mir vol. 47, 2007/2, pp. 175 – 192

mir
Management
International Review

Mie Augier/David J. Teece

Dynamic Capabilities and Multinational Enterprise: Penrosean Insights and Omissions

Abstract and Key Results

- Penrose's legacy is a curious one. Much cited, but little read, her work is recognized as one of the main intellectual foundations for modern resource based theories of business strategy and theories of organizational routines and capabilities.
- However, Penrose did not aim to contribute to the field of strategy; her goal was to advance understanding of the nature of the firm and its growth. Nevertheless, there are important insights in Penrose's work that have implications for international business and for strategy.
- We discuss some of the implications of Penrose's work as well as its limitations. We also briefly discuss the usefulness of adopting a "Penrosean" capability perspective in multinational enterprise (MNE) strategy analysis.
- The dynamic capabilities framework puts entrepreneurial management into the theory of multinational enterprise, a task Penrose left untouched.

Key Words

Penrose, Multinational Enterprise, Strategy Analysis, Strategic Management, Entrepreneurship, Dynamic Capabilities

Authors

Mie Augier, Post-doctoral Fellow, Graduate School of Business, Stanford University, Stanford, California, USA.
David J. Teece, Mitsubishi Bank Professor of International Business and Finance, Institute of Management, Innovation and Organization, Haas School of Business, University of California, Berkeley, Berkeley, California, USA.

Manuscript received December 2004, revised June 2005, final version received January 2006.

Introduction

Edith Penrose's many and varied contributions to business studies deserve recognition. In her later years, she focused on the oil industry and on multinational enterprises (MNEs).[1] In this paper, we note some of her earlier contributions which helped initiate important streams of research, including the resource based theory of the firm. Her influence has also extended to new streams of research on dynamic capabilities and entrepreneurship. We discuss some implications for MNEs of the dynamic capabilities framework.

In her most important scholarly journey, Edith Penrose set out to develop a theory of the growth of the firm. Indeed, this was the title of her now well-known 1959 treatise.[2] Along the way she made several other astute observations about firms that turned out to be provocative to scholars interested in the theory of the firm and business strategy. It is these observations – particularly the notion that the firm is best thought of as a bundle of resources – which now constitute her better-known legacy.

The Resource Based Theory of the Firm

Penrose defined the internal resources of the firm as "the productive services available to a firm from its own resources, particularly the productive services available from management with experience within the firm" (p. 5). She presents the firm as an "autonomous administrative planning unit, the activities of which are interrelated and are coordinated" by management (pp. 15 et seq.). "A firm is more than an administrative unit; it is a collection of productive resources the disposal of which between uses and over time is determined by administrative decision – the physical resources of the firm consist of tangible things – there are also human resources available in a firm – strictly speaking, it is never resources themselves that are the 'inputs' in the productive process, but only the services that they render" (pp. 24 et seq.).

Put succinctly, Edith Penrose saw the firm as a "pool of resources the utilization of which is organized in an administrative framework. In a sense, the final products being produced by a firm at any given time merely represent one of several ways in which the firm could be using its resources" (pp. 149 et seq.).

As with the dynamic capabilities approach (which we shall discuss later), Penrose was enlightened enough to see a role in economic theory not only for managers but for entrepreneurs. "A theory of the growth of firms is essentially an examination of the changing productive opportunities of firms…" (pp. 31 et seq.). Penrose fur-

thermore saw the business environment as an «image» in the entrepreneur's mind. This is an important insight about entrepreneurship as well as leadership (and the importance of having an entrepreneurial element in leadership). Innovation is very much about the ability of the entrepreneur to look at markets, technologies and business models and to interpret them "differently". Being able to see market and technological opportunities through different lenses (and in new ways) is an important entrepreneurial capability. It enables one to see opportunities that others might miss.

Penrose also recognized that as managers embrace growth, they are forced to decentralize, thereby shifting responsibility down the hierarchy. "New men are brought in and the existing personnel of the firm all gain further experience" (p. 52).[3] Critically, "many of the productive services created through an increase in knowledge that occurs as a result of experience gained in the operation of the firm as time passes will remain unused if the firm fails to expand" (p. 54). These unused resources aren't manifested in the form of idleness, but "in the concealed form of unused abilities" (p. 54). Penrose therefore saw the capacities of management – not exhaustion of technologically based economies of scale – as setting the limit to which a firm could grow. In her view, there was always a limit to the amount of expansion any firm, no matter how large, could undertake in a given period.[4]

It was the unused capacities of management, coupled with the tangibility of certain resources, which also enabled diversification in the Penrosian firm. Industrial R&D could assist by drawing firms into entirely new areas, particularly if the firm focused on more generic R&D activities. Sales and marketing relationships could also be leveraged to support the roll out of new products (pp. 116 et seq.).

Edith Penrose's ideas influenced the work of Teece (1980, 1982) on diversification. In particular, Teece (1982) built on Penrose's observation that "[o]f all outstanding characteristics of business firms, perhaps the most inadequately treated in economic analysis is the diversification of their activities" (Penrose 1959, p. 104) in outlining a theory of the multi-product firm. This in turn alerted the strategy field to her work on resources, impacting Wernerfelt (1984) and others. But it wasn't so much her claim that managers learn and develop unused capacities that has received the most attention in recent years.[5] Rather, it was her representation of the firm as a pool of resources that has caught the imagination of scholars in the field of business strategy.

