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Dynamic and Improvisational Capabilities in Small Defense Contractor Firms: An Investigation into the Role of IT Enabled Business Processes

Gabriel Beltran

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Dynamic and Improvisational Capabilities in Small Defense Contractor Firms: An Investigation

into the Role of IT-Enabled Business Processes

BY

Gabriel Beltran

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree

of

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ACCEPTANCE

This dissertation was prepared under the direction of the GABRIEL BELTRAN'S Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctoral of Philosophy in Business Administration in the J. Mack Robinson College of Business of Georgia State University.

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LIST OF ABBREVIATIONS

(In Alphabetical Order)

AMC - Awareness-Motivation-Capability

CCR - Central Contractors Registry

CRM – Customer Relations Management

CWS - Cooperative Work Systems

DAS - Defense Acquisition System

DoD – Department of Defense

FAR – Federal Acquisition Regulation

FASA - Federal Acquisition Streamlining Act

IED - Improvised Explosive Devises

IT - Information Technology

MCSC – Marine Corps Systems Command

NPD – New Product Development

OMS - Organizational Memory Systems

PRMS - Project and Resource Management Systems

RBV – Resource-Based View

RFP – Request For Proposal

SAM - System for Award Management

TINA - Truth in Negotiations Act

ABSTRACT

Dynamic and Improvisational Capabilities in Small Defense Contractor Firms: An Investigation

into the Role of IT Enabled Business Processes

BY

Gabriel Beltran

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In turbulent environments where the competitive landscape is shifting and uncertain, the dynamic capabilities by which firm manager's, integrate, build, and reconfigure internal and external competences becomes the source of sustained competitive advantage. As they attempt to reconfigure their organizational competencies, firms are turning to Information Technology (IT) resources as an enabling resource. While the importance of dynamic capabilities has been widely recognized, in today's fast paced and ever changing business landscape, the need for improvisational capabilities has also been underscored. Whereas dynamic capabilities refer to the ability to respond to change through "planned" reconfiguration in moderately turbulent times, improvisational capabilities refer to the ability to respond to change through "spontaneous" reconfiguration in highly turbulent times. This study begins to defragment dynamic and improvisational capability literature and demonstrate the need for these two complementary capabilities. This study also develops and offers an initial prescription for executing these

complementary capabilities. This study highlights the significant differences in the execution of

dynamic and improvisational capabilities at the sub-routine level. Lastly, this study offers

valuable insight into how IT can enable both dynamic and improvisational capabilities.

I INTRODUCTION

Today's defense industry is as competitive, complex, and unpredictable as it has ever been. Unpredictable competitive actions of defense contractors, the complexity of emerging technologies and customer requirements, and the unpredictability associated with foreign wars and defense budgets, has created an environment of rapid changes and uncertain future for small defense contractors. These organizations are rethinking strategies, rebuilding organizational structures, and passionately competing for the waning defense dollars. The resulting industry has emerged as one characterized by constant and unrelenting turbulence.

Turbulence can present itself as moderate when small predictable changes occur or as high velocity when large unexpected changes occur. Eisenhardt and Martin (2000) state that moderately dynamic markets are ones in which change occurs frequently, but along roughly predictable linear paths. In contrast, when markets are very dynamic or what is termed "high velocity," change becomes nonlinear or less predictable. Recent research suggests that industry turbulence can occur as "waves," that are roughly predictable, and as "storms," which are strong and occur unexpectedly (Pavlou & El Sawy, 2010).

In the face of unrelenting and constant turbulence, defense industry executives and managers are striving to stay ahead of competitors and satisfy increasingly demanding customers. In order to be successful they must monitor the changing environment and quickly respond to changes by reconfiguring existing resources to create efficient and effective processes and relevant competencies. In turbulent environments where the competitive landscape is shifting, Teece et al. (1997) submit that firm-specific capabilities or the dynamic capabilities by which firm managers, integrate, build, and reconfigure internal and external competences to address rapidly changing environments becomes the source of sustained competitive advantage.

While the dynamic capabilities literature is vast, it is also varied. Dynamic capabilities literature has been fragmented and sometimes vague. Pavlou and El Sawy (2011) note that different labels have been used in the literature to refer to similar capabilities, or similar labels have been used to refer to different capabilities. They have attempted to reconcile the various labels and meanings from the literature, and group them under the following parsimonious set of dynamic capabilities for reconfiguring existing operational capabilities. They are: (i) sensing; (ii) learning, (iii) integrating, and (iv) coordinating capabilities.

Firms are increasingly turning to their Information Technology (IT) resources to facilitate dynamic capabilities with the hopes of staying competitive in their industry. Teece and Pisano (1994) state that since most of the valuable assets inside any firm are knowledge related, the coordination and integration of such assets create value that cannot be easily replicated in a market. In today's business environment, practitioners and scholars agree that IT-enabled business processes can be a major driver of competitive advantage (Chi, Holsapple, & Srinivasan, 2008; El Sawy & Pavlou, 2008). The linkage between IT enablement and competitive advantage becomes even more critical as firms struggle to keep pace in turbulent environments. Through IT enablement, they are attempting to reconfigure existing operational capabilities better and faster than their industry competitors.

While the literature has emphasized the importance of organizational dynamic capabilities for some time, researchers have begun to realize and emphasize the need for organizational improvisational capabilities (Eisenhardt & Martin, 2000; El Sawy & Pavlou, 2008). Whereas dynamic capabilities refer to the ability to respond to change through "planned" reconfiguration in moderately turbulent environments, improvisational capabilities refer to the

ability to respond to change through "spontaneous" reconfiguration in highly turbulent environments (El Sawy & Pavlou, 2008).

Although extensive literature exists on the concepts of dynamic capabilities and IT enablement, there are few studies that address the concept of improvisational capabilities. Accordingly, this study examines small defense contractor firms' ability to be dynamic and improvisational in the reconfiguration of their business processes through IT enablement. The research question guiding the study is: How are small defense contracting firms achieving dynamic and improvisational capabilities through IT enablement? To pursue the answer to this question, I begin by determining if the proper industry context is present, that is does the defense industry experience both moderate velocity turbulence and high velocity turbulence? Next, I determine if the proper firm context is present, that is are the firms demonstrating both dynamic and improvisational capabilities? I then examine how IT is facilitating or enabling dynamic and improvisational capabilities using the proposed set of dynamic capabilities - sensing, learning, integrating, and coordinating capabilities (Pavlou and El Sawy 2011).

The remainder of this thesis begins with an overview of the defense contracting industry. This is followed by a literature review of dynamic capabilities and improvisational capabilities, IT as an enabler of dynamic and improvisational capabilities, and competitive advantage. Next, I describe the research methodology used in the study. I follow with the research findings, and then a discussion of the findings. Finally, I present contributions to theory, recommendations for practice, and a conclusion.

II THE DEFENSE INDUSTRY

II.1 The Federal Acquisition Process

The method by which the federal government obtains both supplies and services is commonly referred to as the Federal Acquisition Process. The government uses this process to enter into contracts with private industry for the procurement of goods and services. The objective of the process is not only to obtain goods and services, but also to ensure the government gets what it needs on time and at a fair and reasonable price. The government enters into contracts under the authority of the constitution's preamble, which states the Federal Government shall, "…provide for the common defense, promote the general Welfare, and secure the Blessings of Liberty….". Funding in support of government contracting comes by way of congressional appropriations. In this research I discuss defense appropriations as related to the procurement of goods and services.

The Federal Acquisition Regulation (FAR) is a set of rules in the Federal Acquisition Regulation System, which guides the Federal Government in their procurement of goods and services. The Statement of Guiding Principles for the Federal Acquisition System contained in the FAR offers a concise statement intended to be user friendly for all participants in the process. FAR subpart 1.102 states:

"(a) The vision for the Federal Acquisition System is to deliver on a timely basis the best value product or service to the customer, while maintaining the public's trust and fulfilling public policy objectives. Participants in the acquisition process should work together as a team and should be empowered to make decisions within their area of responsibility.

(b) The Federal Acquisition System will—

(1) Satisfy the customer in terms of cost, quality, and timeliness of the delivered product or service by, for example—(i) Maximizing the use of commercial products and services; (ii) Using contractors who have a track record of successful past performance or who demonstrate a current superior ability to perform; and (iii) Promoting competition;

(2) Minimize administrative operating costs;

(3) Conduct business with integrity, fairness, and openness; and

(4) Fulfill public policy objectives.

(c) The Acquisition Team consists of all participants in Government acquisition including, not only representatives of the technical, supply, and procurement communities, but also the customers they serve, and the contractors who provide the products and services.

(d) The role of each member of the Acquisition Team is to exercise personal initiative and sound business judgment in providing the best value product or service to meet the customer's needs. In exercising initiative, Government members of the Acquisition Team may assume if a specific strategy, practice, policy or procedure is in the best interests of the Government and is not addressed in the FAR, nor prohibited by law (statute or case law), Executive order or other regulation, that the strategy, practice, policy or procedure is a permissible exercise of authority."

The Statement of Guiding Principles for the Federal Acquisition System offers a brief summary of exactly how the acquisition process is carried out. The statement guides the Government Contracting Officers, who have authority to legally bind the government as well as the defense contractors providing services or supplies to the government. Four federal procurement laws have a significant effect on federal procurements. These statutes and their intended purposes are as follows:

1. The Competition in Contracting Act of 1984 (CICA) Pub.L. 98-369 (Title VII), which shifted the focus from the method of procurement to the use of sources of procurement. This statute governs "whom" you procure from, as opposed to "how" you procure. The previous law emphasized formal advertising over negotiated procurements; CICA emphasizes the use of competitive procurements.

2. The Small Business and Federal Procurement Competition Enhancement Act of 1984, Pub.L. 98-57. This act was intended to eliminate unfair procurement procedures that inhibited free and open competition. It also was intended to create opportunities for small businesses in competitive procurements.

3. The Defense Procurement Reform Act of 1984, Pub.L. 98-525. This act was a collection of congressional initiatives designed to improve the effectiveness of the Department of Defense acquisition process.

4. Federal Acquisition Streamlining Act (FASA) of 1994 Pub.L. 103-355. This act repealed or modified over 225 other provisions of law that affected the acquisition process. Some of the areas affected were; a simplified acquisition threshold, electronic commerce, Truth in Negotiations Act (TINA), contract formations, bid protests, and contract administration.

II.2 Actors in the Acquisition Process

Guided by Acquisition Law and the Federal Acquisition Regulation, government-contracting officers enter into contracts with government contractors for the procurement of goods and services. It is the government contracting officer and the government defense contractor that are two actors of interest in this research.

Contracting officers are appointed in writing and awarded a Certificate of Appointment by the head of a government agency. Each contracting officer has certain limitations imposed on

their overall authority and those limitations are annotated on the Certificate of Appointment. Contracting officers have authority to enter into, administer, and terminate contracts. They are responsible for ensuring the performance of all necessary actions for effective contracting, ensuring compliance with the terms of each contract, and safeguarding the interests of their Agency or the United States in its contractual relationships (Hearn, 1999).

No government contract can be entered into unless the contracting officer ensures that all requirements of all contracting and acquisition laws are met. The government contractor, or defense contractor, as they will be referred to in the remainder of this study, are employees of a private corporations, or other business formations, who engage in the practice of selling services or goods to the department of defense. Just as the federal government has contracting officers, the defense industry employs contracting managers, administrators and specialists. The private entity contracting team interfaces with the government contracting officer in the execution of their contracting duties.

II.3 Small Defense Contractor Firms

Small defense contractor firms are project based service providers and as such they are constantly responding to Requests for Proposal (RFP) to the federal government. Contractor responses, or proposal, are tailored to address the specific requirements of each RFP, and the Statement of Work (SOW) contained within each RFP. Each proposal submitted allows these firms the opportunity to be competitively awarded a contract for services, which usually range in duration from 3 to 5 years. Project based service contracts have a lifecycle, or a firm beginning and end date. Contracts awarded are usually structured with a base year, with additional option years, typically. The government customer can exercise each option year or may choose to re-

compete the work and not exercise an option year. Reasons not to exercise an option year could be poor performance on the contractor's part or a change to the project requirements.

In order to write and submit a proposal, small businesses form capture teams with an appointed capture manager who typically reports to a division manager and is responsible for overseeing the formation of the proposal and the submittal. It is important to mention that small businesses do not make an offer or bid for every opportunity. Firms go through an extensive opportunity identification and evaluation decision process as they elect to bid or not bid for an opportunity. If they elect to bid, they determine their best estimate of, or probability of winning (p-win), and the monetary value of the opportunity to determine how much of a firm's resources are dedicated to the proposal effort.

While small defense contractors are competing within their industry to gain opportunities, they must all be concerned with sustainment of current, or previously captured work. They do this by attempting to provide highly qualified personnel in the industry. There is constant battle between competitors to attract, recruit, and retain talent in the industry. Small contractors are forced to compete for talent not only amongst themselves, but with large defense contractors as well. The hope is that highly qualified personnel will provide efficient and effective service to the customer thereby keeping the small defense contractor in favor with the government customer.

There is also a link between sustaining existing work and obtaining new work. Since small defense contractors perform services for the Federal Government, they are subject to statutory and regulatory compliance standards. Within these standards is the standard of "responsibility." An offerer must be deemed a "responsible offerer." A responsible offerer must meet two primary factors for consideration of a competitively awarded a contract. First, they

must demonstrate that they will complete the contract in a satisfactory and timely manner. Second, the contractor must meet collateral statutory and regulatory qualifications criteria, such as socio-economic goals. The first criterion is typically demonstrated through successful completion of analogous work.

III.1 Dynamic Capabilities

The resource-based view of a firm (RBV) is well-established theoretical framework for understanding how firms achieve competitive advantage and how they sustain that advantage (Barney, 1991; Eisenhardt & Martin, 2000; Nelson, 1991; Penrose, 1959; Peteraf, 1993; Prahalad & Hamel, 1990; Schumpeter, 1934; Teece, Pisano, & Shuen, 1997; Wernerfelt, 1984). RBV asserts that firms can be thought of as bundles of resources and that the resources are heterogeneously distributed across firms. RBV also assumes that resource differences persist over time (Amit & Schoemaker, 1993; Eisenhardt & Martin, 2000; Mahoney & Pandian, 1992; Penrose, 1959; Wernerfelt, 1984). Based on these assumptions, researchers have theorized that when firms have resources that are valuable, rare, inimitable, and non-substitutable they can achieve sustainable competitive advantage by implementing fresh value-creating strategies that cannot be easily duplicated by competing firms (Barney, 1991; Conner & Prahalad, 1996; Eisenhardt & Martin, 2000; Nelson, 1991; Peteraf, 1993; Wernerfelt, 1984). Looking beyond RBV, firms in today's rapidly changing markets must demonstrate responsiveness coupled with innovation. Firms must also have the leadership and management necessary to innovate and redeploy not just internal, but external competencies as well. This approach to competitive advantage, the dynamic capability approach, has two key emphases. First, it refers to the shifting character of the environment; second, it refers to the key role of management in appropriately adapting, integrating, and re-configuring internal and external organizational skills, resources, and functional competences toward a changing environment (Teece et al., 1997). Teece and Pisano (1994) argue that the competitive advantage of firms' stems from dynamic capabilities

rooted in high performance routines operating inside the firm, embedded in the firm's processes, and conditioned by its history.

Teece and Pisano (1994) propose three organizational and managerial processes, 1) coordination/integrating, 2) learning, and 3) reconfiguring — as core elements of dynamic capabilities. Coordination and integration refer to a manager's ability to coordinate and integrate both internally and externally. Learning is the process by which repetition and experimentation allow for tasks to be completed more effectively and more efficiently. Learning includes both organizational and individual learning. Reconfiguration is the ability to sense the environment and determine when asset structures need to be transformed both internally and externally. Teece and Pisano (1994) point out that these processes are a subset of the processes that support sensing, seizing, and managing threats and further suggest that together they might be thought of as asset 'orchestration' processes.

