

Dynamic capabilities: A review and research agenda

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The notion of dynamic capabilities complements the premise of the resource-based view of the firm, and has injected new vigour into empirical research in the last decade. Nonetheless, several issues surrounding its conceptualization remain ambivalent. In light of empirical advancement, this paper aims to clarify the concept of dynamic capabilities, and then identify three component factors which reflect the common features of dynamic capabilities across firms and which may be adopted and further developed into a measurement construct in future research. Further, a research model is developed encompassing antecedents and consequences of dynamic capabilities in an integrated framework. Suggestions for future research and managerial implications are also discussed.

Introduction

Since the 1990s, relentless competition has driven firms constantly to adapt, renew, re-configure and re-create their resources and capabilities in line with the competitive environment. This is captured in the notion of dynamic capabilities (Eisenhardt and Martin 2000; Teece *et al.* 1992, 1997), which has provided an important impulse in empirical research. Dynamic capabilities encapsulate wisdom from earlier work on distinctive competence (Learned *et al.* 1969; Selznick 1957), organizational routine (Nelson and Winter 1982), architectural knowledge (Henderson and Clark 1990), core competence (Prahalad and Hamel 1990), core capability and rigidity (Leonard-Barton 1992), combinative capability (Kogut and Zander 1992) and architectural competence (Henderson and Cockburn 1994).

Empirical research illustrating the evolution of firm capabilities dates back to before the 1990s (see, among others, Eisenhardt 1989; Fredrickson 1984), and has flourished since then.

Yet, the search for an enhanced understanding of dynamic capabilities continues. It is argued that in theory dynamic capabilities exhibit commonalities across firms (Eisenhardt and Martin 2000). However, such commonalities have not been systematically identified. Researchers refer dynamic capabilities to a wide range of resources, processes and capabilities. As a result, the literature features mixed use and interpretation of terminologies (Thomas and Pollock 1999). In addition, empirical studies to date have primarily addressed firm- or industry-specific processes pertinent to dynamic capabilities based on case studies. Thus far, research on dynamic capabilities has been conducted on a piecemeal basis, and

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research findings remain disconnected. It is imperative to synthesize the conceptual debates and the diverse empirical findings towards a more integrated understanding of dynamic capabilities. The objectives of this paper are: (i) to evaluate the theoretical and empirical development of dynamic capabilities in order to identify the issues that remain to be resolved; (ii) to identify the commonalities of dynamic capabilities across firms (we label these the ‘component factors’ of dynamic capabilities) drawing from a prolific but fragmented body of empirical findings; and (iii) to propose a research model incorporating antecedents and consequences of dynamic capabilities. The tasks are increasingly important for several reasons: (i) a timely synthesis of the literature contributes to the basis of theory building in the area of dynamic capabilities; (ii) the identification of the commonalities of dynamic capabilities across firms provides a framework for future research and encourages cross-comparison of research findings; and (iii) the component factors of dynamic capabilities identified and the research model proposed in this study can be adopted and further developed by future empirical studies attesting to a nomenclological network of the dynamic capabilities construct.

Development of the Resource-based View and Dynamic Capabilities

Penrose (1959) provided initial insights into the resource perspective of the firm. However, ‘the resource-based view of the firm’ (RBV) was put forward by Wernerfelt (1984) and subsequently popularized by Barney (1991). Many authors (e.g. Barney 2001a,b; Barney *et al.* 2001; Day and Wensley 1988; Dierickx and Cool 1989; Eisenhardt and Martin 2000; Mahoney and Pandian 1992; Nelson and Winter 1982; Priem and Butler 2001a,b; Winter 2003; Zahra and George 2002; Zollo and Winter 2002) made significant contribution to its conceptual development.

The essence of the RBV lies in the emphasis on resources and capabilities as the genesis of

competitive advantage: resources are heterogeneously distributed across competing firms and are imperfectly mobile which, in turn, makes this heterogeneity persist over time (Barney 1991; Mahoney and Pandian 1992; Penrose 1959; Wernerfelt 1984). Fundamentally, it is the VRIN (valuable, rare, inimitable and non-substitutable) resources of the firm that enable or limit the choice of markets it may enter, and the levels of profit it may expect (Wernerfelt 1989). Yet, resource advantage may not be sufficient – the firm needs to possess distinctive capabilities to make better use of its resources (Penrose 1959). Entering the 1990s, the highly dynamic business environment challenged the original propositions of the RBV as being static and neglecting the influence of market dynamism (Eisenhardt and Martin 2000; Priem and Butler 2001a,b). Dynamic capabilities, encapsulating the evolutionary nature of resources and capabilities, emerged to enhance the RBV (Eisenhardt and Martin 2000; Helfat 1997; Teece *et al.* 1992, 1997; Zahra and George 2002). Scholars have since endeavoured to integrate the two literature areas (e.g. Makadok 2001) in line with what Williamson (1991, 76) astutely commented:

The leading efficiency approaches to business strategy are the resource-based and the dynamic capabilities approach ... It is not obvious to me how these two literatures will play out – either individually or in combination. Plainly, they deal with core issues. Possibly they will be joined.

The RBV expands the body of knowledge of differential firm performance and elevates the understanding of strategic management (Mahoney and Pandian 1992; Priem and Butler 2001a,b). It is complementary to leading theoretical frameworks in strategic management, which either give equivalent attention to firms’ internal strengths and weaknesses versus external opportunities and threats (Andrews 1971; Ansoff 1965; Learned *et al.* 1969), or exclusively emphasize external competitive forces (Porter 1980). Nevertheless, the validity of the RBV as the framework of reference in organizational theory has been

questioned in several key aspects (Barney 2001a; Conner 1991; Eisenhardt and Martin 2000; Priem and Butler 2001a,b), such as the definitions, the linkage to market dynamism and the mechanisms of transforming resource advantage into competitive advantage. In line with these considerations, a key question is 'to what extent does the concept of dynamic capabilities complement the original propositions of the RBV?'

