

Dynamic Capabilities and Knowledge Management: an Integrative Role for Learning?*

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Modern strategic management theories try to explain why firms differ, because new sources of competitive advantage are keenly sought in the dynamic and complex environment of global competition. Two areas in particular have attracted the attention of researchers: the role of dynamic capabilities, and the firm's abilities for knowledge management. In this paper, we argue that there is a link between these two concepts, which has not been fully articulated in the literature. The aim of the paper is therefore to ascertain the conceptual connection between them as a basis for future research. Our proposed framework acknowledges and critiques the distinct roots of each field, identifies boundaries, and proposes relationships between the constructs and firm performance.

Introduction

The terms 'dynamic capabilities' and 'knowledge management' are commonly used in discussions of how best to manage organizations in dynamic and discontinuous environments. The dynamic capabilities approach of strategic management (Eisenhardt and Martin, 2000; Teece, Pisano and Shuen, 1997) seeks to explain why some organizations are more successful than others in building competitive advantage within dynamic markets. Meanwhile, knowledge management has been presented as a fundamental strategic initiative and the most important guarantor of sustainable competitive advantage for firms

(Grant, 1996). While the dynamic capabilities view emphasizes the renewal of resources by reconfiguring them into new capabilities and competences (Teece, Pisano and Shuen, 1997), knowledge management research often focuses on providing solutions to managers to create, retain, transfer and use an enterprise's explicit and tacit knowledge (Cepeda and Vera, 2005).

Up to a point, the two fields have acknowledged the importance of each other. Researchers focusing on dynamic capabilities have recognized that their nature and evolution can be described in terms of knowledge (Eisenhardt and Martin, 2000), and that the ability to create, integrate, transfer and use knowledge on an ongoing basis underpins the firm's capabilities and competitive advantage (Teece, 1998). At the same time, some scholars with a primary interest in knowledge processes have started to examine conceptual links to dynamic capabilities (He and Wong, 2004; Sambamurthy and Subramani, 2005), and others have investigated empirically how dynamic capabilities can be facilitated by knowledge

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management (Cepeda and Vera, 2005; Gold, Malhotra and Segars, 2001; Haas and Hansen, 2005; Sher and Lee, 2004).

However, although these recent studies have started to draw on each other's domains, these attempts have been partial and eclectic, in the sense that they have adopted and used elements that fit their own purposes, without necessarily being aware of the depth of the rivers in which they are fishing. This is problematic for three reasons. First, there are occasions when researchers unconsciously use ideas and models drawn from the other fields without being aware of the discussions that have led to constructs emerging, and this sometimes leads to conceptual confusion between the fields. Second, researchers may be unaware of the potential limitations in the other field, and this can mean that they build ideas on foundations that are not as secure as they might imagine. Third, without deeper knowledge of the other field, researchers may often miss out on opportunities to develop their own fields more substantially.

In this paper we therefore seek to understand the potential convergence between dynamic capabilities and knowledge management, to provide a theoretical account of the overlaps and complementarities existing between them, and to establish a theoretical link between these constructs and performance. We start by reviewing critically the two constructs and acknowledging their distinct roots; next, we examine the overlaps between dynamic capabilities and knowledge management, and the boundaries/differences that distinguish them; third, we propose a model which explicitly integrates the two concepts and discusses potential links to performance; and finally, we present conclusions and directions for future research.

Evolution of constructs: debates and critiques

Dynamic capabilities

The idea of dynamic capability originated in the strategy field and was encapsulated in the classic paper by Teece, Pisano and Shuen (1997). This has spawned a number of papers, which have formed a dominant perspective, although in recent years the idea of dynamic capabilities has also been adopted by functional disciplines such

as marketing, human resources and information technology. We therefore start by reviewing some key debates within the 'dominant' tradition, and then summarize some of the perspectives and contributions from functional disciplines. We finish the section with a summary of the main areas of agreement and disagreement with regard to dynamic capabilities.

Dynamic capabilities are frequently positioned as an extension of the resource-based view, which suggests that each organization possesses a different profile of tangible and intangible resources and capabilities, and these differences account for variations in organizations' competitive positions and their performance (Amit and Schoemaker, 1993; Barney, 1991; Penrose, 1959; Peteraf, 1993; Reed and DeFillippi, 1990; Rumelt, 1984; Wernerfelt, 1984). The core principles of the resource-based view are that resources and capabilities which are simultaneously valuable, rare, imperfectly imitable and non-substitutable – the VRIN conditions – are the main source of above-normal rents and competitive advantage (Barney, 1991; Wernerfelt, 1984). In a recent restatement of resource-based theory, Peteraf and Barney (2003) caution against overgeneralizing the theory and emphasize that it is only intended to explain performance differentials within the same industry.

