

*Exploring Organizational IT Learning Mechanisms For  
Dynamic IT Capabilities*

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## **Abstract**

It is widely recognized that most organizations struggle to manage information technology (IT) resources and projects effectively so as to bring about positive business impact. The challenge of effective IT management is exacerbated by the continuous evolution of IT and changing competitive demands, which require firms to continuously innovate their design, deployment and use of IT systems. Drawing from the dynamic capabilities perspective, we argue that contexts of highly dynamic competitive and technological markets require firms to develop “dynamic IT management capabilities” in order to effectively manage their IT resources over time. We further argue that developing and maintaining dynamic IT management capabilities is facilitated by a set of organizational IT learning mechanisms. Drawing from existing theory, we identify seven such organizational IT learning mechanisms and present a conceptual model that is being used in an ongoing empirical study that seeks to identify how organizations continuously learn to manage IT effectively over time.

## **1 Introduction**

It is widely recognized that many organizations struggle to manage information technology (IT) resources effectively so as to bring about positive business impact. This challenge of effective management of IT is exacerbated by the continuous evolution of IT capabilities and changing competitive demands (Sambamurthy, Bharadwaj, and Grover 2004). Such turbulence in the external competitive and technological environments requires continuous organizational learning to assess the business opportunities and implications of emerging technologies, experiment with innovative IT-enabled business processes, implement new IT systems based upon these new technologies, and evaluate their business impact (Wheeler, 2002).

For the past decade, information systems (IS) researchers have developed the concept of "IT Absorptive Capacity" to examine the ability of organizations to absorb new IT innovations (Cohen & Levinthal, 1990; Zahra & George, 2002). Much of the research to date has examined static models of IT Absorptive Capacity. For example, Boynton, Zmud and Jacobs (1994) stated that a firm's absorptive capacity for IT is comprised of "the conjunction of IT-related and business-related knowledge possessed by and exchanged among IT managers and business unit or line managers" (p.300), combined with the effectiveness of the organization's IT management processes. However, the challenge of effective management of IT resources and capabilities in the context of turbulent external environments renders static models of IT Absorptive Capacity ineffective in providing descriptive and prescriptive models of effective IT innovation over time.

Against this background, we embarked upon a research project aimed at developing an empirically based model of dynamic organizational IT learning. Our research question was "how do organizations continuously learn to effectively manage IT over time?" This paper proceeds as follows: Section two reviews the dynamic capabilities perspective that serves as the theoretical foundation for our model. Section three explicates the details of our conceptual model for how organizations continuously learn to effectively manage IT over time, and Section four concludes with a summary and directions for future research.

## **2 Theoretical Foundations**

An appropriate theoretical foundation for assessing continuous organizational learning in highly dynamic and competitive environments is the dynamic capabilities

perspective (Eisenhardt and Martin, 2000; Teece, Pisano, and Shuen, 1997). According to the dynamic capabilities view, firms seek to gain competitive advantage in the market-place by dynamically reconfiguring available resources in order to renew functional competencies to meet the ever-changing requirements of the dynamic external environment. Dynamic capabilities refer to a firm's ability to integrate, reconfigure, gain and release resources to match and create market change (Eisenhardt & Martin, 2000, p. 1107). Successful firms constantly establish or enhance dynamic capabilities to lead, initiate, and address changes in the business marketplace. Dynamic capabilities are built over time through basic learning mechanisms such as repeated practice, past failures, codification of learning insights and the intentional pacing of experience (Eisenhardt and Martin 2000).

The dynamic capabilities perspective builds on the Resource-Based View of the firm (Barney, 1991), which argues that firms who sustain valuable, rare, inimitable, and non-substitutable resources are able to hold advantage over their competitors. However, according to the dynamic capabilities perspective, simply possessing such resources alone is not enough to guarantee competitive advantage—at least not sustained competitive advantage. Instead, firms must learn to quickly reconfigure their resources in order to offer new and viable value propositions (e.g., products and services) to the marketplace. Consistent with Eisenhardt and Martin, we define dynamic capabilities as the “organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die” (Eisenhardt and Martin 2000, p 1107).

