



SECTION 2. COMPETITIVENESS, TRADE-OFFS AND VALUE CREATION

Hierarchical strategies and strategic fit in the keep-or-sell decision

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Abstract

Purpose – Besides applying knowledge in own products and services, firms increasingly exploit their knowledge assets externally, e.g. by means of licensing out technology. The aim of this paper is to help firms achieve strategic fit in the keep-or-sell issue, which results from potential external knowledge exploitation.

Design/methodology/approach – The keep-or-sell decision refers to the issue whether to commercialize knowledge assets externally in addition to exploiting them inside the organization. Because of the high opportunities and risks of externally leveraging knowledge, the keep-or-sell decision constitutes a major area of conflict between strategies at different levels, particularly knowledge vs product strategies, corporate vs business unit strategies and R&D vs marketing strategies. After detailing the keep-or-sell decision, the paper conceptually explores how firms may respond to potential conflicts in the keep-or-sell decision by achieving strategic fit.

Findings – The paper identifies, in particular, three major characteristics of a firm's strategic approach, i.e. coordination, centralization, and collaboration, which may help firms achieve strategic fit in the keep-or-sell issue.

Originality/value – The keep-or-sell decision is a unique arena for studying hierarchical strategies and strategic fit. As a result, this paper has major implications for research into strategic fit, hierarchical strategies, knowledge management and open innovation. Achieving fit across a firm's different strategies in the keep-or-sell issue is essential for firm performance in a knowledge-based economy.

Keywords Corporate strategy, Strategic management, Knowledge transfer, Licensing, Innovation, Technology led strategy

Paper type Research paper

Introduction

External knowledge exploitation refers to commercializing knowledge assets either exclusively or in addition to their application in a firm's own products or services, e.g. licensing-out transactions. The commercialization of knowledge assets is not a new phenomenon (Lamoreaux and Sokoloff, 1998; Lichtenthaler, 2005). However, it was considered an appropriate strategy only in some specific situations in the past because most industrial firms focused on their product business (March, 1991; Sanderson, 1998; Gallea and Ghobadian, 2004). A main reason for the traditional underutilization of the external mode of exploiting knowledge is the imperfections in the knowledge markets (Teece, 1981; Arora *et al.*, 2001). Despite these imperfections, an active acquisition of external knowledge could be observed in many companies since the end of the 1980s



(Jones *et al.*, 2001; Lichtenthaler and Lichtenthaler, 2004). As a result, firms are faced with the make-or-buy decision, i.e. the issue whether to develop knowledge in-house or whether to acquire it from external sources (Kurokawa, 1997; He and Nickerson, 2006).

Only since the end of the 1990s, however, has the external commercialization of knowledge assets become a broader trend (Chesbrough, 2003a; Lichtenthaler, 2005; Gassmann, 2006). Various pioneering companies, such as Texas Instruments, Lucent Technologies, Dow Chemicals and DuPont, generate hundreds of million dollars in annual licensing revenues (Sullivan and Fox, 1996; Arora *et al.*, 2001; Chesbrough, 2003a; Kline, 2003). Moreover, firms may realize major strategic benefits, such as gaining access to external knowledge or establishing own technologies as industry standards (Grindley and Teece, 1997; Rivette and Kline, 2000; Arora *et al.*, 2001; Koruna, 2004). Besides these positive effects, the commercialization of knowledge assets contains substantial risks. Above all, external knowledge exploitation may strengthen competitors as a result of diffusing competitively relevant knowledge (Teece, 1986; Rivette and Kline, 2000; Arora *et al.*, 2001). Therefore, firms are increasingly faced with the keep-or-sell decision, i.e. the issue whether knowledge should be applied in the firm's own products and services or whether it is commercialized, additionally or exclusively, in disembodied form (Lichtenthaler, 2005).

Despite the recent increase in external knowledge exploitation, prior research has largely neglected the keep-or-sell decision. The literature comprises mainly managerial works (e.g. Rivette and Kline, 2000; Davis and Harrison, 2001). As a result, the major strategic implications that derive from the keep-or-sell issue due to a potential active commercialization of knowledge assets have not been addressed. The strong need for research is underlined by the substantial managerial difficulties of many firms that contrast the enormous success of some pioneering companies (Escher, 2003; Lichtenthaler, 2006a). Moreover, prior research has shown that firms which actively commercialize knowledge assets are usually also deeply involved in acquiring external knowledge (Ford, 1985; Lowe and Taylor, 1998). One major reason for this finding may be the strategic approach to knowledge transactions in these firms (Ford, 1988; Grant and Baden-Fuller, 2004).

Therefore, this article examines the role of different strategies in the keep-or-sell issue. As internal innovation constitutes the core business of most industrial firms, a basic volume of new products and services is developed independent of the specific strategic approach (Atuahene-Gima and Ko, 2001; Rigby and Zook, 2002; O'Regan *et al.*, 2006). Regarding external knowledge exploitation, by contrast, there is not a substantial basic volume of knowledge transactions in most firms because their activities in this area are still limited (Tschirky *et al.*, 2000; Elton *et al.*, 2002; Koruna, 2004). Thus, the impact of the strategic approach likely is very high, and the examples of some pioneering firms underline the importance of a firm's knowledge exploitation strategy (Chesbrough, 2002; Cohen, 2004; Shuchman, 2004).

Moreover, the substantial revenues and the high risks inherent in external knowledge exploitation emphasize the importance of the keep-or-sell issue. In particular, the keep-or-sell decision constitutes a major area of conflict between strategies at different levels, e.g. corporate strategy vs business unit strategy. Thus, the keep-or-sell decision seems to be a unique arena for studying hierarchical strategies and strategic fit. Accordingly, this article addresses the following fundamental questions:

- What role do hierarchical strategies play in the keep-or-sell issue?
- What are major sources of conflict between different strategies in the keep-or-sell decision?
- How may firms achieve strategic fit in the keep-or-sell issue?

After detailing the keep-or-sell decision from a knowledge-based theoretical perspective, this article addresses the major areas of conflict between different strategies in the keep-or-sell issue. These conflicts may arise between strategies at distinct levels, particularly knowledge vs product strategies, corporate vs business unit strategies and R&D vs marketing strategies. Then, the paper explores how firms may respond to these challenges by achieving strategic fit in the keep-or-sell decision. To achieve strategic fit in the keep-or-sell issue, three major characteristics of a firm's strategic approach to knowledge exploitation are identified: coordination, centralization and collaboration. These three principles may help firms avoid or overcome strategic conflict in the keep-or-sell issue. The implications of this analysis for theory and practice are discussed, and directions for future research are presented.

Accordingly, this article offers several contributions. It constitutes the first work that examines in detail the strategic challenges of the keep-or-sell issue. Thus, this research deepens our understanding of realizing value from knowledge in open innovation systems (Chesbrough, 2003a; Laursen and Salter, 2006). Moreover, it addresses numerous emerging themes in knowledge management. By analyzing strategic issues in the decision to transfer knowledge assets to recipients outside the firm, it deepens our understanding of nonefficiency perspectives on organizational boundaries (Santos and Eisenhardt, 2005) and congruence between properties of contexts (Argote *et al.*, 2003). In addition, the paper has major implications for research into hierarchical strategies and strategic fit. In the following section, a brief overview of the keep-or-sell decision is given from a knowledge-based theoretical perspective.