The resource-based view has come in for some criticism, however. Priem and Butler (2001) argue that it is essentially a static theory that has difficulty incorporating the evolution over time of the resources and capabilities that form the basis of competitive advantage. And Teece, Pisano and Shuen (1997) argue that it recognizes but does not explain the sources of heterogeneity, nor does it explain the nature of isolating mechanisms that enable competitive advantages to be sustained. Accordingly, they propose the dynamic capabilities view, which stresses that in turbulent environmental conditions a firm must rely on the ability to create, maintain and renew its bases of competitive advantage. In this sense, it parallels the ideas of Schumpeterian competition, where competitive advantage is based on 'creative destruction' of existing resources and 'novel combinations' of new functional competences (Pavlou and El Sawy, 2004).

The focus of Teece, Pisano and Shuen (1997) is on what leads to sustainable competitive advantage in conditions of rapid environmental and

market change. Their oft-quoted definition is: 'dynamic capabilities are the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments' (Teece, Pisano and Shuen, 1997, p. 516). They stress the importance of the firm's current asset position, history (path dependence) and the organizational processes or routines, including learning as 'a process by which repetition and experimentation enable tasks to be performed better and quicker. It also enables new production opportunities to be identified' (p. 520).

There are a number of critiques of the paper by Teece, Pisano and Shuen (1997). Zollo and Winter (2002), for example, claim that it is tautological because it defines a 'capability' as an 'ability'; likewise Priem and Butler (2001) point out that dynamic capabilities are generally only identified where there is a sustained competitive advantage, and therefore it is tautological to claim that they are properties which induce competitive advantage. This leads to a general complaint that the concept of dynamic capabilities is insufficiently underpinned by empirical data, since the Teece paper was based on summarizing studies which had been designed to examine phenomena other than dynamic capabilities.

Subsequent discussions have spawned three main debates. Eisenhardt and Martin (2000) suggest that, although the model of Teece, Pisano and Shuen (1997) works well in moderately dynamic environments, it does not work so well in what they refer to as 'high-velocity markets'. In these conditions, the apparent stability of dynamic capabilities breaks down, and they become 'unstable processes that are challenging to sustain' (2000, p. 1106). They also question whether dynamic capabilities are unique to individual firms, reflecting individual idiosyncrasies and specific path dependences, or whether they exhibit commonalities across firms, so they are not themselves likely to be sources of competitive advantage. Distinctiveness comes in the specific ways firms develop and employ them, and this variability gives firms a basis to pursue different types of competitive advantage (Zahra and George, 2002). Thus, dynamic capabilities are essential, but it is how such capabilities are deployed and used within a context that enables them to be successful or otherwise.

A second debate centres on the relationship between resources, routines and capabilities: whether the focus should be on the adaptation of resources themselves (Helfat and Peteraf, 2003), on the routines that make resources operative, or upon the routines which enable resources to be reconfigured (Zollo and Winter, 2002). Winter (2003), and previously Collis (1994), try to address this issue by differentiating a capability hierarchy in which operational (zero-level), dynamic (first-order) and learning (second-order) capabilities are intrinsically linked to one another. Operational capabilities or routines are geared towards the operational functioning of the organization; dynamic capabilities are dedicated to the modification of operational routines; finally, learning capabilities facilitate the creation and modification of dynamic capabilities.

This leads to the third debate around the role of learning. Some authors (Bowman and Ambrosini, 2003; Teece, Pisano and Shuen, 1997) have referred to learning as a specific type of process underlying dynamic capabilities, which is based on repetition, experimentation and identification of new opportunities. Conversely, Zott (2003) identifies learning of resource deployment as a performance-relevant attribute of dynamic capabilities. Other authors (Eisenhardt and Martin, 2000; Winter, 2003) argue that learning mechanisms guide the evolution of dynamic capabilities. These conflicting positions, sometimes semantic, are partially resolved by Zollo and Winter (2002), who consider dynamic capabilities to be the result of learning to shape operational capabilities, and this again reflects the idea that learning may itself be considered as a 'second-order' dynamic capability.

Despite these debates, we may find some signs of an emergent consensus in the literature regarding dynamic capabilities. First, there is a distinction between dynamic capabilities and operational capabilities, with changes in the latter being the visible outcome of dynamic capabilities. Second, a 'capability' is the potential to do certain things, not the things that are done (Dougherty, Barnard and Dunne, 2004). If they are 'dynamic', they connote change and evolution (Winter, 2003). Third, dynamic capabilities reside in the potential to change resources, routines and competences. Fourth, dynamic capabilities reside in routines rather than resources themselves, especially if these are 'high level' routines (Zollo

and Winter, 2002). Fifth, the process of learning may be a central element in the creation and renewal of dynamic capabilities. Examination of the processes by which firms learn is thus critical to understanding dynamic capabilities (Mahoney, 1995; Zollo and Winter, 2002).

Finally, it is interesting to conclude this section with some brief observations on how the idea of dynamic capabilities has also been adopted by the functional literature. There are two threads to this literature: first, that functional capabilities produce the routines which lead to general dynamic capabilities; second, that functional routines and procedures themselves embody dynamic capabilities. An example of the former from the field of marketing is the introduction of mechanisms to maintain close relationships with customers, which can enable companies to respond very quickly to potential or actual changes in the market. Thus, Verona and Ravasi (2003) examined how Oticon, the hearing aid company, maintains panels of consumers who not only provide feedback on existing products but also become major contributors to the development of new products; similarly, Griffith and Harvey (2001) examine the way marketing mechanisms can create flexibility and productivity when developing global products.