First, the RBV and its associated terminologies, i.e. resources, processes, capabilities and core capabilities, lack clear definitions (Thomas and Pollock 1999). Priem and Butler (2001a,b) comment that research on the RBV mainly adopts and paraphrases Barney's (1991, 101) statements: firm resources are 'all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness'. This indicates no distinction between resources and capabilities. Furthermore, Barney (1991, 106) states that a firm achieves competitive advantage when 'implementing a value creating strategy not simultaneously being implemented by any current or potential competitors'. Eisenhardt and Martin (2000) reckon that Barney's (1991) definition suggests that VRIN resources that drive competitive advantage are identified by observing superior performance and then attributing that performance to the unique resources that the firm appears to possess – this makes the definition of the RBV tautological.

Unfortunately, the concept of dynamic capabilities, like the RBV, has not prevailed over such definitional issues. Teece *et al.* (1997, 515) define capabilities as 'the key role of strategic management in appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competences to match the requirements of a changing environment'. This is hardly different from their definition of dynamic capabilities: 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly

changing environments' (Teece *et al.* 1997, 516). Furthermore, Eisenhardt and Martin (2000, 1107) define dynamic capabilities as 'the firm's processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources – to match and even create market change' and 'the organizational and strategic routines by which firms achieve new resources and configurations as markets emerge, collide, split, evolve, and die'. This suggests that dynamic capabilities are simply processes, and therefore this does not lend further understanding of the distinction between dynamic capabilities and processes. Confounding the situation is the fact that a significant number of empirical studies pertinent to dynamic capabilities do not explicate the concept (i.e. Delmas 1999; D'Este 2002; Figueiredo 2003; Farrant and Flynn 1999; George 2005; Lehrer 2000; Malerba *et al.* 1999; Mota and de Castro 2004; Salvato 2003; Sako 2004; Woiceshyn and Daellenbach 2005). Instead, these studies simply describe how firm evolution occurs over time, most usually illustrated through case studies. Moreover, there are even contradictory arguments in the literature. For example, Zollo and Winter (2002) reckon that dynamic capabilities are structured and persistent in a given organization, while Rindova and Kotha (2001), through their empirical research, identify dynamic capabilities as emergent and evolving. Given the mixed use and interpretation of terminologies, the definitional issue of dynamic capabilities remains to be clarified.

Second, the RBV has been criticized for being static, and sustained competitive advantage has been seen as unlikely in dynamic markets (D'Aveni 1994; Eisenhardt and Martin 2000). Its key assumptions – the persistently heterogeneous resources of the firm and the maintenance of rents resulting from the absence of competition in either acquiring or developing complementary resources (Mahoney and Pandian 1992) – are dubious in the context of volatile, unpredictable environments. Hence, the RBV fails to address the influence of market dynamism and firm evolution over time.

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Reconciling this, the concept of dynamic capabilities is intrinsically linked to market dynamism. Eisenhardt and Martin (2000) reckon that dynamic capabilities exhibit different features in two types of markets: (i) moderately dynamic markets, where changes occur frequently but follow predictable and linear paths, industry structures are relatively stable (accordingly, firms rely heavily on existing knowledge, and designs of processes and activities typically follow a problem-solving approach) (Fredrickson 1984); (ii) high-velocity markets, where changes are non-linear and less predictable, market boundaries are blurred and industry structures are ambiguous and shifting. Thus, a firm's dynamic capabilities' focus is on rapidly creating situation-specific new knowledge (Eisenhardt and Martin 2000). Empirical work on dynamic capabilities has encompassed market dynamism as a key driver for firm evolution, for instance, in the studies of the evolution of the Spanish pharmaceutical industry (D'Este 2002), the Portuguese moulds industry (Mota and de Castro 2004) and the Indian software industry (Athreye 2005) (see Appendix 1).

Third, the RBV has been attacked for its failure to define mechanisms that explain how resources are transformed to competitive advantage (Mosakowski and McKelvey 1997; Priem and Butler 2001a,b; Williamson 1999). Early work on the RBV posits that firm performance is associated with short-term rent generation via value-creating diversification strategy, which cannot be easily duplicated by competitors (Barney 1991; Nelson 1991; Wernerfelt 1984). Traditional theory of diversification is based on excess capacity of productive factors (resources) arising from the uneven speed of operation at all units (Gorecki 1975; Penrose 1959; Teece 1982). The unused productive factors create unique opportunities for diversification, although subject to market opportunities (Chandler 1990; Teece 1980). Firms are inclined to diversify into other industries assigned to the same category of their existing industry (Lemelin 1982), and to enter industries that

are related to their primary activities (MacDonald 1985; Stewart *et al.* 1984). Thus, firms grow in the directions set by their resources and capabilities, which slowly expand and evolve (Penrose 1959; Richardson 1972). Despite its emphasis on excess resources and firm diversification, the RBV does not elucidate how resources create competitive advantage: in other words, the mechanism to explain the linkage between resources and product markets (Priem and Butler 2001a,b). Indeed, the RBV simplifies strategic analysis with an implicit assumption of homogeneous and immobile product markets featuring unchanging demands and, consequently, the role of product markets is underdeveloped.

Empirical research on dynamic capabilities has begun to fill the vacuum area of the transformational mechanisms. For example, in the study of the US metal-working sector, one that fell into 'complete disrepair' after World War II owing to its inability to respond to the rise of new competitors, particularly from Japan, the transformation of Brimfield Precision Inc. from a machinist dependent on a few customers and price-based contracts to a designer and manufacturer of various surgical instruments was accomplished through a range of processes: (i) evolving from a 'boot in the butt', hierarchical firm to one that is skill based and reliant on shop-floor production teams; (ii) instilling continuous improvement in design and manufacturing; and (iii) developing in-plant innovative capabilities (Farrant and Flynn 1999). Empirical studies also reveal other processes pertinent to dynamic capabilities, such as the internal and external integration of knowledge in a healthcare firm (Petroni 1998), dynamic learning in telecommunication firms (Majumdar 1999), capability possession, deployment and upgrading in international expansion (Luo 2000), technology accumulation in cross-border transactions of biotech firms (Madhok and Osegowitsch 2000), continuous transformation of organizational forms in Yahoo! and Excite (Rindova and Kotha 2001), mobilizing and transforming capabilities in the Hollywood movie industry

