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Dynamic Ambidexterity: Exploiting Exploration for Business Success in the Digital Age

Jeffrey Alexander Dixon
Queen\'s University School of Business, jdixon@queensu.ca

Kathryn Brohman
Queen's University, kbrohman@business.queensu.ca

Yolande E. Chan
Queen's University, ychan@business.queensu.ca

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Introduction

For startup firms, innovation is their main modus operandi. At the organizational level, they are digital natives, birthed in the era of digital business models. Well-established, traditional businesses, however, face a unique set of challenges in introducing digital business models: how can they balance "keeping the lights on" with an existing non-digital business model while concurrently committing resources to develop an innovative digital business model? For those firms that successfully manage this tension, a subsequent challenge arises. Once the innovation proves successful, how can the firm then embed the new digital business model into their ongoing operations? This is especially difficult when the new business model might negatively impact, if not eradicate, the existing traditional business model.

Consider the radical transformation of the book-selling industry over the past twenty years. Following its public listing in 1993, Barnes & Noble brokered a series of acquisitions and pursued an aggressive growth strategy to become the dominant book superstore in America. Yet it faced stiff competition from many bricks and mortar competitors, ranging from independent bookshops to mall stores and other progenitors of the large box store model. Only a year later, a Wall Street executive left the comforts of his corporate suite to start an online bookstore from his garage. By 1995, Amazon.com had sold their first book and by 1997 claimed to be "the world's largest bookstore" (https://en.wikipedia.org/wiki/Amazon.com). Barnes & Noble sued Amazon, claiming it wasn't a bookstore at all. History has proven Amazon to be correct.

The conflict between these two business models was clear. Amazon was able to quickly reinvent the bookselling industry through a digital business model because it had no investment in an existing physical model. Today, Barnes & Noble is the only surviving chain of physical bookstores in America, and its survival has been hard won. They too have pursued a digital strategy alongside their bricks and mortar model, but the commitment to existing physical resources has reduced their agility. Where Amazon was able to build a distribution network optimized for its digital business model, Barnes & Noble had to enter this new world with resources committed to store leases and warehouses designed to service physical stores. Other bricks and mortar retailers have been less fortunate. In some industries, then, the ability to take a digital innovation and embed it into existing operations can be a matter of survival for large firms.

Scope

To address this issue, this paper offers a review of the IS ambidexterity literature and then advances a theoretical model for embedding digital business models into existing organizational routines. Ambidexterity arises from a need to explain how firms can navigate environmental turbulence (e.g., March 1991). In the digital age, many firms find the pace of change in their industry is increasing as new competitors emerge from previously unrelated industries. Such jolts to the competitive landscape require existing players to be continually innovating while also "keeping the lights on" to maintain existing revenue streams in the near term.

The discourse on ambidexterity is an attempt by the strategy literature to resolve two fundamental dichotomies. First, is the conflict between those who argue that strategy is a predetermined plan from which structures and activities flow (e.g., Porter 1980, Andrews et al. 1986), and those who view strategy as an over-arching narrative and set of choices which emerge from the firm's evolving activities and structures (e.g., Mintzberg 1994). Second, is the dispute over the nature of organizational and industrial change. On the one hand, some see change as the result of major jolts to industries, which render existing business models obsolete and generate large opportunities for new models (e.g., Schumpeter 1942). On the other hand are those who view change as an ongoing process of micro-adaptations (e.g., Nelson & Winter 1982).

Ambidexterity suggests that neither of these tensions need be an either/or proposition. Instead, Tushman and O'Reilly (1996) argue, "Long-term success is marked by increasing alignment among strategy, structure, people, and culture through incremental or evolutionary change punctuated by discontinuous or

revolutionary change that requires the simultaneous shift in strategy, structure, people, and culture" (p. 11). The path to success, they propose, is a proactive approach to environmental jolts, fostered by pursuing both resource exploitation and resource exploration strategies at the same time. Thus, a firm can realize the benefits of ongoing evolutionary change by mining their existing resources through an exploitation strategy, while also working towards large innovations through exploration strategies. In this regard, they have both pre-determined and emergent strategies operating cooperatively.

Beginning with the work of Galliers (2004), ambidexterity has since been applied to the more specific context of information systems (IS). As digital business models fuse IS and corporate strategies, researchers are increasingly calling for work on this underdeveloped field (Chen et al. 2010, Galliers 2011, Ward 2012). Despite the growing demand for research on IS ambidexterity, limited research has been conducted and we know of no comprehensive review of the literature. From this context emerges a central research question:

How can businesses with existing traditional business models integrate an innovative digital business model into their ongoing organizational routines?

The paper is organized as follows. First, it provides a methodology for the literature review on IS ambidexterity. Second, the review summarizes the foundational perspectives on organizational ambidexterity from the strategy literature and it reviews their development in the IS literature. Third, it draws on the literature review to advance a framework for dynamic ambidexterity which explains how firms integrate innovative digital business models into existing organizational routines. Last, the paper concludes with a discussion of limitations, contributions to the literature, and avenues for future research.

Methodology

To review the IS ambidexterity literature, this paper used the literature review methodology recommended for emerging fields in Webster and Watson (2002). ABI/Inform Global was used as the primary database of inquiry. An initial search of peer-reviewed abstracts for "ambid*" produced 217 results. Abstracts of these articles were reviewed for relevance based on centrality of ambidexterity to the paper's argument as well as utilization of an IS perspective. Of these papers, 206 were excluded. A subsequent manuscript review of the remaining papers excluded an additional paper.

A further search of all text in the "Basket of Eight" top-tier MIS journals[1], produced 45 results. These papers' full manuscripts were reviewed using the same criteria as the ABI/Inform Global results, resulting in 20 of the papers being excluded for relevance. A further two papers were duplicates to the ABI/Inform Global results, leaving 33 included papers. A subsequent backwards review of the papers was conducted to capture any missed papers. Twenty-five additional papers were identified in this search, although they are largely from the strategy discipline and provide helpful background to the review of the included IS-related studies.

Organizational Ambidexterity

Two foundational papers from the strategy literature have informed a view of ambidexterity as a strategy to manage the exploitation of existing resources while also exploring the development of new resources. First, Duncan (1976) presents "a contingency model for designing organizations for innovation" (p. 167). His emphasis on organizational design for the purpose of ambidexterity leads to a recognition that different organizational structures are required for different phases of the innovation process. He thus proposes "switching" as a strategy for managing how the organization might structure itself for the different innovation stages. In the early phases of innovation, the organization should structure itself to allow for complexity with looser controls, while in the implementation phases, the structure should shift toward tighter controls and formalization. In this view, ambidexterity is achieved, then, through alternating temporal phases.