The keep-or-sell decision

Since the 1980s, corporate competition has changed, particularly with regard to the importance of knowledge in today's economy. As competition has become increasingly knowledge-based (Lane and Lubatkin, 1998; Seely Brown and Duguid, 1998; Amesse and Cohendet, 2001), both firms and strategic management theorists have focused their attention in the context of corporate strategy upon knowledge. Many companies have started knowledge management initiatives and try to actively manage their knowledge bases (Nonaka and Takeuchi, 1995; Teece, 2000). Furthermore, there has been a substantial increase in the external acquisition and external exploitation of knowledge assets by which companies attempt to complement and capitalize their knowledge bases (Kurokawa, 1997; Rivette and Kline, 2000). Corporate strategy theory has reflected and stimulated these trends. By emphasizing the influence of knowledge and technology, researchers have tried to overcome the black box of the economist's production function as well as the focus on transaction costs and on tangible resources of former theories (Grant, 1996; Spender, 1996).

Some researchers have moved towards a distinctly knowledge-based theory of the firm (Grant, 1996; Spender, 1996), adopting a view on corporations as distributed knowledge systems (Tsoukas, 1996). Moreover, knowledge has a fundamental role in various other theories. Although knowledge is not the sole focus of these approaches,

the authors consider knowledge a crucial resource and emphasize the importance of knowledge creation and knowledge application. Among others, this is true for the evolutionary theory (Nelson and Winter, 1982), the resource-based view (Wernerfelt, 1984; Prahalad and Hamel, 1990; Barney, 1991), the dynamic capabilities approach (Teece *et al.*, 1997; Eisenhardt and Martin, 2000) and the technology-based theory (Granstrand, 1998). As a result, there are various theoretical approaches, which are in many ways complementary and are aimed at explaining how companies may gain and sustain a competitive advantage against the background of an increasing importance of knowledge and a growing intensity and dynamism of competition.

Apart from the importance of knowledge generation and its application and value appropriation inside the firm (Lichtenthaler and Ernst, 2006), these theoretical approaches underline that knowledge may be regarded as an economic good itself (Granstrand, 2000; Lichtenthaler, 2006b). Firms may be characterized as both product domain and knowledge domain, and an efficient use of a company's knowledge requires congruence between these domains (Grant and Baden-Fuller, 2004). However, perfect congruence usually does not exist in reality (Grant, 1996) which gives rise to the markets for knowledge, in which a company may operate both as a buyer and supplier of knowledge (Teece, 1981). At the very least, the existence of these markets for knowledge expands the strategy space.

Teece (1986) pointed out that if a firm cannot appropriate rents through commercializing knowledge assets, it should acquire complementary assets, which facilitate the internal application of the knowledge. Reductions in the transaction costs in the markets for knowledge, by contrast, increase the propensity of firms to externally exploit knowledge (Arora *et al.*, 2001). In this context, Arora *et al.* (2001) have underlined that stronger intellectual property protection may be a mixed blessing for firms in knowledge-intensive industries. Although stronger intellectual property rights raise barriers against imitation by rivals, they may nonetheless ultimately result in more intense product market competition by facilitating knowledge transactions (Arora *et al.*, 2001).

Because of the possibility of internally and externally exploiting knowledge, a company generally has a choice between two options. In some situations, actual "either-or" decisions have to be taken (Lichtenthaler, 2005). Often, however, the internal and external modes of knowledge exploitation do not exclude one another (Ford, 1988; Brockhoff, 1998). Nevertheless, a company always has to decide whether to develop particular dynamic capabilities and internally exploit its knowledge assets or whether to build up different capabilities to be able to successfully manage the external commercialization of knowledge (Teece *et al.*, 1997; Zack, 1999). Despite the complementary character of internal and external knowledge exploitation, a company therefore has to take keep-or-sell decisions, which refer to the question whether knowledge should be applied in the firm's own products and services or whether it is commercialized, additionally or exclusively, in disembodied form (Lichtenthaler, 2005).

The well-known make-or-buy decision in knowledge acquisition describes the question whether to develop knowledge in-house or whether to acquire it from external sources (Kurokawa, 1997; He and Nickerson, 2006). While internal R&D has traditionally been viewed as an important source of knowledge acquisition, an increasing inward transfer of knowledge may be observed in most companies since the 1980s (Veugelers, 1997; Gassmann and Reepmeyer, 2005). This has led to a more

thorough analysis of the make-or-buy issue in many companies and to renewed scientific interest in this field of research (Pisano, 1990; Kurokawa, 1997; Veugelers, 1997; Veugelers and Cassiman, 1999).

With regard to the keep-or-sell decision in knowledge exploitation, the traditional business strategies of large firms have focused on the internal application of knowledge assets (March, 1991; Chesbrough, 2003a). By contrast, external knowledge exploitation, e.g. out-licensing transactions, was used to a limited degree in the past (Elton *et al.* 2002; Koruna, 2004). In recent years, however, a considerable trend towards a more active commercialization of knowledge assets could be observed (Rivette and Kline, 2000; Lichtenthaler, 2005). As this development is a trend from practice rather than a movement initiated by academic research, scientific interest in external knowledge exploitation and in the keep-or-sell issue has grown only recently (Tschirky *et al.*, 2000; Granstrand, 2004; Koruna, 2004).

In particular, the keep-or-sell decision requires balancing the benefits and risks of commercializing knowledge assets. Apart from generating licensing revenues, external knowledge exploitation may be pursued to achieve a variety of strategic objectives. Among them are gaining access to external knowledge, setting industry standards, profiting from infringements of a firm's intellectual property, realizing learning effects and guaranteeing "freedom to operate" (Grindley and Teece, 1997; Rivette and Kline, 2000; Lichtenthaler, 2005). Regarding the risks of commercializing knowledge assets, there is basically a trade-off between realizing the monetary and strategic benefits on the one hand and protecting a firm's knowledge base and its idiosyncratic competencies on the other (Teece, 1986; Arora *et al.*, 2001). These potential negative consequences and the resulting fear of giving away "corporate crown jewels" (Kline, 2003) are a main reason why most companies concentrated on internal knowledge exploitation and neglected the commercialization of knowledge assets in the past (Ford, 1985; Vickery, 1988; Elton *et al.*, 2002).

Despite the partial appropriateness of transaction cost theory (Coase, 1937; Teece, 1981; Caves *et al.*, 1983; Seely Brown and Duguid, 1998), no detailed and comprehensive framework for the keep-or-sell decision in commercializing knowledge assets has emerged yet. While the role of the particular knowledge asset has been addressed in relative detail (Ford and Ryan, 1981; Lichtenthaler, 2005), other factors, especially the influence of the potential knowledge recipient, have mostly been ignored. Owing to the high complexity and context-dependency of the decision, it will be difficult or even impossible to develop a comprehensive framework as intended by Ford (1988). It appears to be more important that companies establish an overall external knowledge exploitation strategy, which is closely coordinated with the firm's corporate strategy and with its internal knowledge exploitation strategies. On this basis, individual keep-or-sell decisions may be taken (Ford, 1988; Arora *et al.*, 2001). In particular, an overall strategy will allow for responding to the potential conflicts of strategies in the keep-or-sell decision. These potential strategic conflicts in the keep-or-sell issue will be addressed in the following section.

Conflict of strategies in the keep-or-sell decision

The conceptualization of different hierarchical strategies constitutes a major approach to strategizing in theory and practice (Burgelman, 1983; Porter, 1987; Ensign, 1998; Frishammar, 2003; Grant, 2003; O'Regan and Ghobadian, 2004). Because of the

fundamental effect of external knowledge exploitation, i.e. transferring proprietary knowledge assets to recipients outside the firm (Lichtenthaler, 2005), the keep-or-sell issue bears major potential for conflict between different strategies. Basically, these conflicts may arise from different degrees of openness with regard to externally leveraging knowledge.