(Lampel and Shamsie 2003), and knowledge creation, absorption, integration and reconfiguration in a Danish hearing-aid manufacturing firm (Verona and Ravasi 2003) (see Appendix 1). However, such research findings primarily reveal firm- or industry-specific processes, and no existing studies have summarized the commonalities of dynamic capabilities across firms. Yet, the commonalities are indeed identifiable and measurable (Eisenhardt and Martin 2000) and are critical for the development of the dynamic capabilities concept. The reasons are mainly threefold: first, the common features formulate the component factors of the dynamic capabilities construct and can be adopted by future studies for examining the relationships of dynamic capabilities and other organizational parameters; second, the common features of dynamic capabilities reveal how firms transform resource advantage to marketplace advantage at a general level, rather than in the firm-specific context, and hence can be adopted as a framework to reveal firms' transformational mechanisms in general; and third, existing work in the RBV is primarily theoretical, devoid of meaningful implications for practitioners (Priem and Butler 2001a,b), and the firm-specific processes of dynamic capabilities identified in empirical studies do not provide common guidance for firms. Hence, the component factors of dynamic capabilities can guide the development of actionable prescriptions (Eccles and Nohria 1992; Mosakowski 1998) or practical tools and techniques for managers to use for the purpose of improved performance (Priem and Butler 2001a,b).

In summary, the emergence of dynamic capabilities has enhanced the RBV by addressing the evolutionary nature of firm resources and capabilities in relation to environmental changes and enabling identification of firm- or industry-specific processes that are critical to firm evolution. However, based on the above literature review, a few questions remain to be answered: How are dynamic capabilities distinguished from resources, processes and capabilities? What are the commonalities of

dynamic capabilities across firms? What are the relationships between dynamic capabilities and other organizational variables, particularly firm strategy and firm performance? This paper aims to answer these questions below.

Dynamic Capabilities: The Concept and the Component Factors

We define dynamic capabilities as a firm's behavioural orientation constantly to integrate, reconfigure, renew and recreate its resources and capabilities and, most importantly, upgrade and reconstruct its core capabilities in response to the changing environment to attain and sustain competitive advantage. By this definition, we first argue that dynamic capabilities are not simply processes, but embedded *in processes*. Processes are often explicit or codifiable structuring and combination of resources and thus can be transferred more easily within the firm or across firms. Capabilities refer to a firm's capacity to deploy resources, usually in combination, and encapsulate both explicit processes and those tacit elements (such as know-how and leadership) embedded in the processes. Hence, capabilities are often firm-specific and are developed over time through complex interactions between the firm's resources (Amit and Schoemaker 1993). For example, quality control is a process that can be easily adopted by firms, whereas total quality management (TQM) is not just a process, but requires the firm's capability to develop an organization-wide vision, empowering employees and building a customer-orientation culture. Total quality management requires the firm not only to install a quality management process, but most importantly to tap into the tacit 'energy' of the firm.

Given the above conceptual distinction, we discuss firm resources and capabilities in a 'hierarchical' order, with particular reference to a firm's competitive advantage. Resources are the foundation of a firm and the basis for firm capabilities. Therefore, we refer to

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resources as the ‘zero-order’ element of the hierarchy. Resources can be a source of competitive advantage when demonstrating VRIN traits. However, in dynamic market environments, VRIN resources do not persist over time and hence cannot be a source of sustainable competitive advantage. Capabilities are ‘first-order’ and this is likely to result in improved performance, when firms demonstrate the ability to deploy resources to attain a desired goal. Core capabilities are ‘second-order’ and are a bundle of a firm’s resources and capabilities that are strategically important to its competitive advantage at a certain point. For example, the success of Zara in the fast-changing fashion industry relies on its core capability in responsiveness to customers, which in turn is derived from a bundle of capabilities, including swift copy of catwalk design, advanced information systems, just-in-time production and shop-floor-led stock control, which combine together for success. Therefore, the emphasis of core capabilities is on the ‘integration’ of resources and capabilities in light of a firm’s strategic direction. However, even core capabilities can become irrelevant or even ‘core rigidities’ if and when the environment changes (Leonard-Barton 1992). In such conditions, firms create a ‘competency trap’ for themselves, becoming ever better at an ever less relevant set of processes (Tallman 2003; Teece *et al.* 1997). Hence, the ‘third-order’ dynamic capabilities emphasize a firm’s constant pursuit of the renewal, reconfiguration and re-creation of resources, capabilities and core capabilities to address the environmental change. Collis (1994) makes a particularly explicit point that dynamic capabilities govern the rate of change of capabilities. Thus, we contend that dynamic capabilities are the ‘ultimate’ organizational capabilities that are conducive to long-term performance, rather than simply a ‘subset’ of the capabilities, as Teece *et al.* (1997) suggest.

Eisenhardt and Martin (2000, 1117) reckon that dynamic capabilities cannot be a source of sustained competitive advantage; the only way that they can be a source of competitive

advantage is if they are applied ‘sooner, more astutely, and more fortuitously’ than competition to create resource configurations. According to Eisenhardt and Martin (2000), dynamic capabilities are just another type of capability and become irrelevant over time. In contrast, we argue that the ability to apply capabilities ‘sooner, more astutely, and more fortuitously’ is, indeed, at the heart of dynamic capabilities. If a firm is viewed as a bundle of resources and capabilities, dynamic capabilities underline the processes of transforming firm resources and capabilities into outputs in such forms as products or services that deliver superior value to customers; such transformation is embarked on in such a swift, precise and creative manner in line with the industry’s changes. In line with Barney *et al.*’s (2001a,b) argument that the ability to change quickly and alertness to changes in the market are costly for others to imitate and thus can be a source of sustained competitive advantage, we posit that dynamic capabilities are a source of sustained competitive advantage.

Further, we reckon that the concept of dynamic capabilities is not another management puzzle, and the transformational mechanisms can be revealed. At a firm-specific level, resources and capabilities may differ across firms, firms may start at different points in the competitive ‘race’, and the paths to dynamic capabilities may be specific to the firm or the industry. Existing qualitative research has revealed a plethora of firm- or industry-specific transformational mechanisms. At a general level, we concur with Eisenhardt and Martin (2000, 1108) that the common characteristics of dynamic capabilities across firms are identifiable and dynamic capabilities demonstrate the nature of ‘commonalities in key features, idiosyncrasy in details’. Drawing on existing empirical findings (see Appendix 1), we identify three main component factors of dynamic capabilities, namely adaptive capability, absorptive capability and innovative capability. Below, we delineate how the three component factors together explain firms’ mechanisms of linking internal resource

advantage to external marketplace-based competitive advantage.