Within the field of human resource management, the introduction of 'high-performance work systems', through mechanisms such as empowerment, reduced hierarchy and a strong emphasis on training and development, is intended to create the flexibility and dynamism that enables companies to compete successfully in global markets (Sparrow, Brewster and Harris, 2004). Similarly, many companies deliberately move expatriates across subsidiaries and national boundaries in order to build and disseminate capabilities (Chung, Gibbons and Schoch, 2006; Minbaeva and Michailova, 2004).

The alternative view is that dynamic capabilities can be embodied in functional capabilities. This can be illustrated from within the retail, banking and consulting industries where the existence of IT-based information systems creates both efficiencies and flexibilities that lead to competitive advantage (Chuang, 2004; Lin and Silva, 2005). Gratton and Ghoshal (2005) claim that organizations possess distinct 'signatures' which are leadership and relational processes that are deeply embedded in the history and traditions

of organizations, providing unique and inimitable dynamic capabilities, and hence sustainable competitive advantage. On balance, we think that the former view is more useful for our present discussion because it provides clearer distinctions between core constructs, so this is how we will present the role of knowledge management later in the paper.

In this section, we have tried to demonstrate and explain some of the major themes in the rapidly expanding literature on dynamic capabilities. We have also identified current critiques, debates and areas of the emerging consensus. We think it is important that scholars from outside this field are aware of the critiques and debates; but for our present purposes we will extend the points around the emerging consensus where we seek to examine potential areas of overlap between dynamic capabilities and knowledge management in the next section.

Knowledge management

The idea of knowledge management has become important due to the increased awareness of the importance of knowledge for the organization's prosperity and survival, and due to the increased availability of IT to store, distribute and generally 'manage' knowledge. In particular, the 'knowledge-based view' of the firm proposes knowledge as a key resource, and therefore is a development of the resource-based view as a source of competitive advantage (Grant, 1996; Kogut and Zander, 1992).

It is important to distinguish knowledge from the process of trying to manage it: the terms organizational knowledge and knowledge management are both frequently incorporated into academic papers, but there is not always clarity about the differences between them (Vera and Crossan, 2003). We start with *organizational knowledge*, which contains a fundamental distinction derived from Polanyi's (1967) work on explicit and tacit knowledge. The former can be codified and written, and is therefore easy to articulate, capture and distribute; the latter is associated with personal skills and experience and is hence more difficult to articulate and distribute. This distinction has been popularized in the field of organizational studies, particularly by Nonaka and Takeuchi (1995), who suggest that organizational knowledge is created through

the interaction of tacit and explicit forms of knowledge.

Many of the authors in this field consider that the primary challenge lies in understanding the nature and processes of tacit knowledge as opposed to explicit knowledge (Orlikowski, 2002; Tsoukas, 2003). Thus, Lave and Wenger (1991) develop the view that knowledge is 'situated' in the practice of everyday work rather than being the possession of individuals; other authors such as Cook and Brown (1999) and Brown and Duguid (1998) articulate a parallel distinction between 'knowing' and 'knowledge'; and others (Cook and Yanow, 1993; Nicolini and Mezner, 1995; Nicolini, Gherardi and Yanow, 2003) develop the idea that organizational knowledge is sustained through social processes within 'communities of practice', rather than being the sum of individual cognitions. Although the distinction may seem simplistic, it is important, and the contrasting traditions are summarized in Table 1.

There has also been an interest in how the creation, development, retention and transfer of knowledge can be described as a learning process. In this respect, Chiva and Allegre (2005) argue that there are parallels between the possession/practice divide in knowledge management and a cognitive/social divide within organizational learning theory. Additionally, the framework proposed by Crossan, Lane and White (1999) conceives of organizational learning as a dynamic process of strategic renewal, involving a tension between creating new knowledge (exploration) and using existing knowledge (exploitation). Both forms of knowledge can originate from outside the organization, as with 'absorptive capacity' (Zahra and George, 2002), or from inside the organization through various mechanisms of intra-organizational knowledge sharing (Tsai, 2002).

We now turn to *knowledge management*, which is concerned with identifying, developing and leveraging knowledge in organizations to help them to compete (Alavi and Leidner, 2001). Similar to organizational knowledge, there is a

basic divide between those interested in the technology of knowledge management and those who see human processes as being paramount (Alvesson and Karreman, 2001; Easterby-Smith and Araujo, 1999; Gloet and Berrell, 2003). The technology side focuses on the information processing and business information systems which are designed to manage knowledge. Key knowledge management initiatives include IT infrastructures, data warehouses and virtual centres of expertise, as well as other technical and managerial procedures. The human side focuses on the sense-making behaviours of individuals, on social relations and cultural factors when handling organizational knowledge, and frequently touches on fundamental questions about the organization.

