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A model for assessing the coherence of companies' knowledge strategy

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Abstract
This paper proposes a strategic model for assessing the coherence between companies' knowledge strategies and their business strategies as well as in their competitive and organisational contexts. In analysing knowledge management literature, we locate three principal strategies: (1) knowledge development (internal or external), (2) knowledge sharing (codification or personalisation) and (3) knowledge exploitation (internal or external). We then position the three strategies and six related policies in the context-content-process dimensions of Pettigrew's model to create a useful framework for strategic analysis and a model to assess the coherence of companies' knowledge strategy. The model can be used to evaluate how an existing knowledge strategy aligns with a company's characteristics and to formulate and implement a coherent knowledge strategy based on the current competitive environment, organisational context and business strategy.
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Introduction

Over the last two decades, managers, consultants and scholars have increasingly been turning attention to issues related to knowledge management (KM), demonstrating a particular interest in strategies and corporate policies that could be more effective in preserving and developing the intangible assets that determine and increase companies' competitive advantages.

This stream of studies on KM is inextricably linked to the resource-based theory (or resource-based view) of the firm. According to this theory, a company's growth and performance are influenced by its resources and capabilities (Penrose, 1959; Wernerfelt, 1984). Organisational knowledge, represented by know-how, culture, routines and experiences, is characterised by its inimitability and generates added value for customers and scarcity for competitors (Barney, 1991), thereby creating a competitive advantage. Competitive advantage is not only linked to the presence of a high level of know-how and specific or inimitable knowledge within the company but is also fundamental to the creation of new knowledge that is useful to constantly further the existing competitive advantage (Grant & Spender, 1996; Alavi & Leidner, 2001). For these reasons, KM, defined as management of all processes involving knowledge (Nonaka, 1994; Quintas *et al*, 1997; Waltz, 2003; Watson & Hewett, 2006), has attracted increasing interest in recent years.

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Companies' KM can be viewed through at least four perspectives.

The first perspective focuses on defining the processes that characterise KM, for example, how knowledge is created, developed, stored and reused within a business environment (e.g. Alavi & Leidner, 2001; Dewett & Jones, 2001; Zahra & George, 2002; Argote *et al*, 2003; Wijnhoven, 2003; Alavi *et al*, 2006; Rodriguez-Elias *et al*, 2008).

The second perspective concerns the analysis and application of techniques and tools that support KM. One basic assumption is that KM processes can be managed more effectively through the most appropriate use of information and communication technologies (ICT) (Lindvall *et al*, 2003). Even if technology is not the sole factor to consider when implementing a KM project (Tsui, 2002), there is no doubt that it plays an important role as a catalyst for success (Rodriguez-Elias *et al*, 2008). Many authors, however, stress that implementing useful tools is not sufficient to achieving a successful KM project (Tsui, 2002; Alavi *et al*, 2006; Halawi *et al*, 2006).

A third perspective concerns the evaluation of KM and intangible assets in general. According to this view, intangible assets are divided into three main categories of capital: human capital, structural capital and relational capital (Edvinsson, 1997; Edvinsson & Malone, 1997; Roos & Roos, 1997; Roos *et al*, 1997; Sveiby, 1997).

The final perspective concerns the formulation and implementation of companies' knowledge strategies (Hansen *et al*, 1999; Zack, 1999, Beckett *et al*, 2000; Bierly & Daly, 2002, Choi *et al*, 2008). Here, the fundamental assumption is that the real competitive advantage of KM remains only a potential advantage if it is not linked to the *strategy* that drives business (Hansen *et al*, 1999; Zack, 1999; Smith, 2004; Halawi *et al*, 2006) as well as its *organisational context and competitive environment* (Wang, 2001; Droge *et al*, 2003; Thornill, 2006; Merono Cerdan *et al*, 2007).

In the existing literature, compared to the first three perspectives (processes, tools and evaluation), the topic of knowledge management strategy, or *Knowledge Strategy*, has been under researched and has only been studied in a fragmentary way. Furthermore, scholars have primarily focused on a particular policy of the companies' knowledge strategy rather than on proposing a comprehensive strategic framework. Consequently, the principal aim of our research is to close this gap in studies of knowledge strategies and companies' strategies. The majority of the existing contributions to knowledge strategies focus on a specific knowledge strategy instead of presenting a full picture or, if they do attempt a more comprehensive analysis, a complete framework of reference that allows managers to align different companies' strategies (business strategy, organisational and competitive contexts) to knowledge strategies is missing.

Taking these considerations as a point of departure, our research aims to propose a model that assesses the coherence between a company's knowledge strategy and its business strategy as well as in its competitive and organisational contexts. In analysing the KM literature, we found three fundamental knowledge strategies and six related policies. We designed a useful framework for strategic analysis based on the context-content-process dimensions of Pettigrew's strategic model (Pettigrew, 1988; Pettigrew & Whipp, 1991). Our model links the strategies and policies associated with certain dimensions characterising competitive environment, business strategy and organisational context, which define the characteristics of businesses and allow for a coherent assessment of existing companies' knowledge strategies and a proper formulation of future KM policies. Finally, we discuss the results and limits of our research and propose future directions.

The contributions of this paper are aimed at providing a framework (1) to assess the coherence between knowledge strategies and business strategies and (2) to help managers identify the most suitable knowledge strategies for their company given the firm's context and business strategy.