Teece et al. (1997) define dynamic capabilities as the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments. Teece and colleagues state that the term 'dynamic' refers to the capacity to renew competences so as to achieve congruence with the changing business environment; certain innovative responses are required when time-to-market and timing are critical, the rate of technological change is rapid, and the nature of future competition and markets difficult to determine. Further they state the term 'capabilities' emphasizes the key role of strategic management in appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competences to match the requirements of a changing environment. They also state that dynamic capabilities reside in large measure with the enterprise's top management team, but

are impacted by the organizational processes, systems, and structures that the enterprise has created to manage its business.

Dynamic capabilities are not tautological, vague, and endlessly recursive (Teece et al., 1997). Dynamic capabilities actually consist of many well-known processes, "such as alliancing, product development, and strategic decision making that have been studied extensively in their own right, apart from RBV" (Eisenhardt & Martin, 2000). They also state that the value for competitive advantage lies in their ability to alter the resource base by creating, integrating, recombining, and releasing resources.

The effectiveness of dynamic capabilities is dependent on market dynamism (Eisenhardt & Martin, 2000). Dynamic capabilities rely on factors such as existing knowledge. Moderately dynamic markets are those with frequent change, but they change along predictable linear pathways. Moderately dynamic markets are relatively stable in their industry structures with clear boundaries and players (e.g., competitors, customers, complementers). In moderately dynamic markets, effective dynamic capabilities rely on existing knowledge. Managers analyze situations in the context of their existing tacit knowledge and rules of thumb, and then plan and organize their activities in a relatively orderly fashion (Burns & Stalker, 1961). Managers develop efficient processes that are predictable and relatively stable with linear steps, beginning with analysis and ending with implementation (Helfat, 1997).

In contrast, when markets are very dynamic or what is termed 'high velocity' (e.g., Eisenhardt, 1989), change becomes nonlinear and less predictable (Eisenhardt & Martin, 2000). High-velocity markets are ones in which market boundaries are blurred, successful business models are unclear, and market players (i.e., buyers, suppliers, competitors, complementers) are ambiguous and shifting. The industry structure in high velocity markets is unclear. Future

uncertainty does not follow a predictable pattern; therefore modeling cannot be of much help. In high velocity markets dynamic capabilities rely more on emerging situation dependent new knowledge unlike moderate markets that depend on existing knowledge. Existing knowledge can actually be a disadvantage if managers overgeneralize from past situations (Argote, 1999).

Effective dynamic capabilities in high velocity markets are simple, not complicated as they are in moderately dynamic markets (Eisenhardt & Martin, 2000). The simple routines keep managers focused on the situation at hand while allowing them to develop new knowledge as opposed to using old existing knowledge that may or may not apply. Eisenhardt and Martin (2000) state that simple routines consist of a few rules that specify boundary conditions on the actions of managers or indicate priorities, and are more appropriate in fast-moving markets where attention is in short supply.

While dynamic capabilities are simple in high velocity markets, they are not without structure (Burns & Stalker, 1961; Lawrence & Lorsch, 1967). Simple routines provide enough structure (i.e., semi-structure) so that people can focus their attention amid the noise of considerable information and possibilities, help provide sensemaking about the situation, and help people act with confidence in these highly uncertain situations where it is easy to become paralyzed by anxiety (Eisenhardt & Martin, 2000).

In high-velocity markets dynamic capabilities involve the creation of new, situation-specific knowledge and not involve the extensive use of tacit knowledge or complex social routines that cannot be codified even if they may be present. Engaging in experiential actions to learn quickly and compensate for limited, relevant existing knowledge creates situation specific knowledge (Eisenhardt and Martin, 2000). Dynamic capabilities often use prototyping and early testing to gain new knowledge quickly. Such actions create rapid learning through small losses

and immediate feedback (Argote, 1999; Sitkin, 1992). Dynamic capabilities in high velocity markets proceed in an iterative fashion. Managers adjust to new information and changing conditions, they engage in more recycling through steps such as developing alternatives and implementation that would be linear in moderately dynamic markets (Eisenhardt & Martin, 2000). Dynamic capabilities in high velocity markets rely on real-time information, cross functional team relationships, and constant communication amongst those involved in the process and with those external to the organization but still involved with the process. Real time information helps people adjust their plans since problems and opportunities are spotted more quickly than when individuals are more distant from information. Real-time information also builds intuition about the marketplace such that managers can more quickly understand the changing situation and adapt to it (Eisenhardt, 1989). Dynamic capabilities in these markets are characterized by multiple courses of action and implementation of multiple options. Beginning with multiple courses of action provides alternative action choices to facilitate change as situations change (Eisenhardt, 1989). Eisenhardt and Martin (2000) point out that multiple courses of action also give managers the confidence to act more quickly since they have basis for comparison. The emotional inability to cope with uncertainty is a major factor that slows down managers in high-velocity markets (Eisenhardt, 1989).

The effects of market dynamism on dynamic capabilities have several implications (Eisenhardt & Martin, 2000). One is that sustainability of the capabilities themselves varies with the dynamism of the market. In moderately dynamic markets, dynamic capabilities resemble the traditional conception of routines (Cyert & March, 1963; Nelson & Winter, 1982; Zollo & Winter, 1999). Capabilities are complicated, predictable, analytic processes that rely extensively on existing knowledge, linear execution and slow evolution over time (Eisenhardt & Martin,

2000). They point out that as managers gain experience exercising these capabilities and as codification takes place, they become engrained in the organization, which makes them sustainable and even inertial. Codification of the routines through the technology or formal procedures enhances that sustainability (Argote, 1999).

Dynamic capabilities can be disaggregated into the capacity (1) to sense and shape opportunities and threats, (2) to seize opportunities, and (3) to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise's intangible and tangible assets (Teece, 2007). Dynamic capabilities include difficult to duplicate enterprise level capabilities required to adapt to changing customer and technological opportunities. They also embrace the enterprise's capacity to shape the ecosystem it occupies, develop new products and processes, and design and implement viable business models (Teece, 2007).

With regard to sensing and shaping opportunities and threats, Teece (2007) asserts that in fast-paced, globally competitive environments, consumer needs, technological opportunities, and competitor activity are constantly in a state of flux. He further submits that opportunities open up for both newcomers and incumbents, putting the profit streams of incumbent enterprises at risk. Teece et al. (1997) states that while some emerging marketplace trajectories are easily recognized, most emerging trajectories are hard to discern. Sensing (and shaping) new opportunities are very much a scanning, creation, learning, and interpretive activity (Teece, 2007).

Top management leadership skills are required to sustain dynamic capabilities (Teece, 2007). Amongst these skills is the ability to continuously orchestrate assets and corporate renewal, including the redesign of routines. This is because the sustained achievement of

superior profitability requires semi-continuous and/or continuous efforts to build, maintain, and adjust the complementarity of product offerings, systems, routines, and structures (Teece, 2007). While these changes in routines are occurring the new routines must complement the old routines left in place, they must be appropriately integrated. Otherwise, work will not proceed efficiently, and conflicts of one kind or another will arise. Teece (2007) states that periodic if not continuous asset orchestration, involving achieving asset alignment, co-alignment, realignment, and redeployment is necessary, to minimize internal conflict and to maximize complementarities and productive exchange inside the enterprise.

It is important to distinguish and understand dynamic capabilities as they relate to operational capabilities. Winter (2003) states that capabilities are collections of routines and capabilities describe how effectively routines are executed relative to the competition (Nelson & and Winter, 1982). According to Winter (2003) while both operational and dynamic capabilities are collections of routines, dynamic capabilities describe the ability to reconfigure and change, whereas operational capabilities denote the ability to "make a daily living." Dynamic capabilities govern the change of operational capabilities by reconfiguring them to keep them relevant to the changing environment (Collis, 1994).

Pavlou and El Sawy (2011) offer a proposed set of dynamic capabilities by relying on the work of Eisenhardt and Martin (2000) who note: "dynamic capabilities actually consist of identifiable and specific routines that often have been the subject of extensive empirical research in their own right." Pavlou and El Sawy (2011) suggest that dynamic capabilities are tools for reconfiguring existing operational capabilities and involve (i) sensing; (ii) learning, (iii) integration, and (iv) coordination capabilities. These dynamic capabilities are neither exhaustive

nor sufficient for reconfiguration to occur, but they are posited as important enablers of the

ability to reconfigure operational capabilities. Their view is summarized in Figure 1:

Figure 1: A framework for representing the proposed measurable model of dynamic capabilities.
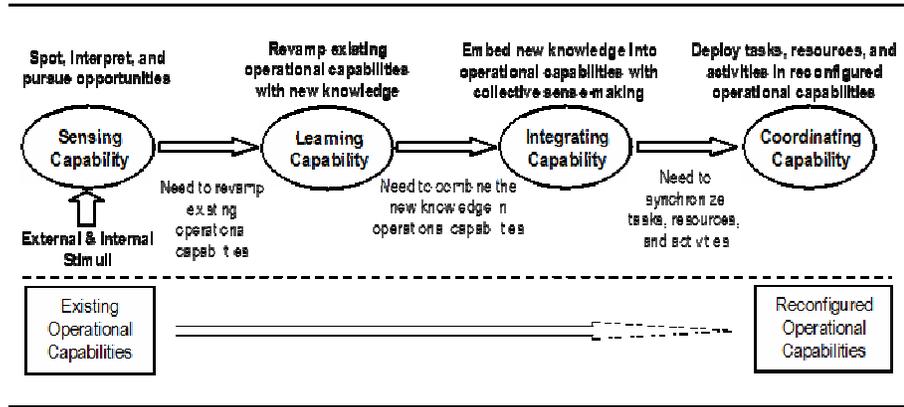
Figure 1 Framework

Reproduced from Pavlou and El Sawy (2011)

Pavlou and El Sawy view dynamic capabilities as distinct capabilities with subroutines.

This is consistent with other literature (Brown & Eisenhardt, 1997) which also views dynamic

capabilities as complex combinations of simpler routines. Pavlou and El Sawy (2011) offer the

following definitions of sensing, learning, integrating, and coordinating capabilities.

Table 1 Dynamic Capabilities Definitions

Sensing Capability	The ability to spot, interpret, and pursue opportunities in the environment.
Learning Capability	The ability to revamp existing operational capabilities with new knowledge
Integrating Capability	The ability to embed new knowledge into the new operational capabilities by creating a shared understanding and collective sense-making.
Coordinating Capability	The ability to orchestrate and deploy tasks, resources, and activities in the new operational capabilities.

Pavlou and El Sawy (2011) define sensing capability as the ability to spot, interpret, and pursue opportunities in the environment. To accomplish reconfiguration of operational capabilities firms must continuously survey market trends and new technologies to sense and capitalize on new opportunities. Teece et al. (1997) note, "The ability to calibrate the requirements for change and to effectuate the necessary adjustments would appear to depend on the ability to scan the environment, to evaluate markets and competitors, and to quickly accomplish reconfiguration ahead of competition."

Pavlou and El Sawy (2011) identify the three basic routines of the sensing capability as: (i) generating market intelligence (Galunic & Rodan, 1998), (ii) disseminating market intelligence (Kogut & Zander, 1996), and (iii) responding to market intelligence (Teece, 2007). These routines are related to kindred routines in the dynamic capabilities literature. Generating market intelligence relates to identifying customer needs (Teece, 2007), being responsive to market trends (Amit & Schoemaker, 1993), identifying market opportunities (Day, 1994), recognizing rigidities (Sinkula, 1994), and detecting resource combinations (Galunic & Rodan, 1998). Pavlou and El Sawy (2011) state that disseminating market intelligence relates to

interpreting market intelligence (Kogut & Zander, 1996), making sense of events and developments, and exploring new opportunities (Teece, 2007). Responding to market intelligence also relates to initiating plans to capitalize on market intelligence (D'Aveni, 1994), and pursuing specific market segments with plans to seize the new market opportunities (Teece, 2007).

Pavlou and El Sawy (2011) define a learning capability as the ability to revamp existing operational capabilities with new knowledge. According to Zahra and George (2002) who propose that absorptive capacity (learning) is a dynamic capability, the four underlying routines of the learning capability are acquiring, assimilating, transforming, and exploiting knowledge. Pavlou and El Sawy (2011) note that routines relate to kindred terms in the dynamic capabilities literature. They state that first, acquiring knowledge relates to obtaining new knowledge (Cohen & Levinthal, 1990). Second, assimilating knowledge relates to knowledge articulation (Zander & Kogut, 1995) and knowledge brokering (Eisenhardt & Martin, 2000). Third, transforming knowledge relates to innovative problem solving (Iansiti & Clark, 1994), brainstorming (Pisano, 1994), and creative new thinking (Henderson & Cockburn, 1994). Finally, exploiting knowledge relates to pursuing new initiatives (Van Den Bosch, Volberda, & De Boer, 1999), seizing opportunities with learning (Teece, 2007), and revamping operational capabilities (Grant, 1996).

Pavlou and El Sawy (2011) define integrating capability as the ability to combine individual knowledge into the unit's new operational capabilities. The note that integrating routines: contribution, representation, and interrelation of individual input to the collective business unit, are closely related to dynamic capabilities. Specifically, contribution relates to disseminating individual input within the business unit (Okhuysen & Eisenhardt, 2002). Representation relates to visualizing how people fit in, how other people act, and how the unit's

activities fit together (Crowston & Kammerer, 1998). Interrelation relates to integrating individual inputs within a unit to hone the reconfigured operational capabilities by executing a collective activity (Helfat & Peteraf, 2003).

Integrating capability facilitates reconfiguration through its three basic routines (Pavlou and El Sawy, 2011). They state that first, contribution to the unit helps collect and combine individual inputs. Second, representation builds a shared understanding, creates a common ground, and develops new perceptual schema (Weick & Roberts, 1993). Third, because reconfiguration requires a new logic of collective interaction, interrelation helps the routinization of the reconfigured operational capabilities (Okhuysen & Eisenhardt, 2002). Weick and Roberts (1993) argue that groups with more integrated capabilities can better react in novel situations, whereas Zollo and Winter (2002) view dynamic capability as a collective activity by arguing that reconfiguring in a disjointed way does not even exercise a dynamic capability. Finally, Teece (2007) views the integration of knowledge as a foundation of dynamic capabilities.

Coordinating capability enables reconfiguration by administering tasks, activities, and resources to deploy the reconfigured operational capabilities since the new configurations of operational capabilities require effective coordination of tasks and resources and synchronization of activities (Iansiti & Clark, 1994; Helfat & Peteraf, 2003). Pavlou and El Sawy (2011) define coordinating capability as the ability to orchestrate and deploy tasks, resources, and activities in the new operational capabilities. The basic routines of coordinating capability also draw upon the dynamic capabilities literature, namely assigning resources to tasks (Helfat & Peteraf, 2003), appointing the right person to the right task (Eisenhardt & Brown, 1999), identifying complementarities and synergies among tasks and resources (Eisenhardt & Galunic, 2000), and orchestrating collective activities (Henderson, 1994).

While the benefit of dynamic capabilities has been widely discussed in existing literature, scholars have begun to explore the need for additional capabilities. These additional capabilities are termed, "improvisational capabilities." Improvisational capabilities, as discussed in recent literature streams, occur when organizations do not have adequate time to plan or their existing formal plans do not adequately apply.

III.2 Improvisational Capabilities

Improvisation takes place when there is not enough time for formal planning, when existing plans do not apply because of novel conditions (Crossan, 1998), and when the time gap between planning and execution is cut short or actually converges (Moorman & Miner, 1998b). Improvisation occurs for various reasons such as, when novel events cannot be addressed with existing operational capabilities, when there is not enough time or it is too costly to engage in formal planning, when there is a need to act outside formal plans to cope with novel situations (Pina e Cunha, Vieira da Cunha, & Kamoche, 1999), and also when there is a "time pressure to solve problems and address opportunities quickly" (Miner, Bassof, & Moorman, 2001). Improvisation also occurs when organizations must react urgently to novel events and environmental surprises, and when intentional decisions are made to forego formal planning (Mendonça, 2007).