Adaptive Capability

Adaptive capability is defined as a firm's ability to identify and capitalize on emerging market opportunities (Chakravarthy 1982; Hooley *et al.* 1992; Miles and Snow 1978). Chakravarthy (1982) distinguishes adaptive capability from adaptation. The latter describes an optimal end state of survival for a firm, while adaptive capability focuses more on effective search and balancing exploration and exploitation strategies (Staber and Sydow 2002). This type of 'balancing' act is brought to a strategic level and linked to the resource perspective: adaptive capability is manifested through strategic flexibility – the inherent flexibility of the resources available to the firm and the flexibility in applying these resources (Sanchez 1995). The development of adaptive capability is often accompanied by the evolution of organizational forms. Rindova and Kotha (2001, 1276) provide a vivid account of how Yahoo! and Excite adapt themselves and compete through continuous morphing permeated in many aspects of the organizational 'life': firms undergo 'comprehensive, continuous changes in products, services, resources, capabilities and modes of organizing'. The case illustrates that dynamic capabilities are reflected through a firm's adaptive capability in terms of strategic flexibility of resources and the alignment between the firm's resources, its organizational form and constantly shifting strategic needs (Rindova and Kotha 2001). Other empirical studies (e.g. Alvarez and Merino 2003; Camuffo and Volpato 1996; Forrant and Flynn 1999) also reveal that the ability to adapt to environmental changes and align internal resources with external demand is critical to firm evolution and survival in several industries. Firms that have high levels of adaptive capability exhibit dynamic capabilities (Teece *et al.* 1997).

In the existing literature, measures for adaptive capability are multidimensional, including

a firm's ability to adapt their product–market scope to respond to external opportunities; to scan the market, monitor customers and competitors and allocate resources to marketing activities; and to respond to changing market conditions in a speedy manner (Oktemgil and Gordon 1997). The most recent work by Gibson and Brikshaw (2004) measures adaptability through evaluating whether the firm's management systems encourage people to challenge outmoded traditions, practices and sacred cows, allow the firm to respond quickly to changes in the market and evolve rapidly in response to shifts in its business priorities.

Absorptive Capability

Cohen and Levinthal (1990, 128) refer to absorptive capacity: 'the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends ... the ability to evaluate and utilize outside knowledge is largely a function of the level of prior knowledge'. Firms with higher absorptive capability demonstrate stronger ability of learning from partners, integrating external information and transforming it into firm-embedded knowledge. Woiceshyn and Daellenbach (2005), in their study of Canadian oil and gas firms, find that firms' absorptive capability is critical for success in the face of external technological change. Their findings reveal that, when adopting the new horizontal drilling technology, firms with higher absorptive capability experience a relatively efficient adoption process leading to positive performance outcomes, while firms with lower absorptive capability encounter significant difficulties. The differential absorptive capability across firms is exhibited in several aspects: more efficacious adopters (vs less efficacious ones) (i) demonstrate long-term commitment of resources in the face of uncertainty (vs short-term limited commitment and reverse at the first sign of failure); (ii) learn from various partners and own research and experience and develop first-hand knowledge

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of the new technology (vs competitive imitation and second-hand knowledge); (iii) thoroughly analyse the new drilling technology and share information within multidisciplinary teams (vs superficial analysis and functional structure); (iv) develop and use complementary technologies (vs no complementary technologies used); and (v) possess a high level of knowledge and skills in areas relevant to applying the new technology (Woiceshyn and Daellenbach 2005). Other empirical studies (e.g. George 2005; Salvato 2003; Verona and Ravasi 2003) also reveal that firms' ability to acquire external, new knowledge, assimilate it with existing, internal knowledge and create new knowledge is an important factor of dynamic capabilities in several industries (see Appendix 1). The more a firm demonstrates its absorptive capability, the more it exhibits dynamic capabilities.

A significant number of prior studies use R&D (research and development) intensity (defined as R&D expenditure divided by sales) as a proxy to absorptive capability (e.g. Tsai 2001). Other studies (e.g. Chen 2004) use multiple indicators to measure the extent of the firm's ability to assimilate and replicate new knowledge gained from external sources. Zahra and George (2002) reckon that absorptive capability is a multidimensional construct and propose four component factors of the absorptive capability construct: knowledge acquisition, assimilation, transformation and exploitation. However, empirical studies have not developed and validated a multidimensional construct of absorptive capability.

Innovative Capability

Innovative capability refers to a firm's ability to develop new products and/or markets, through aligning strategic innovative orientation with innovative behaviours and processes (Wang and Ahmed 2004). As indicated in the definition, innovative capability encompasses several dimensions. Prior research has emphasized different combinations of these dimensions. For example, Schumpeter (1934) suggests

a range of possible innovative alternatives, namely, developing new products or services, developing new methods of production, identifying new markets, discovering new sources of supply and developing new organizational forms. Miller and Friesen (1983) focus on four dimensions: new product or service innovation, methods of production or rendering of services, risk-taking by key executives and seeking unusual and novel solutions. Capon *et al.* (1992) study three dimensions of organizational innovativeness: market innovativeness, strategic tendency to pioneer and technological sophistication. Recent studies pertinent to dynamic capabilities have focused largely on new product development only as an internal enabler for firm change and renewal (Daneels 2002; Dougherty 1992). For example, in a study of Spanish domestic pharmaceutical firms in the period 1990–97, D'Este (2002) identifies that, among manufacturing, R&D and marketing, building new product development capability is particularly associated with enhanced firm performance. In the study of small metal-working firms in Northern Italy, Gurizatti *et al.* (1997) find that success depends on developing new competences of 'a cumulative character' and in-house innovative capability. Other studies (e.g. Deeds *et al.* 1999; Delmas 1999; Lazonick and Prencipe 2005; Petroni 1998; Tripsas 1997) also reveal that, in several industries, firms' innovative capability is a critical factor for firms' evolution and survival in light of external competition and change. The more innovative a firm is, the more it possesses dynamic capabilities.