If Duncan (1976) is responsible for coining "organizational ambidexterity", it is March (1991) who added the exploration/exploitation language to the discussion. This stems, perhaps, from a noted difference in

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[1] European Journal of Information Systems, Information Systems Journal, Information Systems Research, Journal of AIS, Journal of Information Technology, Journal of MIS, Journal of Strategic Information Systems, MIS Quarterly

emphasis between the two. Duncan (1976) addresses the innovation process specifically. In contrast, March is concerned with the much broader organizational challenge of allocating limited resources between the "exploration of new possibilities", and the "exploitation of old certainties" (March 1991, p. 71).[2] These include "search, variation, risk taking, experimentation, play, flexibility, discovery, innovation" on the one hand, and, "refinement, choice, production, efficiency, selection, implementation, execution" on the other (March 1991, p. 71). In considering the problem, he further notes that these two broad sets of organizational activities generate very different returns. Exploitative activities have more predictable outcomes with benefits reaped in short time periods, whereas exploratory activities produce less certain returns with far longer horizons for returns on investments. Consequently, the adaptive processes common to most firms which help improve the performance of exploitative activities will hinder the performance of exploratory activities. As discussed below, many have taken this theory to investigate how governance and business unit structure might foster ambidexterity.

In contrast to Duncan (1976) and March's (1991) implications for the relationship between ambidexterity and organizational structure, a second body of literature has grown out of two additional strategy papers. Tushman and O'Reilly (1996) shifted the discussion from innovation and organizational learning (Duncan 1976) and exploration/exploitation (March 1991) to one of managing incremental and revolutionary change. They argue that these two types of change form a pattern by which organizations evolve: "periods of incremental change punctuated by discontinuous or revolutionary change" (Tushman & O'Reilly 1996, p. 11). Ambidexterity, in this conception, has to do with nurturing discontinuous change by aligning competencies, strategies, structures, cultures, and skills, while periodically reorienting the same elements to enable revolutionary change. While firms that cannot reorient will see success in stable markets, their inertia will lead to organizational failure when markets shift.[3] Ambidexterity, then, is a problem of organizational inertia.

Gibson and Birkinshaw (2004) have been instrumental in marking a clear delineation between what they term "structural ambidexterity" (e.g., Duncan 1976) and a growing emphasis in the literature on the importance of processes and systems. To address this view, they propose contextual ambidexterity as, "the behavioral capacity to simultaneously demonstrate alignment and adaptability across an entire business unit [where] alignment refers to coherence among all the patterns of activities in the business unit… [and] adaptability refers to the capacity to reconfigure activities… quickly to meet changing demands in the task environment" (Gibson & Birkinshaw, 2004, p. 209). Their empirical study demonstrates a relationship between four organizational contextual factors – stretch, discipline, support, and trust – and performance, with ambidexterity mediating the relationship. Notably, they measured ambidexterity as the interaction term between alignment and adaptability in a business unit, suggesting that ambidexterity is not merely the ability to align and adapt, but also pertains to the manner in which these capabilities impact one another.

The work of Gibson and Birkshaw (2004) is important in advancing contextual ambidexterity as an alternative to the punctuated equilibrium view of organizational change. As advocated by Christensen (1997) and Gupta et al. (2006) among others, punctuated equilibrium proposes that disruptive change occurs at distinct moments in time, thus disrupting ongoing market and firm norms. Gibson and Birkinshaw (2004) adopt a view of contextual ambidexterity in which the firm nurtures both types of change at the same time, a view that is extended in O'Reilly and Tushman (2008). Gupta et al. (2006), however, suggest that both types of change strategies may be appropriate for firms in different contexts.

Ambidexterity in the IS Literature

This section now turns to applications of ambidexterity in the IS literature where the construct is used increasingly to explain how firms manage technology investment and innovation in the context of evolutionary and revolutionary change (Merali et al. 2012). While the majority of existing research and theory falls into one of the structural or contextual ambidexterity camps, as will be discussed below, a handful of recent papers attempt to reconcile the two views, leading to new insights into the nature of ambidexterity and technology.

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[2] See Kyriakopolous and Moorman (2004) for further discussion of ambidexterity and limited resources.
[3] Burgelman's (1991) case study of Intel provides a valuable case study of overcoming organizational inertia.

Structural Ambidexterity

From Duncan (1976) and March (1991) a stream of research in the IS literature has emerged investigating ambidexterity from a structural perspective. In their discussion of the challenges faced in deriving innovation from outsourcing, Aubert et al. (2015) highlight two structural approaches to ambidexterity in the outsourcing context. The first is creating organizational subunits with differing cultures, processes, and managerial controls. In the context of outsourcing, they propose organizing different teams who support different outsourcing functions: one organized around generating innovation from outsourcing partners, and one to manage ongoing contractual obligations. The second approach is temporal separation in which the firm focuses on one mode at a time. In an outsourcing context, this normally begins with an exploratory mode and, as innovations are developed with the outsourcing partner and as viable products/services develop, it switches to an exploitation mode marked by stricter controls and clearer deliverables from the outsourcing partners.

These two approaches are reflected in several other IS ambidexterity studies. Several of these emphasize *temporal separation* or *switching* as a means of structuring ambidexterity. Lyytinen and Rose (2006) adopt an agility perspective and thus look at the impact of five considerations on organizational process goals: innovative content, risk, quality, cost, and speed. They argue for a temporal shifting between exploratory and exploitative activities in which the balance between these five considerations also shifts. Thus, during an exploratory phase, the firm or business unit is tolerant of high risks and costs in order to drive innovation. As innovations are commercialized, firms or business units move to an exploitation phase in which costs, innovation, and risk are kept low in order to drive high quality and speed.

Dos Santos et al. (2012) address IT-enabled investment opportunities. In describing the tension between new and current business investments in IT they argue for temporal separation driven by limitations on organizational resources. In resource-constrained periods, firms will limit their investments, focusing on current business investments (exploitation), whereas, in times of surplus resources, they will consider new business investments (exploration). Thus, there is a movement back and forth between the two.