While improvisation can be viewed as a failure of formal planning (Moorman and Miner, 1998), the positive role of improvisation has also been recognized (Hatch, 1998; Hutchins, 1991; Lewin, 1998; Majchrzak, Logan, McCurdy, & Kirchmer, 2006; Weick, 1995, 1998). Improvisation is not inherently good or bad because the lack of planning does not necessarily imply inferior results (Vera & Crossan, 2005). Pavlou and El Sawy (2010) point out that improvisation may even be intentionally chosen as a deliberate strategy to avoid a lengthy and

costly planning process, particularly when the new conditions are expected to be novel and unique. As Winter (2003) explains, improvisation often occurs strategically as an autonomous decision to take advantage of spontaneity. Improvisation may also be deliberately employed because the anticipated outcome of spontaneous actions is expected to be superior (Pavlou & El Sawy, 2010).

Existing literature has mostly used jazz or theater as a metaphor for improvisation (e.g., Hatch, 1998; Weick, 1998). While the goal of musicians is to intentionally come up with new music, organizations need to cautiously change to match new environments while maintaining their stability and structure (Zack, 2000). Pavlou and El Sawy (2010) state improvisation is not universally valuable for all organizations, and it should be used judiciously under specific conditions. Following the "science of competitiveness" (Chi, Hartono, Holsapple, & Li, 2008), Pavlou and El Sawy (2010) state that they "presume improvisation to occur and have positive effects in highly turbulent environments with urgent, unanticipated, and impactful storms caused by unpredictable actions of aggressive competitors, unanticipated changes in customer needs, and disruptive technologies that make it impossible to reconfigure through formal planning."

In order for actions to qualify as a capability, the set of actions must be collective, repeatable or patterned, and purposeful; they cannot be individual, ad hoc, or random (Winter, 2003). Even though improvisation has its origins in individuals, it also extends to groups, units, and organizations (Eisenhardt & Tabrizi, 1995; Hutchins, 1991; Kamoche & Cunha, 2003; Weick, 1993). Miner et al. (2001) describes improvisation as a collective activity and Crossan (1998) describes improvisation as a means for collective action. Moorman and Miner (1998) propose the term "collective improvisation" to describe a system of individuals who communally

engage in improvisation. Thus, improvisation is viewed as a collective capability (Pavlou & El Sawy, 2010).

Improvisation is a repetitive, patterned, and deliberate activity that can be enhanced with repetition and practice (Moorman & Miner, 1998). Pavlou and El Sawy's (2010) view of improvisation as innovation is consistent with the view that innovation is not a random process, but a patterned one, even if it seems chaotic at first (Cheng & Van de Ven, 1996). "Improvisation is a disciplined craft. Its skills can be learned through continual practice and study" (Crossan, Lane, White, & Klus, 1996). Pavlou and El Sawy suggest that organizations often repeat and even institutionalize their improvisational activities, learn by observing their best practices and outcomes (Vera and Crossan, 2005), and prepare to rely on them when the opportunity for improvisation arises (Weick, 1979).

Brown and Eisenhardt (1997) view improvisation as a capability for frequent and endemic change. Improvisation is also viewed as a capability to strategically change daily operations to address new environmental situations (Galbraith, 1990). Improvisation is also viewed as the ability to generate new combinations of resources to address turbulent environments (Ciborra, 1996). And Miner et al. (2001) describe improvisation as a set of micro-patterns that are spontaneously recombined in creative ways.

Literature views improvisation as a major means for accomplishing reconfiguration and change, and the goal of improvisational capabilities is to develop new operational capabilities that better respond to novel conditions (Pavlou and El Sawy, 2010). Improvisational capability is thus a purposeful capability that aims to reconfigure existing operational capabilities by acting outside past practices to address novel events (Cunha et al. 1999, Weick 1998). Pavlou and El

Sawy (2010) also assert that improvisation is purposefully utilized to result in new innovations; or, it is spontaneously used as a means to address novel situations.

Pavlou and El Sawy (2010) find that improvisational capabilities are consistent in spirit with the competitive dynamics (Smith, Ferrier, & Ndofor, 2001) and hyper-competition (e.g., D'Aveni 1994). These two literature streams theorize and demonstrate that organizations can achieve higher performance by being capable of implementing competitive actions (Grimm & Smith, 1997). Competitive actions are viewed as newly developed and externally directed market-based moves that seek to enhance competitiveness by challenging the market status quo through innovations in products and services (Ferrier, Smith, & Grimm, 1999). Notably, firms that possess a more complex base of capabilities are in a better position to launch competitive actions, also showing that organizations that act more frequently, faster, and with more complexity have a higher performance (Ferrier et al. 1999).

In NPD those firms who have improvisational capabilities can engage in competitive actions by building new and improved products that can keep them ahead of competitors (Pavlou and El Sawy, 2010). They offer this as being consistent with Schumpeter (1934), who views competitive actions as the novel combinations of existing resources that arise from the (improvisational) capability to effectively engage in competitive actions.

The awareness-motivation-capability (AMC) framework (Chen, 1996) in the competitive dynamics literature explains how firms engage in competitive actions and inter-firm rivalry. The AMC framework lists three pillars for undertaking competitive actions: awareness to proactively seek opportunities in the environment, motivation to undertake competitive actions, and the capability to challenge the competitors' actions. These three pillars were shown to raise competitive tension in an industry (Chen, Kuo-Hsien, & Tsai, 2007) and increase rivalry among

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multinational organizations (Yu & Cannella, 2007). Pavlou and El Sawy (2010) state that improvisational capabilities are consistent with the AMC framework in the sense that they reflect the awareness of unpredictable events in the environment and the motivation and ability to respond to them with spontaneous competitive actions. In "storms" where improvisational capabilities are likely to emerge, there is less emphasis on awareness and motivation and more emphasis on the ability to respond effectively (Pavlou & El Sawy, 2010). Thus, improvisational capabilities reflect a specific capability to be aware of, motivated by, and capable of engaging in effective improvisational actions.

Environmental turbulence creates unexpected conditions that call for novel solutions (Vera and Crossan, 2005). Pavlou and El Sawy (2010) offer the example of the iPhone as an unexpected product that was injected into the environment, which served to make plans for new products under development less relevant or even irrelevant. They state that when competitive actions such as these transpire, the need for improvisation becomes more prevalent. Environmental turbulence makes it likely that existing operational capabilities no longer meet customer needs, forcing NPD work units to exercise their improvisation capabilities to adapt to novel events with new products (Moorman & Miner, 1998a).

As the successful execution of a capability depends on its frequent practice (Winter 2003), turbulent environments favor improvisational capabilities. Pavlou and El Sawy (2010) state that the spontaneous nature of improvisation is ideally suited for highly turbulent environments. Improvisation may even be the only feasible choice in turbulent environments because planning may not be appropriate or even feasible (Crossan, Cunha, Vera, & Cunha, 2005). Vera and Crossan (2004) suggest that the relationship between improvisation and

performance is equivocal, with improvisation being more valuable under unpredictable conditions and time pressure.

El Sawy and Pavlou (2008) point out however, that improvisation is not ad-hoc problem solving. "Improvisation is basically characterized by timely convergence of planning and action and that improvisation is deliberate" (Tjørnehøj & Mathiassen, 2010). Enterprises realize that they often need to improvise in new contexts, and they learn how to improvise and become adept at improvising in novel situations. Since enterprises face many novel situations in turbulent environments, improvisation is likely to be a repeated activity that is enhanced with practice (El Sawy & Pavlou, 2008).

III.3 Dynamic Capabilities vs. Improvisational Capabilities

El Sawy and Pavlou (2008), make a clear the distinction between dynamic and improvisational capabilities even though they are both means for facilitating reconfiguration and change. Dynamic capabilities emphasize planned and well-timed reconfiguration of operational capabilities; improvisational capabilities emphasize the spontaneous and intuitive recombination of resources in real time to build new operational capabilities in response to a novel situation. Dynamic capabilities stress disciplined flexibility, while improvisational capabilities require creativity and intuition (El Sawy & Pavlou, 2008). While both dynamic and improvisational capabilities involve planning, dynamic capabilities focuses on how to best respond to an anticipated situation, whereas improvisational capabilities require the enterprise to learn how to be prepared to respond to any novel situation.

Literature has shown that both improvisational and dynamic capabilities are valuable in turbulent environments. Pavlou and El Sawy (2010) make the case for the importance of both capabilities by stating that, "organizations that invest in dynamic capabilities are generally better

prepared to change." They site Weick (1998) who offers that the field of strategic management generally favors judicious strategic planning. They say that it is possible to anticipate predictable patterns of change (waves) in moderately turbulent environments; therefore, dynamic capabilities may be the optimum option by drawing on past experience to plan reconfiguration.

They also point out however, that organizations may not always have the luxury of planning, and improvisational capabilities may be the only viable means for change in unexpected storms, where action must be taken urgently without prior planning. Improvisational capabilities are likely to be effective when the environment is so turbulent with frequent storms that sense-making collapses (Weick 1993) and past experience offers little help. Improvisational capabilities also help speed action by avoiding the lengthy reconfiguration process often required by dynamic capabilities (Eisenhardt & Tabrizi, 1995). Also, organizations that rely on improvisational capabilities may reconfigure faster and more cheaply than dynamic capabilities that require costly formal planning (Winter 2003). Pavlou and El Sawy (2010) hence state that although dynamic capabilities are expected to be more effective in moderately turbulent environments, improvisational capabilities may trump dynamic capabilities in highly turbulent environments.

Since we view both improvisational and dynamic capabilities as new capabilities, both of which replace old operational capabilities, we turn to Pavlou and El Sawy (2010) to understand the differences between the two. Pavlou and El Sawy (2010) state that since both improvisational and dynamic capabilities reconfigure existing operational capabilities, it is necessary to outline their distinction; they offer their table below.

Table 2 Differences Between Improvisational and Dynamic Capabilities

Reproduced from Pavlou and El Sawy (2010)

	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

Pavlou and El Sawy (2010) make four assertions distinguishing between dynamic and improvisational capabilities. They state that first, they are different in how they deal with environmental changes, dynamic capabilities aim to predict, sense, and "ride" quasi-predictable patterns (waves) in the environment; improvisational capabilities aim to spontaneously respond to unanticipated and unpredictable events (storms). They use this statement as evidence that different types of environmental turbulence create a need for both improvisational and/or dynamic capabilities. Second, they are different in terms of prior planning. Whereas dynamic capabilities rely on formal planning for a given situation, planning for improvisational capabilities is not situation specific, but it is "planned spontaneity" by learning how to respond to any novel situation. Third, in terms of their underlying nature, improvisational capabilities have

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an unstructured, emergent, and urgent nature that act in a narrow "window of opportunity";

dynamic capabilities have a structured, stable, and disciplined nature that act in a larger window

between planning and execution. And lastly, or fourth, dynamic capabilities are based on a logic

of "planned opportunity" by stressing disciplined flexibility (Eisenhardt & Martin, 2000); in

contrast, improvisational capabilities are founded on a "logic of spontaneous responsiveness" by

reacting to novel situations with spontaneity and intuition (Pavlou & El Sawy, 2010).

Pavlou and El Sawy (2010) proposed distinction between improvisational capabilities and

dynamic capabilities is consistent with the work of Eisenhardt and Martin (2000), who also

distinguish between two types of capabilities based on the environment in which they operate. In

moderately turbulent environments, dynamic capabilities are similar to traditional routines,

which are analytic and stable, with predictable outcomes. In contrast, improvisational capabilities

in high-velocity markets are viewed as iterative, highly experiential, and contingent processes

with unpredictable outcomes. While Eisenhardt and Martin (2000) view both processes under the

umbrella of dynamic capabilities, Pavlou and El Sawy (2010) refer to the former as dynamic

capabilities and the latter as improvisational capabilities. Eisenhardt and Martin (2000)

acknowledge that dynamic capabilities are difficult to sustain in high-velocity markets, labeling

them instead as "improvisational processes."

Pavlou and El Sawy (2010) distinction between improvisational and dynamic capabilities

is also consistent with (Collis, 1994) who proposed three categories of capabilities: the first type

relates to operational capabilities, "those that reflect an ability to perform the basic operational

activities of the firm." The second category relates to dynamic capabilities, "the ability to learn,

adapt, change, and renew over time." The third category relates to improvisational capabilities,

such as the ability to "recognize the intrinsic value of other resources or to develop novel

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strategies before competitors." Pavlou and El Sawy (2010) submit that even though improvisational and dynamic capabilities are different, both capabilities emerge from innovation-based competition, in which competitive advantage is based on the creative destruction of existing operational capabilities and their reconfiguration into superior new operational capabilities (Schumpeter 1934). This is also consistent with Collis (1994) who argues that both improvisational capabilities and dynamic capabilities replace older operational capabilities.

III.4 Information Technology as an Enabler

Existing IT capability literature has been mainly rooted in the resource-based view of capabilities (Pavlou and El Sawy, 2006). The various IT-related resources combine to form an IT capability that is valuable, rare, non-imitable, and non-substitutable (Mata, Fuerst, & Barney, 1995). Taking this perspective, IT capability can be defined as "the ability to mobilize and deploy IT-based resources in combination with other resources and capabilities" (Bharadwaj, 2000). Pavlou and El Sawy (2006) point out that IT capability has been viewed as a complex, multi-dimensional construct, and the literature has proposed several specific IT-related resources that combine to form an IT capability. The three related IT dimensions are: (a) the acquisition of IT resources, such as technology assets (Ross, Beath, & Goodhue, 1996), IT objects (Tippins & Sohi, 2003), and the overall IT infrastructure (Bharadwaj, 2000); (b) deployment of IT resources through tight IT-business relationships, such as IT-business partnering (Ross et al., 1996), IT partnerships (Bharadwaj, Sambamurthy, & Zmud, 1999), and business IT vision (Feeny & Willcocks, 1998); and (c) leveraging of IT resources, such as technical IT skills (Mata et al., 1995, Tippins & Sohi 2003, Ray et al., 2005) and human IT resources (Bharadwaj, 2000; Powell & Dent-Micallef, 1997; Ross et al., 1996). Based on these three dimensions, IT capability can be defined as the "firm's ability to acquire, deploy, and leverage its IT resources to shape and

support its business strategies and value chain activities" (Bharadwaj, Sambamurthy, & Zmud, 2002).

This three-dimensional representation of IT capability views the construct at the firm level of analysis, and views the IT capability construct to be predominantly drawn from within the IT unit (Pavlou & El Sawy, 2006). Pavlou and El Sawy (2006) extend this IT capability construct to NPD business users by arguing that because the acquisition and deployment dimensions of IT capability are largely based on the IT investment decisions of IT executives and are primarily implemented by IT staff within the IT unit, the acquisition and deployment dimensions of IT capability are unlikely to differ.

El Sawy and Pavlou (2008), propose that IT infrastructure capabilities can enable the business capabilities "trifecta," which in turn influence a business's strategic advantage when environmental turbulence is high. El Sawy and Pavlou (2008) use the term, "business capabilities trifecta" to capture operational, dynamic, and improvisational capabilities. They define IT Infrastructure and IT infrastructure capabilities as described below:

• IT Infrastructure is the IT hardware, software, and networks, including applications software and database management software that are available to the enterprise.

• IT infrastructure capabilities are the enterprise's ability to be aware of what functionalities the IT infrastructure has to offer, to understand when and how to use them, and, when using them, to take advantage of specific IT functionalities and their combinations.

Organizations are increasingly engaging in competitive dynamics that are enabled or induced by information technology (IT) (Pavlou and El Sawy, 2010). Chi et al. (2008b) assert that empirical studies have shown that competitive advantage may be achieved with the effective leveraging of IT. Since competitive advantage in fast paced environments is directly related to

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undertaking reconfiguration better, faster, and more efficiently than the competition, IT researchers have devoted much attention to studying how IT can facilitate reconfiguration by enhancing agility and dynamic capabilities (Houghton et al. 2004, Pavlou and El Sawy 2006, Pavlou and El Sawy 2010).

Pavlou and El Sawy (2010) build on emerging literature to identify specific capabilities that organizations could develop and exercise with the aid of IT to address diverse types of turbulent environments. They state that the term turbulence describes the conditions of unpredictability in the environment because of rapid changes in customer needs, emerging technologies, and competitive actions. Where environmental turbulence may be manifested as either "waves," which are roughly predictable in their pattern, or "storms," which are rapid, have a strong impact, and occur unexpectedly. In their work they identify, theorize, operationalize, and empirically test specific capabilities that could be most suitable for "waves" and "storms."