Empirical research on innovation is long standing. Avlonitis *et al.* (1994), Capon *et al.* (1992), Hurley and Hult (1998), Miller and Friesen (1983), Subramanian and Nilakanta (1996) and Wang and Ahmed (2004) have addressed the concern of effectively measuring organizational innovative capability, and multiple indicators have been developed to measure the dimensions of innovative capability (i.e. strategic innovative orientation, behavioural, process, product and market innovativeness) (Wang and Ahmed 2004). We

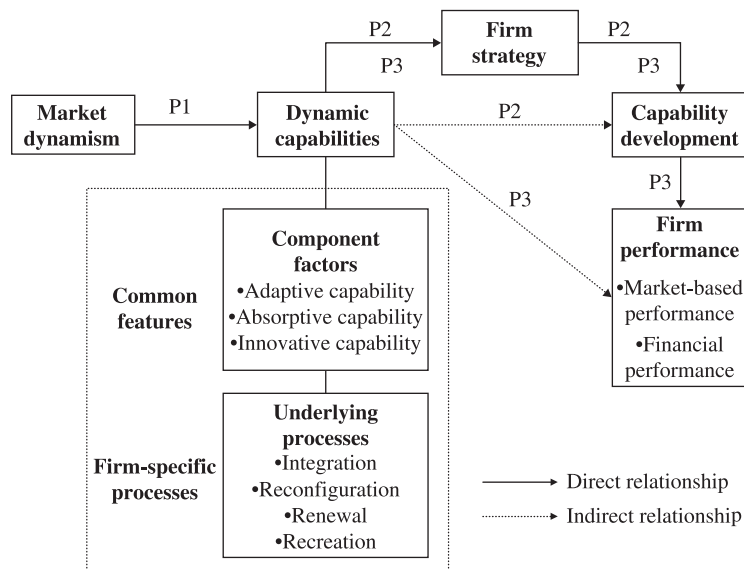


Figure 1. A research model of dynamic capabilities.

reckon that these multidimensions are important in measuring the overall innovative capability as a component factor of the dynamic capabilities construct.

Conceptually, we reckon that adaptive capability, absorptive capability and innovative capability are the most important component factors of dynamic capabilities and underpin a firm's ability to integrate, reconfigure, renew and recreate its resources and capabilities in line with external changes. The three factors are correlated, but conceptually distinct. Each has a particular emphasis: adaptive capability stresses a firm's ability to adapt itself in a timely fashion through flexibility of resources and aligning resources and capabilities with environmental changes. Hence, the focus of adaptive capability is to align internal organizational factors with external environmental factors. Absorptive capability highlights the importance of taking in external knowledge, combining it with internal knowledge and absorbing it for internal use. Innovative capability effectively links a firm's inherent innovativeness to marketplace-based advantage in terms of new products and/or markets. Thus, innovative capability explains the linkages

between a firm's resources and capabilities with its product market. Existing empirical studies of dynamic capabilities, primarily based on qualitative case studies, have found that the three component factors are indeed common across several industries, as discussed above, although firms may develop their dynamic capabilities from their unique starting points and through their unique paths (Cockburn *et al.* 2000; Eisenhardt and Martin 2000; Mota and de Castro 2005).

A Research Model of Dynamic Capabilities

A primary interest in management research is to identify relationships between organizational variables. Dynamic capabilities, as an emerging concept, need to be examined in an integrated framework incorporating the antecedents and consequences. Below, we propose and delineate a research model (see Figure 1).

Market Dynamism

The conceptualization of dynamic capabilities encompasses market dynamism as an influential

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factor for firm capability development and evolution (Eisenhardt and Martin 2000). A dynamic market environment can be caused by a leading factor or a combination of several factors, including industry technological innovation, regulatory change, economic cycle and the changing competitive nature of the industry. Tripsas (1997) illustrates that radical technological innovation in the typesetting industry was a major factor of market dynamism. Firms with higher dynamic capabilities developed technological capability and adapted themselves accordingly.

Conversely, in a study of the US film industry, Lampel and Shamsie (2003) illuminate that regulatory change altered industry dynamism which, in turn, influenced firms' dynamic capabilities during the 1950s and 1960s. Until the 1940s, Hollywood was dominated by eight large integrated hierarchical firms, which held key resources internally for long periods of time. Barriers to entry and imitation of key resources and capabilities were high. The film-making process was characterized by a cycle of internal creation of resource bundles – finished products were created using internal resources and released through studio-owned distribution channels into exhibition chains owned or dominated by the same studios. Pressured by US regulators and competition from television, studios as an integrated system of production, marketing and exhibition broke down (DeVany and Walls 1991; Schatz 1999) and became financing and distribution hubs with a key role in resource bundling (Wasko 1982). In the post-studio era, firms are required to develop the capability to bundle resources increasingly taking place at the interface between the studios and the external environment, rather than internally, and rely heavily on networks of capital providers, talent agents and independent producers (Christopherson and Storper 1989; Fleming 1998). This illustrates that firms operating in a certain industry at a certain point of time must create core capabilities responding to market changes, and hence the more dynamic a market is, the 'sooner, more

astutely, and more fortuitously' (Eisenhardt and Martin 2000, 1117) the firm needs to upgrade and recreate its core capabilities, and the higher the level of dynamic capabilities the firm demonstrates. While prior research has focused primarily on one of the factors causing market changes, there is a need for a systematic examination of the influence of market dynamism on a firm's dynamic capabilities. Therefore, we propose that:

- *Proposition 1.* Market dynamism is an antecedent to firms' dynamic capabilities; the more dynamic a market environment, the stronger the drive for firms to exhibit dynamic capabilities in light of external changes.

Capability Development and Firm Strategy

We refer to 'capability development' as an 'outcome' of a firm's dynamic capabilities over time. Thus, we distinguish 'capability development' from 'capability building', which is referred to as a 'process' of dynamic capabilities (Makadok 2001). Measures for capability development often involve a comparison of the same aspects of a firm's capabilities at different points in time. Capability development as an outcome of dynamic capabilities over time is frequently discussed and evidenced in empirical research. For example, Figueiredo (2003) indicates that dynamic capabilities play a substantial part in the accumulation of technological capability in two Brazilian steel firms. Other examples support that dynamic capabilities have an impact on the development of new product development capability (Clark and Fujimoto 1991), project capability (Brady and Davies 2004), technology adoption and integration capability (Woiceshyn and Daellenbach 2005) and service capability (Athreye 2005).