However, what Penrose precisely meant by resources remains rather vague.[6] Moreover, the Penrosian view that growth is fueled primarily by underutilized managerial capabilities can be challenged.[7] In particular, enterprise growth can be attributed to market and technological factors as well as to the strong financial rewards that both managers and shareholders receive as the business enterprise grows. Growth also flows from investment in R&D, as pointed out by several business historians and economists.[8]

From the perspective of modern (strategic) management, a missing dimension in Penrose is an understanding of the basis for competitive advantage. Penrose im-

plicitly adopts a profit-seeking framework; but other than a very general discussion of the competitive strength of small and large firms, she does not address the question of how firms develop competitive advantage. While she does recognize the importance of managerial skills, she underplays the role of intangible assets, though they are mentioned.[9] In this sense, she is not "modern"; but she was ahead of her time in many ways, not least of which is that she did recognize the importance of the entrepreneurial activities of management. However, this was only mentioned in passing, and the importance of managerial action in sensing and seizing emerging opportunities and managing threats.

The importance of knowledge assets is also underplayed. This ought not be surprising since the world Penrose was observing was one in which there were still significant barriers to trade and investment, and in such environments know-how is less critical as a factor in determining competitive advantage (Teece 2000, Chapter 1). Outsourcing and off shoring debates were not center stage in the early post war economy which was her laboratory.

Nevertheless, the Penrosian conceptualization of the firm remains relevant. Her insights remain good starting points for developing a theory of the firm, and for understanding the role of the manager. Her perspective is compatible with the recent emphasis on the importance of routines and processes. Routines and processes can be thought of as providing underutilized capacity that management can leverage for growth.

Penrose and the Theory of Dynamic Capabilities

As noted, and with the benefit of hindsight, Penrose appears to have underplayed growth driven by the entrepreneurial elements of management. She seems to recognize that know-how can be used to convert physical assets to different uses.[10] The firm, she said, was "both an administrative organization and a collection of productive resources, both human and material" (p. 320). The services rendered by these resources are the primary inputs into a firm's production processes and are firm specific in the sense that they are a function of the knowledge and experience that the firm has acquired over time. This is in essence a recognition of the path-dependent nature of organizational processes and routines and their roles in carrying knowledge (later emphasized by Cyert and March (1963) and Nelson and Winter (1982).[11]

When services that are currently going unused are applied to new lines of business, these services can also function as a growth engine for the firm through diversification (Teece 1980, 1982). Learning likewise enables the organization to use its resources more efficiently. As a result, even firms that have weak balance sheets may

nevertheless be able to grow as managerial capacity is freed up for new uses as a result of managerial and organizational learning.[12] Penrose appears to be articulating a weak form of what is now referred to as the dynamic capabilities approach.

The dynamic capabilities approach seeks to provide a coherent (and evolutionary) framework for how firms develop competitive advantage, and maintain it over time. In essence, dynamic capabilities are about identifying the foundations that undergird long run enterprise growth and prosperity. First outlined in working papers (Teece/Pisano/Shuen 1990), and then published in Teece and Pisano (1994) and in Teece, Pisano and Shuen (1997),[13] the dynamic capabilities approach builds upon the theoretical foundations provided by Schumpeter (1934), Williamson (1975, 1985), Cyert and March (1963), Rumelt (1984), Nelson and Winter (1982), Teece (1982) and Teece and Pisano (1994). As discussed above, it is consistent with certain elements of Penrose's framework too. If one can explain the foundations of long run profitability, one is quite some distance down the road to a theory of the growth of the enterprise. This was of course Penrose's ambition.

Dynamic capabilities refer to the (inimitable) capacity firms have to shape, reshape, configure and reconfigure the firm's asset base so as to respond to changing technologies and markets. Dynamic capabilities relate to the firm's ability to proactively adapt in order to generate and exploit internal and external *firm specific competences,* and to address the firm's *changing environment* (Teece/Pisano/Shuen 1997). As Collis (1994) and Winter (2003) note, one element of dynamic capabilities is that they govern the rate of change of ordinary capabilities.[14] If a firm possesses resources/competences but lacks dynamic capabilities, it has a chance to make a competitive return for a short period, but superior returns cannot be sustained. It may earn Ricardian (quasi) rents, but such quasi rents will be competed away, often rather quickly. It cannot earn Schumpeterian rents because it hasn't built the capacity to be continually innovative. Nor is it likely to be able to earn monopoly (Porterian) rents since these require market power coupled with exclusive behavior or strategic manipulation (Teece/Pisano/Shuen 1997). Dynamic capabilities thus not only include an organization's (non-imitable) ability to sense changing customer needs, technological opportunities, and competitive developments; but also its ability to adapt to – and possibly even to shape – the business environment in a timely and efficient manner. A significant element of intentionality is involved.

The development and astute management of intangible assets/intellectual capital is now central to sustained enterprise competitiveness, requiring new conceptual frameworks for business and economic analysis. As former U.S. Federal Reserve Chairman Alan Greenspan remarked, "we must begin the important work of developing a framework capable of analyzing the growth of an economy increasingly dominated by conceptual products".[15] Dynamic capability theory is a framework that is well equipped to meet this challenge (Teece 2006b).

Penrose's framework is consistent with elements of the dynamic capabilities framework. Her emphasis on the fungible nature of resources obviously provides

scope for the notion that a firm's competencies can be reshaped. But as noted, her framework was bereft of considerations of competitive advantage.[16] The whole inimitability story is missing.[17] Nor did she emphasize the role of the changing environment and the constant need to improve and renew capabilities. She saw learning as an opportunity, not a necessity. She also underplayed the resource allocation role of management. She recognized the importance of entrepreneurship but did not develop this concept much nor did she show how entrepreneurship could be important to the erection of new markets.

Other Growth Issues and the Penrose Effect

We have emphasized Penrose's contribution to the resource-based theory of the firm. Some of her ideas are consistent with the dynamic capabilities framework; yet until two decades ago when strategy scholars picked up on this work (Teece 1982), Penrose's emphasis on fungible resources had not received much attention in either the economics or the strategic management literature. Rather, it was her work on constraints on firm level growth and on the role of learning that received attention. While she recognized how the fungible nature of a firm's resources could create the foundation for lateral enterprise expansion, it was her emphasis on the administrative and managerial constraints on growth that captured the attention of scholars.