As most industrial firms focus on applying their proprietary knowledge in own products, they are not necessarily open to external knowledge exploitation (Elton *et al.*, 2002; Chesbrough, 2003a). Depending on their particular scope and direction, different strategies consider the commercialization of knowledge assets in an entirely different way. In particular, there are major differences regarding the openness to commercializing knowledge assets, which result in three major areas of conflict between different strategies: knowledge vs product strategy, corporate vs business unit strategy and R&D vs marketing strategy. In the following, the issue of knowledge vs product strategies is addressed.

Knowledge strategy vs product strategy

Knowledge may be regarded as an economic good (Granstrand, 2000). Firms may be characterized as both product domain and knowledge domain, and an efficient use of a company's knowledge requires congruence between these domains (Grant and Baden-Fuller, 2004). As perfect congruence usually does not exist (Grant, 1996), firms have to decide whether the rents from their knowledge assets are commercialized best by integrating into related markets, by selling intermediate output or by selling the knowledge assets themselves (Teece *et al.*, 1997). Accordingly, firms may simultaneously operate on the markets for products and services and on the markets for knowledge.

With an increasing importance of knowledge transactions (Grant and Baden-Fuller, 2004), a firm's knowledge strategy (Zack, 1999) does not only constitute a strategy that is subordinate to the firm's product strategies in realizing value from knowledge through internal innovation. Instead, it represents a complementary strategy to a firm's product strategies (Tschirky *et al.*, 2000). While product strategies focus exclusively on the product business, external knowledge exploitation is mainly regarded as a potential avenue of diluting a firm's competitive advantage in the product markets (Lorange, 1980). Knowledge strategy, by contrast, takes a broader approach to exploiting knowledge assets and is therefore more open to externally commercializing knowledge (Zack, 1999). After discussing the potential conflict between knowledge and product strategies, the following section deals with the issue of corporate vs business unit strategies.

Corporate strategy vs business unit strategy

While knowledge strategies take a broader approach to exploiting knowledge assets than product strategies, corporate strategy similarly takes an overall perspective on a firm's business activities (Ansoff, 1965; Porter, 1987; Grant, 2003). The business unit strategies often tend to be relatively reserved with regard to externally leveraging knowledge although the commercialization of a particular knowledge asset might be appropriate from a corporate perspective. Because of incentive systems and other reasons, however, business unit strategies tend to focus exclusively on the local

optimum for their particular business unit and not on the overall optimum for the whole company (Ansoff, 1965; Burgelman, 1983; Richter and Schmidt, 2005).

A corporate-level strategy in external knowledge exploitation (Tschirky *et al.*, 2000; Lichtenthaler, 2005) has to balance this focus by showing that external knowledge exploitation may be beneficial even if it negatively affects the competitive position of a particular business unit. From a firm-level perspective, it is appropriate to realize a knowledge transaction if its negative effects are overcompensated by the positive effects for the firm as a whole. For instance, a firm may decide to externally commercialize knowledge to generate licensing revenues, which overcompensate a decrease in the revenues and profit of a particular business unit. Besides potential conflicts between the corporate and business unit level, conflicts may arise between the functions of R&D and marketing, which are addressed in the following section.

R&D vs marketing strategy

As the focus of the marketing department is traditionally on a firm's product or service business (Brockhoff and Chakrabarti, 1988; Tschirky *et al.*, 2000; Escher, 2003), the marketing function in most firms is relatively reserved with regard to externally leveraging knowledge. The main reason for this reserved approach is the fear of strengthening competitors in the product business due to commercializing "corporate crown jewels" (Kline, 2003). As a result, the commercialization of knowledge assets is pursued much more proactively by the R&D department.

Often, the R&D department is faced with the challenge of increasing the return on a firm's R&D expenditures (Edler *et al.*, 2002). Moreover, many firms have set up initiatives of organizing corporate R&D departments as profit centers (Lichtenthaler, 2005). Similar arguments apply to the approach of intellectual property departments or specialized external knowledge exploitation units, e.g. licensing functions (Tschirky *et al.*, 2000), which are usually responsible for coordinating the external knowledge commercialization activities. As there is often a structural or hierarchical link of the intellectual property or licensing department to the R&D department (Tschirky *et al.*, 2000; Escher, 2003), the conflict of functional strategies in the keep-or-sell decision basically boils down to coordinating the R&D and marketing functions. To cope with these potential conflicts and align the different strategies, firms may design their strategic approaches to the keep-or-sell issue. This alignment of strategies at different levels is addressed in the following section.

Alignment of strategies in the keep-or-sell decision

Successfully approaching the keep-or-sell decision requires in the first step a strategic approach to internal and external knowledge exploitation (Ford and Ryan, 1981; Lichtenthaler, 2005). However, prior research has shown that external knowledge commercialization is often still regarded as an *ad hoc* operation in practice (Fu and Perkins, 1995; Escher, 2003). Because of the imperfections in the markets for knowledge (Teece, 1981; Arora *et al.*, 2001), networks and personal contacts have often played a key role in initiating knowledge transactions (Bidault and Fischer, 1994; Fu and Perkins, 1995). Although these imperfections support informal approaches to externally leveraging knowledge, they should be integrated into a more formalized knowledge exploitation strategy (Ford, 1988; Teece, 1998; Tschirky *et al.*, 2000).

In internal knowledge exploitation, product-market strategies determine with which products a firm addresses which product markets (Lorange, 1980; Burgelman, 1983). An external knowledge exploitation strategy, by contrast, determines with which knowledge assets the firm addresses which knowledge markets (Koruna, 2004; Lichtenthaler, 2005). To reduce potential conflict of different strategies in the keep-or-sell decision, three major characteristics of a firm's strategic approach could be identified: coordination, centralization and collaboration (Figure 1). While these characteristics facilitate the development of strategic fit in the keep-or-sell issue, they have implications for addressing hierarchical strategies to achieve strategic fit in general. The first issue of coordination is addressed in the following section.

Coordination

To realize the benefits of externally leveraging knowledge and reduce the potential conflict knowledge strategies vs product strategies, developing a specific strategy constitutes a first step. To make the external commercialization of knowledge a truly strategic activity, however, companies should take an integrated view comparing their current and future knowledge assets with both internal and external exploitation opportunities (Teece, 1986; Chesbrough, 2003b). Such an approach will facilitate an adequate use of the two complementary modes of knowledge exploitation, and it will permit a more effective integration of the firm's knowledge about particular markets and applications.

If external knowledge exploitation is an integral part of a firm's overall business strategy, the identification of knowledge commercialization opportunities ideally does not only consider knowledge that has already been developed and is used or not used inside the company. Instead, it will already start during internal or external knowledge acquisition to take external knowledge exploitation into account in all major decisions regarding a company's knowledge assets (Ford and Ryan, 1981). Thus, it seems beneficial to integrate the external knowledge exploitation strategy into the firm's overall corporate strategy and to coordinate it with a firm's knowledge generation and internal knowledge exploitation.

Regarding the coordination of external knowledge exploitation with knowledge generation, companies should not only consider the commercialization of knowledge assets starting from their current knowledge base. Rather, it should already be taken into account in decisions on building up particular competencies and in the make-or-buy decisions on developing these competencies:

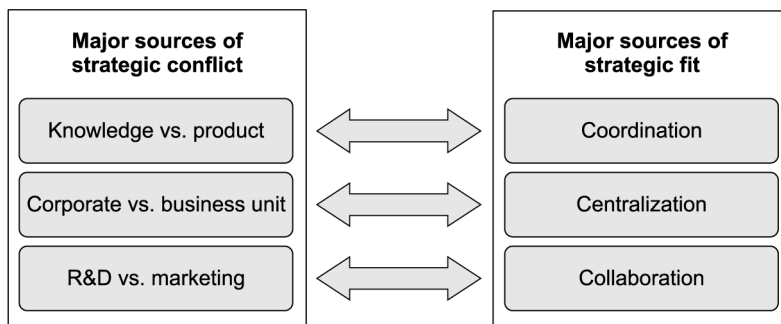


Figure 1. Strategic conflict and strategic fit in the keep-or-sell decision

[A] company must not base its development decisions on the projected returns from product sales alone. Instead, it should consider potential returns from the technology as a whole (Ford and Ryan, 1981, p. 121).