A second approach to structural ambidexterity is delineating exploration and exploitation by *business function.* A resource-based view of the firm influences Tarafdar and Gordon's (2007) theoretical development of seven IS competency antecedents to firm innovation. Although they do not build an explicit ambidexterity framework, they apply the construct specifically to the IS function, which they characterize as having "supply" and "demand" elements. On the one hand, the supply side "deals with ensuring the delivery of IT services to support business functions [whereas the] "demand" side has to do with helping the business innovate through the use of IT" (p. 364). Their structural argument entails proper allocation of resources to each function. Operational modes are characterized by maintenance, cost efficiency, and targeted investments on the supply side, and communication, problem and opportunity identification, risk taking, and long-term oriented investments. This is not unlike the hybrid approach to IS development proposed by Vessey and Ward (2013). Although they do not frame their model theoretically as ambidexterity, they suggest an approach to development where agile methods are applied to adaptive and enabling IS functions and traditional development methodologies are applied to administrative IS functions.

A study of ambidexterity in open-source software (OSS) development (Temizkan & Kumar, 2015) also differentiates the exploration and exploitation activities around business functionality. In this case the researchers contrast innovation-oriented OSS activities against implementation-oriented OSS activities. They empirically demonstrate that patch development acts as exploitation while feature development acts as exploration. Further, they note that organizational units pursuing exploration are smaller, more decentralized, and more flexible than those responsible for exploitation" (p. 121). Thus, they highlight how exploration and exploitation business units differ in two key dimensions: governance structures and team composition.

In addition to these two structures, Lee et al. (2013) demonstrate the further influence of *firm characteristics* on ambidexterity. Drawing on an absorptive capacity lens to study organizational learning, they argue that firms must absorb learning from both exploitative and exploratory activities. Further, they contend that learning from exploitative activities is often a missed opportunity because while exploratory activities can offer greater advances, the learning process is less efficient than with exploitative activities. Thus, firms should not overlook the many incremental benefits gained through exploitative learning. Their

structural approach to ambidexterity leads them to consider the role of firm size in the ambidexterity-performance proposition. Theirs is a significant study, then, as it is the first to demonstrate a significant moderating effect whereby large firms reap increased benefits of learning ambidexterity on performance due to their more complex structures, which allow employees to absorb learnings from both types of activities. Others consider the importance of loose coupling in which various activities in the firm "are responsive, but that each event also preserves its own identity and some evidence of its physical or logical separateness" (Weick 1976, p. 3). Levinthal (1997) in particular has demonstrated the importance of loose coupling for adaptation strategies which supports the notion of structural ambidexterity.

Thus, studies adopting a structural view of ambidexterity typically inherit March's (1991) exploration-exploitation view of ambidexterity and argue that ambidexterity can be managed through combinations of temporal separation and allocation by business unit or function, and are further enabled by business characteristics including firm size.

Contextual Ambidexterity

In contrast to structural ambidexterity, several IS studies have adopted Tushman & O'Reilly's (1996) alignment-adaptability view to advance the contextual approach to ambidexterity. Im and Rai (2014) define contextual ambidexterity as focusing, "on the management system—namely, the culture, processes, and routines—to achieve synergy between alignment and adaptation" (p. 74). In their study of customer-vendor relationships, they investigated the relationship between three interorganizational relationship structures – use of operation support systems (OSS), use of interpretation support systems (ISS), and decision interdependence – on interorganizational relationship ambidexterity. In other words, ambidexterity is a function of their firm-partner practices: their ability to integrate operations (OSS use), discover and learn together (ISS use), and collaborate in decision making. Further, ambidexterity is measured as an interaction term between their agility and adaptation measures, indicating that it has a multiplicative effect, generating greater performance and quality outcomes than merely possessing both factors in isolation.

Two papers by Ramesh, Monhan, Cao and Sarker (Ramesh et al. 2012; Cao et al. 2013) develop contextual ambidexterity further. They extend the construct to the individual level, defining contextual ambidexterity as,

> "the behavioral capacity to simultaneously pursue conflicting demands, such as the ability to demonstrate alignment and adaptability across a business unit. It is achieved by building a set of processes or systems that enable and encourage individuals to make their own judgments about how to divide their time between conflicting demands for alignment and adaptability rather than by creating dual structures." (Ramesh et al. 2012, p. 325)

Thus, rather than two operational modes moving across business units, or remaining in a business unit but shifting in emphasis over time, ambidexterity is the firm enabling individual workers to operate in both modes at the appropriate time. They argue through a case study of software development that ambidexterity can be achieved through balanced practices that are appropriate for the project context. Thus, for traditional development, an operational focus drawing on formal structures can enable a performance management context marked by discipline and stretch. In contrast, for agile development, a relational focus drawing on distributed project teams enables a social project context marked by support and trust. In a subsequent study of outsourcing activities, Cao et al. (2013) further demonstrated how governance can balance the relational and contractual elements of an outsourcing relationship.

Napier et al. (2011) extended the understanding of the four contextual dimensions of ambidexterity – discipline, stretch, support, and trust – by adding Pettigrew's (1985, 1987) contextualist inquiry lens to a case study of agile development in a software firm. This perspective suggests that four organizational improvement processes – diagnosing, visioning, intervening, and practicing –can generate ambidexterity from the contextual factors. Their case study demonstrates that by implementing these processes, they shifted from a reactive strategy (i.e., low alignment, low adaptation), to an exploitation strategy (i.e., high alignment, low adaptation), and ultimately to a sustainable, high-performing ambidexterity model (i.e., high alignment, high adaptation).

Governance also emerges in Tiwana's (2010) study of systems development. Drawing on Gibson and Birkinshaw's (2004) alignment-adaptivity constructs, he approaches governance from a control perspective. He proposes that the flexible nature of agile development methods require a different set of

control mechanisms to traditional software development methods. Because firms are increasingly seeing the need for both types of development, often in line with the supply and demand elements of IT functionality discussed by Tarafdar and Gordon (2007), they require systems development ambidexterity. This type of ambidexterity emphasizes implementing the appropriate control mechanisms for the right development approaches. A study of mobile workers (Kietzmann et al. 2013) further supports the role of governance in fostering ambidexterity, suggesting that individuals within mobile communities of practice perform best when balancing organizational alignment (i.e., their work contributes to the organization's strategic goals) and individual discretion (i.e., their professional judgment allows them to manage conflicting alignment/adaptability demands). This view of the role of professionals in ambidexterity begins to suggest a loose coupling lens, not unlike the notion of exploratory/exploitative business units being loosely coupled in the structural ambidexterity literature.

A contrasting view of contextual ambidexterity emerges in a survey of managers from 1500 Canadian firms by De Clerq et al. (2013). This study advances contextual ambidexterity by testing the contingency factors impacting the ambidexterity-performance relationship. They identify two "knowledge exchange" factors – informational justice and task conflict – and two "competitive environment" factors – resource competition and reward interdependence. Thus, the knowledge exchange factors test how well knowledge moves within the firm, while the competitive environment factors measure the resource accessibility within the firm. They demonstrate that the ambidexterity-performance relationship is enhanced by knowledge exchange within the firm, but negatively impacted by intra-firm competition.