Penrose argued that the human resources required for firm growth and the management of change are firm specific. As a corollary, at any moment in time these resources are constrained by their internal availability. Put differently, managerial capacity cannot be expanded indefinitely and at will. Rather, expansion requires the recruitment and development of additional high-level human resources.[18] Accordingly, the level of current efficiency will, beyond a point, diminish with the rate of change in size.

The above constraints on firm growth became known as the "Penrose effect". Both microeconomic and macroeconomic scholars recognized the Penrose effect in the 1960s. These scholars incorporated Penrosean thinking into their work (e.g. Marris 1964, Uzawa 1969). However, as noted above, we think the more enduring legacy will be Penrose's conceptualization of the firm as a bundle of (quasi fungible) resources.

Interestingly, the Economic Journal (1961) predicted that the "Theory of the Growth of the Firm" would be an influential book; however, that influence has been far greater in the field of strategy than in the field of economics. Economists in the main are resistant to her teachings, as they imply the total inadequacy of the neoclassical theory of the firm.[19]

Entrepreneurship, Enterprise Design, and the Role of Markets

As implicitly recognized by Penrose, firms need to be viewed as human organizations, not computer controlled machines. As such, firms must confront challenges in the realm of organizational design including imperfect incentive alignment, imperfect governance, and bureaucratic decision-making. Organizations facilitate decisions because they constrain the set of alternatives as well as the relevant parameters to be considered. Organizations can be rendered more effective and efficient by improving the ways in which those limits are defined and imposed (Simon 1947, March/Simon 1958).

While Penrose may have recognized the human element in organizations, she did not really explore issues of organizational *design*. As noted by Herbert Simon, "[d]esign calls for initiative, focus of attention on major problems, search for alternatives. One cannot choose the best, one cannot even satisfice, until one has alternatives to choose from." Nowhere is this clearer than in the *entrepreneurial* activities of organizations. As Simon has observed: "Especially in the case of new or expanding firms, the entrepreneur does not face an abstract capital market. He or she exerts much effort to induce potential investors to share the company's views (often optimistic) about its prospects. This executive is much closer to Schumpeter's entrepreneur [and to the Penrosian manager] than to the entrepreneur of current neoclassical theory. Whether the firm expands or contracts is determined not just by how its customers respond to it, but by how insightful, sanguine and energetic its owners and managers are about its opportunities – by how much they possess of the "animal spirits'' that Keynes was obliged to introduce into his account of the trade cycle (Nelson/Winter 1982)." (1991, pp. 35 et seq.) These factors go beyond the managerial elements highlighted by Penrose. Arguably, they are more important.

One example of the importance of design is in the development of the "architecture" of a business firm. This element of design is embedded in part in management's choice of (or creation of) a business model. A business model defines the manner in which a business enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit. It reflects the firm-specific assumptions about what customers want and how an enterprise can be profitable as a result of the value delivered. The business model determines: (1) how the revenue and cost structure of business is to be "designed" and then possibly "redesigned" to meet customer needs; (2) the ways in which the resources are to be assembled and the relevant market segments can be identified; (3) the mechanisms through which value can be created and captured. The purpose of a business model is to "articulate" the value proposition, identify targeted market segments, define the structure of the value chain, and estimate the cost structure and profit potential (Chesbrough/Rosenbloom 2002, pp. 533 et seq.). In short, a business model is a plan for the financial and organizational "architecture" of a business that makes valid assump-

tions about costs, scale, and customer and competitor behavior. It outlines the contours of the solution required to win in the market place. Getting the business model right is critical to the success of a new business; adjusting and/or improving the model is likely to be critical for continued success. However, the importance of "business models" has been largely neglected in the management and economics literature, at least until recently. A firm's capacity to create, adjust, hone and replace business models is a critical building block of this firm's dynamic capabilities.

Design issues are also important when considering the *changing nature and dynamics* of international business. In recent decades, increased globalization, and in particular outsourcing and off shoring, appear to have gained momentum. However, while globalization has expanded, it is by no means "complete". Precisely because cross-border integration is incomplete (i.e., the world is characterized by semi-globalization) the study of international business and multinational enterprise remains an important scholarly activity.[20] Otherwise, mainstream strategy and management content would suffice for international business too. Because of incomplete integration and differences in business environments, locational factors and institutional differences must be taken into account. Such differences do not merely indicate the presence of barriers to the internationalization of business; they can also be beneficial to MNEs.

In recent decades, the MNE has been shaped by three key developments critical to its nature and scope: (i) the simultaneous increase in both the outsourcing and the off-shoring of production, (ii) the emergence of a distributed and open innovation model, i.e. not only production and manufacturing are being outsourced, but so is innovation, and, (iii) the development of low cost information and computer technology, which enables small firms to perform transactions, and adopt business models, previously only available to large enterprises. For instance, internet-based companies such as Amazon, eBay, Google, and Yahoo make it possible for small businesses to reach global markets that were previously inaccessible, except at considerable cost. This has led to the emergence of what might be thought of as "mini"-multinationals, sometimes employing only a handful of workers, and using internet-based technology to anchor the coordination of their global activities. In short, information and computer technology has enabled efficient global operations for very small as well as small, medium, and large enterprises. Small enterprises in particular may be launched from multiple jurisdictions – rendering the home/host country dichotomy irrelevant from the time of organizational founding. Also, these mini-multinationals are often founded by individuals collaborating across boundaries, and they exhibit MNE characteristics from their birth. Designing and orchestrating the business model and organizational structure of such firms has become increasingly complex. In the realm of the external environment, markets for such expanding firms must be "seized" and, sometimes, created.