For instance, it might be beneficial to develop knowledge internally rather than to acquire it from external sources to realize external knowledge exploitation opportunities, which could not be achieved with knowledge that has been acquired from external sources. This type of systematic coordination of external knowledge exploitation strategy into corporate strategy is particularly important as there is a trend towards a closer linkage between the process of generating new knowledge and the process of exploiting knowledge (Brockhoff, 1998).

In addition, the coordination of a firm's knowledge exploitation strategy comprises the alignment of external knowledge exploitation with internal knowledge exploitation, especially with a firm's product strategies and new product development programs. A close coordination is essential due to the interdependencies between the two modes of exploiting knowledge (Ford, 1988). On the one hand, external knowledge exploitation will usually limit the current and future internal knowledge exploitation opportunities. In many cases, it will not be beneficial to use internal and external knowledge exploitation simultaneously. Moreover, the diffusion of knowledge assets and the potential lack of developing the necessary complementary assets will influence the firm's future internal knowledge exploitation potential. On the other hand, the external knowledge exploitation strategy will often only be successful if it is closely linked to the firm's internal exploitation strategies and competitive strategies (Porter, 1980; Helms *et al.*, 1997), which also demonstrates the high degree of interdependence.

This is particularly true for many of the strategic functions of commercializing knowledge assets, such as setting industry standards, which are directed at both internal and external knowledge exploitation activities (Koruna, 2004). Accordingly, firms should not only formulate the well-known types of product-market strategies (e.g. Lorange, 1980), but they should widen the perspective of their corporate strategies to incorporate external knowledge exploitation and develop adequate "meta-strategies" to harmonize their knowledge management activities (Smothers, 1990; Brockhoff, 1998). Taking into account the requirement of complementary assets (Teece, 1986; Arora *et al.*, 2001), the critical factor of such strategies may be seen in the goal of maximizing the rents derived from knowledge assets in the broader context of corporate strategy. To align corporate and business unit strategies, centralization is an important means, and it is described in the following section.

Centralization

To cope with the conflict corporate strategy vs business unit strategies, firms may establish a formal external knowledge exploitation strategy at the corporate level. Drawing on prior research into corporate strategy (Ansoff, 1965; Ensign, 1998; Chaharbaghi and Lynch, 1999; Bowman and Helfat, 2001; Richter and Schmidt, 2005), a firm's corporate external knowledge exploitation strategy may be considered a company's overall plan with regard to the commercialization of knowledge assets. Thus, this strategy is what makes a firm's external knowledge exploitation add up to more than the sum of individual knowledge transactions, for example synergies due to learning effects, centralization or portfolio management (Burgelman, 1983; Porter,

1987; Lieberman, 1989). To understand how to formulate a corporate external knowledge exploitation strategy, the three essential criteria for developing successful corporate diversification strategies (Porter, 1987), i.e. internal knowledge exploitation strategies for the product and service markets, may be transferred to the level of knowledge markets.

First, the particular knowledge markets that a firm addresses have to be structurally attractive or capable of being made attractive (Porter, 1979; Baysinger and Hoskisson, 1989). While this aspect is essential for diversification, it is less important for external knowledge exploitation due to the limited need to build up specific resources. However, attractiveness certainly matters if, for example, the decision is taken to continue developing knowledge to realize external knowledge exploitation opportunities. Second, the cost of entry into the knowledge markets must not capitalize all the expected future revenues from these fields (Porter, 1987; Lieberman, 1989; Root, 1994). Because of imperfections in the knowledge markets, entry costs may be substantial for a single knowledge transaction. Because of the multi-project perspective of the corporate-level view, however, initial entry costs may pay off if a sufficient return is achieved over numerous knowledge transactions. Third, the corporation as a whole must gain competitive advantage from external knowledge exploitation (Burgelman, 1983; Porter, 1987; Thomas and Pollock, 1999). While research into corporate diversification strategy emphasizes the advantages that a business unit may realize from being part of a corporation (Porter, 1987), the focus in externally leveraging knowledge is on the benefits that a particular knowledge transaction provides to the firm.

A specific external knowledge exploitation strategy at the corporate level likely reduces the potential conflicts between the corporate and business unit level by giving directions and setting goals (Ansoff, 1965; Burgelman, 1983; Grant, 2003; Richter and Schmidt, 2005). This type of corporate-level strategy does not necessarily imply the centralization of external knowledge exploitation activities at the corporate level (Tschirky *et al.*, 2000; Escher, 2003). Owing to the high diversity of the tasks along the external knowledge exploitation process, a decision for a more centralized or a more decentralized approach does not constitute an “either-or” decision. Rather, the situation may be interpreted as a continuum of organizational options with the purely centralized and purely decentralized approaches as the extreme cases. However, a relatively centralized organizational approach facilitates the implementation of an external knowledge exploitation strategy at the corporate level. Most pioneering and highly successful companies in external knowledge exploitation, such as IBM, DuPont and Texas Instruments, have chosen to carry out their activities in a centralized way (Sullivan and Fox, 1996; Arora *et al.*, 2001; Cohen, 2004; Shuchman, 2004).

As both centralized and decentralized organizational approaches involve the participation of employees from all levels, an external knowledge exploitation strategy at the corporate level needs to be accompanied by a close collaboration between the corporate and the business unit level (Mintzberg *et al.*, 1998; Grant, 2003). As a firm’s knowledge is not resident at a particular organizational level, a close alignment of the tasks that are realized at the corporate level and at the business unit level appears to be essential. Because of interdependences between many tasks (Escher, 2003) and the complementary character of the relevant knowledge at the corporate and the business unit level, multiple interfaces have to be taken into account.

The fact that many companies observe a relatively reluctant attitude of business unit managers with regard to externally commercializing knowledge (Shuchman, 2004) points to considerable problems in this area and to great opportunities for improving the current strategic approaches of many firms (Lichtenthaler, 2005). Above all, it seems necessary to balance the influence of both levels despite a possibly centralized strategic approach. While overriding the interests of the business units likely reduces the intention to initiate knowledge transactions at the business unit level, an overemphasis on business-unit objectives could lead to situations that are sub-optimal from the perspective of the whole company (Porter, 1987). A fair collaboration, by contrast, will lead to win-win situations, which will favor additional knowledge exploitation. Collaboration is also critical for aligning marketing and R&D strategy. This topic is addressed in the following section.

Collaboration

Owing to potential conflicts between functional strategies, in particular marketing strategy vs R&D strategy, a close collaboration between these units is essential in developing a firm's strategic approach to the keep-or-sell issue. The interface between the R&D and marketing department may constitute a considerable communicational barrier (Brockhoff and Chakrabarti, 1988; Griffin and Hauser, 1996; Ernst and Teichert, 1998). Accordingly, firms should strongly rely on cross-functional integration mechanisms in developing knowledge exploitation strategies to reduce potential inter-functional conflicts (Sherman *et al.*, 2005). Moreover, this approach helps combine the different knowledge bases of these departments by communicating the relevant knowledge and ideas across the organization, which may be regarded as a distributed knowledge system (Tsoukas, 1996). While the R&D department contributes the expertise in the particular knowledge assets, the marketing department possesses detailed insights into relevant markets for the knowledge assets. The market knowledge that is gained as a byproduct of own production and sales (Abernathy, 1978) may be useful to externally commercialize knowledge assets.