While still situated within the domain of contextual ambidexterity, De Clerq et al.'s (2013) model is quite different to that of Ramesh et al. (2012). That earlier study measured the contextual factors as antecedents to ambidexterity and measured ambidexterity as an interaction term between alignment and adaptability. Here in De Clerq et al. (2013), the contextual factors are modeled as moderators in the ambidexterity-performance relationship and there is no direct measure of ambidexterity. Instead, it is assumed that if a firm has high alignment and high adaptability, then they are ambidextrous. This configurational approach to ambidexterity (i.e., high/low alignment, high/low adaptability) is not unique to De Clerq, but stems from He and Wong's (2004) original factor analysis of the exploration/exploitation construct, which has since been extended in the IS literature (e.g., Popadiuk's (2012) model of these as second order latent variables).

Despite the differing approaches within the contextual ambidexterity literature, several key themes emerge. First, contextual ambidexterity emphasizes the organizational context such as culture and process as the drivers of ambidexterity rather than organizational structure. Second, it contends that it is individuals who must balance between alignment and adaptability activities. The role of the organization is to create an environment in which employees have the necessary resources and support to decide appropriately where to allocate their resources toward these competing demands. Third, to date there has been no formative study of the contextual factors that might foster ambidexterity. That said, emerging themes emphasize governance and control; the movement of knowledge and learning within the organization; and empowering employee decision making in managing the alignment-adaptability balance.

Emerging Perspectives on Ambidexterity

The majority of IS studies on ambidexterity, then, have fallen into one of these two camps drawing from two different theoretical traditions. Structural studies typically draw on Duncan (1976) and March (1991) and frame ambidexterity as an exploration-exploitation dichotomy. Contextual studies draw on Tushman and O'Reilly (1996) and Gibson and Birkinshaw (2004) and approach ambidexterity as a problem of alignment and adaptability. In some cases, studies have been agnostic, failing to discuss ambidexterity mechanisms in their models (e.g., Revilla et al. 2016). A number of recent studies, however, propose that the differences between exploration/adaptability and exploitation/alignment are minimal and that these two perspectives may, in fact, be highly compatible.

Ambidexterity as Vacillation

Take for example, the view of ambidexterity offered by Aubert et al. (2015) who propose ambidexterity as one of four mechanisms for deriving innovation from outsourcing relationships. Their agnostic approach to theory results in three proposals for managing the ambidexterity mechanism. The first two are the above described structural and contextual approaches. The third is an as yet unexplored view of ambidexterity in the IS literature, organizational vacillation. Boumgarden et al. (2012) describe this strategy as, "modulating between a structural orientation focused on exploration and a structural orientation focused on

exploitation" (p. 591). A challenge with Boumgarden et al.'s paper is that they propose vacillation as an alternative way to manage the exploration/exploitation tension compared to structural ambidexterity.

As seen in the above discussion on structural ambidexterity, however, there is already a tradition of studying structural ambidexterity through temporal separation in the IS literature (e.g., Lyytinen & Rose 2006, Dos Santos et al. 2012). Thus, Boumgarden et al.'s (2012) organizational vacillation is very much in line with this tradition in the literature. Where they advance the discussion toward a more integrated view of ambidexterity, however, is in highlighting structural ambidexterity through separate business units as static ambidexterity compared with organizational ambidexterity which is dynamic in nature. In other words, a static structural composition will almost always be unsustainable over time, whereas a more agile approach to ambidexterity will allow firms to maintain this tension in the long run.

This attempt to describe ambidexterity as a dynamic process is in part a response to March's (1991) original contention that maintaining the tension between exploration and exploitation is a difficult task. Indeed, one study found only 6% of organizations were able to do so (Leidner et al. 2012) and others suggest that the ongoing maintenance of such a dual strategy is impossible (Christensen 1997). Other research, however, is more promising regarding the viability of ambidexterity. Grover et al. (2007) found that telecommunications firms were successfully pursuing ambidextrous strategies rather than punctuated equilibrium (i.e., one approach at a time) or semi-structure (i.e., models in which incremental and radical innovation activities compromise each other) approaches.

Ambidexterity as Site-Switching

This notion of ambidexterity as a dynamic construct is well explored in Huang et al. (2014), who introduced the construct of site-shifting. In contrast to a physical site, they draw on the notion of a strategy site as, "the social and relational space where IT-enabled practices are bundled together in particular ways by the practitioners involved and that can change over time as an outcome of praxis" (p. 33). Their study explores how a ticketing firm drew on existing resources and practices to continue its existing business, while also evolving into new ticketing business models (i.e., exploration) through site-shifting practices. These social and relational spaces evolve by means of two evolutions. First, the set of actors involved in the activities evolves over time. Second, each individual actor changes over time by learning through the process of engaging in developing activities.

This model of an emergent ambidexterity fostered through evolving practices and relationships draws on both structural and contextual components of ambidexterity. A subsequent study by Huang et al. (2015) draws on Gibson and Birkinshaw (2004) to suggest that both structure and context serve as enabling mechanisms for ambidexterity. Thus, ambidexterity as a fluid, dynamic organizational strategy is not bound to a structural or contextual perspective. Instead, these are two organizational characteristics should be managed on an ongoing basis to maintain the dynamic balance between exploratory and exploitative activities.

Ambidexterity as Dynamic Tension

Elsewhere, Dixon and Brohman (2017) have conceptualized ambidexterity using a dynamic tension framework. They propose dynamic tension as a firm's ability to turn two competing forces into complementary factors that enable improved firm performance. Three elements are critical to this tension. First, are the two organizational factors in tension, here conceptualized as digital business model innovation (i.e., exploration) and organizational routines (i.e., exploitation). The third element is a dynamic tension mechanism, akin to the enabling factors in Huang et al. (2014).

Although not explicitly stated in their theoretical approach, their findings from studying a remote patient monitoring pilot project reflect both a structural and contextual perspective of ambidexterity. They found three contextual factors which act as dynamic tension mechanisms. The first is leadership awareness, which is the ability of leadership to empower employees in their roles and also maintain the appropriate balance of resources to maintain organizational routines and the new digital business model innovation. The second is organizational awareness, which is the ability to integrate across siloed structures and generate flexibility and connectedness within the organization to shift these resources and adopt change practices over time. The final is technological awareness, which is the organization's openness to experiment with new technologies and respond to the inevitable technical challenges as new business models are explored.