Knowledge strategy and policies

The relevance of knowledge assets as fundamental strategic factors in business success has been widely recognised in today's competitive scenario (Barney, 1991; Grant, 1991; Drucker, 1993). In fact, more and more organisations credit their competitiveness to their knowledge assets and consider knowledge to be the differentiating competitive lever in a knowledge economy (Nonaka & Takeuchi, 1995). In such an environment, suitable development, management and exploitation of a company's knowledge assets have become a strategic aspect to its success and a competitive priority.

Strategy can be essentially defined as a plan designed to achieve a particular long-term aim, while policy can be defined as a course or principle of action adopted or proposed by an organisation or individual (Oxford English Dictionary, 2008). Following the characterisation of the three strategic dimensions of Pettigrew's content-context-process strategic model (Pettigrew, 1988; Pettigrew & Whipp, 1991), we consider *knowledge strategy* to be the *strategy content* (the objective/result of strategy activities) and *knowledge policy* to be the *strategy process* (the plan of strategy activities to reach the desired results). Consequently, for a single strategy, there can be multiple policies. Therefore, knowledge strategy formulation should be related to context (internal and external) and should plan the processes in this context to successfully achieve an overall goal or objective (Pettigrew, 1992) or to move the company forward incrementally (Mintzberg, 1994).

Based on a review of the literature, we have identified three primary knowledge strategies:

- *Knowledge development*, characterised by the two policies of *internal* and *external development* (or *exploration*) of organisational knowledge, as stated in Zack's (1999)

seminal contribution and subsequently developed by Beckett *et al* (2000), Bierly & Daly (2002), Maier & Remus (2003), Pai (2005) and Choi *et al* (2008).
- *Knowledge sharing*, characterised by the two policies of *personalisation* and *codification* of organisational knowledge, as stated in the seminal contribution of Hansen *et al* (1999) and subsequently developed by Beckett *et al* (2000), Schulz & Jobe (2001), Maier & Remus (2003), Choi & Lee (2003), Scheepers *et al* (2004), Jasimuddin *et al* (2005) and Choi *et al* (2008).
- *Knowledge exploitation*, characterised by the two policies of *internal* and *external exploitation* of organisational knowledge, as stated by Beckett *et al* (2000) and subsequently taken up by Chesbrough (2003), McKenzie & Van Winkelen (2004) and Lichtenthaler (2007, 2008).

Knowledge development

The first KM strategy concerns the development (or exploration) of new knowledge. In his seminal piece, Zack (1999) divides companies into two categories:

- provincial firms, which explore internal knowledge resources (people's minds, intrinsic behaviours, procedures, software and equipment, knowledge recorded in documents or databases);
- cosmopolitan firms, which explore external sources of knowledge (publications, universities, government agencies, professional associations, personal relations, consultants, inter-organisational alliances).

Companies that develop knowledge internally possess a unique knowledge that is difficult to imitate. Conversely, the knowledge developed outside a company's boundaries is available to competitors and, in some situations, can be more expensive (e.g., consulting services) and difficult to transpose and implement in the own organisational context. However, exploration of external knowledge allows the firm to have different points of view and approaches to problem-solving. A company should be able to recognise the value of new external knowledge, assimilate it, and apply it to commercial ends, a process that is critical to its innovative capabilities. This ability, termed 'absorptive capacity' by Cohen & Levinthal (1990), is a function of the level of prior related knowledge (e.g., skills, shared scientific or technological developments, etc.).

Bierly & Daly (2002) also identify a strategy of knowledge development and distinguish two policies depending on the source, that is, internal and external knowledge exploration policies. Internal development of knowledge is inextricably linked to the processes of creation, integration and sharing of knowledge within organisational boundaries. Acquisition of external knowledge, however, consists of two steps: (1) organisational members' exposure to external sources of knowledge and (2) transfer of said knowledge within the company. The authors argue that the ideal situation is achieved by balancing internal and external sources of knowledge.

Another significant contribution emerges from the study by Choi *et al* (2008). Through an empirical study of 131 Korean companies, the authors identify precise links between knowledge development policies (internal or external) and knowledge sharing policies (discussed in the following sub-paragraph). In particular, their study shows that combining personalisation strategy with internal development of knowledge and combining codification strategy with external development of knowledge allow the company to achieve greater business performance. Regarding the internal-external development of knowledge (exploration strategy), the authors argue that a balance between these two policies increases the opportunities for the company to achieve higher performance.

Creating new knowledge is the basis of innovation and offers the promise of sustainable success in the future from new products/services. So the knowledge development literature overlaps with innovation strategy literature (Nevis *et al*, 1995; Chesbrough, 2003). Knowledge, in fact, can be seen as a resource base for the innovation process (Cohen & Levinthal, 1990). An organisation that focuses on internal learning can have more control over the development process and can better understand the nature of tacit knowledge (Chesbrough & Teece, 1996). Nevertheless knowledge development success comes when a fluid and flexible environment encourages interplay between tacit knowledge and explicit knowledge (McKenzie & van Winkelen, 2004). Chesbrough (2003) suggests that using internal sources of knowledge means having the people, infrastructure and capacity to create and acquire new knowledge without the need for external sources in the so-called closed innovation process. On the contrary, the open innovation model, in which a company makes use of external sources, such as collaborations with research institutions (universities, research laboratories, etc.), acquisitions of companies and start-ups of innovative projects, is a more flexible and efficient strategy.

Knowledge sharing

The knowledge sharing strategy is based on the most important classification of knowledge, that is, tacit and explicit knowledge (Polanyi, 1967; Nonaka, 1994). Therefore, starting from this integral concept, it is possible to relate two distinct but balanceable policies: codification and personalisation (Hansen *et al*, 1999).