Accordingly, a firm's ability to externally leverage knowledge not only depends on its interface with the external environment but also on the knowledge transfers across and within organizational subunits (Cohen and Levinthal, 1990). If every subunit only makes use of its own knowledge, the great opportunities of communicating knowledge across different subunits, particularly in a diversified firm, will remain unrealized. For the level of both subunits and individuals, prior research has found considerable benefits of accessing external knowledge that may be facilitated by intra-firm communication and knowledge management systems (Szulanski, 1996; Hansen, 1999; Hoegl *et al.*, 2003).

Apart from ensuring close intra-organizational communication, it seems beneficial to establish a participatory strategic approach to the keep-or-sell issue that will result in a broader knowledge architecture (van den Bosch *et al.*, 1999). An active participation of the employees from different departments appears essential to identify knowledge commercialization opportunities (Cohen and Levinthal, 1990; van den Bosch *et al.*, 1999). A participatory strategic approach may be achieved by stimulating informal and autonomous activities of employees in parallel to their regular work. Above all, firms may benefit from the T-shaped skills of selected employees (Iansiti, 1993; Madhavan and Grover, 1998). In particular, it appears helpful to draw on the

knowledge of R&D employees, who have often developed new knowledge themselves and may have interesting ideas for its potential external commercialization, either exclusively or in addition to internal application. Although an active involvement of these persons is suggested, their limited resources for external knowledge exploitation are acknowledged, which usually does not constitute a firm's core business. However, the identification of knowledge commercialization opportunities may be realized by these persons along with their ongoing work without major resource requirements (Allen, 1977; Cohen and Levinthal, 1990). After identifying three major characteristics of a firm's strategic approach to overcome conflicts in the keep-or-sell issue, the implications of this analysis will be discussed in the following section.

Discussion

The three major characteristics of a firm's strategic approach, i.e. coordination, centralization and collaboration, help a company achieve strategic fit in the keep-or-sell issue. In addition, however, these three principles may be applied to other fields, in which conflict of strategies and strategic fit play an important role. Coordination basically refers to activities of aligning different strategies that have been developed or currently are developed (Burgelman, 1983; Martinez and Jarillo, 1991). Centralization, by contrast, mainly refers to giving clear directions, which reduce coordination requirements a priori due to a variety of mechanisms, such as standardization of processes and limitations of the search space (Porter, 1987; Grant, 2003). Thus, centralization does not require the realization of all activities at the corporate level because it exclusively refers to strategizing. Finally, collaboration describes the possibility to reduce interface problems and potential conflict by aligning different strategies, e.g. R&D and marketing strategies, in the process of strategy development (Grant, 2003; Richter and Schmidt, 2005). While these three principles have been derived from an analysis of the keep-or-sell issue, which constitutes an excellent arena for studying strategic fit, they are likely helpful for deepening our understanding of strategic fit and interdependencies between hierarchical strategies in completely different fields.

With regard to the keep-or-sell issue, the imperfections in the markets for knowledge have often led to relatively informal approaches to external knowledge exploitation (Fu and Perkins, 1995; Escher, 2003). However, these informal mechanisms should be complemented by a strategic approach to the keep-or-sell decision, which is aligned with a firm's other hierarchical strategies (Ford, 1988). This strategic approach offers two major advantages. First, it will help firms realize the monetary and strategic benefits of commercializing knowledge assets (Ford, 1988; Davis and Harrison, 2001). Apart from providing direction for these activities, which may lead to gains in effectiveness and efficiency, a clear strategy will facilitate the coordination of knowledge transactions. Thus, it will allow for optimizing the results of the external knowledge exploitation program instead of optimizing individual transactions (Sullivan and Fox, 1996; Kale *et al.*, 2002). Second, this strategic approach will facilitate the control of potential risks, which mainly refer to diluting the firm's idiosyncratic competencies (Arora *et al.*, 2001; Kline, 2003). These potential negative consequences will be limited by giving clear directions instead of regarding each knowledge transaction as an isolated action.

Most firms considered external knowledge exploitation an *ad hoc* operation in the past (Escher, 2003; Lichtenthaler and Ernst, 2006). Therefore, their strategies likely emerged from the weakly coordinated decisions of multiple organizational members, following a “strategy as emergent process” view (Grant, 2003). Accordingly, a formal strategic approach may be regarded as an important strategic innovation (Mintzberg, 1994; Grant, 2003), and it may have a positive impact on a firm’s performance in commercializing knowledge assets (Ghobadian and O’Regan, 2002). However, earlier works have shown that overly formalized approaches may have negative effects because they may be a source of institutional inertia (Baden-Fuller and Stopford, 1994; Markides, 1998). Above all in dynamic environments, firms may easily plan more than they know. Thus, excessively formalized strategies may lead to inflexibility (Feurer and Chaharbaghi, 1995; Brown and Eisenhardt, 1998). As most firms focus on their product business, the external mode of knowledge exploitation has largely been neglected (Elton *et al.*, 2002). Therefore, formal strategies will hardly lead to overly formalized “strategy as rational design” (Grant, 2003) planning processes at the moment. Rather, formal strategies will help firms arrive at an appropriate level of formalization, which facilitates “planned emergence” types of strategies (Grant, 2003).

These strategies may help firms overcome the *ad hoc* approaches to commercializing knowledge assets that they often pursued in the past. Instead, external knowledge exploitation is considered an essential part of the firms’ knowledge strategies. The commercialization of knowledge assets is aligned with the firm’s internal innovation strategies in an integrated approach. The importance of strategic functions of commercializing knowledge assets and the interdependencies between internal and external knowledge exploitation (Arora *et al.*, 2001; Koruna, 2004) have shown that firms need to develop integrated knowledge exploitation strategies. These strategies have to facilitate keep-and-sell approaches to knowledge exploitation instead of focusing on actual “either-or” decisions in the keep-or-sell issue. Accordingly, the emergence of the open innovation paradigm may lead us to fundamentally rethink traditional assumptions on the relationship between product business and external knowledge exploitation, e.g. out-licensing transactions. Product business and licensing appear to be complements rather than substitutes in knowledge exploitation. After discussing major implications of the analysis in this section, the final section concludes and underlines interesting avenues for further research.

Conclusion

The implications of the present article go far beyond the field of outward knowledge transfer. By analyzing how firms may capture value from knowledge assets, we have addressed a key topic of corporate strategy in knowledge-based companies. In the presence of markets for knowledge, external knowledge exploitation is not a marginal activity that may be managed exclusively by a dedicated licensing function. Instead, achieving strategic fit across a firm’s different strategies in the keep-or-sell issue is essential for firm performance in a knowledge-based economy. With the trend towards more open innovation systems, companies will increasingly commercialize knowledge assets. Thus, it will become more and more difficult for firms to completely refrain from externally leveraging knowledge assets. The external commercialization of knowledge will not merely be an option but rather a necessity in order to keep up with

the firm's competitors. Refusing to commercialize knowledge assets may well result in a substantial weakening of a firm's competitive position in the future.