These two perspectives derive from different epistemological positions, respectively positivism and social constructionism, and this affects both the forms of knowledge that are valued and how they should be managed (Swan *et al.*, 1999). However, because both share an interest in knowledge for the benefit of the organization, they have been considered complementary rather than exclusive views, giving rise to an integrative perspective which some authors have named 'socio-technical' (Pan and Scarbrough, 1999). This integrative perspective describes the organization from both the technological and human approaches, suggesting IT and social factors are independent but interacting components. An alternative of the socio-technical view is the 'contingency' framework of Hansen, Nohria and Tierney (1999) which suggests that, when the primary task is easily routinized or standardized, then the technical solutions are more appropriate; but when tasks are not easily routinized then the human solutions are preferable.

But the knowledge management literature has also been criticized on a number of grounds. First is the assumption that knowledge can actually be 'managed' in a systematic way by organizations, which is seen as unduly prescriptive (Vera and Crossan, 2003). Second, the emphasis on the management of knowledge often focuses on managing the knowledge that is easily handled, and it neglects tacit forms of knowledge which are harder to codify and yet potentially more significant for competitive advantage. Third, the bulk of the literature concentrates on the technical side of knowledge management, and

Table 1. *Contrasting forms of organizational knowledge*

Tacit	Explicit
Practice	Possession
Knowing	Knowledge
Social	Cognitive

therefore neglects the more complex social and political factors which influence, for example, whether or not employees will contribute to, or use, organizational knowledge management systems (Tenkasi and Boland, 1996).

In sum, there are parallels between the literature on organizational knowledge and knowledge management. There is reasonable consensus about two distinct ways of understanding and managing organizational knowledge, although there are finer points between kinds of knowledge and debates about how it can best be transmitted, particularly in tacit form. And there is uncertainty about whether this has to be based on personal experience or whether it is best distributed through communities of practice. There are choices about how knowledge management strategies should adapt to different task characteristics, and also there is growing awareness of the potential role of learning in the creation and dissemination of knowledge, particularly when it is in tacit form.

Boundaries and overlaps

In the preceding section we reviewed current thinking, debates and critiques of the dynamic capabilities and knowledge management literatures. There are a number of areas of potential overlap, but also features where the contribution of one or the other is distinctive. Figure 1

summarizes our conclusions about the domains and boundaries of the dynamic capabilities and knowledge management fields. We show dynamic capabilities and knowledge management as overlapping fields of research, but recognize that there are topics which are dealt with primarily by one, or other, field. We therefore start this section by summarizing what is distinctive in the literature regarding each of dynamic capabilities and knowledge management. We then explore where there are areas of overlap, or potential synergies.

Distinct contributions

As suggested earlier in this paper, the idea of dynamic capabilities emerges as an extension of the resource-based view of the firm, while knowledge management is more consistent with knowledge-based theories of the firm. Although the last builds upon and extends the former, the resource-based view broadly focuses on firms' resources, whether tangible or intangible, property-based or knowledge-based. The premise of most dynamic capabilities research is that organizations must use and renew their tangible and intangible resources and capabilities to sustain competitive advantage in rapidly changing environments. Conversely, the knowledge-based view focuses mainly on the stock of knowledge resources in the firm, on understanding what knowledge is, on

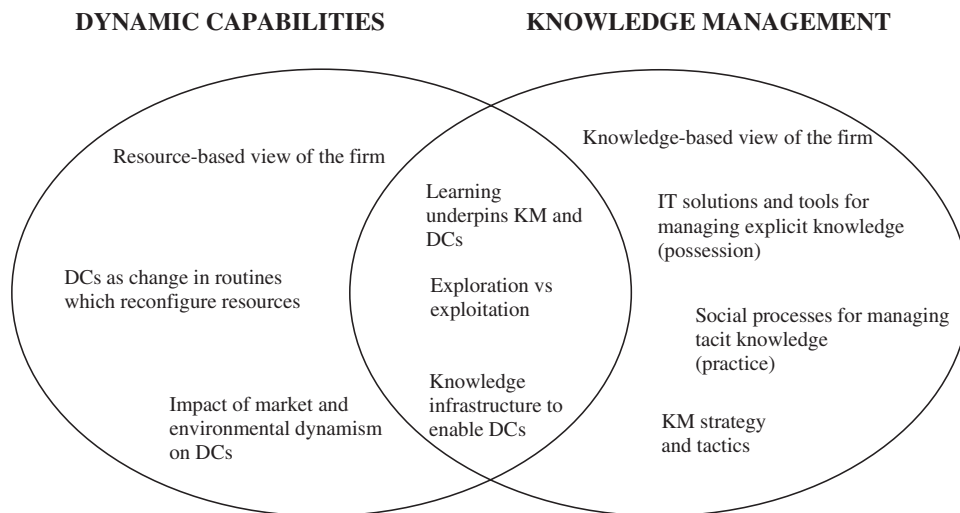


Figure 1. Boundaries and overlaps of the dynamic capabilities and knowledge management fields (KM, knowledge management; DCs, dynamic capabilities)

defining knowledge typologies, and on how best it can be managed.