Although Penrose did recognize the importance of creating markets as a result of entrepreneurship, she did not address the *simultaneous* role of entrepreneurs in creating markets and designing organizations.[21] An essential characteristic of or-

ganizations/firms is that they embody knowledge, which can't be easily bought and sold. Sometimes, the only way to capitalize on knowledge is to start a firm and build the necessary complementary assets (Teece 1986).[22] Profit flows from innovation, buttressed by the development of complementary technologies, and the astute deployment of complementary assets.

Penrose's work differs from Coase's (1937), in terms of the rationale for the firm's existence and expansion. She does not assume that "in the beginning there were markets". Her perspective is more in keeping with Simon's (1991) perspective that "in the beginning there were firms"; entrepreneurs create new markets by starting entrepreneurial organizations because the relevant external capabilities simply aren't there (cf. Langlois 1992).[23]

Penrose emphasized entrepreneurial imagination and the non-market nature of entrepreneurial knowledge. She noted that it is: "evident that such management [entrepreneurship] cannot be hired in the market place" (p. 45). A few decades earlier Frank Knight (1921) perceptively linked the existence of firms to entrepreneurs seizing opportunities for profit in the face of uncertainty: "It is … true uncertainty which … gives the characteristic form of 'enterprise' to economic organization as a whole and accounts for the peculiar income of the entrepreneur" (1921, p. 232).[24]

Her vision of entrepreneurship is very close to that of Frank Knight. She emphasized entrepreneurship as explicitly an organizational phenomenon: "The productive activities of … a firm are governed by what we shall call its 'productive opportunity', which comprises all of the productive possibilities that its 'entrepreneurs' can see and take advantage of " (p. 31). Entrepreneurs have "intimate knowledge of the resources, structure, history, operations and personnel of the firm" (p. 54).

There are other ideas in strategic management that were not directly anticipated by Penrose, perhaps in part because she did not self-consciously endeavor to provide normative frameworks for managers. Hence, her neglect of certain issues now considered important to the field of management today should not be construed as a criticism, but merely as an observation. One such example is the idea that markets need to be developed. It is common in economics to assume that markets exist. As Arrow (1974) observed: "Although we are not usually explicit about it, we really postulate that when a market could be created, it would be." If it is not, this reflects market failure, and such failure can in turn be attributed to "transaction costs" or "adverse selection". The absence of certain insurance markets is a typical example. As a general rule, economics suggests that markets fail because inputs or outputs are not priced properly. For example, gasoline that pollutes is consumed "too much" because the costs of using it are not fully internalized. Arrow (1956) and Arrow and Debreu (1959) do discuss the absence of fully developed contingent claims markets, but in the main such lacunae are explained by the absence of demand, or just simply transaction costs.

Moreover, in commercializing new technologies, pioneering entrepreneurs often find that formal market research and expert forecasts, however sophisticated

from a methodological perspective, fail to predict which new markets will come into existence, and where and when these markets will actually materialize. Christensen (1997), Mintzberg (1994) and others have documented a wide variety of cases that illustrate this unpredictability in business. Human history also attests to this unpredictability in other areas – such as Columbus' discovery of the New World or the fall of the Berlin Wall.

There is little in economics to suggest that markets can be shaped by the purposeful decisions of managers, i.e. by firms. Penrose chose not to develop that point either. For her theory of the growth of the firm, markets were not specifically treated. However, firm behavior shapes markets just as markets shape firm behavior and firm growth. Consistent with this view, Herbert Simon argued that perhaps we should not assume an explanation is needed of why *firms* actually exist. Simon uses the illustration of a visitor from Mars approaching earth observing economic exchanges, with organizations appearing as green areas, and market transactions as red lines in between. What does the visitor see? Organizations, green areas, would be dominant. We live in an "organization economy" rather than a "market economy", and organizations are more ubiquitous than market transactions; even more so if we go back in history (Simon 1991). Simon suggests that the more natural question to ask than the Coasian one, is "why do markets exist"? Instead of focusing on theories to explain the existence of firms, Simon raises questions such as, why do particular organizational forms (such as professional services firms) exist, and how should they be structured? How do these organizational forms relate to broader processes of (technological, cultural, etc.) change in the modern economy? What motivates people in real organizations (authority, rewards, loyalty, identification, coordination)? These are issues to be addressed by strategic management in the future; not all of these are Penrosian themes sensu stricto.

Dynamic Capabilities, Resources and Competitive Advantage: Implications for MNEs

While Penrose may not have fully developed the capability concept, the subsequent development of the (dynamic) capabilities approach can be usefully applied to MNEs. Somewhat under-researched in mainstream MNE theory (at least as far as internalization theory is concerned), has been consideration of the importance and the particulars of the firm's managerial and organizational capabilities, although this is now being addressed.[25] To the extent that notions of organizational capability have been around for decades, and have received much attention recently, more efforts to embed the capability concept into MNE theory would appear useful so as to align more closely academic research on the MNE and strategic management theory.

As discussed above, Edith Penrose had provided elements of a resource-based/capabilities perspective. She viewed the firm as an administrative organization, and as a pool of production resources: "At all times there exist, within every firm, pools of unused productive resources and these together with the changing knowledge of management, create a productive opportunity which is unique to each firm. Unused productive services are, for the enterprising firm, at the same time a challenge to innovate, an incentive to expand, and a source of competitive advantage". (Penrose 1960, p. 2). As Pitelis (2000) notes, unused resources are critical to Penrose's theory of internal or "organic"/endogenous enterprise expansion.

Penrose certainly did not overplay, from a theoretical perspective, the international aspects of large corporations, believing that the differences do not, in fact, require theoretical distinction (1987, p. 56). However, she did note that: "the managerial, technological, or financial contribution from the parent may be considerable and generally make new real resources available to the local economy", (1968, p. 43).