Codification policy is based on the use of ICT tools: knowledge can be carefully codified and stored in databases from which it can be easily accessed by appropriate employees. Knowledge is encoded using a 'people-to-document approach'; it is stored by those who developed it, made available and independent and then reused. This approach allows many employees to find the necessary source of knowledge without having to contact the individual who originally developed it. This creates the opportunity for economies of scale in the reuse of codified knowledge.

Personalisation policy refers to a situation where knowledge is closely tied to those who developed it and is transmitted through direct contact among employees ('people-to-people' approach). In this case, the objective of ICT tools is to support communication flows of knowledge as opposed to storage. Knowledge is not codified – and in many cases it cannot be codified – and is directly exchanged between members of a company, through meetings and brainstorming or indirectly, through phone calls, e-mail and videoconferencing.

Knowledge sharing goals and strategies are rarely mentioned in a business strategy since the effectiveness of sharing practices is difficult to measure and sharing barriers are not sufficiently identified (Riege, 2005). Nevertheless the academic literature on knowledge sharing strategy is wide-ranging (e.g. DiBella *et al*, 1996; Beckett *et al*, 2000; Schulz & Jobe, 2001; Maier & Remus, 2003; Jasimuddin *et al*, 2005; Wu & Lee, 2007; Choi *et al*, 2008), and the classification between personalisation and codification of knowledge, which reflects Polanyi's (1967) historical division between explicit and tacit knowledge, is universally recognised and accepted. However, there exists an academic debate concerning the balance between and focalization of the two policies of knowledge sharing. Table 1 summarizes the debate.

Hansen *et al* (1999) note that majority of companies use both policies but do not use them equally. DiBella *et al* (1996) suggest that the best approach is an 80/20 balance, that is, focusing on one policy and using the other as a support. The choice of policy must reflect the company's business strategy, particularly, how it creates value for customers, generates profit and manages its staff. In this way, if the nature of the business drives the organisation to face similar problems, it is convenient to adopt the codification policy to gain efficiency by reusing codified knowledge. This policy is, therefore, preferred in the case of firms producing standardised products in a mature market and when the knowledge can easily be made explicit. Consequently, employees are more focused on the reuse of existing knowledge rather than on the development of new knowledge. However, if the company's problems are unique and not repetitive and the value for the customer is provided by highly customised products, then a personalisation policy for knowledge sharing is suggested. In this context, employees must be able to deal with different situations that are not resolvable with standard procedures.

Scheepers *et al* (2004) propose an improvement to Hansen *et al*'s strategic model: knowledge sharing strategy should not be a mix of codification and personalisation policies (80/20) that is constant over time but must instead be dynamic. Therefore, the combination of the two policies should follow a developmental path leading to an effective use of knowledge through both dimensions (codification and personalisation). Therefore, an 80/20 mix of codification and personalisation (or vice versa) is desirable when initially implementing the strategy (the authors agree with Hansen *et al* that in the initial phase, emphasis on both strategies would be risky), but there are two possible evolutionary paths that should lead the companies to a 50/50 strategy. The choice of which of the two paths is best for each company depends not only on the nature of the business but also on other factors, such as the corporate culture.

Choi & Lee (2003) also examine codification and personalisation strategies but define them as system-orientation and human-orientation knowledge strategies (or explicit-oriented and tacit-oriented for knowledge processing). Of these two dimensions (explicit and tacit knowledge), they delineate four KM styles:

(1) Passive style, which places little emphasis on codification (explicit knowledge) and personalisation (tacit knowledge). Knowledge is not managed in a systemic and rigorous way, and there are neither IT nor organisational tools to manage it. Companies in this situation essentially do not exploit their knowledge.

(2) System-oriented style, which places emphasis on the codification and reuse of knowledge. Companies use IT tools to reduce complexity in accessing and using knowledge and access economies of scale through the reuse of codified knowledge.

(3) Human-oriented style, which places emphasis on the acquisition and sharing of tacit knowledge and interpersonal experiences. Knowledge stems from informal organisational networks; it is not searched in databases and repositories but is shared informally (De Toni & Nonino, 2010). Communication and trust are critical factors of success.

Table 1 Mapping of the knowledge sharing debate: balance *vs.* focus strategy

Author	Year	*Knowledge sharing*	
		Codification vs. Personalization	
		Balance (50/50)	*Focus (80/20)*
DiBella, Nevis and Gould	1996		X
Hansen, Nohria and Tierney	1999		X
Choi and Lee	2003	X	
Scheepers, Venkitachalam and Gibbs	2004	X	
Choi, Poon and Davis	2008		X

(4) Dynamic style, which places emphasis on the management of tacit knowledge (personalisation) and on the management of explicit knowledge (codification). These organisations are typically communication-intensive and supported by powerful ICT systems because they gain a competitive advantage from their own knowledge.

Through this model, Choi & Lee (2003) propose the first criterion for choosing one strategy over another. They argue that there is no need to focus on one of the two strategies and use the other only as support; rather, developing both in a dynamic style leads to superior performance. Moreover, in line with Scheepers *et al*, they suggest a dynamic strategy that changes over time according to a set of parameters, above all changes in industry knowledge.

Knowledge exploitation

Compared to the other two strategies, knowledge exploitation has been discussed the least in the KM literature. Despite this scarcity of research, we have identified some significant studies.