Some have argued that the Resource-Based View, and by implication the Dynamic Capabilities Perspective, is tautological (Williamson, 1999; Priem and Butler, 2000). According to this view, these theories are of little value because they can not predict who will attain super-normal returns, but can only explain historical outcomes based on an analysis of the market's response to value propositions. Recent theorizing has addressed this tautological concern by defining dynamic capabilities in terms of their functional relationship to resource manipulation as opposed to firm performance (Eisenhardt and Martin 2000). We share this conception of dynamic capabilities and argue below that firms who develop a dynamic capability of IT management will have the ability to reconfigure their IT systems and processes to meet the changing demands of their marketplace, whether that be internal clients, or external customers, without regard for the firm's overall

financial performance.

## **2.1 Dynamic Capabilities and IT Management**

There are three distinct attributes of dynamic capabilities that are helpful in understanding how firms learn to manage IT effectively. First, dynamic capabilities are composed of commonalities or “best practices” across firms. While the exact nature and relevance of “best practices” is not clear in any area of business, their presence in IT management is well-established. The proliferation of practitioner books, magazines, and conferences related to effective practices of IT management is ample evidence. Thus, we argue that the organizational routines that comprise the dynamic capability of IT management can be viewed as “best practices” that are somewhat transferable, or generalizable, across organizations.

Second, dynamic capabilities vary with market dynamism. That is, where a firm’s primary industry market can be classified as highly dynamic, a dynamic capability may function as simple rules or guidelines in use by management (Eisenhardt and Sull, 2001). On the contrary, in low velocity markets firms that demonstrate a dynamic capability of IT management are likely to operate according to well-established procedures, methodologies, norms and protocols.

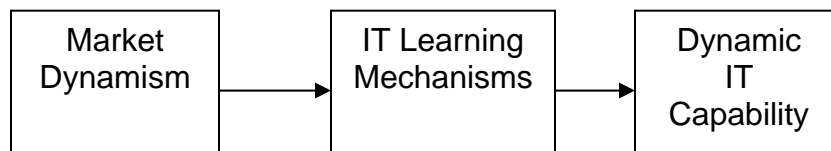
Third, and finally, the evolution of dynamic capabilities within firms is guided by well-known learning mechanisms such as experience, mistakes, and feedback (Argote, 1999). Consequently we argue that as firms accumulate experiences with IT management and continually assess the market’s response to their value propositions, they will intentionally shuffle their IT management practices based on the on-going learning they incur.

Based on these dimensions of a dynamic capability, we argue that firms with a dynamic capability of IT management are able to continuously learn to effectively manage IT over time. That is, they have cultivated a learning organization (Senge, 1999) that can readily adopt best-practices of IT management in order to reconfigure their IT resources and processes to match with an ever-changing environment. In the next section we examine some of the important learning mechanisms that guide the evolution of a dynamic capability of IT management.

## **3 Conceptual Development**

Researchers have argued that there is no one best way to learn, but that different approaches may be required to learn in different market environments (Pisano, 1994). The existing management literature pertaining to organizational learning provides insights into various organizational learning mechanisms that can aid firms in developing, establishing, and maintaining dynamic capabilities. Using concepts from this literature we offer a theoretical model of the learning mechanisms firms use to continuously learn to effectively manage IT resources over time (Fig. 1).

As defined above, we refer to a firm's ability to consistently rearrange their IT processes and resources to better align with an ever-changing environment as a "Dynamic IT Management Capability" (hereafter referred to simply as a dynamic IT capability). Drawing from the dynamics capabilities view, such a dynamic IT capability is built and sustained by a set of organizational learning mechanisms. Based on the Dynamic Capabilities Perspective, we argue that these mechanisms are influenced by an organization's structure and the availability of its information and knowledge resources as well as the dynamism of its competitive market. Our conceptual model is illustrated in Figure 1. The primary focus of this paper is to provide a conceptual justification and initial empirical operationalization of our model and to identify several hypothesized IT learning mechanisms.