The general framework advanced by dynamic capability theory sees difficulty-to-imitate and globally exercised dynamic capabilities (and resources) as foundational to the competitive advantage of MNEs.[26] The greater the diversity and rate of change in business environments, the more critical dynamic capabilities become for the MNE's financial performance.

Some observers have identified a modality of competition, referred to as hypercompetition. It is a modality "characterized by intense and rapid competitive moves, in which competitors must move quickly to build [new] advantages and erode the advantages of their rivals" (D'Aveni/Gunther 1994, pp. 217 et seq.). Hypercompetition appears to be the result of rapid innovation, globalization, and deregulation. Dynamic capabilities are likely to be essential to the survival of MNE in industries and environments characterized as hypercompetitive.

As noted above, it is necessary that the MNE build capabilities that are "sustainable" i.e. inimitable. Inimitability is more likely to occur in the presence of "isolating mechanisms" and "tight appropriability regimes" (Rumelt 1987; Teece 1986, 2000).[27] When the appropriability regime is "tight", differential performance can be more readily sustained, at least for some length of time.[28]

The dynamic capabilities perspective on the MNE addresses more than simply the need for rapid innovation, adaptation, and flexibility. It also identifies the importance of proactive entrepreneurial behavior shaping the MNE's footprint. In the presence of significant gaps between the cost structures and growth rates of national economies, the MNE's ability to respond to – and shape – the changing kaleidoscope of opportunities at home and abroad is critical to success. Outsourcing and off-shoring activities to foreign subsidiaries and alliance partners, involves establishing quality control and product/service evaluation protocols on a global basis.

Indeed, dynamic capabilities are resident in a firm's processes and routines as well as within the firm's top management team. Maintaining dynamic capabilities

within the MNE requires continuous entrepreneurial activity on a global scale. Entrepreneurial activity is different from – but related to – managerial activity. It is about understanding opportunities, getting things started, and finding new and better ways of putting things together. It is about coordinating on a global basis the assembly of disparate and usually co-specialized resources, getting "approvals" for non-routine activities, sensing business opportunities, and finding ways to deploy capabilities globally as well as locally. We have come to associate the entrepreneur with the individual who starts a new business providing a new or improved product or service. Such action is clearly entrepreneurial; but the entrepreneurial function required in the MNE context should not be thought of as confined to new enterprise startup activities.

The replication of capabilities involves transferring or redeploying competences (technological or organizational) from one concrete economic setting to another. Since productive knowledge is usually embodied, the transfer of skill cannot be accomplished by simply transmitting information. Only in those instances where all relevant knowledge is fully codified and understood can replication be collapsed into a simple problem of information transfer. Too often, the contextual dependence of original performance in the home market is poorly appreciated, so unless the MNE has already replicated its systems of productive knowledge in other markets, the act of replication is likely to be difficult (Teece 1976). Indeed, replication and transfer are often impossible absent the transfer of people, though this can be minimized if investments are made to convert tacit knowledge to codified knowledge. Often, however, this is simply not possible.

In short, competences and capabilities, and the routines upon which they rest, are usually rather difficult to replicate. Even understanding what all the relevant routines are that support a particular competence may not be transparent. Indeed, Lippman and Rumelt (1982) have argued that some sources of competitive advantage are so complex that the firm itself, let alone its competitors, does not understand them.[29] As Nelson and Winter (1982) and Teece (1981, 1982) have explained, many organizational routines are quite tacit in nature. Imitation can also be hindered by the fact that few routines are 'stand-alone'; coherence may require that a change in one set of routines in one part of the firm (e.g. production) be accompanied by changes in some other part (e.g. R&D).

Some routines and competences seem to be attributable to local or regional forces that shape firms' capabilities at early states in their lives. Porter (1990), for example, shows that differences in local product markets, local factor markets, and institutions play an important role in shaping competitive capabilities. Differences also exist within populations of firms from the same country. Various studies of the automobile industry, for example, show that not all Japanese automobile companies are top performers in terms of quality, productivity, or product development (see, for example, Clark/Fujimoto 1991). The role of firm-specific history has been highlighted as a critical factor explaining such firm-level (as opposed to regional

or national-level) differences (Nelson/Winter 1982).[30] Replication in a different context may thus be rather difficult.[31]

At least two types of strategic value flow from replication. One is the ability to support geographic expansion, and has been emphasized here. The other is the ability to support product line expansion. To the extent that the capabilities in question are relevant to customer needs elsewhere, replication can confer value.[32] Another is that the ability to replicate also indicates that the enterprise has the foundations in place for learning and improvement. Considerable empirical evidence supports the notion that the understanding of processes, both in production and in management, is the key to process improvement. In short, an organization cannot improve that which it does not understand.

Factors that make replication difficult also make imitation difficult. Thus, when the MNE's productive knowledge is more tacit, it becomes harder for the MNE itself to replicate it, and for competitors to imitate it. When the tacit component is high, imitation may well be impossible, absent the hiring away of key individuals and the transfer of key organizational processes.

In conclusion, the concept of dynamic capabilities, when applied to the MNE, highlights organizational and managerial competences, critical to achieve superior performance. Key ingredients are difficult-to-replicate routinized processes, the basic manner in which a business is designed, as well as the decision frames, heuristics and protocols that enable MNEs to avoid poor investment choices and embrace astute ones. Once assets are within management's orbit, their effective utilization and continuous orchestration on a global basis becomes essential. Indeed, orchestration directed at achieving new combinations and new asset co-alignments is central to the dynamic capabilities framework. Preventing imitation and internal rent dissipation are key elements too.

Lying at the heart of dynamic capabilities are several fundamental management/organizational skills including: (1) learning and innovation processes; (2) business "design" competence (what business model to employ); (3) investment allocation decision heuristics; (4) asset orchestration, bargaining and transactional competence, and (5) efficient governance and incentive alignment (Teece 2006). Buttressing these is an understanding of the processes of imitation and the strategies and processes that can be used to protect intellectual property. Widely diffused managerial and organizational competence cannot be core elements of an MNE's dynamic capabilities.