As mentioned above, the dynamic capabilities perspective seeks to explain how firms achieve and sustain competitive advantage within ever-changing environments. The critical aspects of dynamic capabilities are the ability of the firm to identify the changing market environment, to sense the need and the opportunity, and then to accomplish the necessary transformation in its routines which reconfigures resources and creates significant value.

There is a growing agreement in the literature that dimensions of the general competitive environment of a business (environmental contingencies) will influence the development of dynamic capabilities (Eisenhardt and Martin, 2000). Furthermore, certain characteristics of the general business environment (i.e. uncertainty, complexity, munificence) moderate the relationship between dynamic capabilities and competitive advantage (Aragon-Correa and Sharma, 2003; Benner and Tushman, 2003; Marsh and Stock, 2003; Pavlou and El Sawy, 2004). In the case of the knowledge management literature, although it has a contingency side, it tends to be focused on the internal characteristics, including forms of knowledge and types of tasks, that influence the suitability of knowledge management initiatives (Becerra-Fernández and Sabherwal, 2001; Spender, 1996).

The knowledge management literature has most explicitly discussed whether knowledge is a possession or if it is embedded in practice by differentiating knowledge and knowing (Orlikowski, 2002). Therefore, knowledge can be understood as something that individuals, groups or organizations *have* (knowledge as possession); but also as something that individuals, groups and organizations *do* (knowledge as practice). Both forms of knowledge have a role to play, depending on the types of knowledge and tasks that are involved.

The distinction between knowledge as possession and knowledge as practice is reflected in the alternative approaches to knowledge management. Most of the contributions of the knowledge management literature to date have focused on IT-based tools and systems, whereby technical knowledge management infrastructures are presented as a pipeline to knowledge codification and organization (Alavi and Leidner, 2001;

Davenport and Prusak, 1998; Gold, Malhotra and Segars, 2001) and to extensive knowledge transfer (Davenport and Prusak, 1998; Ko, Kirsch and King, 2005; Van den Brink, 2003) as a coordination mechanism (Tanriverdi, 2005).

Meanwhile critiques have begun to argue that technical solutions cannot provide a full understanding of complex situations (Bender and Fish, 2000) and lack the emotional richness and depth of live interaction (Swan *et al.*, 1999). We also note the importance of social processes, and thus the management of people, social networks and communities within organizations in order to handle the problem of sharing tacit knowledge. Hence knowledge management initiatives should be consciously and deliberately concerned with the processes of developing, sharing and using tacit knowledge, skills and expertise.

Lastly, knowledge management needs to include both strategic and tactical efforts if it is to be aligned with business strategy (Vera and Crossan, 2003). At the strategic level, the knowledge required to execute the firm's strategic intent needs to be identified and compared with existing knowledge, in order to locate strategic knowledge gaps (Zack, 1999). A knowledge management strategy should indicate plans for manipulating knowledge and other organizational resources and will guide members to manipulate knowledge, producing and consuming resources in the process. At the tactical level, knowledge management is about the everyday enabling of the specific processes through which knowledge is created, captured, transferred, integrated and applied; it thus facilitates the manipulation of resources to develop needed knowledge on the basis of day-to-day work.

Overlaps

First, both fields share the recognition that knowledge change and adaptation is directly related to the concept of learning (i.e. Crossan, Lane and White, 1999; Eisenhardt and Martin, 2000; Zollo and Winter, 2002). We have mentioned the broad consensus in the literature that learning capabilities act as the source of dynamic capabilities, while operational capabilities are the visible outcome of dynamic capabilities. Together, the concepts of knowledge management and organizational learning have usually belonged to different fields of research. But since learning

can be defined in terms of the processes of knowledge creation, retention, application etc. (Vera and Crossan, 2003), they fit together in such a way that knowledge management can be considered as ‘managed learning’ within organizations by providing solutions to these knowledge-associated processes (Prieto, 2003; Vera and Crossan, 2003). We conclude that organizational learning thus represents an opportunity to unify the insights from both dynamic capabilities and knowledge management.

A second area of overlap is that dynamic capabilities depend upon the evolution of knowledge through both exploration and exploitation (Levinthal and March, 1993). Exploration activities are primarily aimed to introduce the variations that generate new ideas and to select the most appropriate ones through, for example, alliances (Das, 2006) and organizational networking (Hendry and Brown, 2006). Exploitation involves the replication of existing methods into new contexts and their wider dissemination. The benefits of exploitation are thus based on increased efficiency, while that of exploration is based on increased innovation. Although the field of dynamic capabilities emphasizes the renewal of the firm’s overall resources and the field of knowledge management focuses on knowledge-specific resources and routines, both fields have produced a number of research papers about the processes of knowledge exploration and exploitation. For example, Zollo and Winter (2002) link dynamic capabilities to a ‘knowledge evolution cycle’ that involves both exploration and exploitation, and Swan *et al.* (1999, 2000) recognize that the objective of knowledge management can be to enhance both knowledge exploitation and exploration.