The strategy of exploitation of knowledge has the important objective of finalising the potential competitive advantage built through the realisation of the other two strategies (knowledge development/exploration and sharing). This strategy can lead to two distinct policies: the internal exploitation of knowledge and the external exploitation of knowledge (Beckett *et al*, 2000). In fact, there are two possible ways of profiting from the company's knowledge: (1) exploitation of knowledge that has been developed and codified in the organisation, in new product/service development or in organisational and strategic renewal (internal exploitation) and (2) selling knowledge and know-how outside the organisational boundaries (external exploitation), for example, through technical advice or transfer of patents.

Exploiting existing knowledge can bring short-term returns by improving efficiency and reducing cost (McKenzie & Van Winkelen, 2004). Lichtenthaler (2007) suggests that companies should adopt the strategy of external exploitation (e.g., through technology licensing) together with the 'classic' strategy of internal exploitation. In this way, companies may develop their external networks of business relationships and thus discover more opportunities to acquire knowledge beyond organisational boundaries. Companies are therefore constantly facing the 'keep-or-sell' dilemma of maintaining and exploiting their distinctive knowledge inside or selling it outside.

The exploitation of internal or external knowledge is made possible by the different dimensions of product and knowledge domains that characterise firms. An efficient internal exploitation of knowledge requires a perfect congruence between these two domains (Grant & Baden-Fuller, 2004 in Lichtenthaler, 2007). In reality, however, this congruence hardly exists, which creates conditions for the emergence of a knowledge market itself.

Although these two policies of exploitation are not mutually exclusive (as for internal-external development and personalisation-codification sharing), a company must choose either to develop skills to exploit their knowledge assets internally or to build different skills to exploit externally. This concept is linked with the open innovation model (Chesbrough, 2003).

In conclusion, the literature on knowledge exploitation suggests the existence of two policies: internal exploitation and external exploitation.

Adopting a policy of internal exploitation means that all the knowledge acquired, created and stored is then applied in the development of processes, products and services. In other words, all knowledge is transformed into know-how that remains within the company and 'embedded' in products. This policy creates competitive barriers because competitors can only see the finished product and cannot clearly identify all the hidden processes and activities.

The external exploiting of knowledge means that, in a controlled manner, the knowledge is sold outside through, for example, the sale of patents (Cohen, 1998; Beckett *et al*, 2000). In other words, a company that adopts a policy of exploitation sells its knowledge outside; for instance, companies with this kind of political exploitation are consulting firms that sell their knowledge and experiences to other companies.

Knowledge is a very important resource that is difficult to copy and creates a significant competitive advantage; for these reasons, a strategy based on transfer, even if controlled, is rarely adopted by traditional enterprises (manufacturing). However, this trend is currently undergoing a reversal of direction and a greater acceleration thanks to the dissemination of the open innovation model, which is seen as openness to the outside world, both in the acquisition and in the exploitation of knowledge (Chesbrough, 2003).

A model for assessing the coherence of companies' knowledge strategies

An analysis of literature on knowledge strategy allowed us to identify three knowledge strategies employed by companies: development (or exploration), sharing and exploitation. Hypothetically, a company should pursue all three strategies, according each the same level of importance, but limited resources creates a trade-off and requires their correct balance.

As highlighted in the introduction, many authors assert that knowledge strategy must be aligned with business strategy and with competitive and organisational contexts. The contextualist approach (Pettigrew, 1985) seemed to us the most adept and useful in defining a framework for the strategic analysis of KM.

We placed the three strategies and six policies in the Pettigrew's context-content-process framework. This model of strategy formulation was originally proposed by Pettigrew (1988) and further developed by Pettigrew & Whipp (1991) as a means of generating strategic change

and improving companies' competitive performance. Pettigrew (1988) suggested that organisational strategy should be formulated and reformulated by exploring three essential dimensions: context, content and process. Implementing strategy and strategic change is a continuous process occurring in given contexts where the overall coherence between process and content has a critical influence on organisational performance (Pettigrew & Whipp, 1991).

According to this strategic model, which is subdivided into three interacting elements, a company must perform three macro-analyses to formulate and implement its knowledge strategy:

- Context (Where?): analysis of internal and external characteristics that influence the company in the development of the knowledge strategy. Internal context is constituted by those organisational elements that influence the companies' change, while external context refers to the competitive environment in which the organisation operates.
- Content (What?): analysis of objectives, key skills, profiles involved in the development of the company's strategy, knowledge assets and the financial, economic, organisational and human resources needed and available to properly develop the knowledge strategy and to create and maintain a competitive advantage.
- Process (How?): defining policies for managing knowledge assets to achieve the objectives that were defined in the content section; in particular, the process defines what steps the strategic process (Mintzberg, 1994), the decision-making process, the knowledge-strategy process (Hansen *et al*, 1999) and the organisational-setting process should follow.

From this framework, we propose the following KM strategic model:

- Context (Where?): the company analyses the business context to properly align KM strategies and policies. Context can be subdivided into external (competitive environment) and internal context (business strategy and organisational context).
- Content (What?): the company decides how to allocate resources among the three knowledge strategies (development *vs*. sharing *vs*. exploitation).
- Process (How?): How does company want to achieve the knowledge strategy goals? Which policy does the company want to pursue? For example, regarding development strategy, the question arises of whether to develop new knowledge internally or externally as well as how to do that.

Figure 1 illustrates our knowledge strategy framework.