Note that dynamic capabilities flow from more than just learning and technological accumulation. This is not meant to downplay the importance of technological accumulation. Technological innovation and learning remain important mechanisms by which firms build from specific (technological) capabilities. However, in a world where the global outsourcing of R&D is common (Teece/Pisano/Shan 1988, Chesbrough 2003) it becomes problematic to rely too much on in house R&D as the sole foundation of competitive advantage. Orchestrating a global portfolio of technological assets inside and outside the enterprise is now essential.

The dynamic capabilities framework relegates an MNE's administrative competence to secondary importance, unless such competence is embedded in distinct and difficult to replicate business processes. Stable administrative functions can typically be outsourced to multiple vendors. Of course, there may well be circumstances where administration is complex, novel, and difficult to imitate in which case it can be the source of competitive advantage.

The distinct skills, which constitute an MNE's dynamic capabilities cannot generally be bought or "outsourced"; they must be built, or at least assembled. Once co-specialized assets are assembled, they must be skillfully orchestrated on a global basis. Such orchestration skills require astute decision-making on a global basis and an entrepreneurial capacity built into the management team. These skills and processes are instrumental to long-run enterprise performance and cannot be outsourced without loss of competitive advantage. They lie at the core of the MNE's capabilities. MNEs possessing dynamic capabilities are able to quickly respond to – and shape – evolving technologies and marketplaces. Accordingly, such firms should exhibit superior enterprise performance over multiple product life cycles.

While Penrose did not anticipate most and certainly not all elements critical to successful international expansion, she did play an important role by being an important inspiration to dynamic capabilities. Her search for a theory of the growth of the firm is in some measure answered by the dynamic capabilities framework.

Conclusion

Within the field of strategic management, Penrose's work has often been extensively cited while also being mis-characterized. What is needed is careful scholarship, initiated by a careful reading of her work, especially the Theory of the Growth of the Firm. In this paper, we have discussed some of her insights relevant to strategic management, entrepreneurship, international business, and industrial organization. We have also indicated certain limitations to her framework and analyses. A critical reading of her writings can nevertheless provide fresh insights to economics and management.

Acknowledgements

We are grateful to Giovanni Dosi, Richard Nelson, Christos Pitelis, Alain Verbeke and two anonymous referees for comments on earlier drafts; to the Kauffmann Foundation, the Sloan Foundation and the Lester Center for Entrepreneurship & Innovation for support and to Frances Darnley and Patricia Lonergan for skillful assistance.

Endnotes

1 For an extensive coverage of Penrose's overall contribution, see Penrose and Pitelis (1999).
2 Less well known, but also elaborating the theme of the growth of the firm, is her case study of the Hercules Powder Company, published in 1960. It was originally intended for inclusion in the Theory of the Growth of the Firm but was omitted to keep down the size of the book though the case study was designed to illustrate the theory outlined in the book.
3 This has subsequently come to be known as the "Penrose Effect".
4 In her own words, describing the limits of growth as being generated by the same dynamics underlying the growth process itself: "[B]ecause the very nature of a firm as an administrative and planning organization requires that the existing responsible officials of the firm at least know and approve, even if they do not in detail control, all aspects of the plans and operations of the firm … the capacities of the existing managerial personnel of the firm necessarily set a limit to the expansion of that firm in any given period of time, for it is self-evident that such management cannot be hired in the market place" (p. 45). Note the emphasis on the missing markets for management – we shall return to that issue later in this paper in sections 4 and 5.
5 This is discussed in more detail in section 4 below.
6 Teece, Pisano, and Shuen (1997) tried to tighten this by defining resources as firm specific assets that are difficult if not impossible to imitate. Trade secrets and certain specialized production facilities are examples. These assets are difficult to transfer because of transfer and transaction costs, amplified in the presence of tacit knowledge.
7 The flip side of this is of course that a firm's growth is limited by the capabilities of its incumbent management (the "Penrose Effect" discussed later).
8 Moreover the use of "excess resources" may involve positive costs, see Pitelis (2002).
9 At least industrial R&D is discussed along with customer relationships.
10 As Penrose writes: "For physical resources the range of services inherent in any given resource depends on the physical characteristics of the resource, and it is probably safe to assume that at any given time the known productive services inherent in a resource do not exhaust the full potential of the resource... The possibilities of using services change with changes in knowledge… there is a close connection between the type of knowledge possessed by the personnel in the firm and the services obtainable from its material resources" (1959, p. 76).
11 The links between Penrose and Cyert & March are discussed in Pitelis (2006).
12 Teece's paper on the multiproduct firm (Teece 1982) was the first to apply Penrose's ideas to strategic management issues. This paper focused on developing further Penrose's idea that human capital in firms is usually not entirely 'specialized' and can therefore be (re)deployed to allow the firm's diversification into new products and services. He also extended the Penrosian notion that firms' possess excess resources which can be used for diversification. Later, Wernerfelt (1984) cites Penrose for "the idea of looking at firms as a broader set of resources … [and] the optimal growth of the firm involves a balance between exploitation of existing resources and development of new ones".
13 This explains why references to dynamic capabilities began before the publication of this paper. In the early to mid 90's, the working paper versions were quoted. See for instance Mahoney and Pandian (1992).
14 For the particulars on the specific nature of different types of dynamic capabilities, see Teece (2006b).
15 Chairman Alan Greenspan also noted recently, "over the past half century, the increase in the value of raw materials has accounted for only a fraction of the overall growth of U.S. gross domestic product (GDP). The rest of that growth reflects the embodiment of ideas in products and services that consumers value. This shift of emphasis from physical materials to ideas as the core of value creation appears to have accelerated in recent decades" (Remarks of Alan Greenspan, Stanford Institute for Economic Policy Research 2004).
16 See also Rugman and Verbeke (2002).
17 Except perhaps for her discussion on "impregnable bases" see Pitelis (2004).