IT-leveraging capability has a direct positive effect on dynamic capabilities because these three types of IT systems enhance the ability of NPD work units to sense the environment, enhance learning, integrate resources, and coordinate activities (Pavlou & El Sawy, 2006). Ferrier et al. (2007) views competitive actions and organizational capabilities as being inseparable from IT. Chi et al. (2008b) states the effective use of IT systems is proposed to enhance the ability to undertake competitive actions by enhancing the awareness, motivation, and capability to execute competitive (improvisational) actions.

Pavlou and El Sawy (2006) examine the aggregate role of IT-leveraging capability in NPD, but in order to examine the role of individual IT systems on improvisational capabilities, they break down the IT-leveraging capability into its three underlying system components,

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namely the effective use of project and resource management systems (PRMS), organizational memory systems (OMS), and cooperative work systems (CWS) (Pavlou & El Sawy, 2010).

Pavlou and El Sawy (2010)'s work on the effect of IT systems is based on Vera and Crossan (2005), who proposed three conditions that must be in place for effective improvisation: first, a set of rules must be in place to enable the management of existing resources (Vera & Crossan, 2005). Second, memory from past projects helps create awareness of past improvisational actions and procedures that may be used for the focal situation (Mendonça, 2007). Third, real-time information and communication, the concurrent interaction among people based on immediate feedback, can facilitate brainstorming, creativity, and problem solving (Brown & Eisenhardt, 1995). Pavlou and El Sawy (2010) state that these three conditions are enhanced by the effective use of PRMS, OMS, and CWS, respectively. They also point out that although there is not a strict one-to-one relationship among these three preconditions and the three proposed IT systems, the functionalities of each IT system have a predominant role in facilitating each of the three conditions, respectively.

III.5 Competitive Advantage

Business processes are actions that firms engage in to accomplish some business purpose or objective. Thus, business processes can be thought of as the routines or activities that a firm develops in order to get something done (Nelson & Winter, 1982; Porter, 1991). Business processes include the process for acquiring supplies and other raw materials, the process of producing products or services, the process of delivering products or services to customers, and the process of providing after sales service (Porter, 1985).

Resources can only be a source of competitive advantage if they are used to do something; i.e., if those resources are exploited through business processes (Stalk, Evans, &

Sgulman, 1992). Porter (1991) argues that resources are not valuable in and of themselves, but they are valuable because they allow firms to perform activities, that is, business processes are the source of competitive advantage.

Business processes that exploit intangible firm resources are more likely to be a source of competitive advantage than business processes that exploit tangible firm resources (Barney, 1991; Dierickx & Cool, 1989; Itami & Roehl; Lippman & Rumelt, 1982). In organizations today, intangible and tangible resources are likely to be bundled together. That bundling can allow for the execution of a particular business process. For example, computer hardware and software (tangible resources and capabilities with limited potential for sustained competitive advantage) may be bundled with an organization's commitment to customer service (an intangible resource and capability with the potential to generate such advantages) to enable the execution of customer service, an important business process in at least some firms (Ray, Barney, & Muhanna, 2004). Ray et al. (2004) also point out that while tangible resources are important in enabling a firm to execute a business process, of these two types of resources, only the intangible are likely to be a source of sustained competitive advantage. Also, firms that fail to efficiently and effectively translate their resources and capabilities into business processes cannot expect to realize the competitive advantage potential of these resources. While these resources may retain the potential for generating competitive advantage for some period of time, that potential can be realized only if used in business processes, for it is through business processes that a firm's resources and capabilities get exposed to the market, where their value can be recognized (Ray et al., 2004).

Eisenhardt and Martin (2000) addresses the logical links among dynamic capabilities, resources, and competitive advantage, which they point out is a problematic area within RBV

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(Priem & Butler, 2001). The authors make three points. First, they argue that the view that valuable, rare, inimitable, and non-substitutable (VRIN) dynamic capabilities are themselves the source of long-term competitive advantage in dynamic markets misidentifies the source of that advantage. They view effective dynamic capabilities as having commonalities across firms in terms of key features (popularly termed, 'best practice'). Therefore, they submit, dynamic capabilities violate the RBV assumption of persistent heterogeneity across firms. Eisenhardt and Martin (2000) argue that while firms with more effective dynamic capabilities such as superior product innovation and alliancing processes are likely to have competitive advantage over firms with less effective capabilities, dynamic capabilities are not themselves sources of long-term competitive advantage.

The potential for long-term competitive advantage lies in using dynamic capabilities sooner, more astutely, or more fortuitously than the competition to create resource configurations that have that advantage (Eisenhardt and Martin, 2000). Long-term competitive advantage lies in the resource configurations that managers build using dynamic capabilities, not in the capabilities themselves. Effective dynamic capabilities are necessary, but not sufficient, conditions for competitive advantage (Eisenhardt & Martin, 2000).

Second, Eisenhardt and Martin (2000) argue that RBV thinking overemphasizes the strategic logic of leverage. While certainly some resource configurations do lead to long-term competitive advantage and some situations such as those with significant scale economies or network effects favor the emergence of such advantages, long-term competitive advantage is infrequently achieved in dynamic markets. They state that the reality is that competitive advantage is often short term. In these situations, it makes sense for managers to compete by

creating a series of temporary advantages. Their strategic logic is opportunity (Lengnick-Hall &
Wolff, 1999).

Dynamic capabilities are best conceptualized as tools that manipulate resource
configurations (Eisenhardt and Martin, 2000). Sometimes it is effective to use these tools to
enhance existing resource configurations and to strengthen current position using RBV's path-
dependent strategic logic of leverage. Here, the goal is long-term competitive advantage.
However, they point out, that more frequently, in dynamic markets, it makes sense to use
dynamic capabilities to build new resource configurations and move into fresh competitive
positions using a path-breaking strategic logic of change (Karim & Mitchell, 2000). Here, the
goal is a series of temporary competitive advantages. The broad point is that a blend of strategic
logics makes sense in dynamic markets (Eisenhardt & Martin, 2000).

Third, and lastly, Eisenhardt and Martin (2000) state that high-velocity markets are a
boundary condition for RBV, a much needed addition to the theory (Lengnick-Hall & Wolff,
1999; Priem & Butler, 2001). They point out that firm managers must cope with the external
challenge of competition, and also with the internal challenge of potentially collapsing dynamic
capabilities. They also point out that RBV's path-dependent strategic logic of leverage lacks
logic of change that is crucial in dynamic markets, and strategic logic also underplays the
difficulty of predicting the length of current advantage and the sources of future advantage.

RBV's assumption of the organization as a "bundle of resources" breaks down in high-
velocity markets. Eisenhardt and Martin (2000) point out that in high velocity markets resources
are added, recombined, and dropped with regularity (Galunic & Eisenhardt, 2001; Galunic &
Rodan, 1998). Therefore, if resources are too tightly bundled it can be problematic. Eisenhardt
and Martin (2000) state that RBV's emphasis on long-term competitive advantage is often

unrealistic in high-velocity markets and that short-term, unpredictable advantage is more the norm. Here, growth is a more useful performance metric than profit. Eisenhardt and Martin (2000) argue that RBV misses the strategic role of time. Understanding the flow of strategy from leveraging the past to probing the future and the rhythm of when, where, and how often to change is central to strategy in high-velocity markets (Brown & Eisenhardt, 1998). Eisenhardt and Martin (2000) state that while RBV centers on leveraging bundled resources to achieve long-term competitive advantage, strategy in high-velocity markets is about creating a series of unpredictable advantages through timing and loosely structured organization. And they go on to state that the strategic logic is opportunity and the imperative is when, where, and how often to change.

Teece (2007) views, "dynamic capabilities as the foundation of enterprise-level competitive advantage in regimes of rapid (technological) change." Teece (2007) puts forth a framework, which indicates that the extent to which an enterprise develops and employs superior (non-imitable) dynamic capabilities will determine the nature and amount of intangible assets it will create and/or assemble and the level of economic profits it can earn. The framework also emphasizes that the past will impact current and future performance. However, while this may be true, Teece (2007) points out that there is much that management can do to simultaneously design processes and structures to support innovation while unshackling the enterprise from dysfunctional processes and structures designed for an earlier period.

Teece (2007) offers a dynamic capabilities framework which recognizes that the business enterprise is shaped but is not necessarily trapped by its past. Teece's point is, that enterprises can even shape their ecosystem and their future as they attempt to achieve competitive advantage.

Literature also suggests that improvisational capabilities are a source of competitive advantage. Pavlou and El Sawy (2010) state that because improvisational capabilities are highly intangible, they are difficult to describe, imitate, and substitute, this makes them a potential source of competitive advantage. Pavlou and El Sawy (2010) point out that in new product development (NPD), improvisation occurs by reconfiguring operational capabilities by spontaneously drawing on existing resources to build superior new ones to match changing market needs, technologies, and competitors' new products. And they say that given the unstructured nature of improvisational capabilities that deal with a novel situation each time, it is difficult to specify universal means by which improvisational capabilities reconfigure new operational capabilities. The authors refer to (Brown & Eisenhardt, 1997; Eisenhardt & Tabrizi, 1995; Miner et al., 2001; Moorman & Miner, 1998a) for instances of competitive actions that draw on improvisational capabilities to develop successful new products.

Ferrier et al. (1999) suggests that effective competitive actions enhance firm performance. In order to gain competitive advantage, firms need to understand customers and markets, and integrate this knowledge appropriately with technical knowledge (Mathiassen & Vainio, 2007). Chi et al. (2008a) offers that competitive actions over time, builds a long-term competitive advantage via many temporary advantages. Pavlou and El Sawy (2010) submit that improvisational capabilities can enhance the quality of competitive actions to support competitive strategy. Evidence shows that organizations that quickly respond to competitive new product introductions with new products enjoy higher stock returns (Lee, Smith, Grimm, & Schomburg, 2000). Pisano (1994) demonstrated that learning by doing with frequent experimentation and real-time prototyping (resembling improvisational capabilities) are valuable capabilities in the biotech industry. Moreover, the capability to spontaneously respond to crises

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(Hutchins 1991, Weick 1993), aggressively react to competitors (Miner et al. 2001), match changing market needs and emerging technologies (Brown & Eisenhardt, 1997), and support improvisational decision making in real time (Perry, 1991) help build a series of temporary advantages in NPD with the competitive introduction of new products (Pavlou & El Sawy, 2010).

I draw from the above literature streams throughout the remainder of this study.

IV   RESEARCH METHOD AND CASE STUDY DESIGN

IV.1 Research Method and Design

Yin (2009) states there are three conditions that should be considered when selecting a research method, (1) the type of research question posed, (2) the extent of control an investigator has over actual behavioral events, and (3) the degree of focus on contemporary as opposed to historical events. Yin (2009) finds case study method most appropriate when the form of the research question is a "how" or "why" question. He also states that the case study method is a preferred in examining contemporary events, but when the relevant behaviors cannot be manipulated. Yin (2009) states that a case study's unique strength is its ability to deal with a full variety of evidence, documents, artifacts, interviews, and observations-beyond what might be available in other methods. Myers (2009) states that case studies can be used as exploratory to discover the relevant features, factors, or issues that might apply in other similar situations. He further states that the purpose of case study research in business and management is to use empirical evidence from real people in real organizations to make an original contribution to knowledge (Myers, 2009).

I have elected to use a multiple-case case study because this method meets the three conditions put forth by Yin (2009). And the purpose of case study research as described by Myers (2009) appears most appropriate for my study.

Yin (2009) states that because a research design is supposed to represent a logical set of statements, you also can judge the quality of any given design according to certain logical tests. Four tests have been commonly used to establish the quality of any empirical social research. These tests have been summarized in numerous textbooks (Kidder and Judd, 1986). The four tests are:

- *Construct Validity:* identifying correct operational measures for the concepts being studied.

- *Internal Validity:* (for explanatory or causal studies only and not for descriptive or exploratory studies) seeking to establish a causal relationship, whereby certain conditions are believed to lead to other conditions, as distinguished from spurious relationships.

- *External Validity:* defining the domain to which a study's findings can be generalized.

- *Reliability:* demonstrating that the operations of a study - such as the data collection procedures-can be repeated, with the same results.

Myers (2009) states that case study research can take positivist, interpretive, or critical forms. The first type, positivist case study research, attempts to meet the requirements of positivist social science. Work of this kind is often justified in positivist terms –case study research is seen as a method for testing and refining hypotheses or propositions in real the real world. Yin (2009) discusses the importance of propositions and emphasizes construct validity, internal validity, external validity, and reliability. Another example of the positivist approach is Eisenhardt (1989) who offers a process towards the development of testable hypotheses and theory, which are generalizable across settings.

Interpretive case studies generally attempt to understand phenomena through the meanings that people assign to them. Unlike positivist case studies, which define quality in terms in of validity and reliability, interpretive case studies define quality in terms of the plausibility of the story and the overall argument (Meyers, 2009).

Myers suggests that one of the main advantages of case study research is its "face validity." By face validity, Myers' refers to a well-written case study based on empirical research in an organization that represents a real story that other researchers can identify with. Another advantage, Myers notes, is that most case studies are also contemporary, which means that the

case documents on one of more firms attempt to deal with issues of current importance to other firms as well.

Myer's suggest the following guidelines for producing an exemplary case study.

1.   The case must be interesting.

2.   The case must display sufficient evidence.

3.   The case study should be complete.

4.   The case study must consider alternative perspectives.

5.   The case study should be written in an engaging manner.

6.   The case study should contribute to knowledge.

My multiple-case case study seeks to uncover and tell other researchers something they did not know before, qualifying it as "interesting" to researchers and practitioners. I hope to extend theory as a result of my study. With regard to sufficient evidence, Yin (2009) cites six sources of evidence that are typically used in case studies: documentation, archival records, interviews, direct observations, participant observations, and physical artifacts. My first source of evidence are publically available documents such as Central Contractors Registry/System for Award Management (CCR/SAM) documents to verify firm data such as years in business, size standard, annual revenues, new releases for contract awards, etc. My second, and main source of data is semi-structured interviews that were recorded and then transcribed. My third source of evidence is direct observation during interviews. With regard to "completeness" my case study collected relevant evidence to augment existing theory. Further, my study will consider alternative perspectives to include alternative participant views and disagreements amongst participants. A goal of this study is to write it in an "engaging" and creative manner that can

captivate scholars and practitioners alike. Lastly, my study not only attempts to offer intrinsic value, but it also attempts to offer a contribution to scientific knowledge by extending theory.

According to Eisenhardt (1989) cases may be chosen to replicate previous cases or extend emergent theory, or they may be chosen to fill theoretical categories and provide examples of polar types. Replication logic is analogous to the logic used in multiple experiment design (Hersen & Barlow, 1976). Yin (2009) states that analytic conclusions independently arriving from two cases, as with two experiments, will be more powerful than those coming from a single case alone. My selection of a multiple-case, case study is an attempt to use replication logic to strengthen my findings generalizability.

IV.2 Site Selection

The selection of the study sites was driven by purposeful, replication logic (Yin, 2009). The sites offered the potential to investigate the IT enabled innovation for achieving dynamic and improvisational capabilities in small defense contractor firms. Our selection of study sites was driven by following factors: i) the sites offered the appropriate setting to understand the phenomenon of dynamic and improvisational capabilities through IT enablement. They offered a theoretically relevant organizational context because of the turbulent environments in which they operate, ii) the sites also offered opportunities for disconfirming our expectations (Dube & Pare, 2003; Markus, 1989) that the organization will be able to successfully use IT enablement of business processes to achieve dynamic and improvisational capabilities because study participants have achieved different levels of competitive success, and iii) finally all the study participants have been actively engaged in the use of IT for improving their competitive position. These criteria ensured that our selection of case study sites provided a rich context to understand

and develop insights on the use of IT enablement for achieving dynamic and improvisational capabilities. Table 4, below, provides a summary of the characteristics of the study sites.