After two decades of research on the exploration–exploitation trade-off (Adler, Goldoftas and Levine, 1999; He and Wong, 2004), scholars in organization theory have concluded that the degree of success of business organizations lies in their potential to conduct both exploration and exploitation activities simultaneously (Levinthal and March, 1993; March, 1991; Oshri, Pan and Newell, 2006). Dynamic capabilities are manifest when a firm simultaneously explores and exploits its knowledge and competences. This combination is reflected in the concept of ambidexterity introduced by Gibson and Birkinshaw (2004) which involves two essential dimensions – performance

management and social support – that give rise to dynamic capabilities.

Finally, both dynamic capabilities and knowledge management researchers have identified knowledge resources that are critical to achieving and sustaining competitiveness (Tidd, Bessant and Pavitt, 1997). Researchers such as Lawson and Samson (2001) and Verona and Ravasi (2003) identify personal skills and knowledge, physical technical systems, structural and managerial systems, and cultural values and norms as essential constituents for building dynamic capabilities. In the knowledge management literature there is also convergence around cultural, structural, human and technological factors as key elements of a successful knowledge management infrastructure which can support the generation, acquisition, retention, transfer and utilization of knowledge (Chuang, 2004; Gold, Malhotra and Segars, 2001; Lee and Choi, 2003; Van den Brink, 2003). Human, cultural and structural conditions traditionally fit around the internal social context of the firm, while technological conditions conform to the technical context of the firm.

Building on the conclusions from this initial review, the following section presents an integrative framework that relates dynamic capabilities and knowledge management to firm performance.

Towards an integrative framework

In this section we map out the relationships between knowledge management and dynamic capabilities (Figure 2) based primarily on the foregoing discussion, and we add further comments below where more justification appears to be necessary. We also extend the model in two directions. First, we identify the process of learning as a central mechanism that links the two concepts together. This draws on the review in the preceding sections which identified learning processes as being important in a number of respects, but we try to extend the thinking in this section by drawing on and summarizing some key concepts from the learning literature. Second, we extend the analysis to consider relationships with, and the impact on, corporate performance, which we define as the organization’s success or failure in achieving its financial and non-financial (i.e. quality, reputation, growth) goals.

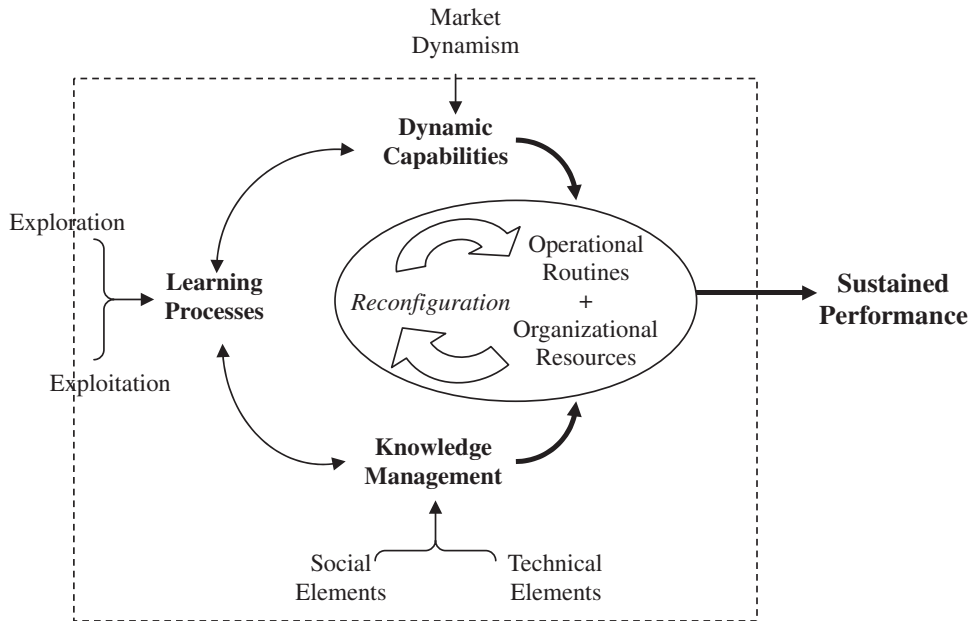


Figure 2. Linking knowledge management and dynamic capabilities

Since this model is quite complex, we will explain it in stages, starting with the more obvious links between knowledge management and dynamic capabilities, then explaining the potential mediating role of learning capabilities, and finishing with a discussion of the potential links to performance.

Knowledge management and dynamic capabilities

The core of the model is about ensuring that the firm has the organizational resources (which include knowledge) and operational routines (which include functional capabilities) that are appropriate to the current business context. These are what Winter (2003) refers to as operational (zero-order) capabilities; and mechanisms need to be in place to ensure that they can be appropriately reconfigured as business circumstances change.