A final consideration concerns the balance between implementing the different knowledge strategies. The dualism between development (exploration) and exploitation has been widely debated, but the knowledge sharing strategy has not been considered. Based on this debate, there are two opposing trends: some authors (March, 1991; Zack, 1999; McKenzie & Van Winkelen, 2004; Bierly & Daly, 2007) suggest that the winning approach is to balance the two strategies, while others (Bierly & Chakrabarti, 1996; Bierly & Daly, 2002) argue the need to focus on one of the two strategies. The argument supporting the first thesis is the non-exclusivity of exploration and exploitation: exploration without exploitation is not economically sustainable in the long term because the latter provides profits for the whole organisation (Zack, 1999).

However, the second thesis is supported by the fact that a company needs a large amount of resources to

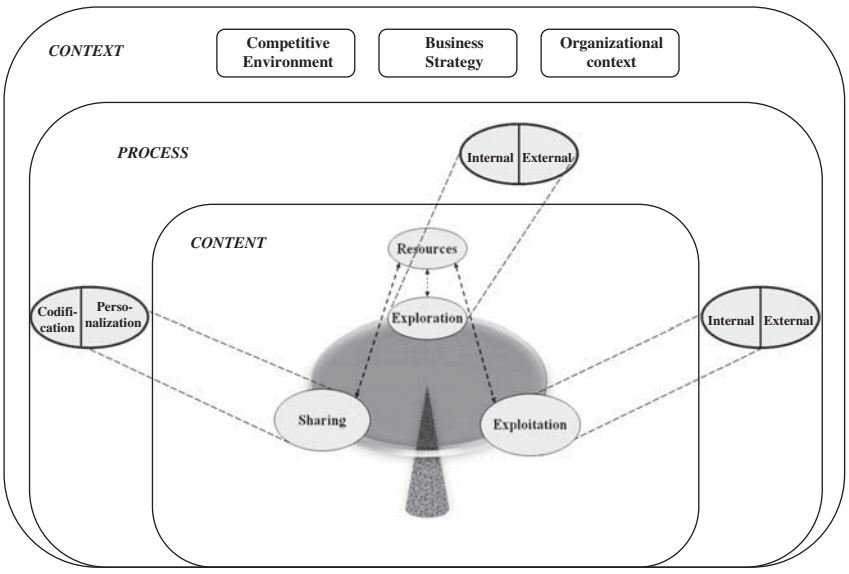

Figure 1 A framework for the strategic analysis of companies' knowledge strategies

properly develop and follow both strategies (Bierly & Daly, 2002).

A model for linking knowledge strategies to business context and strategies

Our research objective has been to propose a strategic model to assess the coherence of a company's knowledge strategy (as-is state) with the characteristics of the business and to formulate a proper knowledge strategy (to-be state). Consequently, starting from the framework proposed above, through further literature analysis, we have identified several dimensions that characterise the competitive environment, the organisational context and business strategy as well as which should be aligned to the three essential KM strategies and related policies.

These dimensions are linked in a model shown in Figure 2 and are based on certain theoretical assumptions.

The business strategy adopted by an organisation can be formulated starting from an analysis of the competitive environment and organisational context but is also strongly influenced by the company's vision, mission and values. The classical theories of enterprise, such as industrial organisation, argue that enterprise strategy is highly dependent on market structure (Bain, 1951, 1954; Mason, 1959; Stigler, 1961; McGee & Thomas, 1986). The resource-based view theory, however, argues that the company's business strategy is shaped by its unique and inimitable resources, capabilities and expertise (De Toni & Tonchia, 2002). The relationship between business strategy and organisational context, however, cannot be considered unidirectional because, as demonstrated in Ward & Duray's (2000) study of a large set of U.S. companies, business strategy in turn influences the internal organisational context. Finally, vision, mission and values represent the original business idea and influence the determination of business strategy, as they determine the organisation's lines of thought and culture and the future objectives and resources to achieve them.

Our literature review focused on competitive environment, business strategy and organisational context, as it would be very difficult to identify dimensions of vision, mission and values that would allow the analysis of their many facets.

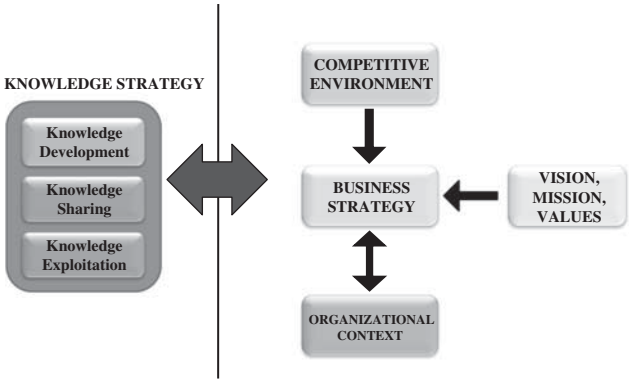

Figure 2 A model for assessing the coherence of companies' knowledge strategies

The resources of an organisation are made up of tangible and intangible assets, which allow implementation of the company's strategy (Amit & Schoemaker, 1993), with knowledge occupying a leading position in the company's resources. This is one of the fundamental theoretical assumptions of the so-called knowledge-based theory of the firm (Nonaka & Takeuchi, 1995; Grant, 1996; Spender, 1996a, 1996b; Cole, 1998), which argues that knowledge is a firm's most strategically significant resource (Zack, 2005). This theoretical and empirical background justifies the existence and the need of a link between knowledge strategy (left area) and the three dimensions described above (competitive environment, business strategy and organisational context – right area) which represents the core of our model for assessing the coherence of companies' knowledge strategies. After defining the dimensions that constitute the three macro-areas, we searched for linkages between these dimensions.