The question is 'Do firms develop similar capabilities over time?' The answer is that the path of building capabilities is not universal across firms, and therefore the outcome of

capability development is different across firms. Firms tend to develop capabilities as directed by their firm strategy. Teece *et al.* (1997) point out that the RBV is complementary to industrial organization theory; the latter takes an outside-in approach and considers the essence of strategy formulation as relating a firm to its environment. According to the industrial organization theory, a firm must find itself a favourable position in an industry from which it can best defend itself against competitive forces, or even influence them in its favour by such strategic actions as deterring entry or raising barriers to entrance, etc. (Porter 1980), whereas the RBV postulates an inside-out approach: what a firm can do is not just a function of opportunities and threats in the industry, but most importantly, the resources it possesses (Learned *et al.* 1969; Teece *et al.* 1997). The key to a firm's survival and success lies in its ability to create a set of distinctive capabilities that enable it to stand out in the competition (Dierickx and Cool 1989). Day and Wensley (1988) label this resource-based approach to strategy as the SPP (sources-positional advantage-performance) paradigm: a firm's resources and capabilities determine its positional advantage (i.e. differentiation, cost leadership and focus strategy), which, in turn, leads to firm performance. In Spanos and Lioukas's (2001) study of Greek small and medium-sized firms, firm assets (i.e. organizational, marketing and technical assets) are found to have a strong positive effect on strategy (i.e. innovative differentiation, marketing differentiation and low cost). This indicates that the more a firm is equipped with resources and the stronger its capabilities to use these resources, the more likely it is to develop a more complex and advantageous strategy (Amit and Schoemaker 1993; Spanos and Lioukas 2001).

Furthermore, a firm possessing higher levels of dynamic capabilities focuses on developing capabilities as navigated by its strategic choices. For example, when the firm's strategic orientation is to achieve differentiation, its dynamic capabilities may direct toward concentrating its assets on developing

innovative capability, which results in higher levels of innovative products or services. In contrast, when adopting a cost leadership strategy, the firm may focus on efficient manufacturing and overall cost cutting. Hence, this paper proposes that capability development is an outcome of dynamic capabilities, often steered by firm strategy. The intervention of strategy on capability development also implies that firms face organizational trade-offs in choosing between alternative capability development (Teng and Cummings 2002). In a study of the European air transport industry, Lehrer (2000) finds that firms must choose between evolutionary and revolutionary capability regimes: the former regime features a series of small steps within the existing strategic boundaries, whereas the latter features a series of strategic leaps and, where necessary, in a discontinuous way. Hence, we contend that:

- *Proposition 2.* The higher the dynamic capabilities a firm demonstrates, the more likely it is to build particular capabilities over time; the focus on developing particular capabilities is dictated by the firm's overall business strategy.

Firm Performance

The concepts of the RBV and dynamic capabilities place substantial emphasis on differential firm performance. More specifically, firms' ability to attain and sustain competitive advantage is the focal point of reference (Dierickx and Cook 1989; Dosi 1988a,b; Dosi and Marengo 1993; Nelson and Winter 1982; Pavitt 1991; Penrose 1959; Rothwell 1977). Given the path-dependent nature of dynamic capabilities, it is meaningful to examine the impact of dynamic capabilities on long-term performance, which can be measured by the firm's key (both market and financial) performance indicators in comparison with its main competitors or the industry average over a period of five to ten years. This is evidenced by the significant number of longitudinal studies of dynamic

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capabilities (i.e. Athreye 2005; Helfat 1997; Lampel and Shamsie 2003; Majumdar 1999; Pisano 2000; Rindova and Kotha 2001) (see Appendix 1). Empirical evidence supports that each of the three component factors of dynamic capabilities plays an important role in firms' long-term survival and success. For example, Rindova and Kotha (2001) highlight that adaptive capability embedded in various aspects of organizational renewal is a critical success factor for Yahoo! and Excite in hyper-competitive environments. Zahra and George (2002) view absorptive capability as a dynamic capability which influences the nature and sustainability of a firm's competitive advantage. Finally, D'Este (2002) and Gurizatti *et al.* (1997) provide evidence that a firm's innovative capability essentially enables it to change internally and effectively respond to new market demands. Given the above evidence, we argue that dynamic capabilities are conducive to long-term firm performance.

Further, we also note that the relationship between dynamic capabilities and firm performance is more complex than a simple, direct effect. For example, Spanos and Lioukas (2001) find that firm assets have a significant direct impact on market performance (i.e. market share, absolute sales volume and increase in market share and sales), but their impact on profitability (i.e. return on equity, profit margin and net profits relative to competition) is not statistically significant; instead, the relationship is indirect, mediated by market performance. They also find that firm assets have an indirect effect on market performance mediated by firm strategy. A further examination of Spanos and Lioukas's (2001) research findings reveal that the direct effect of firm assets on market performance is statistically significant but fairly small: 0.277 ($p < 0.01$). This leads us to consider other mediating factors. The findings of qualitative research (i.e. Athreye 2005; Brady and Davies 2004; Clark and Fujimoto 1991; Figueiredo 2003; Petroni 1998; Woiceshyn and Daellenbach 2005) reveal that capability development seems to be a mediator of the dynamic capabilities

and performance relationship. Theoretical development also supports such indirect linkages: dynamic capabilities create and shape a firm's resource position (Eisenhardt and Martin 2000; Galunic and Eisenhardt 2001) and capabilities (Kogut and Zander 1992), which in turn determine the firm's product-market position and, consequently, its performance (Zott 2003). Hence, we propose:

- *Proposition 3.* Dynamic capabilities are conducive to long-term firm performance, but the relationship is an indirect one mediated by capability development which, in turn, is mediated by firm strategy; dynamic capabilities are more likely to lead to better firm performance when particular capabilities are developed in line with the firm's strategic choice.

It is worth noting that there are two key assumptions in our proposed model.

- (1) Underlining capability development is the path-dependent nature of dynamic capabilities: a firm's current position (i.e. the sum of its resources and capabilities) is not only a function of the path it travelled, but also influences its decision and capability of taking up technological opportunities in the future (Teece *et al.* 1997). Capabilities are often built over a long period of time. Therefore, the model may not attest to firms that are driven by short-term orientation only.
- (2) Our research model assumes a 'traditional' mode of firm growth, i.e. through accumulation and development of internal resources and capabilities. In contrast, some firms adopt a 'buy' strategy through a variety of modes, such as merger or acquisition, i.e. bundling external resources to internal rather than developing them from within the firm.