In the upper half of the figure we illustrate the role of dynamic capabilities as the (first-order) capability to modify existing resources and operational routines over time. The need for reconfiguration and renewal of these resources and routines may emanate from changes in the organizational conditions and from changes in the environmental conditions (Zahra, Sapienza and Davidsson, 2006). Thus dynamic capabilities are developed in response to a variety of

conditions including market dynamism. In moderately dynamic environments, as suggested by Eisenhardt and Martin (2000), dynamic capabilities take on a relatively stable, predictable and analytic form, and rely heavily on existing knowledge in enabling the reconfiguration of resources and routines. But in high-velocity markets this apparent stability breaks down, and consequently dynamic capabilities become 'simple, experiential, unstable processes that rely on quickly created new knowledge and iterative execution to produce adaptive, but unpredictable outcomes' (Eisenhardt and Martin, 2000, p. 1106).

In the lower half of the figure we develop the role of knowledge management. Here we are suggesting that knowledge management may also be considered as a first-order capability (Gold, Malhotra and Segars, 2001) which contributes to the reconfiguration of resources and operational routines, both because knowledge is a resource in its own right and because operational routines will be derived from the knowledge that resides within functional disciplines such as marketing, human resources and information systems. According to Pan and Scarbrough (1999), Lee and Choi (2003) and Chuang (2004), knowledge management capabilities need to encompass an appropriate combination of social relationships, managerial practices and technical tools, thus

developing and deploying the knowledge types which are embodied in practice with the knowledge that can be possessed.

The most appropriate balance between the two forms of knowledge depends on managerial choices that will take account of the current business strategy (Cepeda and Vera, 2005; Vera and Crossan, 2003). However, we suggest that it is mostly when knowledge management motivates and supports people and collective activities that dynamic capabilities can be triggered, and therefore social elements may be more significant than technical ones (Prieto and Easterby-Smith, 2006). As stated by Robey, Boudreau and Rose (2000, p. 139): 'Information technologies are subject to complex social processes as they are implemented and used in organizations; they are not plugged in and played without the involvement of numerous actors over significant periods of time.' Therefore firms must create and renew social contexts which enable individuals to engage in both internal and external learning processes in the course of their day-to-day work. This task is difficult if we consider that not only are people the key enablers of creating and using knowledge for competitive advantage, but they may also be the major constraints (Biloslavo and Zornada, 2004).

The role of learning

We have located learning processes on the left-hand side of the figure because they mediate between knowledge management and dynamic capabilities, and contribute to the evolution of both; as such, they are second-order capabilities using the classification of Winter (2003). The bidirectional arrows to and from learning processes indicate that there is mutual interaction between learning processes, dynamic capabilities and knowledge management.

We agree with Zollo and Winter (2002) that exploration and exploitation are both critical learning processes. Exploration is important because it involves moving outside the boundaries of current practice; but exploitation also has a role, provided there are sufficient mechanisms in place to ensure that the consequences of exploitative actions are fed back as a way of reviewing the routines which underpin them. As noted above, there needs to be an appropriate balance between exploration and exploitation

activities, because it may be difficult to be good at both processes simultaneously (Teece, Pisano and Shuen, 1997), and this is again a matter of strategic choice. There also needs to be a recognition that they contain different logics which require different structures, methods and behaviours (He and Wong, 2004), and the way in which they operate will vary according to different industrial and competitive circumstances. As previously suggested, market dynamism shapes the pattern of dynamic capabilities, and will influence the strategic choices between knowledge exploration and exploitation, together with choices between internal and external knowledge.

There is also a strong link between learning processes and knowledge management. The organizational learning literature has explicitly discussed the development of a learning system or infrastructure that affects and is affected by learning processes (Vera and Crossan, 2003). This learning infrastructure consists of embedded learning in the technical procedures and social relationships that are pooled through knowledge management. At a practical level, Zollo and Winter (2002) argue that it is possible to organize 'learning mechanisms' of experience accumulation, knowledge articulation and codification which encapsulate these learning processes. And more specific organizational practices such as skill development, mentoring and reward systems are reported by Orlikowski (2002) as leading to the development of capabilities. These learning mechanisms enable the configuration and reconfiguration (i.e. dynamic capabilities) of the firm's operational resources and routines (Cepeda and Vera, 2005), and are catalysed by the management of the firm's knowledge resources.

The impact on business performance

Most scholars consider the role of dynamic capabilities in firm strategy and performance (Eisenhardt and Martin, 2000; Teece, Pisano and Shuen, 1997; Zahra, Sapienza and Davidsson, 2006; Zott, 2003). But the way dynamic capabilities precisely affect business performance still remains unclear (Zott, 2003) since the empirical testing of the linkage has been hampered by a lack of consensus about their description, their operationalization and their assumed tautological link to performance.