These three factors were identified as elements of digital awareness, a construct which applies Endsley's

(1988) situation awareness - "the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future" (p. 97) – to the context of developing innovative digital business models. Digital awareness is defined as "the dynamic tension mechanism by which the organization can discern the appropriate digital business model innovations to pursue while maintaining existing organizational routines" (Dixon & Brohman 2017, p. 29). As with Huang et al. (2014), then, Dixon and Brohman (2017) propose ambidexterity as a dynamic system which changes over time. The role of the firm in maintaining ambidexterity is twofold. First, it must sense changing opportunities as the external environment shifts and innovations evolve. Second, it must respond on an ongoing basis by continually allocating the right resources to exploration and exploitation at the right time.[4]

The balance between exploration/exploitation or agility/adaptation is never static. In an early stage, an exploration might only need a few resources allocated toward a small pilot project. In other cases, the early stages might require massive R&D investment. As an innovation begins to demonstrate itself as being a viable product, service, or business model, increasing resources might be needed to drive its implementation. Or, by contrast, it might prove to be of no value to the firm, in which case the innovation's resource base should be reduced if not removed altogether. A high-performing firm will be able to continually reevaluate such demands and draw on the appropriate structural and contextual factors to optimize the balance between exploratory and exploitative activities.

Theoretical Lens	Differentiators
Organizational vacillation (Boumgarden et al. 2012)	• Modulating structural orientation between exploration and exploitation • Promotes firm agility • Hard to distinguish from temporal separation
Site switching (Huang et al. 2014)	• Emphasis on praxis • Evolving bundle of IT-enabled practices with changing set of practitioners to absorb new business models over time
Dynamic tension (Dixon & Brohman 2017)	• Use of a tension mechanism to make competing forces complementary • Views tension as a positive force when maintained through ongoing balance

Table 1. Summary of Emerging Perspectives on Ambidexterity

Toward an Integrated Framework of Ambidexterity

Having reviewed three perspectives on ambidexterity in the IS literature, this paper now turns its attention to developing a theoretical framework for dynamic ambidexterity as a way of explaining how existing firms can develop new digital business models. Dynamic ambidexterity is here proposed as the firm's ability to concurrently pursue strategies of resource exploration and exploitation through the ongoing balancing of resources and capabilities. To develop such a framework, two fundamental conflicts in the literature will be addressed: the compatibility of structural and contextual ambidexterity, and ambidexterity as a static vs. dynamic phenomenon.

Reconciling Structural and Contextual Ambidexterity

As the literature review demonstrates, most empirical studies of ambidexterity in the IS literature choose either a structural or contextual approach to ambidexterity and build their methodologies within the confines of those theoretical lenses. Consequently, measures of ambidexterity focus on either factors like business unit governance (i.e., structural) or leadership trust (i.e., contextual), without integrating the two. Occasionally there is construct blurring. Grover et al. (2007), for example, adopt a contextual approach yet use both adoption/alignment and exploitation/exploration language. Elsewhere, others have looked at how structural factors may facilitate contextual ambidexterity (e.g., Boddy and Paton's (2005) investigation of semi-structures and alignment), yet lack a larger discussion of the theoretical implications for the ambidexterity construct.

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[4] For a thorough discussion of a firm's sensing and responding ability see Nazir and Pinsonneault (2012).

A return to the grounding literature in the field, however, suggests that divisions between the two views are largely artificial and unnecessary. In fact, each of the four major sources in the field advocates for both structural and contextual factors as antecedents to ambidexterity. While Duncan's (1976) objective was to "provide a model of the design of innovation organizations" (p. 167), his model integrated contextual factors such as dealing with conflict and effective interpersonal relations. In the case of March (1991), by framing his model for understanding exploration and exploitation in organizational learning, he wrestled with how adaptive processes benefit exploitation in the short run, but are harmful in the long run because they neglect exploration. His conclusions point to the role of organizational processes such as mutual learning to reconcile this tension.

The central papers in contextual ambidexterity are likewise supportive of structural factors. Tushman and O'Reilly's (1996) core argument is that the, "ability to simultaneously pursue both incremental and discontinuous innovation and change results from hosting multiple contradictory structures, processes, and cultures within the same firm" (p. 24). Birkinshaw and Gibson's (2004) survey of 4,195 workers in 10 companies measured and supported contextual factors (e.g., initiative, cooperation, internal brokering, multitasking) while framing them within complementary structural strategies.

This paper proposes, then, that divisions in the literature between the two traditional views of ambidexterity are inherently artificial. Instead, studies which draw on only one or the other view should be regarded as investigations of a particular dimension of ambidexterity, rather than exhaustive approaches to ambidexterity belonging to a particular camp. Further, this study echoes Lavie et al.'s (2010) call for a return to March's (1991) core definitions of exploration and exploitation as shared language in understanding ambidexterity. Thus, while there may be many domain-specific applications of ambidexterity, relating constructs back to March's (1991) broad definitions of exploitation ("refinement, choice, production, efficiency, selection, implementation and execution,") and exploration ("search, variation, risk-taking, experimentation, play, flexibility, discovery, and innovation" (p. 71)) provides a broad umbrella under which ambidexterity can be understood and researched.

By demonstrating the fundamental links between structural and contextual ambidexterity, this paper assumes that the emergent work of Huang et al. (2014)'s ambidexterity-enabling mechanisms and Dixon and Brohman's (2017) dynamic tension mechanisms are appropriate in assuming an integrated view of structural and contextual mechanisms.

Static vs. Dynamic Ambidexterity

An existing challenge in the ambidexterity literature is that despite being theorized as an antecedent to organizational agility (e.g., Lee et al., 2015), variance models create an impression that ambidexterity is a static construct. In other words, ambidexterity is a capability possessed by the firm, and the organizational structuring of ambidexterity (i.e., which business units focus on exploitation or exploration) is pre-determined and fixed. In this mode, ambidexterity could actually lead to organizational rigidity rather than agility.

Critiques, then, have emerged of ambidexterity as an appropriate tool for managing environmental turbulence. Schreyögg and Sydow (2010), for example propose "the fluid organization" as a more effective response to this organizational challenge. This organizational model is characterized by "constant balancing" which is proposed as:

> "a meta-level process that permeates the system through surveillance and the identification of critical information and change necessities. This information is intended to encourage a rethinking of the problem-solving procedures and priorities in use, to initiate a new translation of environmental demands, and possibly even to break or to depart from existing organizational paths" (p. 1259).