Table 3 Selected Organizations

	Employee Count	**Core Competencies**	**Select Customers**	**Years in Business**
Site 1	< 50	Application modernization, infrastructure modernization, and business process optimization	Department of Defense, Veterans Administration, and Department of Homeland Security	8
Site 2	< 50	Engineering and Technology, business analytics, enterprise concepts and strategy, data and information management	Department of Defense	5
Site 3	< 50	Science and Technology, research and development, training, test and evaluation, and program management	Department of Defense, Federal Bureau of Investigation, and the Office of Naval Research	10
Site 4	< 50	Total life cycle management, workforce training, process improvement, and technology transition	Department of Defense	4

V DATA COLLECTION

Yin's six sources of evidence description, noted earlier, is followed by three principles, which he states, if followed prove to maximize the benefits of the multiple evidence sources. The three principles are:

1.   Use multiple sources of evidence.

2.   Create a case study database.

3.   Maintain a chain of evidence.

Following Yin (2009) my first data source are publically available documents such as Central Contractors Registry (CCR) and System for Award Management (SAM) documents to verify firm data such as years in business, size standard, annual revenues, new releases for contract awards. I also review company websites to obtain award announcements and any reported revenue or personnel growth.

My second, and main source of data are semi-structured interviews with C-Suite officers as well as others high-level managers to include directors, program managers, and some high-level system users. I have chosen a semi-structured interview approach to allow for flexibility in data collection. In semi-structured interviews new questions might emerge during the iterative process of data collection and analysis (Myers, 2010). Emails, and phone calls were used to seek clarifications and for follow up. Further, follow up interviews were used as necessary. All interviews were recorded and then transcribed. A total of 24 interviews with "C" class leaders and managers, as well as higher-level systems users provide the primary data for the study.

My third source of evidence is direct observations at the study sites. Each interview took place within each firm's place of business. This allows for the study to be conducted in a natural setting of the case. Yin (2009) states that on-site interviews allow the researcher to observe any relevant behavioral or environmental conditions. A review of these multiple sources helped triangulate the findings and develop a richer picture of increased capability, growth, and competitiveness, which cannot be obtained by interviews alone (Myers, 2010).

Regarding Yin (2009) second principle, a case study database was developed using NVivo qualitative data analysis tool. NVivo is platform designed for storing and analyzing

unstructured data. It allowed me to search and interrogate my data using its query and visualization tools. The use of NVivo as a database to store transcripts and other documents as well an analysis tool allows the raw data that led to any conclusions to be available for inspection (Yin 2009). Yin (2009) states that the lack of a database for case studies is a major shortcoming of case study research and it needs to be corrected. Yin also points out that a database makes cross-case analysis much easier for the researcher. Further using Nvivo as a database allows for well written and appropriate citations that are traceable to specific evidence.

Yin (2009) suggests as his third principle, maintaining a chain of evidence. This allows for readers of the final study to follow the derivation of any evidence from initial research questions to ultimate study conclusions. Yin (2009) suggests a chain that goes back and forth between, case study questions, case study protocol, case study citations drawn from the database, and the case study report. A research protocol was developed for this study linking case study questions to theoretical topics. Also consistent with Yin (2009) this guide helped create an initial coding scheme. This allowed for accurate citing directly from transcripts stored in Nvivo.

VI DATA CODING AND ANALYSIS

As noted earlier, transcripts of interviews constitute the primary data for this study. The concepts identified in section 3 – viz., dynamic capabilities as a potential source of competitive advantage, and IT enabled business processes for achieving dynamic and improvisational capabilities, - serve as the seed concepts for initial coding of the data.

Coding analysis was conducted as each transcript was dissected ensuring relationships between parts were kept intact. A start list of codes was developed (Miles and Huberman, 1994) and this list was used to develop the Nvivo nodes where transcript data was stored, analyzed, and retrieved. Appendix 2 contains the initial set of seed codes. As I was coding I paid special

attention to the data attempting to be alert forming ideas and reactions to the meaning of what I was coding. These ideas proved to be important as they suggest new interpretations, leads, connections with other parts of the data, and they usually point toward questions and issues to look into during the next wave of data collection, and to ways of elaborating some of these ideas (Miles and Huberman, 1994). My first interim coding analysis allowed me to improved data collection and allowed for my "cognitive map" of the case gets richer and more powerful (Miles and Huberman, 1994).

Data collection, data coding, and data analysis was conducted iteratively throughout this study (Miles & Huberman, 1994). I followed the guidance of Miles and Huberman (1994) during each analysis phase. Miles and Huberman (1994) define analysis as three concurrent flows of activity: data reduction, data display, and conclusion drawing and verification.

Data reduction refers to the process of selecting, focusing, simplifying, abstracting, and transforming the data that appear in written-up field notes or transcriptions (Miles and Huberman, 1994). This approach to data reduction was accomplished as I read through my transcripts dissecting them for input into NVivo.

Generically, a display is an organized, compressed assembly of information that permits conclusion drawing and action (Miles and Huberman, 1994). They recommend several techniques including matrices, graphs, charts and networks. Nvivo allowed me to build a nodal network. My nodal network allowed me to display my data and easily go back and forth between nodes analyzing, comparing, contrasting, and confirming data. Using Nvivo also allowed me to conduct cross-case analysis through cross-case displays. Miles and Huberman (1994) state that one aim of studying multiple cases is to increase generalizability, reassuring the researcher that the events and processes in one well-described setting are not wholly idiosyncratic. Eisenhardt

(1989) state that in general people are poor processors of information and the leap to conclusions on limited data (Kahneman and Tversky, 1973). Having all my data in one database, Nvivo, allowed for cross-case comparison and analysis.

The third stream of analysis activity is conclusion drawing and verification. Miles and Huberman (1994) state that from the start of data collection, the qualitative analyst is beginning to decide what things mean – is noting regularities, patterns, explanations, possible configurations, casual flows, and propositions. The competent researcher holds these conclusions lightly maintaining openness and skepticism, but the conclusions are still there, inchoate and vague at first, then increasingly explicit and grounded, to use the classic term of Glaser and Strauss (1967). As stated earlier my analysis was conducted iteratively with coding and data collection. New data was used to refine and/or modify prior concepts. I continued to actively search for any new concepts and relationships that emerge from the data. I moved back and forth amongst the four nodes in Miles and Huberman's model below during data collection and then I shuttled amongst reduction, display, and conclusion drawing and verification for the remainder of my study.
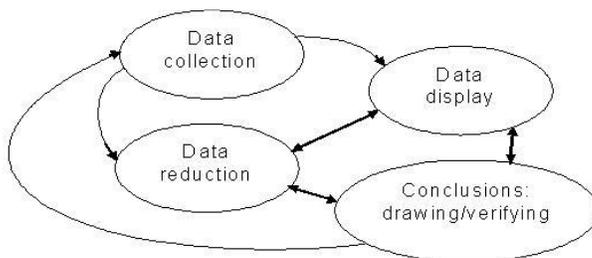
Figure 2 Components of Data Analysis: Interactive Model
Reproduced from Miles and Huberman (1994)

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Initially 20 interviews were conducted, transcribed and coded into Nvivo. During an initial analysis phase it was determined that more detailed information would be required from the respondents in order to fully understand their improvisational capabilities. Another round of interviews was conducted, 4 in total, in an attempt to understand exactly "how" study participants were exercising sensing, learning, integrating, and coordinating capabilities in high velocity turbulence. And more importantly "how" they were exercising these capabilities differently in their attempts to be both "dynamic" and "improvisational."

VII FINDINGS

VII.1 Industry Turbulence

Small defense contracting firms continue to face and attempt to respond to unpredictability and turbulence in their industry. There was consensus among study participants that they exist and operate in an industry that is moderately turbulent interspersed with bouts of high turbulence. One CEO remarked, "I don't think it has ever been a stable industry…" "Turbulence can steer you off course very, very quickly." The moderate turbulence is due to factors such as changes in customer's needs, new technologies, and competitive actions of other firms. The high velocity turbulence is due to factors such as unplanned emerging requirements, fluctuating funding, and federal government policy changes. Sometimes the turbulence manifests itself in "waves" which are predictable in their pattern and sometimes the turbulence comes as "storms" which are rapid, strong, and unexpected, as one COO remarked, "…there are wave changes and then there are big storms."

The needs of customers, who are mostly product and systems acquisition professionals, are constantly changing. The customers are typically performing acquisition services for the federal government and are bound by the DoD Directive 5000 series, which sets forth a unified approach for all services, the Defense Acquisition System (DAS). The DAS acquisition management framework provides the roadmap for acquisition professionals as they move their projects from pre-system acquisition, to system acquisition, and finally system sustainment. As customers move through the phases of systems acquisitions their needs change. The required support functions change as well as the services inside each function. They initially might require research and development support, and as the system is approved for production they might require manufacturing and testing support and eventually during the sustainment phase

they would require fielding, training, and repair support. This approach to acquisitions of systems and products keeps the small defense contractor in a position where his/her service offerings constantly have to change to keep pace with changing customer's needs. When asked about stability in the environment and customer's needs one COO remarked, "I think it is unstable in that the, I guess, level of work varies, you know, from year-to-year and the way that work is made available varies…"

The department of defense works diligently to take advantage of the newest technologies available. They have programs that completely revamp weapons systems, such as the new Joint Strike Fighter, the F-35 Lightning II as well as programs that simply provide new technology insertions into existing products. The quest for new high tech systems or high tech insertions products also serves to keep the industry in a state of constant flux. One CEO expressed this, "Well, particularly for my company because we are in IT and management consulting company, there's some relatively large changes because of how technology is changing. So, for example, you have cloud computing, you know, paradigm shift in the way that the government operates from a technology perspective."

Competitive actions by direct competitors in this industry, as in most industries, contribute to turbulence. One such action taken by a firm is the continuous reevaluation and reconfiguration of pricing so as to be the lowest priced offerer to the government. Those small businesses that are found to be technically acceptable and offer the lowest cost are normally awarded the contract against their competitors. In order to lower their price, small businesses are constantly struggling to lower internal costs related to overhead, general and administrative, and fringe benefits. The challenge ensues as they attempt to balance attracting and keeping the best talent in their direct labor pool, while lowering costs. This balance between costs and direct labor

keep the small businesses juggling and revaluating how they conduct their operations. They are constantly looking for cost savings or cost cutting opportunities. With this approach to lean operations they have injected turbulence into the industry through competitive pricing wars. A Managing Director summarized these actions as such, "I think were seeing a lot of things cut short because the government is making these storm-like, short-cycle decisions to re-compete things in order to either merge work or get better pricing or change the scope in response to different requirements."

High velocity turbulence is also present in the small defense contracting industry. Some factors responsible for these bouts of high velocity turbulence are drastic and emerging systems requirements changes, government spending habits and funding availability, and large sweeping policy changes.

Emerging systems requirements also keep the industry in a state of constant turbulence. As the department of defense's operating environment changes, (i.e. from Iraq to Afghanistan), operational systems requirements also change. In Afghanistan the department of defense found themselves operating in an environment of improvised explosive devises (IED), which immediately changed the requirement from soft or semi-hardened transports to fully hardened transport systems. This unexpected emerging requirement sent product and systems manufacturing firms scrambling to meet emerging customer needs and produced an ongoing ten-year wave of IED research and development turbulence. One COO with over forty years in the industry commented, "I think the budget cycle, you know, with regard to DOD spending is cyclical and that can be observed over the last five or six decades. You go back to the major wartime events drive military spending up and then if you look at the peaks and valleys of that…"

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Government funding for the department of defense has been a virtual rollercoaster of a ride for acquisition professionals and small defense contractors alike for the past ten years or so. A Program Manger remarked, "I think there's always a need for, you know, government contractors and the work that they do. I think sometimes… because of the fiscal ebbs and flows with the government, there can be those hiccups along the way…." One unexpected action, which significantly affected the industry budget, was the government's choice to fund the wars in Afghanistan and Iraq through supplemental appropriations and not through the regular defense budget. While this created new funding streams for programs and services, it also created a potentially unsustainable services and products industry. Now, since those funds are no longer available to supplement the defense budget, acquisition professionals are struggling to sustain weapons systems and support services contracts that were procured with supplemental funding. This decision by the government for appropriations and other actions like the budget sequestration in 2013 injected unforeseen and unplanned for, storm-like, high velocity turbulence into the industry. One Director expressed this, "…we had sequestration and that affected a lot of our competitors very substantially…that wasn't wave-like, that was a big spike …"

Unforeseen policy changes have directly impacted small defense contractors that support agencies such as Marine Corps Systems Command, (MCSC). MCSC is a common customer to several of the firms in this study. MCSC is the acquisition branch for the United States Marine Corps, operating form Quantico, Virginia. One, MCSC policy directed all "engineering" work should be conducted at government labs, such as Space and Naval Warfare Systems Centers, and Naval Surface Warfare Centers. This directive was unexpected and it forced small business customers to redirect work, and funding, to government facilities and away from local small business. Many small business offer engineering services as one of their core competencies and

with that competency no longer in demand, many struggled to add skills that were still in demand or limit their offers to the remaining competencies. This change in business strategy and operational make-up was unexpected and driven by unforeseen policy change by the customer. A Senior Engineer summarized this, "…all the sudden there's a policy implemented that may have been premeditated inside the government for some period of time, but tends to hit the industry with less notification and that, I think, is an example of where the storm effect comes in."

VII.2 Demonstrating Dynamic and Improvisational Capability

VII.2.1 Dynamic capability.

Focal organizations are attempting to be dynamic in their individual responses to industry turbulence. They acknowledge that they do exist in a turbulent environment and as such they must be willing and able to integrate, build and reconfigure competencies and processes to address their rapidly changing environment. A CEO summarized how his company benefits by planning for industry change and company response, "…when you're going to for your planned responses… you know what's happening so you're not under the pressure and stress to react to it, you have time to actually execute a well thought out plan."

While the study participants spend a great deal of time planning and attempting to be prepared in their responses to turbulence, they also discussed their struggle to simply establish daily operational routines. A COO discussed his efforts in formulating the ability to conduct daily operations. When asked if he believes his organization had daily operational processes in place, he responded, "…when I came in, 'the CEO' and I really instantiated a lot of process infrastructure… it's been more recent than previous." He went on to discuss his establishment of a strategic charter that captured their daily operational routines, "…what it did is it provided us a framework for our daily operations…it provides our business rhythm, how we conduct our daily

business and it ties into the processes and procedures that we have that dive down….” while being prepared to reconfigure those processes relevant to daily operations. Their struggle does not end with the establishment of operational processes; it only begins, as these processes need to be reconfigured as they attempt to be dynamic in their response to industry turbulence. One Director voiced his concern when he said, “what I fear is responding to the turbulence alone and losing a sense of purpose that we have, objectives that we're pursuing.”

The study participants stated they are constantly striving to enhance their dynamic capability, and readily admit there is room for improvement, but for now they are all exercising the dynamic capabilities that they do possess. They discussed the plans they have in place, as they are keenly aware they exist in an environment of constant moderate turbulence. A CEO commented, “…we have plans, how to execute… when there is turbulence.” One way these firms are striving to enhance their dynamic capability is through planning and sometimes modeling. They are attempting to go beyond being proactive; they are attempting to be predictive in their environmental sensing and planning. One COO stated, “We model a lot and we try to get out ahead and peer into where we believe we might go. Now that's fairly recent. I mean, we built the model for sequestration in the government shutdown and it was real effective tool for us … once it did happen, we just executed.”

Small firms are limited by their size and the amount of resources at their disposal. They are constantly responding to customer requests and they are attempting to do this with limited staff. They attempt to overcome limited resources by leveraging teaming arrangements with larger firms. A Managing Director summarized this, “… I don’t know if we internally had a dynamic process. I guess it depends on how you look at it, but we imposed requirement on our teammates to help absorb some of those surges that we experienced.” Another study participant

put it as such, "Right now we are limited by the number of folks that we have and we're limited by the number of hours that we have available. One of the things that we've done in terms of proposals is relying on our teammates to augment our capability when we find a shortfall."

VII.2.2 Improvisational capability.