Conclusions and Future Research

This paper set out the first task: to review the development of the RBV and dynamic

capabilities. By evaluating major conceptual and empirical works, we mapped out the development of the dynamic capabilities concept and identified several research questions surrounding the definitional issues, the missing link of transformational mechanisms and common features of dynamic capabilities, and the lack of articulation of the relationships between dynamic capabilities and other organizational parameters.

Following this, our second task was to clarify the conceptualization of dynamic capabilities followed by the identification of the commonalities of dynamic capabilities across firms. We articulated the differences in resources, capabilities, core capabilities and dynamic capabilities in a 'hierarchical' order and positioned dynamic capabilities in the third order of the hierarchy. While resources and capabilities are zero- and first-order foundation, respectively, the key to developing second-order core capabilities is the 'integration' of resources and capabilities in line with a firm's strategic goals. The essence of dynamic capabilities is a firm's behavioural orientation in the adaptation, renewal, reconfiguration and re-creation of resources, capabilities and core capabilities responding to external changes. We conceptualized dynamic capabilities in such a way that the common features are identifiable and measurable, although the processes in which dynamic capabilities are embedded may be specific to the firm and the industry. Based on theoretical grounding and existing qualitative insights, we identified three component factors, i.e. adaptive capability, absorptive capability and innovative capability. Empirical and conceptual studies of adaptive, absorptive and innovative capability are long-standing, mostly in their own right. It is only recently that researchers relate each of these capabilities to a firm's dynamic capabilities, but have not thus far clearly identified them as the component factors of dynamic capabilities. We articulated the linkages between each component capability and dynamic capabilities with a view to explicating the transformational mechanisms that dynamic capabilities entail.

Thus, the component factors reveal the 'black box' of how resources and capabilities can be used to sustain long-term firm performance. Furthermore, the component factors that we identified and elaborated can be adopted and developed into a measurement construct for dynamic capabilities in future studies.

Finally, we proposed a research model incorporating market dynamism as an antecedent to, and capability development and firm performance as consequences of, dynamic capabilities. However, the effects of dynamic capabilities on capability development and firm performance are relatively complex: a firm strengthens particular capabilities as directed by its own strategic goals; and when capability development and firm strategy are effectively aligned, a firm's dynamic capabilities lead to better performance and hence sustained competitive advantage. Prior studies on the relationships between dynamic capabilities and other organizational variables are fragmented and anecdotal. This study proposed an integrated framework for understanding dynamic capabilities and identified transformational mechanisms that link firms' internal resources and capabilities to their strategic choices in the product markets.

Empirical research on resources and capabilities has not yet reached maturity (Miller and Shamsie 1996), despite significant growth in the past few years. The majority of the empirical studies that we selected for review (see Appendix 1) are longitudinal and qualitative, based on single or multiple case studies. These studies have discovered a wide range of firm- or industry-specific processes and capabilities pertinent to dynamic capabilities. These findings are, indeed, the basis of theory building of dynamic capabilities. Future research should continue such qualitative endeavours, but efforts should be made toward establishing linkages between firm-specific processes and the commonalities of dynamic capabilities across firms which we identified in this study (see Figure 1). This will facilitate cross-comparison of research findings and thus enhance the 'collective power' of research outcomes.

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In contrast, quantitative research is under-developed, as evidenced by the smaller number of key empirical studies identified. Further, most prior quantitative studies examine a narrow aspect of dynamic capabilities. For example, George (2005) studies the effects of experiential learning on the cost of capability development, and Athreye (2005) focuses on the evolution of service capability given external and internal factors. An exception is the work by Spanos and Lioukas (2001), which tests a composite model integrating Porter's framework and the RBV (though with particular reference to firm assets rather than a dynamic capabilities construct). Future quantitative research has two eminent tasks:

- (1) To develop and validate a multidimensional construct of dynamic capabilities. This can be guided by the component factors identified in this paper.
- (2) To examine dynamic capabilities in a nomenclological network and provide a better understanding of under what circumstances and how firms should direct their resources and capabilities in search of sustained competitive advantage. Our proposed research model (as shown in Figure 1) can be adopted as a base for future studies.

The managerial 'take-away' of this paper is that, while recognizing the differential positions in resources and capabilities among firms and the different paths toward success, managers can chart their development of dynamic capabilities using the common features that we identified, and benchmark their practices with industry peers. However, managers must not evaluate dynamic capabilities as a stand-alone target. Instead, the change trajectory in the external environment, the firm's historical and current strengths and weaknesses, its long-term strategic orientation and its product-market positioning must be considered simultaneously in order to channel its resources effectively toward capability development. A second key point is that

capability development is time-dependent. Capability development (such as by investing in R&D) does not necessarily produce immediate performance effects. Therefore, firms must not reverse or re-direct capability development efforts at the first sign of failure or even when no immediate results are produced. Effective capability development requires that firms maintain a consistent long-term vision and have long-term performance at heart.

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Note

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Appendix 1. Key Empirical Studies Pertinent to Dynamic Capabilities: 1995–2005