Here we follow the arguments of Eisenhardt and Martin (2000), Winter (2003) and Zahra, Sapienza and Davidsson (2006), among others, in suggesting that competitive advantage does not come from dynamic capabilities themselves but from the new configurations of resources and operational routines resulting from them. Empirical evidence in knowledge management literature also suggests that, in order to achieve a better understanding of knowledge management performance, companies should attempt to link knowledge processes and resources with intermediate outcomes that transform knowledge into business value (Carlucci, Marr and Schiuma, 2004; Gold, Malhotra and Segars, 2001; Lee and Choi, 2003). As defined earlier, operational routines or capabilities are the visible outcome of dynamic capabilities. These capabilities are geared towards the operational functioning of the firm, and they can affect performance measures and lead to above-average returns.

In particular, operational capabilities incorporating knowledge processes and resources in the form of differential and complementary technological and marketing competences (Danneels, 2002) and human resource competences (Hodgkinson and Sparrow, 2002) provide a sustainable competitive advantage to the organization (Tanriverdi, 2005). Technological competences give the firm the capacity to design and manufacture products with certain attributes, and include basic research, research and development, product design, and quality assurance tools. Marketing competences allow firms to serve certain customers and include abilities in managing sales, distribution channels, brand names and advertising, together with knowledge of customer needs. Human resource competences allow the organization both to harness the commitment of organizational members and to introduce flexibility in the application of plans (the dynamic element) which is most important when competing in global markets.

Finally, anecdotal evidence suggests that the relative contribution of knowledge management and dynamic capabilities to a firm's competitive advantage may vary according to several factors. In reviewing the literature, one encounters a very broad range of factors that possibly influence performance results. Resource conditions (Holsapple and Joshi, 2000), firm conditions (Holsapple

and Joshi, 2000; Zollo and Winter, 2002) and environmental conditions (Benner and Tushman, 2003; Massey, Montoya-Weiss and O'Driscoll, 2002; Zollo and Winter, 2002) are usually mentioned as major influences that may lever or constrain the outcomes of knowledge-enabled capabilities. Specially, in integrating this contingent perspective, several authors have proposed that patterns of effective capabilities (those that enhance organizational fit and performance) vary with market dynamism or a competitive business environment (Aragon-Correa and Sharma, 2003; Eisenhardt and Martin, 2000; Keskin, 2005; Marsh and Stock, 2003).

Conclusions and directions for future research

This paper deals with the co-evolution of dynamic capabilities and knowledge management fields by providing synthesis and integration of these closely related concepts. The lack of explicit connection that we note between the dynamic capabilities and knowledge management discourses can be related to the distributed nature of the adoption of these discourses, with a variety of communities encountering ideas in different ways. However, we have critically reviewed previous research in an effort to understand how these discourses fit together and how they can be integrated into a more meaningful conceptual model for both academia and practitioners. We propose the present framework as an instrument to facilitate communication between researchers.

We make five main contributions in this paper. First, we summarize some current ideas and critiques of both knowledge management and dynamic capabilities. Second, we develop a model which synthesizes recent thinking in both fields and demonstrates potential interrelationships between them. Third, we extend the idea of contingency theory in relation to both fields, particularly as a consequence of varying degrees of market dynamism (see Eisenhardt and Martin, 2000). Fourth, we have identified learning processes as a common theme underlying both dynamic capabilities and knowledge management, and as a means of moderating the relationship between exploration and exploitation. Fifth, this paper recognizes that knowledge management

and dynamic capabilities lead to a better performance when they support the operational functioning of the firm. We therefore argue that knowledge management enabled dynamic capabilities are antecedents of specific operational/functional competences which in turn have a significant effect on business performance.

There are a number of practical implications from our analysis and the model proposed. First is the need to understand the complex relationship between dynamic capabilities and knowledge, and the role of knowledge management infrastructures in this process. Second is the need to adopt a holistic approach to dynamic capabilities, incorporating both the exploration and exploitation of knowledge and competences as underlying dimensions of successful dynamic capabilities. In so doing, firms have the opportunity to learn from exploration and exploitation, so that they can build their knowledge base and direct the resource conversion activities of the firm. Third, it is important to understand the way contingency factors based on market dynamism affect the appropriate balance between exploration and exploitation on one hand, and between social and technical processes of knowledge management on the other hand. Fourth, there is a need to understand the critical importance of learning processes, both because they underpin resource and operational renewal processes and because they mediate between environmental dynamism and the appropriate configuration of organizational capabilities.

Relatively few studies have provided empirical insights into the mutually reinforcing interaction between knowledge management and dynamic capabilities. This indicates an important direction for future empirical work, with the opportunity to test the relationships implicit in the proposed integrative model. In testing these relationships, future research needs to address the choice of appropriate measures and methodology. Several instruments are available in the knowledge management literature, while dynamic capabilities have yet received limited empirical verification. There is also potential to examine explicitly the links between other functional strategies and dynamic capabilities, perhaps using the model as a general framework. Finally, future research could build on Cepeda and Vera's (2005) operationalization of dynamic capabilities as

mediators of the link between knowledge management and business performance.

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