While study participants admit they are still struggling to achieve and enhance their dynamic capabilities, they also acknowledge that high velocity changes are present in their industry. Regarding spontaneous response, a COO said, "…we try our best to plan out our changes but you can't always do that…we had the government shutdown back in October. That was pretty storm like." "…it was actually a good experience to go through because now we know how to handle that situation."

Improvisation occurs frequently in enterprises that operate in highly turbulent environments, because there is often insufficient time for formal planning; managers must spontaneously adapt to new conditions on the fly by acting outside their formal plans. A Program Manger summarized his actions outside formal planning, "…you know you can plan with what you know. It may not be complete but you can plan. So that spontaneous factor doesn't destroy the whole plan. It is a reaction. So, in other words, you're 60% of the way there planned and that 40% you now adjust your plan rather than doing nothing and then spontaneously having to come up with the whole solution."

Small defense contractor firms use relatively immature processes. As they work to formally establish processes, they must also be prepared to quickly change their newly formed processes and routines. A CEO stated, "as part of that PM basically kind of falling down on the job, I recognized immediately – so back to improvisation – we need to change our process right

now," as he discussed having to make an immediate decision to forgo formal processes and quickly replace a program manager."

While improvisational capabilities are spontaneous they are also, by definition, not ad hoc. They are repeatable processes and can be enhanced with practice. A CEO remarked, "I don't think that people who experience a lot of turbulence necessarily become better at it, but I think you can. If the challenge is to become better at it and not let it happen to you – right?" Study participants understand this principle and subscribe to it. They are diligent in their efforts to increase their capacity to manage and respond effectively to those situations that are largely unpredictable. The CEO went on to state, "I could certainly just accept turbulence when it happens and say 'oh, well that's happening again, I'm a victim of turbulence.' Or I can try to be, you know, in a position where the next time it happens, okay, yeah I didn't know it was going to happen but this time I'm ready." A Program Manager summarized the need for spontaneity by saying, "if you get a message today to come present and you have get it done, you have to be spontaneous…"

Study participants discussed the absolute and increasing need for improvisational capabilities in high velocity environments. The President of one focal firm discussed the inevitability of dramatic change and the need to position his firm to deal with it, "… what's going to change? We don't know yet, but it's going to change." A Senior Program Manger discussed acting outside formal plans and being spontaneous while dealing with changing customer needs, "…sometimes its not innovation. It's more of a – it's a demanded need." A Director speaking on the need for improvisational capabilities stated he's seeing an increase in, "storm-like, sort cycle decisions" being made by customers in his industry.

VII.3 Analyzing Dynamic and Improvisational Capabilities

In the competitive market space of defense contracting, small defense contractor firms work tirelessly to compete for new opportunities and exploit existing opportunities. They are constantly reevaluating their business processes and reconfiguring these processes to respond to industry turbulence. By reconfiguring their processes they exhibit dynamic capability. And their responses are different depending on the level of perceived turbulence. Using the Pavlou and El Sawy (2011) model of dynamic capability which is comprised of a sensing capability, a learning capability, an integrating capability, and a coordinating capability, I explore the nuances of each capability to understand how each capability is exercised first in moderate-velocity turbulence (dynamic) and then in high velocity turbulence (improvisational).

VII.3.1 Sensing as a dynamic capability.

With regard to "sensing" or the ability to spot, interpret, and pursue opportunities in the environment (Pavlou and El Sawy 2011), small defense contractors are acutely aware of the necessity to monitor the business landscape. One Director discussed the importance of having a sensing capability when he stated, "When you don't have that [sensing capability], it's like getting blindsided by a truck, now you have to react to it and you usually have a lot less time to react to it and you don't always have the time and resources to put together a real good plan."

Study participants also discussed their current capability and their plans for enhancing their sensing capability. One CEO commented, "…we do have some sensing capability now. We probably didn't, you know, eight months ago, nine months ago." One firm's Managing Director discussed their current capability and how they view and approach sensing, "there's the knowledge of the market that you have just from being in operator in the market, …there's that interpersonal awareness that we have from the people we know and the space we operate in."

Some study participants discussed multiple methods of sensing, a COO remarked, "…there are services out there available that help you do forecasting in terms of when certain proposals are going to expire, when there are likely to be re-competed, and when you can expect those re-competes is take place…", "… the owner of the company, he's constantly out there, you know, networking with people…."

VII.3.2 *Sensing as an improvisational capability*

The study participants discussed the differences in their sensing capability in moderate and high turbulence environments. They agreed that in high velocity turbulence environments, generating market intelligence as a routine is different than in moderate turbulence environments. In high velocity turbulence, a single event or single piece of intelligence can require a response or action. There may not be adequate time for intelligence collection or information processing, and firms may be forced to act without a lot of exploration, "We might not explore all the different branches and sequels in terms of understanding what's going on," remarked one Chief Engineer. When disseminating market intelligence in high velocity turbulence study participants are quick to disseminate the limited information or intelligence that they do have to a select few key individuals or decision makers. A CEO stated, "…you only have to give that intelligence to maybe two or three people." They stressed the importance of getting information out quickly and through all possible channels, i.e. email, phone calls, face-to-face, etc. When responding to market intelligence in high turbulence, study participants aim for a shorter response cycle and quicker responses. A Director said, "…we are doing things multiple times per week…which gives you a quicker response time…." They abandon their normal approval channels and routines and instead attempt to respond with innovative approaches. For example, a focal organization used the limited information they had to adapt an existing process.

A Chief Engineer noted, "In high velocity, we've got a new piece of information, were trying to see if it's anything we've ever done before, and if its close enough we'll just adapt a process."

VII.3.3 Learning as a dynamic capability.

With regard to "learning" or the ability to revamp existing operational capabilities with new knowledge (Pavlou and El Sawy 2011), small defense contractors discussed their learning capability. During a discussion on assimilation of knowledge, one Managing Director remarked, "We debrief our proposals, so we can take lessons forward into the next proposal." While discussing the exploitation and assimilation of knowledge, one Senior Engineer noted, "in proposal development there is content that's generic that can be reused and then tailored to a specific proposal and so what we've been doing is sort of developing a library, not only on content, but of how we would approach certain types of document development." Continuing the discussion on the exploitation of knowledge, a Senior Book-Keeper explained how her company hires skilled professional to fill knowledge voids within the company. She remarked, "I've seen him [the CEO], … bring on people that have acquired different additional certifications and knowledge…" A CEO, discussed the exploitation of knowledge in this example, " Through the proposal process and in going out and talking to people, we learned that … this is what other companies have done to compete well in the VA,' and so, we integrated that new proposal manager into the process…"

VII.3.4 Learning as an improvisational Capability.

The study participants discussed the differences in their learning capability in moderate turbulence environments and high turbulence environments. With regard to acquiring knowledge, A CEO, explained, "You cant continue to wait on information. You have to use what's available now." All the study participants stressed the importance of using on-hand

available knowledge. While some study participants rely on heuristics, others use experiential knowledge. A Senior Engineer said, " We'd be more inclined to fall back on heuristics." Some informants discussed the urgency involved in high velocity turbulence for assimilating knowledge. A CEO explained that his organization operates "quick and hasty" in assimilation of knowledge and getting the information to "the right people, at the right time". He stressed, "…the right time is now!" When discussing transforming knowledge, some study participants employed a lot of brainstorming and rapid-response cells. Rapid planning sessions and exploratory problem-solving techniques that utilize self-educating techniques and heuristics were also used. One Director gave this example, "…you're taking in the immediate data, but you have to leverage what you already know to be able to analyze and understand what the problem is and then you make an immediate response."

For exploiting knowledge in high velocity turbulence, study participants discussed their willingness to accept more risk so that they can continue to move forward. They discussed laying out multiple courses of action and then picking the best course. A Director said, "conversations will lead us to develop a course of action or several course of action." The also discussed how the best course may be for them to take no action. They also discussed how in high turbulence it might be necessary for them to reconfigure a process for a "one-time campaign."

VII.3.5 Integrating as a dynamic capability.

Integrating is the ability to embed new knowledge into the new operational capabilities by creating a shared understanding and collective sense-making (Pavlou and El Sawy, 2011). One approach to embedding new knowledge into the proposal writing process was the incorporation of templates into the process. One Business Analyst said, "a template, okay, so if we've got 30 days to respond, this is our general calendar, if we have 45 days or 90 days, … this

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is how were going to approach it." Study participants also discussed contribution and interrelation of individual input. One COO remarked, "…there will be certain points where we'll integrate everyone's input and then re-task, you know, some following efforts so it's kind of a cycle of coordination, decentralized effort, and then you bring it back and you coordinate and integrate ideas and then you decentralize the effort again and do a couple of cycles of that and then we bring it in-house." Another firm's Vice President made this observation when discussing all the subroutines of integrating, "So, we took people working business development that had been casting their net wide and we focused them on specific areas to start concentrating on...to collect very specific information, so that we could make that proposal as good as we could make it and differentiate ourselves…" A Director gave this example of contribution and interrelation of individual input, "For an example, a couple of our individuals within our organization are looking at where there's gaps in the current ISR [Intelligence, Surveillance, Reconnaissance] enterprise… we gathered the data, discussed the data and figured out how to solve the problem." "… we did that in the collaborative environment with the customer… using both our resources and resources of the customer to actually collaborate a solution…"

VII.3.6 Integrating as an improvisational capability.

Study participants discussed the differences in their integrating capability in moderate turbulence environments and high turbulence environments. While discussing contribution of individual input, participants discussed looking for inputs from a subject matter expert immediately. While they looked for expert knowledge within the company, they also stressed the need to look outside the organization. They also discussed and cautioned against making biased decisions by unintentionally listening to "the loudest guy in the room." One Chief Engineer cautioned, "haste would favor the loudest guy in the room, and that's not typically how we

behave here." With regard to representation of individual input they discussed focusing on the experience they had shared as an organization. Using their organizational knowledge, one Director said, "…use the experience we've gained working together." A Vice President stressed the importance of integrating new knowledge "immediately and directly." While discussing interrelation of individual input in high velocity environments, the study participants discussed the importance of integrating the knowledge on hand effectively and then letting the process run, taking corrective actions along the way. A Vice President said, "see how it works, fix it a little bit, let it run, fix it a little bit more" while discussing interrelation of individual input.

VII.3.7 *Coordinating as a dynamic capability.*

With regard to "coordinating" or the ability to orchestrate and deploy tasks, resources, and activities in the new operational capabilities (Pavlou and El Sawy 2011), study participants discussed their individual coordinating capabilities. One COO gave this example of how his firm attempts to orchestrate coordination, "We've tried a couple of different ways, ways of coordinating… sometimes SharePoint, sometimes email, sometimes text message, sometimes voicemail. I don't think we've found a particular method or means of coordination that works all the time. You know, it's usually a belt-and-suspenders routine were we try and coordinate using multiple means." While discussing the proposal process one BD Manager noted, "…by having an initial coordination about what we need, what we usually do is we do some collaboration on the front end in order to synchronize, I guess, expectations for everyone's assignments and then we release everyone to do their writing and their work and then you bring it back at kind of some synchronizing points…" One CEO brilliantly summarized all the sub routines of coordination, assigning resources, appointing the right person, identifying synergies, and orchestrating collective activities, when he relayed this example, " … we also need to get into VA [Veterans

Administration] and so, we took a different tact for a proposal… I didn't write the proposal… I went out and got a professional proposal manager that had insight into the VA… we got some lessons learned on 'okay, this is what other companies have done to compete well in the VA,' and so, we integrated that new proposal manager into the process… and she… coordinated a successful response to the VA."

VII.3.8 Coordinating as an improvisational capability.

While discussing the differences in their coordinating capability in moderately turbulent environments and high turbulence environments, a CEO said, "you just might have to bring temporary resources." The study participants also attempt to "replace people with tools," when assigning resources to tasks. When assigning the right person to the right task in high velocity environments, sometimes it was more important to just assign someone immediately, and worry about assigning the right person later. Further, I observed a strong preference for quick and immediate action. One CEO also discussed using "workarounds" to just get moving and get things done. When identifying complementarities and synergies among tasks and resources, study participants preferred to initially force complementarities as they attempt to orchestrate how people are working together. While orchestrating collective activities, the study participants suggested deploying the new process and then stopping to make a thorough review to identify any corrections that may be required. Also, "feedback mechanisms" were used to make process improvements. One Vice President cautioned that, "when you implement a process very quickly, the implementation itself is likely to go poorly." Many senior executives stressed the importance of feedback learning and immediate corrective actions. One Director stated, "I think there needs to be some sort of feedback mechanism back to our integrating process… maybe we got it wrong and maybe there'll be hints of whether or not we got it wrong before we actually find out the

results." Lastly, in high turbulence critical processes were assigned process owners and supervisors who were held accountable for the outcomes.

The sensing, learning, integrating, and coordinating capabilities nuances that are followed in the focal organizations suggest that the measurable model of dynamic capabilities suggested by Pavlou and El Sawy (2011) is applicable for both dynamic and improvisational capability. However, there are differences in the management of the sub routines as a reflection of amount of turbulence present.

VII.4 The Role of Information Technology.

VII.4.1 IT infrastructure and capability.

Our focal organizations are attempting to capitalize on information technology to compete successfully in an industry riddled with new technologies, emerging requirements, changing customer needs, and other turbulence drivers. They have come to realize that in order to compete and win they must be able to effectively leverage IT. Their IT Infrastructure is comprised of their IT hardware, software, and networks, including applications software and database management software that are available to them.

Where the IT infrastructure is built and maintained varies amongst each contractor firm, some study participants have chosen to configure and maintain their IT infrastructure on site locally. A Managing Director described his firm's infrastructure, " IT infrastructure – so we have a local area network that we operate here on in the building, we operate, maybe a dozen seats, workstations, I guess, within the company. Most of those are co-located here at the main office. We have remote workers to work on-site with the client or work in a different geographic area and we share information though some of the different tools that are available like the Office 365 Suite has been kind of a key tool for us as a small business."

This firm made the decision to move away from locally hosted network and service and went with a commercial vendor. The decision was predicated on the cost to maintain the network versus the cost of the commercial vendor. The decision to move to the vendor was also influenced by their plans to grow larger, which the senior management believes can be better handled by a commercial firm than internal employees. A Director made this statement regarding their decision, "We made a decision… to transition so that we wouldn't be managing that [network] ourselves anymore and we went with a…package, and at the time that we made the decision, we were anticipating a number of contracts… we were looking at how much it would take for us to personally administer that …obviously, there's only a few of us and somebody would have to do that and if we're faced with this rapid expansion, or what we hoped there would be a rapid expansion, we didn't think we'd be able to manage…"

Some study participants have chosen to subscribe to hosted software and services and some have chosen to utilize desktop software and services that include hosted e-mail, social networking and collaboration, and cloud storage. Most, however, seem to use a combination of hosted and desktop software and services. A Chief Engineer remarked, "…one of the things that we wanted to pursue was an infrastructure that was available anywhere, so most of our infrastructure is cloud based. We have access all of our applications, our data stores…."

Of greater importance than the IT Infrastructure itself, is the IT Infrastructure capabilities. The infrastructure capabilities are the contractor firm's ability to know what functionalities are available, and to understand when and how to use functionality and combinations of the functionalities. Some study participants are quickly realizing the advantage of hosted software and services. A Senior Engineer said, "Office 365 Suite has been kind of a key tool for us as a small business; it doesn't require really much of any management. We put people's accounts on

there and that's been a great collaborative tool that has a SharePoint site that we leverage."

Another study participant's CEO discussed leveraging capabilities, "Capabilities, a big thing would be ease of use, ease of sharing. … a lot of us within the office can get to one particular application and share information in there relatively quickly. We can set of people on the systems relatively quickly and share information that way...versus the old days of kind of printing stuff out and walking down the hall and talking about it."

Some study participants are attempting to leverage their hosted software and services as an additional resource that they can market to their customers. One CEO noted, "… our client is … severely restricted in what they can and cannot do with their own computer network. They have a hard time hosting conference calls…so they rely very heavily on us for that … our client relies on us to provide services that they can't provide for themselves both in terms of hosting meetings and online collaboration."