18 As an example, consider Google's expansion of online network advertising into new markets around the world. According to Google's CEO Eric Schmidt, this is limited only by the speed at which the company can hire local staff, "set up bank accounts and collect the money". "Google sees no limit to global drive", Financial Times, February 3, 2005, p. 17.
19 See also Penrose and Pitelis (1999).
20 See also Rugman and Verbeke (2004).
21 The dynamic process of market creation is illustrated in Penrose's study of the Hercules Powder Company where she talks about "the creation of consumer demand as a consequence of entrepreneurial desire to find a use for available productive resources" (Penrose 1960, p. 9).
22 That was essentially also what Frank Knight had in mind: "The receipt of profit in a particular case may be argued to be the result of superior judgment. But it is judgment of judgment, especially one's own judgment, and in an individual case there is no way of telling good judgment from good luck, and a succession of cases sufficient to evaluate the judgment or determine its probable value transforms the profit into a wage. … If … capacities were known, the compensation for exercising them can be competitively imputed and is a wage; only, in so far as they are unknown or known only to the possessor himself, do they give rise to a profit" (1921, p. 311). For a discussion of Knight's theory of the firm, see Langlois and Cosgel (1993).
23 She did also recognize the role of intentionality, an important part of entrepreneurship, as reflected in her early contributions to the debate in the American Economic Review about biological analogies.
24 His full argument is as follows: "With uncertainty entirely absent, every individual being in possession of perfect knowledge, there would be no occasion for anything of the nature of responsible management or control of productive activities. … its [business firm's] existence in the world is a direct result of the fact of uncertainty" (p. 271).
25 See, for example, the various contributions by Rugman and Verbeke (2001, 2003 and 2005). In addition, others have emphasized management expertise in the theory of the MNE e.g. Hood and Young (1979, p. 56) in discussing firm-specific factors, reference management expertise. Indeed, they state clearly (p. 92) that "large corporations do possess, and lay much store by, acquired managerial experience through which profit opportunities are diagnosed. Such experience is an important dimension of an MNE's comparative advantage". The framework developed here endeavors to specify what particular management expertise is likely to be critical.
26 For applications of Penrose's ideas to the MNE, see Pitelis (2000, 2004), Dunning (2003), Rugman and Verbeke (2002, 2004) and various contributions in this special issue.
27 In addition to the importance of intellectual property rights protection, the tacit nature of know-how, and the inherent difficulty of technology transfer, another factor is the importance of the unique coalignment of specific assets. Specific assets may not simply be ubiquitously available.
28 Competitive advantages are continuously eroded by actions of other players that lead again to higher levels of competition and the need to react faster. In the end, these dynamic interactions between firm learning and adaptation, on the one hand, and higher levels of competition and selection, on the other hand, can cancel each other out. This is often dubbed an 'arms race' or 'the Red Queen effect' (Kaufman 1995) after the comment to Alice in Wonderland: "it takes all the running you can do to keep in the same place" (Carroll 1946). Companies adapt faster and faster, but as a consequence of the resulting increase in competition, they do not make any progress. When isolating mechanisms are operative and appropriability regimes are tight, Red Queen effects can be overcome.
29 If so, the firm's advantage is likely to fade, as luck does run out.
30 See also Bartlett and Ghoshal (1989), Rugman and Verbeke (2005).
31 See for example, Rugman and Verbeke (2004).
32 Needless to say, there are many examples of firms replicating their capabilities inappropriately by applying extant routines to circumstances where they may not be applicable e.g. Nestle's transfer of developed-country marketing methods for infant formula to the Third World (Hartley 1989). A key strategic need is for firms to screen capabilities for their applicability to new environments.

References

Alchian, A., Uncertainty, Evolution, and Economic Theory, *Journal of Political Economy,* 58, 3, 1950, pp. 211–222.

Alchian, A., Biological Analogies in the Theory of the Firm: Comment, *American Economic Review,* 43, 4, 1953, pp. 600–603.

Bartlett, C./Ghoshal, S., *Managing Across Borders: The Transnational Solution,* Boston, MA: Harvard Business School Press 1989.

Chesbrough, H./Rosenbloom, R. S., The Role of the Business Model in Capturing Value from Innovation: Evidence from Xerox Corporation's Technology, *Industrial and Corporate Change*, 11, 3, 2002, pp. 529–555.

Chesbrough, H., *Open Innovation: The New Imperative for Creating and Profiting from Technology,* Boston: Harvard Business School Press 2003.

Christensen, C. M., *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail,* Boston, MA: Harvard Business School Press 1997.

Collis, D. J., Research Note: How Valuable are Organisational Capabilities?, *Strategic Management Journal,* 15, Winter Special Issue, 1994, pp. 143–152.

Cyert, R./March, J.G., *A Behavioral Theory of the Firm,* Englewood Cliffs: Prentice Hall 1963.

D'Aveni, R. A./Gunther, R., *Hypercompetition: Managing the Dynamics of Strategic Maneuvering*, New York: The Free Press 1994.

Dunning, J. H., The Contribution of Edith Penrose to International Business Scholarship, *Management International Review,* 43, 1, 2003, pp. 3–19.

Hood, N./Young, S., *The Economics of Multinational Enterprise*, London: Longman 1979.

Jacobides, M., The Architecture of Organizational Capabilities, *Industrial and Corporate Change*, forthcoming.

Knight, F., *Risk, Uncertainty and Profit,* Boston, MA: Houghton Mifflin 1921.

Langlois, R., Transactions-cost Economics in Real Time, *Industrial and Corporate Change*, 1, 1, 1992, pp. 99–127.