Accordingly, an appropriate strategic approach to the keep-or-sell issue will gain additional importance. The three major principles that have been identified, i.e. coordination, centralization and collaboration, will help firms achieve strategic fit in the keep-or-sell decision. In a first step, firms should consider external knowledge exploitation a strategic activity instead of merely regarding it as an *ad hoc* operation. Then, firms should coordinate their product business and external knowledge exploitation activities to harmonize their product and knowledge strategies. Furthermore, it is appropriate to sufficiently centralize the keep-or-sell decision to respond to potential conflict between strategies at the corporate and business unit level. Finally, emphasis should be put on cross-functional collaboration to achieve strategic fit between different functional strategies, above all R&D and marketing. In addition, the implications of the major characteristics of a firm's strategic approach, i.e. coordination, centralization and collaboration, are not limited to external knowledge exploitation. Instead, they may deepen our understanding of strategic fit and hierarchical strategies in general.

As a result, the present article has bridged major gaps in prior research, which is particularly important against the background of increasing knowledge commercialization in practice. Many companies have obviously become aware of the relevance of external knowledge exploitation. Others, however, have not yet recognized the importance and are in danger of missing the substantial monetary and strategic benefits that may be derived from an appropriate strategic approach to the keep-or-sell issue. By addressing strategic issues in the decision to transfer knowledge assets to recipients outside the firm, the present paper has addressed numerous emerging themes in knowledge management, e.g. organizational boundaries and congruence between properties of contexts (Argote *et al.*, 2003).

As much remains to be explored, there are great opportunities for further research into external knowledge exploitation strategies. The previous sections have shown that there are severe limitations of the existing literature on the keep-or-sell issue and on external knowledge commercialization in general. This lack of research becomes obvious if the literature on this topic is compared with the detailed findings of research into the internal exploitation of knowledge, i.e. new product development and innovation (Ernst, 2002), as the complementary exploitation mode and with research into the external acquisition of knowledge as the opposite direction of knowledge transactions (Veugelers and Cassiman, 1999).

In particular, future studies may analyze the implementation of the strategies and the capabilities of firms to realize knowledge commercialization opportunities (O'Regan and Ghobadian, 2004). Thus, empirical research may contribute to validating the appropriateness of the three major characteristics of a firm's strategic approach to the keep-or-sell decision that have been identified in this paper. Moreover, the importance of coordination, centralization and collaboration for reducing the potential conflicts between a firm's strategies at different levels could be analyzed empirically. Accordingly, exploratory case studies and large-scale surveys are encouraged because they may lead to results that are equally relevant to research and practice and may help firms realize value from their knowledge assets. Beyond contributing to research into the keep-or-sell issue, these studies would considerably deepen our understanding of hierarchical strategies and strategic fit in general.

References

- Abernathy, W.J. (1978), *The Productivity Dilemma*, Johns Hopkins University Press, Baltimore, MD.
- Allen, T.J. (1977), *Managing the Flow of Technology: Technology Transfer and Dissemination of Technological Information within the R&D Organization*, MIT Press, Cambridge, MA.
- Amesse, F. and Cohendet, P. (2001), "Technology transfer revisited from the perspective of the knowledge-based economy", *Research Policy*, Vol. 30 No. 9, pp. 1459-78.
- Ansoff, H.I. (1965), *Corporate Strategy*, McGraw-Hill, New York, NY.
- Argote, L., McEvily, B. and Reagans, R. (2003), "Managing knowledge in organizations: an integrative framework and review of emerging themes", *Management Science*, Vol. 49 No. 4, pp. 571-82.
- Arora, A., Fosfuri, A. and Gambardella, A. (2001), *Markets for Technology: The Economics of Innovation and Corporate Strategy*, MIT Press, Cambridge, MA.
- Atuahene-Gima, K. and Ko, A. (2001), "An empirical investigation of the effect of market orientation and entrepreneurship orientation alignment on product innovation", *Organization Science*, Vol. 12 No. 1, pp. 54-74.
- Baden-Fuller, C. and Stopford, J.M. (1994), *Rejuvenating the Mature Business: The Competitive Challenge*, Harvard Business School Press, Boston, MA.
- Barney, J. (1991), "Firm resources and sustained competitive advantage", *Journal of Management*, Vol. 17 No. 1, pp. 99-120.
- Baysinger, B. and Hoskisson, R.E. (1989), "Diversification strategy and R&D intensity in multiproduct firms", *Academy of Management Journal*, Vol. 32 No. 2, pp. 310-32.
- Bidault, F. and Fischer, W.A. (1994), "Technology transactions: networks over markets", *R&D Management*, Vol. 24 No. 4, pp. 373-86.
- Bowman, E.H. and Helfat, C.E. (2001), "Does corporate strategy matter?", *Strategic Management Journal*, Vol. 22 No. 1, pp. 1-23.
- Brockhoff, K. (1998), "Technology management as part of strategic planning – some empirical results", *R&D Management*, Vol. 28 No. 3, pp. 129-38.
- Brockhoff, K. and Chakrabarti, A. (1988), "R&D/marketing linkage and innovation strategy: some West German experience", *IEEE Transactions on Engineering Management*, Vol. 35 No. 3, pp. 167-74.
- Brown, S.L. and Eisenhardt, K.M. (1998), *Competing on the Edge: Strategy as Structured Chaos*, Harvard Business School Press, Boston, MA.
- Burgelman, R.A. (1983), "A model of the interaction of strategic behavior, corporate context, and the concept of strategy", *Academy of Management Review*, Vol. 8 No. 1, pp. 61-70.
- Caves, R.E., Crookell, H. and Killing, P. (1983), "The imperfect market for technology licenses", *Oxford Bulletin of Economics and Statistics*, Vol. 45 No. 3, pp. 249-67.
- Chaharbaghi, K. and Lynch, R. (1999), "Sustainable competitive advantage: towards a dynamic resource-based strategy", *Management Decision*, Vol. 37 No. 1, pp. 45-50.
- Chesbrough, H. (2002), "Graceful exits and missed opportunities: Xerox's management of its technology spin-off organizations", *Business History Review*, Vol. 76 No. 4, pp. 803-37.
- Chesbrough, H. (2003a), "The logic of open innovation: managing intellectual property", *California Management Review*, Vol. 45 No. 3, pp. 33-58.
- Chesbrough, H. (2003b), "The era of open innovation", *MIT Sloan Management Review*, Vol. 44 No. 3, pp. 35-41.