**Fig. 1:** Conceptual Model of the Role of Organizational IT Learning Mechanisms

### 3.1 The Role of Market Dynamism

As argued earlier, dynamic capabilities are theoretically expected to vary with market dynamism (Eisenhardt & Sull, 2001; Eisenhardt & Martin, 2000). We argue that a primary influence of market dynamism is in the implementation of the learning mechanisms that guide the evolution of dynamic capabilities. In markets characterized with highly-dynamic change, we expect that firms with a dynamic capability for IT management will implement

a variety of learning mechanisms designed to capture quick-lessons from short-term projects and IT experimentation. However, in less dynamic markets, firms may develop a dynamic capability for IT management by establishing a relatively thorough and comprehensive IT policy with rigid standards, shared infrastructure, and formal implementation methodologies.

*P1- The set of IT learning mechanisms in use by a firm is influenced by market dynamism*

### **3.2 The Evolution of a Dynamic IT Capability**

A dynamic IT capability can not be bought and installed within an organization. Instead, it requires time and experience with existing IT resources and processes to cultivate an ability to organize and shuffle IT resources into value-creating propositions for a firm. We argue, consistent with prior research, that this capability is guided by well-established learning mechanisms. As firms experiment with IT, achieve successes, and suffer strategic setbacks, they learn how better to manage IT to align with their internal and external environment. Consequently, we argue:

*P2: A dynamic IT capability is developed through a variety of IT learning mechanisms.*

Having established the basic propositions of our model, we now turn our attention to operationalizing the concept of an IT learning mechanism.

### **3.3 IT Learning Mechanisms that Facilitate a Dynamic IT Capability**

Following an extensive review of the management and organization literature, we identified seven mechanisms for organizational IT learning that influence the development of dynamic IT capabilities. These include, (1) repeated practices / procedures, (2) accumulation and codification of past experiences, (3) external boundary spanning, (4) internal boundary spanning, (5) pacing of experience / innovation, (6) sequencing of steps between routines, and (7) incremental experimentation. No claim is made that the seven dimensions for organizational learning are exhaustive.

The next section revisits the literature on organizational learning and provides insights for how these learning mechanisms contribute to the establishment of dynamic

capabilities. Furthermore, we extend these insights into consideration of how equivalent organizational IT learning mechanisms might contribute to the establishment of dynamic IT capabilities. The seven organizational learning mechanisms, the corresponding organizational IT learning mechanisms and their operationalization are summarized in Table 1.

**Repeated Practices/Procedures.** One particular way that firms learn is through the establishment and implementation of repeated practices and routines (Grant, 1996). Routines are used to create stable patterns of behavior that characterize the firm's reaction to internal or external stimuli (Zollo & Winter, 2002). These routines are generally seen as forms, rules, procedures, conventions, strategies, and technologies around which organizations are constructed and through which they operate (Levitt and March, 1988). Routines make it easy for firms to learn, execute, and reproduce reliable and efficient tasks (Galunic & Rodan, 1998; Nelson & Winter, 1982; Meyer & Rowan, 1977). Firms also establish and use routines and processes to assist in establishing and maintaining change (Galunic & Rodan, 1998).

Within the RBV and dynamic capabilities perspective, researchers have posited that the patterns of establishing and maintaining dynamic capabilities are in accordance with the type of market dynamism that the firm operates (e.g., Eisenhardt & Martin, 2000).

Applied to our focus on organizational IT learning mechanisms, we consider whether adherence to formal routines, methodologies, SOPs and IT management processes effectiveness (Boynton, Zmud, & Jacobs, 1994) affects a firm's dynamic IT capabilities.

**Accumulation and Codification of Past Experiences.** Prior research focused on organizational learning has argued that the genesis and evolution of dynamic capabilities should focus on the accumulation and codification of past experiences within the firm (e.g., Eisenhardt & Martin, 2000). Organizations can develop better ways to learn about their markets, by understanding each step in their learning process, critically assessing their learning competency, and then correcting the learning disabilities (Day, 1994). Research has found that organizational learning mechanisms can contribute to the accumulation and codification of past experiences include experience accumulation (Zollo & Winter, 2002), reflection / systematic evaluation of outcomes (Day, 1994) and knowledge codification (Zollo & Winter, 2002). Hence, drawing from existing theory, we posit that a second mechanism for organizational learning centers around the accumulation and codification of past experiences.