Some study participants, however, are still struggling to manage the interfaces between their existing software applications. A CEO stated, "… our whole company is managed in the cloud. The tough part about that is that now we are making sure that all of our cloud-based applications talk each other. That's the next hard part. So we get everything into the cloud so we don't manage any infrastructure associated with their apps but now we need to have those talking to each other, sharing information, gathering analytics on the information, and helping us make decisions."

VII.4.2 IT enablement of dynamic and improvisational capabilities.

VII.4.2.1 Sensing.

Our focal organizations use direct contact with customers to sense the environment. They often work in close proximity with their customers and on occasion even in government

facilities. They use their professional relationships and close proximity to the customer to collect information or even business intelligence. While their proximity to the customer allows them to gather information they also recognize the need to enhance their sensing capability and search for more information from which they can make more informed decisions. At each contractor firm I found examples of them utilizing IT to enhance their sensing capability. A Managing Director noted, "…we use the different SharePoint features for tracking opportunities… and trying to stay on top of what's out there…" " Tools like GovWin, you know, that provide you with a little bit of business intelligence resource and IT resource that you can program it or configure it to run searches based off certain criteria on a daily basis, a weekly basis and send you automatic notifications. So, that automates some of the sensing functions for us."

VII.4.2.2 Learning.

I also find study participants enhance their learning capability by using IT to acquire, exploit, and assimilate knowledge. A Director remarked, "… we use our CRM, customer relations management tool, and SharePoint to house the knowledge and then use the weekly review cycle just to cross between the teams." I also found study participants using their IT systems and applications to assimilate and transform knowledge. An HR Manger discussed using data collected through their content management and collaboration application to facilitate better decision-making. He noted, "What you learn is you're taking in the immediate data, but you have to leverage what you already know, to be able to analyze and understand what the problem is and then you make an immediate response. In a dynamic situation, you can collect data over time and have a chance to not only assimilate it and analyze it in your own mind, but you can share it with somebody else and have them have a chance to interact with you to where you can collect and assess and have more data points than just your own experience." Another study participant CEO

discussed how they used their IT resources to produce a financial model of how a government shutdown might affect them. He stated, "I keep having to go back to sequestration and the government shutdown. We actually – we used our enabling IT to model it. We actually modeled it before it hit."

VII.4.2.3 *Integrating.*

I also found evidence of study participants using IT to enhance their integrating capability. When discussing his firm's integrating capability one Managing Director said, "IT infrastructure…Office 365 Suite has been kind of a key tool for us as a small business; it doesn't require really much of any management. We put people's accounts on there and that's been a great collaborative tool that has a SharePoint site that we leverage." Elaborating on his content and document management application, he said, "… there will be certain points where we'll integrate everyone's input and then re-task, you know, some following efforts so it's kind of a cycle of coordination, decentralized effort, and then you bring it back and you coordinate and integrate ideas, and then you decentralize the effort again, and do a couple of cycles of that, and then we bring it in-house." I found this to be an excellent example of his integrating and coordinating capability.

VII.4.2.4 *Coordinating.*

I found more evidence of study participants using IT to enhance their coordinating capability. A Director discussed using his IT assets to orchestrate collective activities when he said, "we use teleconferencing, net-conferencing … you have the ability to quickly share information with a group of people who aren't co-located, … you don't know when a solicitation is coming out and then all of a sudden it's sprung on you, maybe early and so now you've got the ability to rally the members of your team virtually rather than physically because you're trying to

do this in a matter of hours or days rather than wait for everybody to be co-located so those types of tools might be available."

VII.5 Competitive Advantage

All study sites demonstrated some level of dynamic capability and improvisational capabilities. The focal organizations exercised both their dynamic and their improvisational capabilities in moderate and high velocity turbulence as they work tirelessly to stay competitive in this very dynamic industry.

While discussing achieving a competitive advantage by exercising dynamic capabilities, one Managing Director commented, "I think our ability to use – our effectiveness with those IT tools, is what would give us a competitive advantage. Everybody on the battlefield has a rifle, can everybody hit the – the target." A COO discussed using modeling and simulation to plan for industry change, "We pride ourselves on our planning and modeling capability and we believe that we do that better than many firms that are certainly our size. So, we have used IT to help enable our ability to do that." The COO also discussed achieving a competitive advantage by exercising dynamic capabilities to provide solutions to customer's problems through the use of their IT, "…using IT to examine our customers problems from an ownership perspective. So when we talk entrepreneurial…what we're talking about is the spirit of ownership of a problem …" "when we talk about Mission Informatics as a competitive advantage, that's what we mean and that's how we see ourselves, distinguishing ourselves from companies that are our size that do a lot of commodity IT work, but that's not what we're really interested in. We're interested in more of the decision making to support a mission." A Director of Business Development discussed exercising dynamic capabilities to the benefit of their customers, which he believes enhances his firm's competitive advantage. "…because of the mindset of the owner of the

company, being a former Marine… we've always put our focus on making sure that our responses to the customer are very fast, but yet accurate, so that, you know, when we do respond, we know that we have an answer, not just a guess…. where I'm going with that is our company is competitive because we are dynamic in our ability to respond quickly to the customer."

I also observed how the study participants attempt to enhance dynamic capabilities, and potentially competitiveness, by establishing easily reconfigurable streamlined processes. The President of a firm expressed this, "I do feel we hold an advantage because our process is very streamlined. We're a smaller company… I have a personal working relationship with, the management of this company. So there are not multiple layers that we have to go through to get something done. If there's an action item, the company small and tightknit, everyone is aware of each other's tasking and that allows the process to be completed in an efficient and effective manner." This firm's ability to act quickly in a turbulent environment offers them a distinct competitive advantage. This is in keeping with dynamic capability theory.

I also observed the study participants working to enhance their competitive advantage by exercising their improvisational capabilities. Study participants described how they are adding new personnel who are adept at change to enhance their improvisational capabilities. This ability and willingness to change as an organization can help these firms sustain any advantage they may have. An HR Director commented, "We're better at being dynamic than large companies. Any of the slowness in change or adapting to change has come from us, the managers of the company, not from the employees being able to adapt to a new capability or a new technology. I mean the kids coming out today learn things really fast. It's us being able to take advantage of their knowledge and understanding that they have knowledge and getting out of their way." Another firm's President had a similar approach to enhancing improvisational capabilities. He

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said "… the guy may be hired for doing policy, but he's also got a master's in, you know electrical engineering and being able to help open up the array… by applying his intangible skills, you really are bringing in, you know, not just a policy writer. You're brining in somebody that matches whatever it is … second and third order of effects."

An Operations Manager also discussed working with large companies and how they do not have the same flexibility, or the timeliness in their actions, as do small companies. He discussed exercising improvisational capabilities to satisfy a customer's request to immediately fill an open position. The Manger stated, "A billet came open on one of our contracts and it was a billet that was filled by one of our subs… the government wanted me to fill the spot immediately… I gave the sub two weeks to fill this position and it's a large company. Just getting their recruiting team was like turning a big cruise-ship….". A Senior Engineer shared his perception of improvisational capabilities in small companies "The big business I used to work for, if you saw something wrong and you were trying to fix it, it could take months or a year to get something simple that was already a set process that they had going changed and sometimes it never gets changed whereas if you're a small business, you're a handful of people and this business is running. If there's something wrong, it takes all of about an hour to fix it." This ability to respond to industry turbulence quickly offers a clear competitive advantage for the study participants.

VIII   DISCUSSION

The purpose of this dissertation is to explore how IT is enabling small defense contractor firms to achieve both dynamic and improvisational capabilities. The study attempts to gain insights into how dynamic and improvisational capabilities may be obtained as complementary capability sets (Eisenhardt & Martin, 2000; Teece et al., 2007; Pavlou & El Sawy, 2011). The study also focuses on how firms can execute - sensing, learning, integrating and coordinating capabilities in differing levels of industry turbulence (Pavlou & El Sawy, 2011). Further, the study examines the execution of these four capabilities at the sub-routine level. Lastly, the study focuses on how IT is enabling the sub-routines associated with sensing, learning, integrating, and coordinating capabilities, and the study identifies two additional factors that support the enablement of dynamic and improvisational capabilities in small service firms.

VIII.1 The Defragmentation of Dynamic and Improvisational Capabilities

This study explored dynamic and improvisational capabilities inside four firms. This exploration was facilitated using the measurable dynamic capabilities - sensing, learning, integrating, and coordinating proposed by (Pavlou & El Sawy, 2011). By exhibiting these four capabilities in moderate velocity turbulence, the focal firms were found to be exercising dynamic capabilities. By exhibiting these four capabilities in high velocity turbulence, this study found the focal firms to be exercising improvisational capabilities. These observations serve to demonstrate that dynamics and improvisational capabilities can be treated as complementary capabilities existing, and arguably necessary, inside a single firm. This integrated framework begins the process of defragmenting previous literature (Eisenhardt & Martin, 2000; Teece et al., 2007; Pavlou & El Sawy, 2011), which thus far has treated dynamic and improvisational capabilities as two separate and distinct literature streams.

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No studies to date have attempted to study both dynamic and improvisational capabilities existing inside a single service industry firm. This study has found that the defense contractor service industry exhibits constant moderate velocity turbulence interspersed with high velocity turbulence. The varying degrees of turbulence found in this industry demand service providers exercise both dynamic and improvisational capabilities. Evidence in this study makes a compelling argument supporting the necessity for service providers to posses both dynamic and improvisational capabilities. This, in turn, suggests to direct researchers and practitioners to view dynamic and improvisational capabilities as complementary capabilities, with each being a single component of a complete solution set, for operating inside markets with varying degrees of turbulence.

This study has shed new light on the IT enabled business processes resident inside the service industry. By providing evidence of IT enabled processes that are reconfigurable through the use of IT resources this study begins to answer the question, how are service providers in markets with varying degrees of turbulence developing both dynamic and improvisational capabilities? My research suggests, it is a combination of newly available IT resources and the IT-centric business processes that are giving service providers the ability to respond to turbulence through prior planning and spontaneity. This observation and evidence serve to further defragment dynamic and improvisational capabilities by demonstrating that both capabilities are now achievable through one enabler, IT.

VIII.2 Executing Dynamic and Improvisational Capabilities in Varying Degrees of Turbulence

The evidence collected in this study suggests that the focal firms are demonstrating dynamic and improvisational capabilities, simultaneously. Past literature (Eisenhardt & Martin,

2000; Teece et al., 2007; Pavlou & El Sawy, 2010; Pavlou & El Sawy, 2011) has highlighted the role of dynamic and improvisational capabilities in highly turbulent industries, but there have been no studies that offer prescriptions for how firms can execute these complementary capabilities in varying degrees of turbulence. This study addresses this research gap.

In moderate velocity turbulence, firms should be prepared to respond to industry change through planned process reconfiguration as literature suggests (Eisenhardt & Martin, 2000; Teece et al., 2007; Pavlou & El Sawy, 2011). In addition, my results suggest that they must be adept at sensing the environment and building business intelligence that drives the creation and re-creation of their business processes. In moderate turbulence, firms need to take advantage of time and implement new processes under the direction of well thought out and well engineered plans. They need to garner management support through early and frequent engagement by the management team. They need to reconfigure processes under management supervision and support. They need to exercise their new processes and attempt to refine and create maximum efficiencies in their process reconfigurations. I find that the focal firms are following these procedures because they understand the positive impact that dynamic capabilities have on their ability to successfully compete in moderately turbulent environments.

In high velocity turbulence, firms need to be spontaneous in their response to industry change (El Sawy & Pavlou, 2008; Pavlou & El Sawy, 2010). My research suggests that firms do need to be spontaneous, but also deliberate and accurate in their estimation of necessary process reconfigurations. Firms do not have time to implement new processes in a slow and fragmented manner; they must reengineer processes and implement them promptly to meet the demand for immediate change. They are finding that process innovation and reconfiguration can be accomplished best when management is supportive of those adept at change and those adept at

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operating in high velocity environments. The focal firms understand the positive impact that improvisational capabilities have on their ability to successfully compete in a highly turbulent environment and they are working to hone their capabilities.

VIII.3 Examining the Sub-Routines of Dynamic Capabilities and Improvisational Capabilities

I utilized the set of dynamic capabilities put forth by Pavlou and El Sawy (2011) - sensing capability, learning capability, integrating capability, and a coordinating capability- for exploring the reconfiguration of operational processes. To gain an understanding of the nuances of executing these four capabilities, I conducted my study at the very detailed sub-routine level, which has not been previously done. My study suggests that the execution of these four capabilities is significantly different at the sub-routine level based on intensity level of turbulence.

VIII.3.1   Sensing capability.

With regard to a sensing capability and its sub-routines – generating, disseminating, and responding to market intelligence, the study finds that the focal firms exercise these routines differently depending on whether they were responding in moderate or high velocity turbulence.

In moderate velocity turbulence, the focal firms use multiple sensing mechanisms such as industry specific IT applications that alert them to upcoming solicitations, collecting information while operating in the customer's workspace or offices, and simply talking to industry counterparts. They disseminate information and intelligence widely and frequently in their organizations in an attempt to get information out for planning purposes. They use new intelligence coupled with existing knowledge to completely recreate processes in moderate velocity. And they respond to market intelligence by implementing and executing prior plans.

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In high velocity turbulence, the focal firms understand that "sensing" may result in a single triggering event that will end gathering and begin dissemination. The focal firms disseminate by getting information out quickly and through multiple channels, even if the information is sparse. In high velocity, they tend to select just a few key players within their organizations and distribute the limited information to these key individuals only. The focal firms stressed the importance of shorter and more rapid response cycles in high velocity environments. They attempt to be adaptive in their process recreations, and use limited knowledge to recreate processes in high velocity environments.

In moderate velocity turbulence, the focal firms are generating, disseminating, and responding to market intelligence. In high velocity turbulence, the focal firms are acting on a single piece of collected information or simply reacting to an unforeseen occurrence that demands immediate response. There is no time to gather additional information through continued sensing. In high velocity the firms disseminate and respond.

VIII.3.2   *Learning capability.*

With regard to a learning capability and its sub-routines - acquiring, assimilating, transforming, and exploiting knowledge, this study finds that the focal firms exercise these routines differently depending on whether they were responding in moderate or high velocity turbulence.

In moderate velocity turbulence, the focal organizations hire new employees to fill knowledge voids thereby acquiring knowledge, and they exploit new employee knowledge and skills by adding them to existing processes. In moderate velocity, they assimilate knowledge by taking the time to debrief their proposals in an attempt to understand fully what they did to win or lose a project proposal. The focal firms use document libraries for storing transformed

knowledge for preparing proposals in the future. This use of stored knowledge demonstrates how firms attempting to exercise dynamic capabilities can actually complement their improvisational capabilities as well.

In high velocity environments the focal firms acquire knowledge and begin responding with limited information and they use additional information when, and if, it becomes available to them. In high velocity, the focal firms attempt to be quick in their assimilation of knowledge in order to get the right information, to the right people, at the right time. They rely on rapid planning, rapid-response cells and brainstorming to assimilate and transform knowledge. While attempting to assimilate new knowledge in high velocity environments they sometimes resort to identifying multiple courses of action, and then pick the most effective course, which sometimes can include taking no action. Beginning with multiple courses of action provides alternative action choices as they begin to reconfigure and exploit knowledge.

In moderate velocity turbulence the focal firms are acquiring, assimilating, transforming, and exploiting knowledge. In moderate velocity they have time to acquire enough knowledge to develop and implement well-designed process reconfigurations. In high velocity turbulence, the focal firms are acquiring limited knowledge, which carries forward into assimilating, transforming, and exploiting limited knowledge.

VIII.3.3   *Integrating capability.*

With regard to an integrating capability and its sub-routines - contribution, representation, and interrelation of individual input, the study finds that the firms exercise these routines differently depending on whether they were responding in moderate or high velocity turbulence.

In moderate velocity turbulence, while developing proposals, the firms integrate expert individual input, then break up and work separately in a decentralized setting, and then they come together to integrate individual input. They continue working in this iterative fashion interrelating individual input cyclically, until they are satisfied with their final proposal. They also build templates as a planning tool in their proposal writing process. Building templates also allows for the contribution, representation and interrelation of individual input.