- Coase, R.H. (1937), "The nature of the firm", *Economica*, Vol. 4, November, pp. 386-405.
- Cohen, A. (2004), "Licensing's in and the lawyer's out", *IP Law & Business*, Vol. 4, April, pp. 31-3.
- Cohen, W.M. and Levinthal, D.A. (1990), "Absorptive capacity: a new perspective on learning and innovation", *Administrative Science Quarterly*, Vol. 35 No. 1, pp. 128-52.
- Davis, J.L. and Harrison, S.S. (2001), *Edison in the Boardroom: How Leading Companies Realize Value from Their Intellectual Assets*, John Wiley & Sons, New York, NY.
- Edler, J., Meyer-Krahmer, F. and Reger, G. (2002), "Changes in the strategic management of technology: results of a global benchmarking study", *R&D Management*, Vol. 32 No. 2, pp. 149-64.
- Eisenhardt, K.M. and Martin, J.A. (2000), "Dynamic capabilities: what are they?", *Strategic Management Journal*, Vol. 21, October-November, pp. 1105-21.
- Elton, J.J., Shah, B.R. and Voyzey, J.N. (2002), "Intellectual property: partnering for profit", *McKinsey Quarterly*, No. 4, special issue, pp. 58-67.
- Ensign, P.C. (1998), "Interrelationships and horizontal strategy to achieve synergy and competitive advantage in the diversified firm", *Management Decision*, Vol. 36 No. 10, pp. 657-68.
- Ernst, H. (2002), "Success factors of new product development: a review of the empirical literature", *International Journal of Management Reviews*, Vol. 4 No. 1, pp. 1-40.
- Ernst, H. and Teichert, T. (1998), "The R&D/marketing interface and single informant bias in NPD research: an illustration of a benchmarking case study", *Technovation*, Vol. 18 No. 12, pp. 721-39.
- Escher, J.-P. (2003), "Design and implementation of technology marketing organizations", in Tschirky, H., Jung, H.-H. and Savioz, P. (Eds), *Technology and Innovation Management on the Move*, Orell Füssli, Zurich, pp. 215-28.
- Feurer, R. and Chaharbaghi, K. (1995), "Strategy development: past, present and future", *Management Decision*, Vol. 33 No. 6, pp. 11-21.
- Ford, D. (1985), "The management and marketing of technology", in Lamb, R. and Shrivastava, P. (Eds), *Advances in Strategic Management*, JAI Press, London, pp. 103-34.
- Ford, D. (1988), "Develop your technology strategy", *Long Range Planning*, Vol. 21 No. 5, pp. 85-95.
- Ford, D. and Ryan, C. (1981), "Taking technology to market", *Harvard Business Review*, Vol. 59 No. 2, pp. 117-26.
- Frishammar, J. (2003), "Information use in strategic decision making", *Management Decision*, Vol. 41 No. 4, pp. 318-26.
- Fu, S. and Perkins, D.S. (1995), "Technology licensors and licensees: who they are, what resources they employ, and how they feel", *International Journal of Technology Management*, Vol. 10, pp. 907-20.
- Gallear, D. and Ghobadian, A. (2004), "An empirical investigation of the channels that facilitate a total quality culture", *Total Quality Management & Business Excellence*, Vol. 15 No. 8, pp. 1043-67.
- Gassmann, O. (2006), "Opening up the innovation process: towards an agenda", *R&D Management*, Vol. 36 No. 3, pp. 223-8.
- Gassmann, O. and Reepmeyer, G. (2005), "Organizing pharmaceutical innovation: from science-based knowledge creators to drug-oriented knowledge brokers", *Creativity and Innovation Management*, Vol. 14 No. 3, pp. 233-45.

- Ghobadian, A. and O'Regan, N. (2002), "The link between culture, strategy and performance in manufacturing SMEs", *Journal of General Management*, Vol. 28 No. 1, pp. 16-35.
- Granstrand, O. (1998), "Towards a theory of the technology-based firm", *Research Policy*, Vol. 27 No. 5, pp. 465-89.
- Granstrand, O. (2000), *The Economics and Management of Intellectual Property: Towards Intellectual Capitalism*, Edward Elgar Publishing, Northampton.
- Granstrand, O. (2004), "The economics and management of technology marketing: towards a pro-licensing era?", *International Journal of Technology Management*, Vol. 27 Nos 2/3, pp. 209-40.
- Grant, R.M. (1996), "Toward a knowledge-based theory of the firm", *Strategic Management Journal*, Vol. 17, Winter, special issue, pp. 109-22.
- Grant, R.M. (2003), "Strategic planning in a turbulent environment: evidence from the oil majors", *Strategic Management Journal*, Vol. 24 No. 6, pp. 491-517.
- Grant, R.M. and Baden-Fuller, C. (2004), "A knowledge accessing theory of strategic alliances", *Journal of Management Studies*, Vol. 41 No. 1, pp. 61-84.
- Griffin, A. and Hauser, J.R. (1996), "Integrating R&D and marketing: a review and analysis of the literature", *Journal of Product Innovation Management*, Vol. 13 No. 3, pp. 191-215.
- Grindley, P.C. and Teece, D.J. (1997), "Managing intellectual capital: licensing and cross-licensing in semiconductors and electronics", *California Management Review*, Vol. 39, January, pp. 8-41.
- Hansen, M.T. (1999), "The search-transfer problem: the role of weak ties in sharing knowledge across organizational subunits", *Administrative Science Quarterly*, Vol. 44 No. 1, pp. 82-111.
- He, D. and Nickerson, J.A. (2006), "Why do firms make and buy? Efficiency, appropriability, and competition in the trucking industry", *Strategic Organization*, Vol. 4, pp. 43-69.
- Helms, M.M., Dibrell, C. and Wright, P. (1997), "Competitive strategies and business performance: evidence from the adhesives and sealants industry", *Management Decision*, Vol. 35 No. 9, pp. 678-92.
- Hoegl, M., Parboteeah, K.P. and Munson, C.L. (2003), "Team-level antecedents of individuals' knowledge networks", *Decision Sciences*, Vol. 34 No. 4, pp. 741-70.
- Iansiti, M. (1993), "Real-world R&D: jumping the product generation gap", *Harvard Business Review*, Vol. 71 No. 3, pp. 138-47.
- Jones, G.K., Lanctot, A. and Teegen, H.J. (2001), "Determinants and performance impacts of external technology acquisition", *Journal of Business Venturing*, Vol. 16 No. 3, pp. 255-83.
- Kale, P., Dyer, J.H. and Singh, H. (2002), "Alliance capability, stock market response, and long-term alliance success: the role of the alliance function", *Strategic Management Journal*, Vol. 23 No. 8, pp. 747-67.
- Kline, D. (2003), "Sharing the corporate crown jewels", *MIT Sloan Management Review*, Vol. 44 No. 3, pp. 89-93.
- Koruna, S. (2004), "External technology commercialization – policy guidelines", *International Journal of Technology Management*, Vol. 27, pp. 241-54.
- Kurokawa, S. (1997), "Make-or-buy decisions in R&D: small technology based firms in the United States and Japan", *IEEE Transactions on Engineering Management*, Vol. 44 No. 2, pp. 124-34.
- Lamoreaux, N.R. and Sokoloff, K.L. (1998), "Inventors, firms, and the market for technology: US manufacturing in the late nineteenth and early twentieth centuries", in Lamoreaux, N.R.,