Transferring these concepts to the IT domain, we suggest that the accumulation, evaluation, and review of past IT experiences and IT knowledge codification process lends to organizational learning and the establishment of dynamic IT capabilities.

**External Boundary Spanning.** External boundary spanning is the practice of relating to people, events, and activities outside the organization. While interacting with market environments, organizations normally perform several functions: 1) representing the organization to its external constituencies; 2) scanning and monitoring environmental events that are potentially relevant for the organization's operations; 3) protecting the firm from external environmental threats; 4) protecting information and gatekeeping; 5) negotiating and exchanging with other firms for the acquisition of inputs and the disposal of outputs; 6) coordinating inter-organizational activities (Lawrence & Lorsch, 1967). While boundary spanning, managers attempt to seek ways to respond to and to influence management decisions. While doing so, managers gain information external to the firm and learn how to make better decisions about the dynamic market changes that can occur.

We propose that external boundary spanning contributes to a third organizational learning mechanism. Previous research has indicated that boundary spanning external to the organization (Cohen & Levinthal, 1990), exposure to external sources (Zahara & George, 2002), and scanning with an open-minded inquiry (Day, 1994) together provide elements of this third mechanism.

Applying this perspective to the IT domain, we suggest that external IT boundary spanning (i.e., representation, exposure, scanning, of external sources etc.) aids the organizational IT learning process and the establishment of dynamic IT capabilities.

**Internal Boundary Spanning.** The management literature also indicates that organizational learning is enhanced by a firm's internal boundary spanning activities. These include internal boundary scanning (Cohen & Levinthal, 1990), social integration mechanisms (Zahara & George, 2002), mutually informed mental models for interpretation (Day, 1994), and effective communication structures (Cohen & Levinthal, 1990).

Applying these insights to the IT context leads us to consider how internal IT-Business unit boundary spanning (i.e., effective IT communication structures, informed mental models, social integration mechanisms, etc.) influences how organizations learn and establish dynamic IT capabilities.

**Pacing of Experience / Innovation.** The literature also indicates that the pacing of experience and innovation influences how organizations learn. As mentioned above, the pace of change in dynamic markets dictates the manner in which firms develop dynamic capabilities (Eisenhardt & Martin, 2000; Eisenhardt & Sull, 2001). Eisenhardt & Martin (2000) argue that the pacing of experience and innovation influence how organizations learn how to use resources to establish dynamic capabilities. In particular, the authors argue that the firm's pace of using resources to establish dynamic capabilities is dependent on the constantly changes influenced by moderately-dynamic to high-velocity market environments. In high-velocity markets, the pace of experience and innovation that the firm must contend with is quick and constantly changing. Conversely, the authors state that in moderately-dynamic markets, where the pace of change is not as frequent as in high-velocity markets, the pace of experience and innovation is not as frequent or fast. Hence, the conscious pacing of experience and innovation offers a fifth mechanism for organizational learning.

Drawing from these insights, we consider that the pacing of IT experience and innovation aids or hinders organizational IT learning and the development of dynamic IT capabilities.

**Sequencing of Steps Between Routines.** Firms in dynamic markets often develop efficient routines and processes that are relatively stable, with linear steps beginning with analysis and ending with implementation (Eisenhart & Martin, 2000). In these types of markets, effective decision-making routines and processes are linear and characterized by sequential steps to problem solving: development of alternatives, extensive analysis of alternatives, and choice (Pisano, 1994). Tacit knowledge is frequently coded into detailed routines that precisely specify the sequence steps and subdivide the activities among different individuals. These routines depend heavily on the memory of the firm for routine and enhance the predictability of process (Argote, 1999).

When firms implement routines and processes during the establishment of dynamic capabilities, it is important to sequence and temporally order these routines and processes. Eisenhardt & Martin (2002) argue that the sequencing of steps between routines can also influence how organizations learn how to use resources to establish dynamic capabilities. For example, the authors suggest that single product development routines must precede “probing the future”, and “linking existing products to future opportunities.”