In high velocity turbulence, the focal firms to not have the time for multiple cycles of contribution, representation, and interrelation of individual input before implementation. Instead they look to existing experts for contribution of individual input and use that input as a starting point for rapid process reconfiguration. They reconfigure processes, implement and execute the new processes immediately. After process implementation they attempt to make adjustments and corrections during process execution. They do not appear to be overly concerned with representing and interrelating of individual input during process execution.

In moderate velocity turbulence, the focal firms are demonstrating contribution, representation, and interrelation of individual input. In high velocity turbulence, the sub-routine, contribution of individual input, is being executed in an attempt to begin process reconfiguration immediately, but representation, and interrelation of individual input is not as apparent.

VIII.3.4 *Coordinating capability.*

With regard to a coordinating capability and its sub-routines - assigning resources, appointing the right person, identifying complementarities amongst tasks, and orchestrating collective activities, the study finds the focal firms exercise these routines differently depending on whether they were responding in moderate or high velocity turbulence.

In moderate velocity turbulence, the focal firms attempt to assign resources and appoint the right person to the right task by using existing resources and personnel. The focal firms described proposal development process consisting of initial coordination meeting, distribution of tasks and resources, independent work, and identification of complementarities among distributed tasks. The focal firms attempt to orchestrate collective activities through multiple means of coordination. They use data libraries for sharing common information. They use smart phones and video conferencing for staying in touch and working collaboratively overcoming physical separation.

In high velocity turbulence the focal firms attempt to leverage technology by replacing people with tools or applications. They sometimes bring in temporary employees to ensure they are using the right person, when the "right" person isn't already an employee. In high velocity environments the focal firms also deploy new processes and incorporate feedback mechanisms to identify complementarities amongst tasks, as reconfigured processes are exercised. The focal firms stress how their orchestration of activities must be rigorous during new process execution since processes put into place quickly can unintentionally be implemented poorly.

In moderate velocity turbulence the focal firms are assigning resources, appointing the right person, identifying complementarities amongst tasks, and orchestrating collective activities while reconfiguring the processes. In high velocity turbulence the focal firms are also assigning resources, appointing the right person, identifying complementarities amongst tasks, and orchestrating collective activities. However, in high velocity turbulence the focal firms are not just assigning resources, sometimes they are acquiring new resources. In high velocity, the subroutine - appointing the right person, sometimes requires them to go outside their current

employee base. And the sub-routines - identifying complementarities amongst tasks and orchestrating collective activities, are now being conducted after new process implementation.

VIII.4 IT Enablement of the sub-routines.

The focal firms in this study are in a period of technology transition. They are moving away from locally hosted networks and services and are moving instead to commercially hosted networks and services. They are using desktop software and services that include hosted e-mail, social networking and collaboration, and cloud storage. The firms are undergoing this transition in an effort to decrease the costs associated with building and managing their own networks and services. Further, the firms are realizing the benefit of scalability when using commercially provided networks and services as they all have plans for growth. Most, of the focal firms however, are still transitioning and using a combination of hosted and desktop software and services. The focal firms are quickly realizing the advantages of hosted software and services. Literature has focused on how IT can facilitate and enhance dynamic capabilities, (Houghton et al., 2004; Pavlou & El Sawy, 2006; Sambamurthy et al., 2003) and it has focused on how IT can enhance improvisational capabilities (Pavlou & El Sawy, 2010), but this study offers insights into how IT can directly support – sensing, learning, integrating, and coordinating capabilities.

While sensing, the focal firms are utilizing web-based application frameworks and platforms (i.e. SharePoint and GovWin) to collect, store, organize, share and access valuable information. Information collected at customer sites is fused with information collected through external industry interactions and opportunity management systems to generate business intelligence. They are using their data stores to house business intelligence, which gives accessibility to firm mangers and process owners to facilitate dissemination. And they are able to

use locally stored intelligence to make better and timely decisions as they reconfigure processes and respond to industry change.

During learning, the focal firms are also using customer relationship management (CRM) tools to acquire, assimilate, and store customer information from sales, marketing, customer service and support processes. They are transforming this data by correlating with other data provided by opportunity management systems and exploiting that new knowledge to make better customer focused decisions for building better customer relationships and enhance customer satisfaction and loyalty.

While integrating, the focal firms are also using their SharePoint and GovWin applications to store individually contributed input. After information is stored, they are able to analyze the individual input looking for information relationships. They are then able to integrate and represent the newly derived knowledge into immediate, or planned, process reconfigurations.

While coordinating, the focal firms are using their human resource management (HRM) systems to identify and appoint the right employees to the right tasks. They are using their IT resources not only to manage and assign resources, but as a resource by itself. They are using their teleconferencing and net conferencing to orchestrate coordination from one centralized location as they work collaboratively from multiple locations.

This study was conducted as the focal firms are undergoing a technology transition from local networks and services to commercial networks and services. This study provides a unique and unexpected opportunity to witness the firms as they were implementing and discovering how their new services and enhanced networks can facilitate the sub-routines associated with dynamic and improvisational capabilities.

VIII.5 Other Factors Enabling the Execution of Dynamic and Improvisational

   Capabilities.

   This study sought to distill and understand how IT was enabling dynamic and improvisational capabilities. Two other interesting enablers were identified during the conduct of this study. Organizational structure and organizational leadership were also found to be contributing enablers to achieving dynamic and improvisational capabilities.

   The streamlined organizational structures of these small service firms were found to be very effective in this increasingly turbulent industry. The study found that managers at all levels fulfilled more than one role and sometimes carried more than a single title. Mangers fulfilling multiple roles actually made the decision to reconfigure processes easier and quicker as this streamlined structure required fewer layers of approvals. The simplified structure appeared to make the management teams more agile in their ability to develop and implement new processes. The manager's multiple roles allow them to recognize process component interdependencies, which facilitates intelligent and quick process reconfigurations. Multi-role managers are also exposed to multiple areas of interest and service, this appeared to foster and drive innovation as mangers were exposed to greater, and previously unrelated, information.

   The focal firm's organizational leadership also appeared to be a supporting factor in the enablement of dynamic and improvisational capabilities. All four firms were started and are currently lead by former military officers. Former military officers are trained in improvisation, flexibility, and adaptation. In addition, they are commonly placed in high intensity environments, which allow them to develop and sharpen these skills. This study found that these three attributes contribute greatly to a common leadership style adept in managing change and reconfiguration. This study complements the work of Teece et al. (1997) who suggest the term dynamic

'capabilities,' emphasizes the key role of top management in appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competences to match the requirements of a changing environment.

IX CONTRIBUTIONS

IX.1 Contributions to theory

Findings from this study contribute to understanding how IT is enabling small defense contractor firms to achieve both dynamic and improvisational capabilities. This study offers four contributions to theory: (1) This study begins to defragment existing literature by offering support for researchers to begin viewing dynamic and improvisational capabilities as interdependent, not independent, capabilities. (2) This study offers a prescription for executing these complementary capabilities in varying degrees of turbulence. (3) This study highlights the significant differences of executing dynamic and improvisational capabilities at the sub-routine level. (4) This study offers valuable insight into how IT can directly support both dynamic and improvisational capabilities.

Most existing literature on dynamic capabilities (Eisenhardt & Martin, 2000; Teece & Pisano 1994; Teece et al., 1997; Teece, 2007; Pavlou & El Sawy, 2006, Pavlou & El Sawy, 2011) and improvisational capabilities literature have been fragmented exploring each capability separately. By using a single capabilities framework, originally proposed to measure dynamic capabilities (Pavlou & El Sawy, 2011), to find evidence of firms demonstrating both dynamic and improvisational capabilities, this study begins to bring to light the complementary and interdependent nature of these two capabilities, with each capability being a component of a solution set. Further, evidence in this study makes a compelling argument supporting the necessity for service providers to possess both dynamic and improvisational capabilities as they strive to remain competitive in the industry. This evidence serves to extending the limited research (El Sawy & Pavlou 2008; Pavlou & El Sawy, 2010) by encouraging researchers to begin to view dynamic and improvisational capabilities as necessary and interdependent, not

independent, capabilities. Also, this study has shed new light on the IT enabled business processes in the service industry. Previous research has focused solely on IT and the new product development industry (El Sawy & Pavlou, 2008). And it has offered evidence of newly available IT resources that are serving as an enabler of dynamic and improvisational capabilities. This observation and evidence serve to further defragment dynamic and improvisational capabilities by demonstrating that both capabilities are achievable through one enabler, IT.

Past literature (Eisenhardt & Martin, 2000; Teece et al., 2007; Pavlou & El Sawy, 2010; Pavlou & El Sawy, 2011) has highlighted the role of dynamic and improvisational capabilities in turbulent industries, but there have been no studies that offer a prescription for how firms can execute these complementary capabilities in varying degrees of turbulence. This study provides an initial prescription for how firms can execute dynamic and improvisational capabilities in environments with varying degrees of turbulence. This addresses a gap in existing literature by describing how firms can execute dynamic and improvisational capabilities.

This study provides evidence highlighting the significant differences involved in the execution of dynamic and improvisational capabilities at the sub-routine level. Conducting the study at the sub-routine level provides the initial step in refining the sub-routine execution of dynamic and improvisational capabilities.

This study was intended to provide a detailed understanding of how IT was enabling dynamic and improvisational capabilities. Literature to date has focused on how IT can facilitate and enhance dynamic capabilities, (Houghton et al., 2004; Pavlou & El Sawy, 2006; Sambamurthy et al., 2003) and it has focused on how IT can enhance improvisational capabilities (Pavlou & El Sawy, 2010), but this study is a first at offering insight into how IT can directly support both through the – sensing, learning, integrating, and coordinating capabilities. This

study fills a gap in literature linking IT, dynamic capabilities, and improvisational capabilities, with a proposed measureable model. Additionally, this study identifies two other interesting enablers of dynamic and improvisational capabilities. Organizational structure and organizational leadership were found to be contributing enablers to achieving dynamic and improvisational capabilities in small service firms.

IX.2 Recommendations for practice

As small service firms attempt to respond to industry turbulence by reconfiguring existing operational processes, lessons gather and documented in this study could prove very beneficial. This study offers practical recommendations for small service firms seeking to enhance their dynamic and improvisational capabilities as they strive to achieve a competitive advantage. Firms can benefit greatly by understanding how these focal firms are executing dynamic capabilities and improvisational capabilities at the basic sub-routine level.

Sensing in moderate velocity turbulence: This study suggests that firms can exercise a sensing capability in moderate velocity turbulence by employing the sub routines, generating, disseminating, and responding to market intelligence. In moderate velocity environments, where time is on the side of the firm, firms need to take advantage of the opportunity to collect information, analyze it, look for information gaps, and then to fill those gaps. Firms need to disseminate information widely which allows for a thorough analysis of information at many levels. Further, firms should take full advantage of the moderate turbulence by formulating well thought out and articulated responses to changes in their environment.

Sensing in high velocity turbulence: Evidence suggests that in high velocity turbulence firms need to be prepared to act on limited information. They should consider attempting to fill information gaps not only internally, but also externally, in the interest of having enough

information to act on. Firms should carefully consider their dissemination of information in high velocity environments. Evidence here suggests that firms have had success employing small agile teams with subject matter experts. Firms must practice and become proficient with responding to changes, they need to be able to identify information that drives or requires change and they need to be able to confidently "pull the trigger," before their competitors.

Learning in moderate velocity turbulence: This study suggests that firms can exercise a learning capability in moderate velocity turbulence by employing the sub routines, acquiring, assimilating, transforming, and exploiting knowledge. Firms should practice knowledge acquisition continuously by all means possible. Knowledge acquisition is the first step; it must be followed by diligent knowledge assimilation, brokering and knowledge articulation. These actions allow for innovation in the firm, they contribute to active brainstorming and creative thinking. Transforming and exploitation of knowledge facilitate pursuing new initiatives in moderate turbulence. It is the entire suite of subroutines that allows firms to reconfigure existing capabilities or competencies. Continuous learning allows firm to be information rich and facilitate reconfiguration of obsolete or ineffective operational processes.

Learning in high velocity turbulence: While firms are continuously learning, high velocity turbulence demanding immediate attention may force firms to act with limited knowledge. They may be forced to act with the knowledge that is on hand at any specific time. Lack of time can constrain attempts to adequately articulate knowledge or arrange and coordinate knowledge. Firms need to rely on heuristics and experiential knowledge when time constrains their collection efforts. Firms should use the limited knowledge to develop potential choices, or courses of action, based on the knowledge available. Potential courses of action can

facilitate effective and timely decision-making. Firms can now respond quickly to changing environments and create new processes or competencies.

Integrating in moderate velocity turbulence: This study suggests that firms can exercise an integrating capability in moderate velocity turbulence by employing the sub routines, contribution, representation, and interrelation of individual input. In moderate velocity turbulence, time is on the firm's side, and they should take full advantage of this. Firms need to collect individual knowledge and expertise so they can develop a common understanding through codification. Codification allows individual knowledge and individual expertise to be elevated to the organizational level. It is at the organizational level where knowledge can be exercised in the creation of new organizational processes and competencies.

Integrating in high velocity turbulence: While firms are working diligently to represent and codify individual knowledge, time may work against them in high velocity turbulence. Firms need to understand the trade-offs between being quick to respond and the acquisition and exploitation of knowledge. Firms need to be able to take action with only that knowledge that is immediately available to them. When this occurs firms must ensure they have created enough of a baseline understanding throughout the organization to facilitate new process creation and implementation.

Coordinating in moderate velocity turbulence: This study suggests that firms can exercise a coordinating capability in moderate velocity turbulence by employing the sub routines, assigning resources to tasks, appointing the right person to tasks, identifying complementarities and synergies, and orchestrating collective activities. In moderate velocity turbulence firms should practice well thought out administration of tasks. Firms should take great care assigning resources and activities, constantly looking for interdependencies that may prove crucial to

successful implementation of new processes or competencies. Only after thorough examination and observation should firms finalize the deployment of new processes. Post deployment, firms should continue to monitor and observe new processes looking for process effectiveness or potential improvement opportunities.

Coordinating in high velocity turbulence: As firms attempt to coordinate new operational processes in high velocity they will do well by being flexible in their new tasking of activities and duties. When they look to accomplish new tasks they should not only attempt to match resources with activities, and activities with people, but they should look very closely at how they might be able to leverage technology to replace labor. When evaluating synergies or complementarities they cannot be afraid to initially force relationships in the interest of speed. Firms should not allow themselves to become paralyzed in the face of fast moving and demanding environments. Firms must accept that they may not be implementing new processes to the best of their abilities time not being a factor. Firms must compensate by seeking workarounds or even temporary solutions. Firms must remember that orchestrating and managing coordination in highly turbulent environments call for employing simple routines so that people can focus their attention amid the noise and help provide sense making in highly uncertain situations.

X   LIMITATIONS AND FUTURE RESEARCH

X.1   Limitations

As with any study, this study has limitations that should be addressed. With regard to generalizability, this study chose four cases from a large population of small defense contracting firms. Also, it should be noted that small defense contracting firms operate in the same environment as large defense contracting firms, but large firms were not included in this study. Understanding limitations on generalizability I chose a multiple-case case study in an attempt to use replication logic to strengthen my findings generalizability. Hersen and Barlow (1976) state that replication logic is analogous to the logic used in multiple experimental design and Yin (2009) states that analytic conclusions independently arriving from two cases, as with two experiments, will be more powerful than those coming from a single case alone. Further research should be conducted to include large defense contractor firms if generalizability for the entire defense contracting industry is desirable.

Further, this study could be extended through additional case study research to other small service firms who conduct business in industries with varying levels of turbulence. This would offer additional evidence to increase the generalizability of these findings.

X.2   Future Research

Further research can be conducted on the applicability of the Pavlou and El Sawy (2011) proposed measurable model for dynamic capabilities to determine if this model is most appropriate for measuring improvisational capabilities, or dynamic capabilities in highly turbulent environments.

Further, future research could be conducted using alternate theoretical frameworks suitable for analyzing IT enablement of dynamic and improvisational capabilities. Ambidexterity

theory and Sense and Respond theory may also be appropriately interesting theoretical

frameworks.

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