- Raff, D. and Temins, P. (Eds), *Learning by Firms, Organizations, and Nations*, The University of Chicago Press, Chicago, IL/London, pp. 19-57.
- Lane, P.J. and Lubatkin, M. (1998), "Relative absorptive capacity and interorganizational learning", *Strategic Management Journal*, Vol. 19, pp. 461-77.
- Laursen, K. and Salter, A. (2006), "Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms", *Strategic Management Journal*, Vol. 27, pp. 131-50.
- Lichtenthaler, U. (2005), "External commercialization of knowledge: review and research agenda", *International Journal of Management Reviews*, Vol. 7 No. 4, pp. 231-55.
- Lichtenthaler, U. (2006a), "Technology exploitation strategies in the context of open innovation", *Intellectual Journal of Technology Intelligence and Planning*, Vol. 2 No. 1, pp. 1-21.
- Lichtenthaler, U. (2006b), "Trading intellectual property in the new economy", *International Journal of Intellectual Property Management*, Vol. 1, pp. 241-52.
- Lichtenthaler, U. and Ernst, H. (2006), "Attitudes to externally organising knowledge management tasks: a review, reconsideration and extension of the NIH syndrome", *R&D Management*, Vol. 36 No. 4, pp. 367-86.
- Lichtenthaler, U. and Lichtenthaler, E. (2004), "Organization of international external technology acquisition projects", *International Journal of Technology Transfer and Commercialisation*, Vol. 3 No. 3, pp. 291-307.
- Lieberman, M.B. (1989), "The learning curve, technology barriers to entry, and competitive survival in the chemical processing industries", *Strategic Management Journal*, Vol. 10, pp. 431-47.
- Lorange, P. (1980), *Corporate Planning: An Executive Viewpoint*, Prentice-Hall, Englewood Cliffs, NJ.
- Lowe, J. and Taylor, P. (1998), "R&D and technology purchase through license agreements: complementary strategies and complementary assets", *R&D Management*, Vol. 28 No. 4, pp. 263-78.
- Madhavan, R. and Grover, R. (1998), "From embedded knowledge to embodied knowledge: new product development as knowledge management", *Journal of Marketing*, Vol. 62 No. 4, pp. 1-12.
- March, J.G. (1991), "Exploration and exploitation in organizational learning", *Organization Science*, Vol. 2 No. 1, pp. 71-87.
- Markides, C. (1998), "Strategic innovation in established companies", *Sloan Management Review*, Vol. 39 No. 3, pp. 31-42.
- Martinez, J.I. and Jarillo, J.C. (1991), "Coordination demands of international strategies", *Journal of International Business Studies*, Vol. 22, third quarter, pp. 429-44.
- Mintzberg, H. (1994), "The fall and rise of strategic planning", *Harvard Business Review*, Vol. 72, January-February, pp. 107-14.
- Mintzberg, H., Ahlstrand, B. and Lampel, J. (1998), *Strategy Safari: A Guided Tour through the Wilds of Strategic Management*, Free Press, New York, NY.
- Nelson, R.R. and Winter, S.G. (1982), *An Evolutionary Theory of Economic Change*, Belknap Press, Cambridge, MA.
- Nonaka, I. and Takeuchi, H. (1995), *The Knowledge-creating Company: How Japanese Companies Create the Dynamics of Innovation*, Oxford University Press, New York, NY.
- O'Regan, N. and Ghobadian, A. (2004), "The importance of capabilities for strategic direction and performance", *Management Decision*, Vol. 42 No. 2, pp. 292-312.

- O'Regan, N., Ghobadian, A. and Sims, M. (2006), "Fast tracking innovation in manufacturing SMEs", *Technovation*, Vol. 26 No. 2, pp. 251-61.
- Pisano, G.P. (1990), "The R&D boundaries of the firm: an empirical analysis", *Administrative Science Quarterly*, Vol. 35 No. 1, pp. 153-76.
- Porter, M.E. (1979), "How competitive forces shape strategy", *Harvard Business Review*, Vol. 57 No. 2, pp. 137-45.
- Porter, M.E. (1980), *Competitive Strategy*, Free Press, New York, NY.
- Porter, M.E. (1987), "From competitive advantage to corporate strategy", *Harvard Business Review*, Vol. 65, May-June, pp. 43-59.
- Prahalad, C.K. and Hamel, G. (1990), "The core competence of the corporation", *Harvard Business Review*, Vol. 68 No. 3, pp. 79-91.
- Richter, A. and Schmidt, S.L. (2005), "How does strategy process influence strategy content? Antecedents of consistency between resource allocation decisions and corporate strategy", *Schmalenbach Business Review*, Vol. 57 No. 4, pp. 332-50.
- Rigby, D.K. and Zook, C. (2002), "Open-market innovation", *Harvard Business Review*, Vol. 80 No. 11, pp. 80-9.
- Rivette, K.G. and Kline, D. (2000), *Rembrandts in the Attic: Unlocking the Hidden Value of Patents*, Harvard Business School Press, Boston, MA.
- Root, F.R. (1994), *Entry Strategies for International Markets*, Lexington Books/Macmillan, New York, NY.
- Sanderson, S.M. (1998), "New approaches to strategy: new ways of thinking for the millennium", *Management Decision*, Vol. 36 No. 1, pp. 9-13.
- Santos, F.M. and Eisenhardt, K.M. (2005), "Organizational boundaries and theories of organization", *Organization Science*, Vol. 16 No. 5, pp. 491-508.
- Seely Brown, J. and Duguid, P. (1998), "Organizing knowledge", *California Management Review*, Vol. 40 No. 3, pp. 90-111.
- Sherman, J.D., Berkowitz, D. and Souder, W.E. (2005), "New product development performance and the interaction of cross-functional integration and knowledge management", *Journal of Product Innovation Management*, Vol. 22 No. 5, pp. 399-411.
- Shuchman, L. (2004), "Redmond turns blue", *IP Law & Business*, April, pp. 34-7.
- Smothers, N. (1990), "Patterns of Japanese strategy: strategic combinations of strategies", *Strategic Management Journal*, Vol. 11 No. 7, pp. 521-33.
- Spender, J.-C. (1996), "Making knowledge the basis of a dynamic theory of the firm", *Strategic Management Journal*, Vol. 17, Winter, special issue, pp. 45-62.
- Sullivan, P.H. and Fox, S.P. (1996), "Establishing an out-licensing activity", in Parr, R.L. and Sullivan, P.H. (Eds), *Technology Licensing: Corporate Strategies for Maximizing Value*, John Wiley & Sons, New York, NY, pp. 83-96.
- Szulanski, G. (1996), "Exploring internal stickiness: impediments to the transfer of best practice within the firm", *Strategic Management Journal*, Vol. 17, Winter, special issue, pp. 27-43.
- Teece, D.J. (1981), "The market for know-how and the efficient international transfer of technology", *Annals of the Academy of Political and Social Science*, No. 458, pp. 81-96.
- Teece, D.J. (1986), "Profiting from technological innovation: implications for integration, collaboration, licensing and public policy", *Research Policy*, Vol. 15 No. 6, pp. 285-305.
- Teece, D.J. (1998), "Capturing value from knowledge assets: the new economy, markets for know-how, and intangible assets", *California Management Review*, Vol. 40 No. 3, pp. 55-79.

-
- Teece, D.J. (2000), *Managing Intellectual Capital: Organizational, Strategic, and Policy Dimensions*, Oxford University Press, Oxford/New York, NY.
- Teece, D.J., Pisano, G. and Shuen, A. (1997), "Dynamic capabilities and strategic management", *Strategic Management Journal*, Vol. 18 No. 7, pp. 509-33.
- Thomas, H. and Pollock, T. (1999), "From I-O economics' S-C-P paradigm through strategic groups to competence-based competition: reflections on the puzzle of competitive strategy", *British Journal of Management*, Vol. 10 No. 2, pp. 127-40.
- Tschirky, H., Escher, J.-P., Tokdemir, D. and Belz, C. (2000), "Technology marketing: a new core competence of technology-intensive enterprises", *International Journal of Technology Management*, Vol. 20 Nos 3/4, pp. 459-74.
- Tsoukas, H. (1996), "The firm as a distributed knowledge system: a constructionist approach", *Strategic Management Journal*, Vol. 17, Winter, special issue, pp. 11-25.
- van den Bosch, F.A.J., Volberda, H.W. and de Boer, M. (1999), "Coevolution of firm absorptive capacity and knowledge environment: organizational forms and combinative capabilities", *Organization Science*, Vol. 10 No. 5, pp. 551-68.
- Veugelers, R. (1997), "Internal R&D expenditures and external technology sourcing", *Research Policy*, Vol. 26 No. 3, pp. 303-15.
- Veugelers, R. and Cassiman, B. (1999), "Make and buy in innovation strategies: evidence from Belgian manufacturing firms", *Research Policy*, Vol. 28 No. 1, pp. 63-80.
- Vickery, G. (1988), "A survey of international technology licensing", *STI Review*, December, pp. 7-49.
- Wernerfelt, B. (1984), "A resource-based view of the firm", *Strategic Management Journal*, Vol. 5, April-June, pp. 171-80.
- Zack, M.H. (1999), "Developing a knowledge strategy", *California Management Review*, Vol. 41 No. 3, pp. 125-45.

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