Such a view of ambidexterity as a static organizational capability, however, may result from studies that adopt a particular view of the relationship between ambidexterity and firm resources. As ambidexterity involves the appropriate allocation of resources between exploratory and exploitative activities (e.g., Schreuders & Legesse 2010), many studies adopt a resource-based-view of the firm (e.g., Popadiuk 2012). As such, ambidexterity often emerges in the literature as an organizational capability. In Tarafdar and Gordon (2007), ambidexterity is one of seven IS capabilities linked to process innovation. Yu et al. (2014) propose ambidexterity as a strategic capability that enables firm decision making between innovation

strategies. In Kranz et al. (2016) ambidexterity is the outcome of a balancing capability. And Wilkhamm et al. (2016) define ambidexterity as a second-order construct comprising three ambidexterity capabilities.

By contrast, Daniel et al.'s (2014) study of IS project portfolio management (PPM) explores the PPM construct as comprising four constituent dynamic capabilities, that is, the recombination of resources and capabilities. This, they argue, allows for the balancing of resources across exploratory and exploitative activities. Returning to the foundational ambidexterity literature, however, we find that ambidexterity itself should be considered not as a capability, but as a dynamic capability. Indeed, a later paper by O'Reilly and Tushman (2008) bears the title, "Ambidexterity as a dynamic capability: Resolving the innovator's dilemma." Thus, where Daniel et al. (2014) propose IS PPM as a dynamic capability antecedent to ambidexterity, O'Reilly and Tushman (2008) argue that ambidexterity itself is a dynamic capability.

The implications of this view are significant. Consider, first, that Teece et al. (1997) define dynamic capabilities as "the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (p. 516). This is in contrast to capabilities which pertain to existing organizational processes. While these capabilities provide a competitive advantage in the short term, they do not necessarily prepare the firm for environmental change (see the description of Southwest Airlines in O'Reilly and Tushman 2008).

If ambidexterity is a dynamic capability, the implication is that it does not describe a static balancing of resources. Instead, it pertains to the ongoing shifting of resources and capabilities between exploratory and exploitative activities as, i) environmental factors shift around the firm creating new opportunities and threats; ii) incremental innovations in the firm's ongoing routines (i.e., exploitation) create new opportunities and modes of operation; and, iii) the process of innovation in the firm's exploratory activities generates new business models, products, and services that might transform the firm. This is akin to the "constant balancing" proposed by Schreyögg and Sydow (2010), as well as the high sensing-high responding configuration of highly agile firms suggested by Nazir and Pinnsoneault (2012). Accordingly, this paper proposes dynamic ambidexterity as a dynamic capability central to the firm's ongoing ability to manage the constant rebalancing of resources and capabilities necessary to maintain dual strategies of resource exploration and exploitation.

Theoretical Framework and Propositions

In moving toward a theoretical framework for dynamic ambidexterity, the implications of ambidexterity as a dynamic capability are that ambidexterity models must, by necessity, contain a temporal dimension. Indeed, one of the underlying conditions for ambidexterity, loosely coupled structures (Weick, 1976), assumes that such organizational models will be impermanent in nature. The majority of the frameworks proposed in the above literature, however, fail to address this requirement. Examples like Huang et al.'s (2014) site-shifting approach and Cao et al.'s (2013) ambidexterity pendulum concept suggest that this should be addressed.

This is nowhere more evident than in Duncan's (1976) model. While used as the basis for switching models (e.g., Im & Rai 2014) – i.e., temporal separation between exploration and exploitation – Duncan in fact advocates for switching organizational structures during two phases of the innovation process: initiation and implementation. In other words, Duncan is in fact discussing temporal aspects of exploration activities rather than being concerned with how these balance with exploitation activities. His structural dimensions of complexity, formalization, and centralization offer different configurations for different stages of innovation.

What Duncan (1976) terms the implementation phase of innovation has received some recognition in the literature if not theoretical development or empirical testing. Siggelow and Levinthal (2003) discuss how structures shift from high autonomy and decentralization in the early stages of innovation to reintegration, while only briefly addressing the latter stage as a shift to centralization (i.e., a structural shift). In their discussion of the complementarity between structural and contextual ambidexterity, Birkinshaw and Gibson (2004) argue, "structural separation may at times be essential, but it should also be temporary, a means to give a new initiative the space and resources to get started. The eventual goal should be reintegration with the mainstream organization as quickly as possible" (p. 55). Again, however, little attention is paid to how such reintegration occurs. Given these suggestions in the literature, this paper proposes a two-phase approach to understanding dynamic ambidexterity.

Dynamic Ambidexterity Phase I: Innovation Initiation and Development

Ambidexterity begins with the firm committing resources and capabilities to a new innovation. As staff, facilities, equipment and so on are invested in the development of the new innovation, fewer resources and capabilities are available to support the firm's ongoing, existing business. This creates strain or negative tension as these two activities compete for resources. In fact, as argued by Birkinshaw and Gibson (2004), firms often experience burnout when attempting an ambidextrous strategy for this very reason – they fail to appropriately balance the resource and capability demands of each strategy.

In the presence of ambidexterity mechanisms, those structural and contextual organizational elements that facilitate a constant balancing of resources and capabilities, firms experience a complementarity between exploratory and exploitative activities. Where Lavie et al. (2010) characterize this as resolving the tension through balance, Dixon and Brohman (2017) contend that this is actually the development of a positive tension which heightens the organization's ability to perform. This resulting positive tension is characterized by organizational learning generated through ongoing iterations of the innovation's development. Accordingly, this framework proposes:

P1: A firm's pursuit of a dual strategy emphasizing exploration and exploitation will create competition for resources, a type of negative tension for the organization.

P2: Structural and contextual ambidexterity mechanisms will moderate the relationship between dual strategy and resource competition, creating resource balancing, a type of positive tension for the organization.

P3a: Resource competition will result in reduced firm performance.

P3b: Resource balancing will result in improved firm performance.

The role of environmental turbulence is well established in the ambidexterity literature. For example, although Duncan (1976) was concerned primarily with internal mechanics, March (1991) very clearly framed his discussion in the context of environmental turbulence. Further, while He and Wong's (2004) influential empirical study was unable to control for environmental factors, more recent studies have begun to include environmental turbulence in their empirical models. Lee et al. (2013), for example, found significant results for turbulence as a moderator when the ambidexterity-performance relationship was controlled for firm size. Elsewhere, Pavlou and El Sawy's (2010) development of the improvisational capabilities construct builds on an assumption of the need for ambidexterity in turbulent environments.

The role of environmental turbulence is logical. Maintaining ambidexterity requires organizational resources. In stable environments, innovation will have little benefit. Instead, market leadership is defined by efficiency. Exploitative activities are designed both through structure and context to generate efficiency by means of incremental improvements and tight controls. Investing in innovation and dual strategy will reap few if any benefits and is thus not worthwhile.