Authors	Approach	Focus of the study	Analysed sample	Studied interval
Helfat (1997)	Quantitative	Exploring the role of complementary know-how and other assets in relation to R&D capabilities	26 largest US energy firms (primarily petroleum companies)	1976–1981
Camuffo and Volpato (1996)	Qualitative	Revealing of the evolution of Fiat's automation strategy in three stages	A case study of Fiat Auto	1970s–1990s
Tripsas (1997)	Qualitative	Focusing on the development of technological capability and surviving radical innovation through dynamic capability	Case history of Mergenthaler Linotype in the typesetter industry	1870s–1990s
Petroni (1998)	Qualitative	Focusing on new product development, which is influenced by external and internal integration of knowledge	The Smith & Nephew Group in the healthcare industry	Implicit
Majumdar (1999)	Quantitative	Focusing on whether large and culturally dominant firms can transform their capabilities over time	39 large firms in the US telecommunications industry	1975–1990
Deeds <i>et al.</i> (1999)	Quantitative	Focusing on determinants of new product development from the dynamic capabilities perspective	94 pharmaceutical biotechnology companies	Implicit
Farrant and Flynn (1999)	Qualitative	The transformation of Brimfield Precision Inc from a machinist to a designer and manufacturer of surgical instruments	Brimfield Precision, Inc. in the US metal-working sector	1991–1997
Delmas (1999)	Quantitative	Focusing on the role of technological alliances in creating tacit competences, and reducing the uncertainty arising from technological innovation and regulatory changes	927 cases of technological acquisitions in the hazardous waste management industry in Europe and North America	Implicit
Pisano (2000)	Qualitative	Exploring the role of organizational learning in capability building in the project development context	Longitudinal case studies of four biotech organizations	Implicit
Madhok and Osegowitsch (2000)	Quantitative	Focusing on two interrelated aspects of international diffusion of technology: organizational form and geographical flows of technology	Cross-border transactions of biotech companies between the US and Europe, involving at least one commercial party	1981–1992
Lehrer (2000)	Qualitative	Revealing the organizational trade-off between evolutionary and revolutionary capability regimes in the context of developing critical revenue management capabilities	British Airway, Lufthansa, and Air France in the European airport industry	1980s–1990s
Griffith and Harvey (2001)	Quantitative	Integrating resource- and market-based views of the firm to enhance understanding of a firm's power in international business relationships	US manufacturers' overseas (SME) distributors: 250 Canadian, 250 Chilean, 100 Great Britain, and 100 Filipino	Implicit
Spanos and Lioukas (2001)	Quantitative	Proposing and testing a composite model of competitive advantage, incorporating divergent causal logic of both the Porter's framework and the RBV	147 Greek firms	Implicit

Appendix 1. (Continued)

Authors	Approach	Focus of the study	Analysed sample	Studied interval
Rindova and Kotha (2001)	Qualitative	Focusing on continuous morphing – how the organizational form, function and competitive advantage dynamically coevolved	Yahoo! and Excite	1994–1998
Noda and Collis (2001)	Qualitative	Understanding the evolution of intra-industry firm heterogeneity as a path-dependent process in which market, competitive, and organizational forces interplay	Longitudinal study of seven regional holding companies of Bell in the US cellular telephone industry	1983–mid 1994
D'Este (2002)	Quantitative	Revealing patterns of capability accumulation and inter-firm heterogeneity, and clustering firms along the dimensions of manufacturing, R&D and marketing	67 Spanish domestic pharmaceutical firms	1990–1997
Lampel and Shamsie (2003)	Quantitative	Focusing on the evolution of capabilities in the Hollywood movie industry in the aftermath of the transition from a studio era to a post-studio era	200 films from each of the two periods: studio era and post-studio era, in the Hollywood movie industry	The studio era (1941–1948); the post-studio era (1981–1988)
Alvarez and Merino (2003)	Quantitative	Focusing on the organizational evolutionary processes and their adaptation mechanism, influenced by resources and capabilities, and dependent on environmental dynamism	The Spanish savings and loans institutions	1986–1997
Verona and Ravasi (2003)	Qualitative	Focusing on knowledge creation and absorption, knowledge integration, and knowledge reconfiguration processes of dynamic capabilities	An exploratory case study of Oticon A/S, a leading Danish producer of hearing aids	1988–1999
Meyer and Lieb-Doczy (2003)	Qualitative	Examining the post-acquisition restructuring as evolutionary process	18 longitudinal case studies in Hungary and East Germany	Mainly 1990–1995
Salvato (2003)	Qualitative	Examining strategic evolution as a sequence of intentional recombinations of a company's core micro-strategy with new resources and organizational routines	Comparative case studies of two Italian companies: Alessi, a designer of household articles, and Modafil, leader in several mail order businesses	Alessi: 1921–1993; Modafil: 1960–1992
Figueiredo (2003)	Qualitative	Focusing on how the intra-firm learning processes influence inter-firm differences in technological capability accumulation in the late-industrializing or latecomer context	Case studies of CSN and USIMINAS in the Brazil steel industry	CSN: 1938–1990s USIMINAS: 1956–1990s
Brady and Davies (2004)	Qualitative	Presenting a model of project capability-building consisting of two interacting levels of learning: the bottom-up, project-led phases of learning; and the top-down business-led learning	Case studies of Cable & Wireless Group and Ericsson Telecommunications Limited	Ericsson: 1994–1997 C&W: 1997–2001
Roy and Roy (2004)	Qualitative	Analysing the post-merger integration from the dynamic capabilities perspective	A case study of the HP and Compaq merger	1986–2001

Mota and de Castro (2004)	Qualitative	Focusing on the evolution of firm boundaries, and the (multi paths) equifinality nature of dynamic capabilities	Tecmolde and Iberomoldes, two contrasting cases in the Portuguese moulds industry	Tecmolde: 1968–Iberomoldes: 1975–
Athreye (2005)	Qualitative	Focusing on evolution of service capability conditioned on several internal and external factors	The Indian software industry	1970s–2000 onwards
Woiceshyn and Daellenbach (2005)	Qualitative	Focusing on how different processes of adopting the horizontal drilling technology, resulting in different levels of integrative capability, and hence, affecting efficacy of adoption	Canadian oil and gas companies	1988–1997
Newbert (2005)	Quantitative	Focusing on new firm formation from a dynamic capabilities perspective	A random sample of 817 (18 years or older) American nascent entrepreneurs	Implicit
Sako (2004)	Qualitative	Focusing on factors that facilitate and constrain the sustained development and replication of organizational capabilities of suppliers	Honda, Nissan, and Toyota	Implicit
Keil (2004)	Qualitative	Focusing on the role of learning in developing a capability to create and develop ventures through corporate venture capital, alliances, and acquisitions	Two longitudinal case studies in the information and communication technology sector in Europe	1996–2000
George (2005)	Quantitative	Exploring the effects of experiential learning on the cost of capability development	Patenting and licensing activities at the Wisconsin Alumni Research Foundation	1924–2002
Lazonick and Prencipe (2005)	Qualitative	Analysing the roles of strategy and finance in sustaining the innovation process	Rolls-Royce Plc in the UK high-tech manufacturing	1960s–2005