Langlois, R./Cosgel, M., Frank Knight on Risk, Uncertainty, and the Firm, *Economic Inquiry,* 31, 3, 1993, pp. 456–465.

Loasby, B., *Choice, Complexity and Ignorance*, Oxford: Oxford University Press 1976.

Loasby, B., *The Mind and Method of the Economist*, Cheltenham: Edward Elgar 1989.

March, J.G./Simon, H.A., *Organizations,* New York: Wiley 1958.

Marshall, A., *Principles of Economics*, London: McMillan 1925.

Marris, R.L., *The Economic Theory of Managerial Capitalism.* New York: Free Press of Glencoe 1964.

Mintzberg, H., *The Rise and Fall of Strategic Planning*, New York: Free Press 1994.

Nelson, R./Winter, S.G., *An Evolutionary Theory of Economic Change,* Cambridge: Belknap Press 1982.

Penrose, E., Biological Analogies in the Theory of the Firm, *American Economic Review*, 42, 6, 1952, pp. 804–819.

Penrose, E., Biological Analogies in the Theory of the Firm: Rejoinder, *American Economic Review,* 43, 4, 1953, pp. 603–609.

Penrose, E. T., *The Theory of the Growth of the Firm*, 3rd edition, Oxford: Oxford University Press 1959/1995.

Penrose, E., The Growth of the Firm: A Case Study: The Hercules Powder Company, *Business History Review* 34, 1, 1960, pp. 1–23.

Penrose, P./Pitelis, C. N., Edith Elura Tilton Penrose: Life, Contribution and Influence, *Contributions to Political Economy*, 18, 1, 1999, pp. 3–22.

Pitelis, C., A Theory of the (Growth of the) Transnational Firm: A Penrosian Perspective, *Contributions to Political Economy.* 19, 2000, p. 71–79.

Pitelis, C. N. (ed.), *The Growth of the Firm: The Legacy of Edith Penrose*, Oxford: Oxford University Press 2002.

Pitelis, C. N., Edith Penrose and the Resource-based View of (International) Business Strategy, *International Business Review,* 13, 4, 2004, pp. 523–532.
Pitelis, C., A Note on Cyert and March (1963) and Penrose (1959): A Case for Synergy, Organization Science Special Issue, 'A Behavioral Theory of the Firm? 40 Years and Counting', Submission 2006.
Rugman, A./Verbeke, A., A Final Word on Edith Penrose, *Journal of Management Studies,* 41, 1, 2004, pp. 205–217.
Rugman, A. M./Verbeke, A., A Note on the Transnational Solution and the Transaction Cost Theory of Multinational Strategic Management, *Journal of International Business Studies*, 23, 4, 1992, pp.761–71.
Rugman, A. M./Verbeke, A., Subsidiary-specific Advantages in Multinational Enterprises, *Strategic Management Journal*, 22, 3, 2001, pp. 237–250.
Rugman, A. M./Verbeke, A., Edith Penrose's Contribution to the Resource-based View of Strategic Management, *Strategic Management Journal*, 23, 2002, pp. 769–780.
Rugman, A. M./Verbeke, A., Extending the Theory of the Multinational Enterprise: Internalization and Strategic Management Perspectives, *Journal of International Business Studies*, 34, 2, 2003, pp. 125–137.
Rugman, A. M./Verbeke, A., A Perspective on Regional and Global Strategies of Multinational Enterprises, *Journal of International Business Studies,* 35, 1, 2004, pp. 3–18.
Rumelt, R., Towards a Strategic Theory of the Firm, in Lamb, R. B. (ed.), *Competitive Strategic Management,* Englewood Cliffs, NJ: Prentice Hall 1984.
Rumelt, R./Schendel, D./Teece, D., Introduction, in Rumelt, R./Schendel, D./Teece, D. (eds.), *Fundamental Issues in Strategy,* Boston: Harvard Business School Press 1994.
Schumpeter, J., *The Theory of Economic Development,* Cambridge: Harvard University Press 1934.
Simon, H. A., Organizations and Markets, *Journal of Economic Perspectives,* 5, 2, 1991, pp. 25–44.
Simon, H.A., Strategy and Organizational Evolution, *Strategic Management Journal,* 14, Winter Special Issue, 1993, pp.131–142.
Teece, D., The Market for Know-how and the Efficient International Transfer of Technology, *The Annals of the Academy of Political and Social Science*, 458, 1981, pp. 81–96.
Teece, D., Towards an Economic Theory of the Multiproduct Firm, *Journal of Economic Behavior and Organization,* 3, 1, 1982, pp. 39–63.
Teece, D., *Managing Intellectual Capital,* Oxford: Oxford University Press 2000.
Teece, D., Reflections on the Hymer Thesis, *International Business Review*, 15, 2, 2006, pp. 124–139.
Teece, D., *Explicating Dynamic Capabilities*, Seminar held at the Judge Business School, Cambridge May 2006.
Teece, D./Pisano, G., The Dynamic Capabilities of Firms: An Introduction, *Industrial and Corporate Change,* 3, 3, 1994, pp. 537–556.
Teece, D./Pisano, G./Shuen, A., Dynamic Capabilities and Strategic Management, *Strategic Management Journal,* 18, 7, 1997, pp. 537–533.
Uzawa, H., Time Preference and the Penrose Effect in a Two-Class Model of Economic Growth, *Journal of Public Economy,* 77, 4, 1969, pp. 628–*652.*
Wernerfelt, B., A Resource-based View of the Firm, *Strategic Management Journal,* 5, 2, 1984, pp. 171–180.
Williamson, O. E., *Markets and Hierarchies: Analysis and Antitrust Implications,* New York: Free Press 1975.
Williamson, O. E., *The Economic Institutions of Capitalism,* New York: Free Press 1985.
Winter, S., Understanding Dynamic Capabilities, *Strategic Management Journal,* 24, 10, 2003, pp. 991–995.