**Figure 1. A Theoretical Framework for Dynamic Ambidexterity
Phase I: Innovation Initiation and Development**
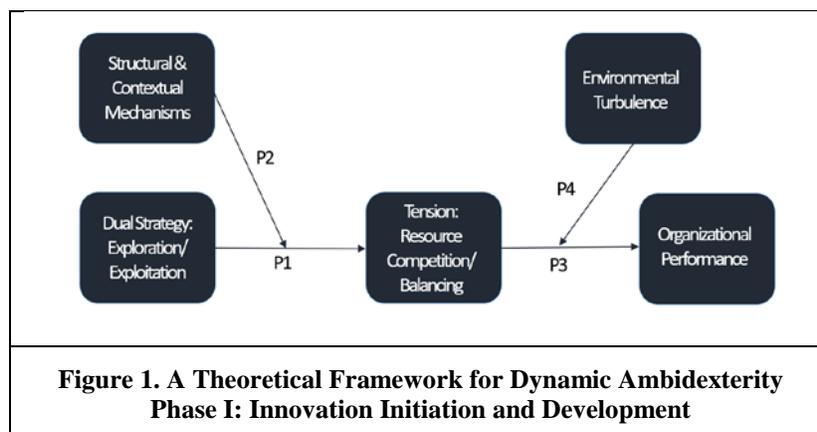
In turbulent environments, however, market leadership and, often, firm survival are defined by keeping ahead of competitors with new and better products and services. New business models can transform

industries, allowing firms to "leapfrog" their competitors. Firms must continually pursue new ways of doing things and respond quickly to competitors' actions. In this context, ambidexterity becomes a source of competitive advantage. Accordingly, this study proposes:

P4: The relationship between ambidexterity and firm performance will be moderated positively by environmental turbulence.

The Innovation Initiation and Development Phase framework is provided in Figure 1.

Dynamic Ambidexterity Phase II: Innovation Reintegration

As the innovation matures, the firm must decide if it offers them a viable business model, process, or service. If it is indeed commercializable, a new question arises: how do we make this part of our ongoing routines? In other words, eventually the innovation is no longer new and must now become part of the business' everyday activities. Processes and structures must exist to ensure the full organization can learn from and implement the innovation on a broader scale. If well implemented, the firm gains an advantage over its competitors. If no reintegration mechanisms exist, however, the firm will be unable to reap the benefits of its exploratory activities, and its investment will be wasted. Thus:

P5: Reintegration mechanisms will allow the routinization of successful innovations across the firm.

P6: Routinization of successful innovations will result in improved firm performance.

A framework for the Reintegration Phase is provided in Figure 2 emphasizing the dominant relationships, although others may exist.

Figure 2. A Theoretical Framework for Dynamic Ambidexterity Phase II: Innovation Reintegration
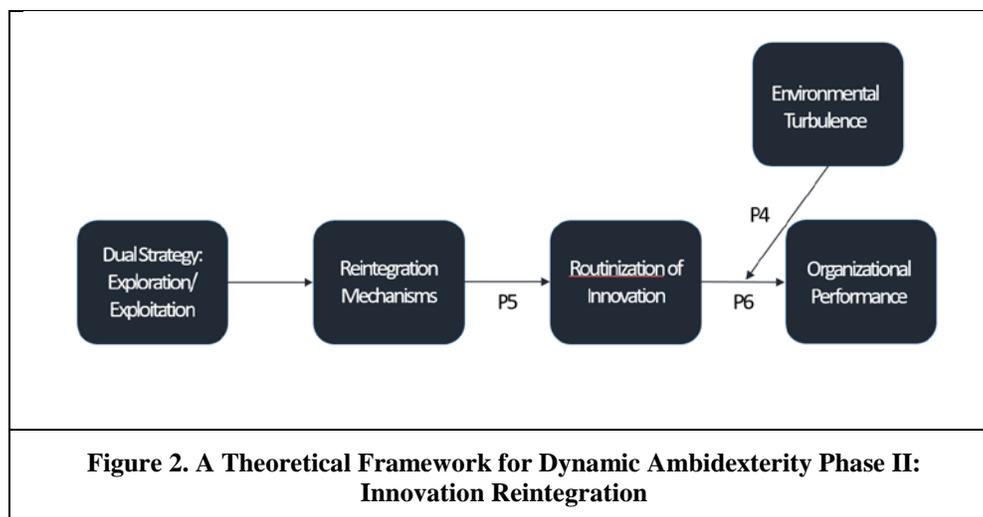
Conclusions

Contributions to Theory

This paper has proposed a framework for dynamic ambidexterity as a dynamic capability. In contrast to more rigid, static understandings of the construct, dynamic ambidexterity enables a dual strategy of resource exploration and resource exploitation to be maintained through the ongoing rebalancing of resources and capabilities. Further, dynamic ambidexterity is temporal in nature and is here theorized as a two-phase process involving, first, this ongoing rebalancing process, and, second, the reintegration of successful innovations into ongoing routines.

As such, this paper makes several contributions to the theoretical development of ambidexterity in the IS literature. First, it establishes ambidexterity as a dynamic capability. Although this approach has an established grounding in the strategy literature, it is not always clear in the MIS literature, which often refers to ambidexterity as traditional capability. While a resource-based view of the firm underlies both perspectives, the emphasis on ambidexterity as a balancing of resources tends to favour the traditional

capability approach. This paper has demonstrated the limitations of this view of ambidexterity. Ambidexterity as a capability can result in organizational rigidity. Organizational structures, processes and culture are fixed into a certain organizational design which may then not be able to respond to the environmental turbulence assumed in an ambidexterity model. By theorizing ambidexterity as a dynamic capability it is appropriately framed to deal with the ongoing change inherent to turbulence.

Further, highlighting the temporal aspect of dynamic ambidexterity makes a significant contribution to the IS literature. If ambidexterity is, indeed, a dynamic construct, then it must be studied and measured as such. The two-phase model suggested above provides a framework to guide the design of longitudinal studies.

A final contribution is that this framework for dynamic ambidexterity reconciles two previously competing approaches to ambidexterity: structural and contextual ambidexterity. Importantly, it demonstrates how the foundational literature in both fields never perceived these two views as mutually exclusive. Instead, there is a shared understanding that ambidexterity is achieved through both structural (i.e., organizational design) and contextual (e.g., organizational processes) factors and that governance is integral to both. The dynamic ambidexterity construct suggests that both approaches are appropriate means to achieving ambidexterity and that their substance will vary at different stages in the innovation process.