Dimensions characterising competitive environment, business strategy and organisational context

Analysis of the literature allowed us to identify certain variables that describe a company's competitive environment (two variables), business strategy (six variables) and organisational context (13 variables), representing the context dimension inside our strategic framework. Among all possible variables identified in the literature, we selected only those directly or inversely correlated with the three knowledge strategies and with the six policies respectively representing the content and process dimensions in particular.

Competitive environment can be characterised using two dimensions:

1. *Market dynamism*, that is, the level of innovation in production/logistics processes, obsolescence of products, unpredictability of the market, ability to monitor the macro trends of the market (Droge *et al*, 2003).
2. *Competitive pressure*, that is, analysis of the well-known five competitive forces model developed by Porter (1985); in particular, the intensity of the competitive market can be investigated through three dimensions (Wang, 2001):
   - bargaining power of customers;
   - the intensity of competitive rivalry;
   - threat of substitute products or services.

Business strategy can be analysed using the following dimensions:

1. *Aggressiveness of competitive strategy* as defined in the model proposed by Miles & Snow (1978), which provides the definition of corporate strategy using four strategic typologies: prospector, analyzer, defender, reactor. The level of aggressiveness and company

typology must be aligned with knowledge sharing and exploitation strategies (Hult *et al*, 2006).
2. *Product standardisation*, that is, the level of standardisation/customisation of company's products (Hansen *et al*, 1999) and the manufacturing process that characterises the firm (e.g., custom production, small batch (or job shop) production, large batch production, mass assembly production, continuous process production) (Miller & Roth, 1994).
3. *Propensity to external relationship*, defined by a willingness to carry out acquisitions, agreements or strategic inter-organisational relationships (Zahra & George, 2002).
4. *Rate of new products' introduction* to the market compared to competitors; number of new products/services that an organisation introduced the previous year (Smith *et al*, 2005). Droge *et al* (2003) suggest considering this an element of business strategy instead of an element of market dynamism because it is part of an overall strategic vision rather than a function of external environmental factors.
5. *Strategic orientation*, defined as cost leadership *vs*. differentiation (Porter, 1980) and people *vs*. technology (Greiner *et al*, 2007). For cost leadership, the organisation must be able to exploit every possible resource that will lead to cost advantages (e.g., economies of scale, proprietary technology, preferential access to suppliers or distributors, favourable location); differentiation strategy, however, requires the company to look for the uniqueness of knowledge assets and of certain attributes of products and services sold to customers.
6. *Centrality of top management*, evaluated on the basis of the authority to make decisions concerning the introduction of new products to the market, entry into new markets and pricing decisions (Wang, 2001). We cite examples of organisational structure through which an enterprise could be configured, in descending order of importance:
   - Functional Structure/Hierarchy: the most traditional structure. Provides a significant centralisation of power and is characterised by a lack of flexibility in strategic and organisational changes.
   - Divisional structure: in which each business unit, which is a division, is vested with great autonomy. Those features common to all strategic business units are maintained centrally.
   - Matrix structure: allows high flexibility and is the most appropriate for dealing with projects. It requires the presence of a new organisational profile: the project manager.

Finally, *organisational context* can be characterised by the following dimensions:

1. *Internal climate* is defined as inclination towards risk (Smith *et al*, 2005), presence of an ethical code shared across the organisation, presence of a climate of trust among employees and between employees and the organisation (Lucas & Ogilvie, 2006).
2. *Level of training/experience* is assessed based on the employees' education and average number of years working in the same industry (Smith *et al*, 2005).
3. *Team working inclination* is evaluated on the basis of the existence of working groups to address the critical situation (Smith *et al*, 2005) and the existence of interfunctional relationships (Lucas & Ogilvie, 2006).
4. *Centrality of functional units in the budgeting process*, that is, the level of importance of functional units in this particular process (Wang, 2001).
5. *Codification level*, that is, the existence of codification of procedures and the application of disciplinary procedures when rules are violated (Wang, 2001).
6. *Personal autonomy*: Nonaka *et al* (1996) suggest that the level of autonomy influences the processes of KM; this can be measured by investigating employees' level of autonomy in performing their duties and dealing with new criticalities; AscoltaTrascrizione fonetica.
7. *Communication intensity in the internal network* is defined by the frequency of contact with various hierarchical levels and with other functional areas and the average length of the relationship (Smith *et al*, 2005).
8. *Problems' complexity* is defined by the technological and social complexity of business problems (Bou-Llusar & Segarra-Cipres, 2006). Technological complexity is, therefore, judged according to the difficulties in implementation or understanding of technology solutions. Social complexity, however, regards the contrasts that may arise among employees dealing with various functions during problem-solving processes. Another way to define complexity problems concerns the nature of problems (repetitive, similar, new) (Greiner *et al*, 2007).
9. *Firm-specific knowledge*: Merono Cerdan *et al* (2007) analyse the knowledge intensity of a sector and distinguish between high and low knowledge intensity industries. In the first typology of industries, the importance of knowledge is greater; in fact, successful companies should have unique firm-specific knowledge assets dependent on their intrinsic characteristics. In contrast, in low-density knowledge industries, such as mature or declining industries, knowledge cannot be firm-specific because almost all companies follow the same processes and routines.
10. *Knowledge diversity and breadth* is evaluated on the basis of the academic experience, work and personal interests of the top management and on the heterogeneity of the working groups within the organisation (Goll *et al*, 2007).
11. *Incentives policy* refers to rewards for formal codification and reuse of knowledge (Lucas & Ogilvie, 2006).