Consequently, we argue that the sixth mechanism for organizational IT learning

focuses on how firms sequence the steps between routines. Transferring this to the IT domain, the sequencing of steps between routines provides a sixth dimension for the IT learning mechanisms that aid firms in establishing dynamic capabilities. In particular, we will attempt to understand how the sequence of steps that comprise the purposeful plan for roll out of IT initiatives contribute to dynamic IT capabilities.

**Incremental Experimentation.** RBV researchers have posited that firms operating in a dynamic market must constantly react to market changes and consistently integrate new and existing knowledge in order to address these market changes (Okhuysen & Eisenhardt, 2002; Zollo & Winter, 2002). Hence, resource and competency building are affected by the firm's ability to improve task performance through trial-and-error experimentation (Dosi and Marengo, 1992). Additionally, Eisenhardt & Martin (2000) argue that dynamic capabilities are established through incremental rounds of experimenting with how resources can be used to establish a competitive advantage.

Applying this to the IT domain suggests our seventh mechanism for organizational IT learning. This research intends to investigate how organizational IT learning mechanisms, such as prototyping, incremental development, phased rollouts, contributes to how an organization institutes and sustains dynamic IT capabilities.

Table 1 summarizes the seven organizational learning mechanisms that build dynamic capabilities, the equivalent mechanisms for organizational IT learning, and some operationalizations of these latter mechanisms.

**Table 1:** From Organizational Learning to Organizational IT Learning Mechanisms

<i>Organizational Learning Mechanisms</i>	<i>Organizational IT Learning Mechanisms</i>	<i>Operationalization</i>
<p><i>Repeated practices/procedures</i> (Eisenhardt and Martin 2000)</p> <p>Frequency and variability of task performance (Grant 1996)</p>	<p><i>Repeated IT practices and procedures</i></p> <p>Adherence to formal methodologies and operating procedures (Boynton, Zmud &amp; Jacobs 1994)</p> <p>IT management process effectiveness (Boynton, Zmud &amp; Jacobs 1994)</p>	<p>Extent of use of methodologies for core IS activities including business systems thinking; project management; architecture and service planning; IT function management; IT development, acquisition maintenance; vendor management (Feeny and Wilcocks 1998; Zmud 1987)</p>
<p><i>Accumulation and codification of past experiences</i> (Eisenhardt and Martin 2000)</p> <p>Experience accumulation (Zollo and Winter 2002)</p> <p>Knowledge codification (Zollo and Winter 2002)</p> <p>Reflection/ systematic evaluation of outcomes (Day 1994)</p>	<p><i>Accumulation and codification of past IT experiences</i></p> <p>IT knowledge codification</p>	<p>Accumulation of “lessons learned” through IT project debriefs and post-implementation reviews of previous IT successes and failures</p> <p>Codifying lessons learned into knowledge repositories of past experiences; libraries of objects for reuse; technical and user support Intranets of FAQ; Budget, business case, RFP and project management methodology templates for future re-use</p>
<p><i>External boundary spanning</i> (Cohen and Levinthal 1990)</p> <p>Exposure to external sources (Zahra and George 2002)</p> <p>Scanning - open-minded inquiry (Day 1994)</p>	<p><i>External IT boundary spanning</i></p>	<p>Frequency of professional conference/seminar attendance; Industry/peer roundtable participation; extent of training &amp; continuing education; targeted recruitment; ratio of new hires; engagement of IT consultants</p>

