Q35 The top management of my company believes that flexible IT resources can provide significant business benefits to the company.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q36 The top management of my company thinks that having flexibility in IT resources is very important.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q37 Our top management encourages creating fast solutions to rapidly developing challenges.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q38 Our top management support training of reacting to novel situations with creative solutions quickly.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q39 We can successfully reconfigure our resources to come up with new productive assets.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q40 We can effectively integrate and combine existing resources into new combinations.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q41 We often engage in resource recombinations to better match our product-market areas and our assets.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

The following section is to get some information about your organization.

Q43 Organizational size: how many full time employees in your firm? _____

Q44 IT department size: how many full time employees in your IT department? _____

Q45 your industry _____

Q46 The structure of my firm is flat.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q47 Our management decision making structure is informal.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q48 In my firm, errors are considered a source of learning.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q49 In my firm, there is room for initiative.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q50 In my firm, we are encouraged to take risks when trying new ideas.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q51 Over the past 3 years, our financial performance has been outstanding.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q52 Over the past 3 years, we have been more profitable than our competitors.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q53 Over the past 3 years, our sales growth had been outstanding.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q54 We have entered new market more quickly than our competitors.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q55 Our success rate of new products or services has been higher than our competitors.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)

Q56 Our market share has exceeded that of our competitors.

- ❍ Strongly Disagree (1)
- ❍ Disagree (2)
- ❍ Neither Agree nor Disagree (3)
- ❍ Agree (4)
- ❍ Strongly Agree (5)