12. *Firm dimension*, that is, small, medium or large, is based on turnover and staff (Real *et al*, 2006).
13. *Firm age* is estimated on the basis of years of activity in the industry or sector (Thornill, 2006). Alternatively, Zahra & George (2002) refer to the experience gained by a company as a product of environmental scanning, benchmarking, interaction with customers, alliances with other organisations and learning by doing.

The linkage between knowledge strategy and competitive environment, business strategy and organisational context

The objective of strategic assessment is to offer indications on how the company should manage knowledge, given the competitive environment in which it operates, the business strategy adopted and its organisational context. Using evidence from the literature, we designed a matrix and a strategic coherence assessment model that correlates the specific dimensions described above with the three knowledge strategies and particularly with the six policies previously identified.

This matrix (Figure 3) is central to our model for assessing the coherence of knowledge strategy. Because the correlations have been obtained by analysing the existing literature, any link identified is associated with specific evidence found in the literature, as shown in the Appendix. In the strategic coherence assessment model, the dots indicate a direct correlation between the variables/dimensions that are at the crossroads of the cell, while the diamonds show an inverse correlation.

The model is divided into two main sections: the section on the right correlates competitive environment, business strategy and organisational context with the knowledge strategies previously identified. The left section correlates the dimensions of competitive and organisational context with business strategy.

Analysis of the correlation matrix indicates, for example, that if the dynamism of the market increases, development of knowledge, whether internal or external, will likely also increase. This is due to the fact that in dynamic industries, knowledge obsolescence is greater; therefore, it is necessary to keep pace with technological innovations (Droge *et al*, 2003; Thornill, 2006).

The left section of the matrix (which, as mentioned above, indicates the relationship between competitive environment, business strategy and organisational context) allows for verifying the existence of a misalignment between business and knowledge strategies. In fact, such misalignments are not always due to incorrect implementation of the knowledge strategy but may be caused by misalignment among the dimensions that characterise the competitive environment, the organisational context and the business strategy.

Misalignment between a variable characterising the organisational context and a KM policy may suggest the need to modify the latter, moving the company to a more coherent knowledge strategy; nevertheless, the variable describing a single aspect of the organisational context could be misaligned with other organisational variables or with business strategy variables. Therefore, in this case, the problem moves from KM to organisational design or business strategy.

Finally, the left portion of the matrix supports strategic analysis and reinforces the relations on the right side. For example, we can consider the aggressiveness of competitive strategy, which is negatively correlated to the level of product standardisation and positively correlated to the rate of new product introduction. Knowledge sharing policies are perfectly coherent with these three variables: high aggressiveness of competitive

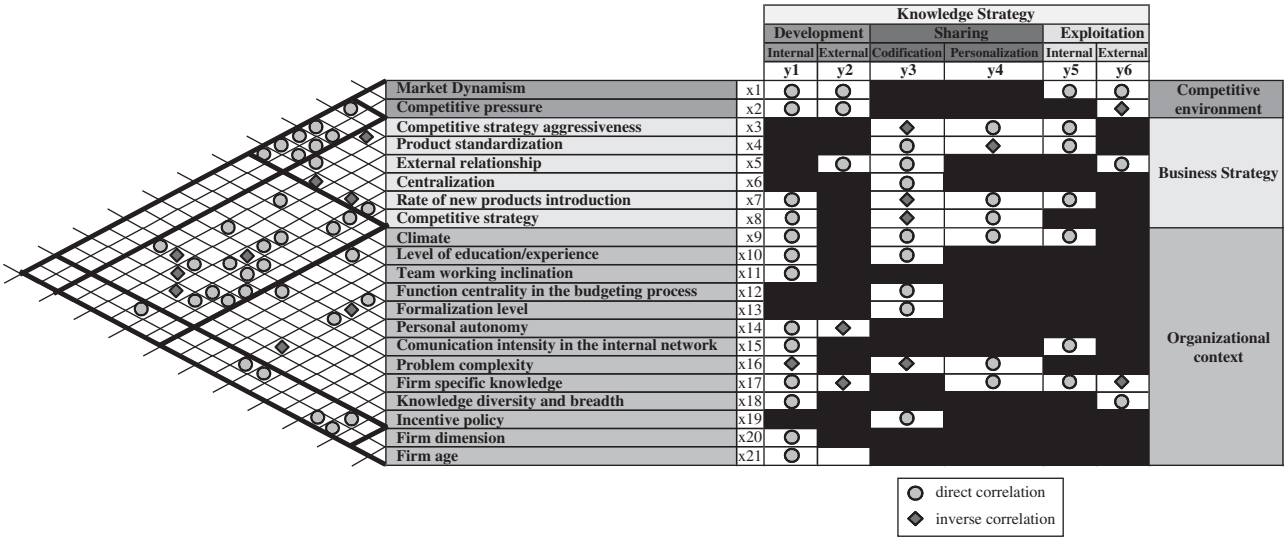

Figure 3 Correlation matrix for coherence assessment of companies' knowledge strategy

strategy and high rate of new products introduction, which are positively correlated, suggest a personalisation policy, while a high product standardisation requires a codification policy.