**Table 1** (continued)

<i>Organizational Learning Mechanisms</i>	<i>Organizational IT Learning Mechanisms</i>	<i>Operationalization</i>
<p><i>Internal boundary spanning</i> (Cohen and Levinthal 1990)</p> <p>Social integration mechanisms (Zahra and George 2002)</p> <p>Mutually informed mental models for interpretation (Day 1994)</p> <p>Effective communication structures (Cohen and Levinthal 1990)</p>	<p><i>Internal IT-Business unit spanning</i></p> <p>Mechanisms for social integration of business and IT professionals</p> <p>Effective IT communication structures</p>	<p>IT-Business Unit committees; CIO engagement with business executives; CIO participation on executive team; IT-user forums for shared experiences; shared behavioral norms; Common understanding of business and IT issues; IT Client Relationship Managers assigned to business units; distribution of IT units/staff among user groups; Cross-functional project teams; cross functional IT briefings and brainstorming sessions; IT newsletters and Intranets.</p>
<p><i>Pacing of experience/innovation</i> (Eisenhardt and Martin 2000)</p>	<p><i>Pace of IT experience/innovation</i></p>	<p>Scope “satisficing” in IT projects; explicit management of IT project portfolio; explicit assessment and alignment of IT risk relative to business environment and risks; alignment of pace of IT initiatives with market dynamics</p>
<p><i>Sequencing of steps between routines</i> (Eisenhardt and Martin 2000)</p>	<p><i>Sequencing of steps between IT routines</i></p> <p>IT Architecture stages (Ross '03)</p> <p>Enterprise system evolution (Goodhue et al. 2002)</p>	<p>Explicit blueprints for IT and information architecture evolution; sequence and allocation of IT activities and responsibilities between significant IT initiatives; Purposeful roll out of IT systems and components;</p>
<p><i>Incremental experimentation</i> (Eisenhardt and Martin 2000) (Dosi &amp; Marengo ,1992).</p>	<p><i>Incremental IT experimentation</i></p>	<p>Presence and pace of “advanced technology group” for experimenting with emerging IT ; IT adoption policies (early to late); business versus IT prototyping; incremental IT development; phased rollout;</p>

#### **4 Summary and Conclusion**

Using the Dynamic Capabilities Perspective as a theoretical foundation, we argue that firms with a dynamic capability of IT management are able to continually shuffle their IT assets—be they human, technical, or relational (Ross, Beath & Goodhue, 1996)—to

align them with the ever-changing requirements of their environment. Despite the continual reorganization of IT management practices, we postulate that firms with a dynamic capability for IT management demonstrate commonalities or “best practices”. Additionally, we contend that the dynamic capability of IT management varies with market dynamism such that in highly dynamic industries it resembles “simple rules” or broad guidelines while in more institutionalized industries it may exhibit a more rigid instantiation. Finally, we argue that the evolution of a firm’s IT management capabilities is guided by organizational learning mechanisms. As firms accumulate and assess their prior experiences they are likely to modify their IT management practices.

In this section, we articulate the theoretical contribution of this paper and describe several opportunities for future empirical research.

#### **4.1 Theoretical Contributions**

This study presents insights into a phenomenon that is of growing importance today: the manner in which firms rely on and utilize IT learning mechanisms to develop and maintain dynamic IT management capabilities. The primary contribution of this paper is a theoretical model that offers an explanation of how firms can continuously learn to effectively manage IT over time. A second theoretical contribution of this paper is the elucidation of seven IT learning mechanisms hypothesized to influence a firm’s dynamic IT capability. Finally, this research represents one of the few IS studies that uses the dynamic capabilities perspective to investigate how the process of establishing dynamic capabilities can be facilitated by specific organizational IT learning mechanisms.

#### **4.2 Directions for Future Research**

By explicating an initial research model, this paper sets the foundation for a program of research about how organizations can continuously learn to effectively manage IT resources. Additionally, we have explicated seven specific IT learning mechanisms that are expected to guide the evolution of a dynamic capability of IT management. Future empirical research can both test for the presence and salience of these seven organizational IT learning mechanisms and explore the presence of additional IT learning mechanisms.

Additionally, future research can examine the role of additional variables such as organizational structure and shared information and knowledge resources for the

development of dynamic IT capabilities.

### **4.3 Conclusion**

In this paper we have articulated a theoretical model based on the dynamic capabilities perspective that describes the role of IT learning mechanisms in guiding an organization to effectively manage their IT resources over time. Additionally, we have offered seven distinct IT learning mechanisms hypothesized to contribute to the development of such capabilities. Future empirical research can test this model to assess its ability to answer our research question, “how do organizations continuously learn to effectively manage IT over time?”

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