Limitations

While the paper does make significant contributions to the literature, it is bounded by several limitations. First, the study is limited to the IS literature and emphasizes the eight top-tier journals in the field. There is a vast array of literature on ambidexterity in the strategy and organizational design domains. While key papers from these fields were included through the backwards review process, a comprehensive approach was not taken to these bodies of work. We are confident, however, that the methodology has provided sufficient insight into the present state of the field. Over thirty papers were included from the database search. This provided enough depth to understand IS approaches to both the structural and contextual views of ambidexterity. Further, several emerging perspectives were highlighted in the literature search. The backwards review also generated consensus across the IS literature on important works in the strategy literature. Review of this research then highlighted important gaps in the IS literature.

It should further be noted that the focus on top-tier IS journals also excluded work on bi-modal infrastructure, defined as, "marrying a more predictable evolution of products and technologies (Mode 1) with the new and innovative (Mode 2)" (Mingay & Mesaglio 2016). It differs from ambidexterity in that it derives from a capabilities perspective, emphasizing bi-modality as the product of organizational capabilities. This is distinct from the resource allocation perspective common to ambidexterity work in the strategy literature. Further, it is explored for the most part in practitioner journals. As such, it does not offer as rich theoretical insight as the ambidexterity tradition in well-established strategy research.

A further limitation is this paper's emphasis on organizational, rather than IT, ambidexterity. As explored in the review, there are many applications of ambidexterity to specific IT contexts. Aubert et al. (2015) and Cao et al. (2013) both utilize the ambidexterity construct to better understand IT outsourcing. Huang et al. (2015) apply ambidexterity to organizational uses of social media. Several papers study software development using ambidexterity, including agile and open-source approaches (Vessey & Ward 2013; Vinekar et al. 2006). Similarly, it has been applied to systems development including ERPs (Newell et al., 2003) and knowledge management systems (Durcikova et al. 2011). Elsewhere, it has been applied to newer themes in the IS literature including Green IT (Bose & Luo 2011) and Health IT (Dixon & Brohman, 2017).

Supplementary to these specific applications of ambidexterity to IT, others make broad applications of ambidexterity to IT problems, with less discussion of the theory or specific mechanisms of the construct. Abraham and Junglas (2011) discuss how IS can be used to transform organizations through organizational will, relating the phenomenon to ambidexterity. Beath et al. (2013) make broad links between ambidexterity and digitally-enabled innovation.

In contrast to these specific applications, this paper addresses the question of organizational ambidexterity, that is, how the firm as a whole can balance exploratory and exploitative activities, using an IS lens. In doing so, it assumes a fusion view of IT. Bharadwaj et al. (2013) conceptualize digital business strategy as a shift in "the role of IT strategy, from that of a functional-level strategy – aligned but essentially always subordinate to business strategy – to one that reflects a fusion between IT strategy and business strategy"

(p. 471). The implication is that in a digital age in which business processes, products, and services all stem from the application of digital technologies, organizational strategy cannot be conceived apart from a technology strategy. Instead, they are fully integrated. Organizational ambidexterity's emphasis on organizational innovation, then, can likewise not be understood as distinct from IT ambidexterity. Given this paper's interest in explaining how existing firms can develop new digital business models, a broader organizational ambidexterity perspective is appropriate.

While this paper generates a framework for organizational ambidexterity, that is not to say that applications to specific IT contexts are not appropriate. Instead, such applications of ambidexterity would be extensions of the broader framework proposed in this paper. Thus, this paper echoes Lavie et al.'s (2010) suggestion that specific ambidexterity research be grounded in a shared understanding of the language and constructs inherent to the broader organizational ambidexterity.

Future Research

The proposed dynamic ambidexterity framework highlights some interesting gaps in the field that will be of interest to researchers. First, the integration of the structural and contextual views of ambidexterity and the resultant implication that different combinations of these factors are required in the two stages of dynamic ambidexterity suggest configuration approaches to research in this field. El Sawy, Malhotra, Park, and Pavlou (2010) have argued that qualitative comparative analysis (QCA) is appropriate for researching digital business, and the application seems highly relevant here. Rather than suggesting that there is a "one size fits all" organizational structure and culture for ambidexterity, this paper proposes that different structures, cultures, and processes will be appropriate in different organizations, contexts, and stages of the ambidexterity process. New research methodologies like QCA will be helpful in empirically studying this phenomenon.

Second, this review has demonstrated the paucity of research on the reintegration stage of ambidexterity, despite it being integral to Duncan's (1976) ambidexterity model. There is accordingly a rich vein of work to be explored both theoretically and empirically in this area. The preliminary findings of Hovorka and Larsen (2006), for example, suggest that network organizations and absorptive capacity can foster "agile adoption", which may point to the potential of applying absorptive capacity theory to understand the reintegration process. Others have discussed the important role of boundary spanners. These are individuals who bridge the exploration and exploitation functions making the reintegration process possible (Montazemi et al. 2012; Temizkan & Kumar 2015). Future research will want to develop appropriate theoretical lenses and more detailed models to understand this stage of dynamic ambidexterity.

Third, a number of smaller questions have been identified in the literature with little subsequent work to date. For example, Lee et al. (2013) have demonstrated large firms reap greater rewards from ambidexterity than small firms, while Schreuders and Legesse (2012) and Carlo et al. (2012) have addressed some of the issues specific to small firms. More work is needed on the role of firm size and ambidexterity. Further, there is no work to date on the relationship between firm frugality and ambidexterity. If an ambidextrous strategy is resource-intensive, it stands to reason that firms that can achieve this goal in a cost-effective manner will outperform their competitors. There may be trade-offs, though, associated with frugality. These implications have not been explored to date. Last, Lavie et al. (2010) and Lavie and Rosenkopf (2006) have raised the possibility of achieving ambidexterity through domain separation such as strategic alliances. This unexplored line of work in the IS literature may be particularly helpful in applying the construct to digital platforms and other intra-organizational approaches to digital strategy.

In summary, the dynamic ambidexterity construct generates numerous opportunities for future research. Emphasizing the temporal nature of ambidexterity sheds light on important gaps in the literature which create interesting opportunities for both theoretical and empirical work. Importantly, dynamic ambidexterity provides a means for understanding how existing firms can develop innovative digital business models while maintaining existing operations and cash flows. The initiation and development phase describes how dynamic tension mechanisms are required to maintain an ongoing balancing of resources and capabilities so these firms can explore the new business models while also sustaining their existing ways of doing things. The implementation phase describes how reintegration mechanisms are essential to turning successful explorations into established business models that either replace or integrate with existing business models to create new organizational routines to sustain the firm into the future.

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