Conclusions, limitations and future directions of research

Based on an analysis of the existing literature, our theoretical research allowed us to develop a strategic framework and a model based on a correlation matrix for coherence assessment of companies' knowledge strategies. The coherence assessment model has been designed to support the formulation and implementation of a KM strategy aligned to the particular context and business strategy of a company. We identified in the literature three main knowledge strategies, which respectively refer to the seminal contributions of Zack (1999), Hansen *et al* (1999) and Beckett *et al* (2000): (1) development of knowledge (internal or external), (2) sharing of knowledge (codification or personalisation strategy) and (3) exploitation of knowledge (internal or external). These dimensions have been correlated to several variables from the literature on competitive environment, business strategy and organisational context and have been summarised in a matrix.

Integrating the arguments proposed in our theoretical research based on the literature analysis, we can advance the following propositions:

Proposition 1: *As the coherence of company's knowledge strategy (policies) with the competitive environment, organisational context and business strategy increases (decreases), the business performance increase (decrease).*

Proposition 2: *The more the three fundamental knowledge strategies (six KM policies) are coherently balanced with the company's resources and with the competitive environment, organisational context and business strategy, the more the business performance increase.*

Our knowledge strategy assessment model can be applied generally. Starting from the dimensions and variables we proposed, it can be used to define a methodology for in-depth strategic analysis of a company's performance from the KM point of view but one that takes into account its particular context and business strategy. This methodology could be used for the following purposes:

- assessing the alignment of existing knowledge strategy (as-is state) with the company's characteristics;
- formulation of an ideal knowledge strategy as a balance of the three fundamental strategies (ideal to-be state) based on competitive environment, organisational context and business strategy.

The principal limitation of our research rests in its theoretical nature. The relationships between the variables of competitive environment, business strategy and organisational context and knowledge strategy as taken from the literature may be further developed and validated, for example, in a more extensive survey of various companies. Consequently, we argue that our results may serve as a starting point for future research and analysis of this topic. The following directions may be pursued in future research:

- design of a methodology for the assessment of knowledge strategy coherence and its validation through a field experiment;
- validation of certain correlations among dimensions that have not yet been proved through rigorous studies;
- empirical validation of the model by a survey of a large and diverse set of companies;
- identification of new dimensions and correlations among these dimensions.

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Appendix

Table A1 References of the correlation matrix for coherence assessment of companies' knowledge strategy

		Knowledge strategy					
		Development		*Sharing*		*Exploitation*	
		Internal	*External*	*Codification*	*Personalization*	*Internal*	*External*
Competitive environment							
Competitive environment	Market dynamism	Nonaka *et al* (1996); Droge *et al* (2003); Thornill (2006)	Chen & Lin (2004)			Droge *et al* (2003)	Dyer & Nobeoka (2000)
	Competitive pressure	Bierly & Daly (2002)	Bierly & Daly (2002)				Dyer & Nobeoka (2000)
Business strategy							
Business strategy	Competitive strategy aggressiveness			Hult *et al* (2006)	Hult *et al* (2006)	Hult *et al* (2006)	
	Product standardization			Hansen *et al* (1999)	Hansen *et al* (1999)	Droge *et al* (2003)	
	External relationship		Zahra & George (2002)	Zahra & George (2002)			Dyer & Nobeoka (2000); Chesbrough (2003)
	Centralization			Wang (2001)			
	Rate of new products introduction	Smith *et al* (2005); Greiner *et al* (2007)		Hansen *et al* (1999); Greiner *et al* (2007)	Hansen *et al* (1999); Greiner *et al* (2007)	Smith *et al* (2005); Brachos *et al* (2007)	
	Competitive strategy	Bierly & Daly (2002)		Greiner *et al* (2007)	Greiner *et al* (2007)		
Organizational context							
Organizational context	Climate	Smith *et al* (2005); Zárraga & Bonache (2005); Alavi *et al* (2006)		Watson & Hewett (2006)	Watson & Hewett (2006)	Brachos *et al* (2007)	
	Level of education/ experience	Smith *et al* (2005); Thornill (2006)		Watson & Hewett (2006)			
	Team working inclination	Smith *et al* (2005); Zárraga & Bonache (2005)					

Table A1 (*continued*)

	Knowledge strategy					
	Development		*Sharing*		*Exploitation*	
	Internal	*External*	*Codification*	*Personalization*	*Internal*	*External*
Function centrality in the budgeting process			Wang (2001)			
Formalization level Wang (2001)			Wang (2001)			
Personal autonomy	Nonaka *et al* (1996); Chen & Lin (2004)					
Comunication intensity in the internal network	Alavi & Leidner, 2001; Zahra & George, 2002; Smith *et al*, 2005; Zárraga & Bonache (2005)				Hansen *et al* (1999); Zahra & George (2002)	
Problem complexity	Bou-Llusar & Segarra- Cipres (2006)		Greiner *et al* (2007)	Greiner *et al* (2007)		
Firm specific knowledge	Chen & Lin (2004)	Chen & Lin (2004)		Merono Cerdan *et al* (2007)	Hayes *et al*, 1992	Hayes *et al*, 1992
Knowledge diversity and breadth	Argote *et al* (2003); Chen & Lin (2004); Smith *et al* (2005); Bou-Llusar & Segarra- Cipres (2006); Goll *et al* (2007)					Hayes *et al*, 1992
Incentive policy			Alavi & Leidner (2001)			
Firm dimension	Gopalakrishnan & Bierly (2006)					
Firm age	Chen & Lin (2004); Gopalakrishnan & Bierly (2006); Thornill (2006)	Zahra & George (2002)				

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