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A knowledge management approach to organizational competitive advantage: Evidence from the food sector

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Summary This paper uses a comparative case study approach to investigate how two small Italian food producers manage their knowledge. The first company under consideration is mainly focused on marketing, while the second on the technology knowledge domain. This paper enriches the existing literature by documenting examples of how companies can successfully manage organizational knowledge on the basis of their relative knowledge domain. This research claims that not only knowledge domain but also innovation behavior seem to be the contingencies that mostly impact on knowledge management system features. In fact, the different combinations of the two variables have deeply different requirements in terms of knowledge management.

Introduction

Knowledge has been recognized as an important source of competitive advantage and value creation (King and Zeithalm, 2003), as an indispensable ingredient for the development of dynamic core competencies and, more generally, as a determinant factor for firms with global ambitions. Moreover, knowledge that firms acquire is a dynamic resource that needs to be nourished and managed carefully. Although this is true for all industries, it is particularly relevant to all those traditional sectors where companies have to cope with globalisation, mature markets, increased customer service, cost reduction and changing purchasing behaviors. The food industry is among these and, due to its great impact on employment and economic output (Menrad, 2004), it has alerted the managerial and academic communities to understand the importance of how to create and effectively use knowledge based resources.

According to Murdoch and Miele (1999), the food industry is increasingly bifurcating into two main systems of production: on one hand, standardized, specialized production processes responding to economic standards of efficiency and competitiveness; on the other hand, localized, specialized production processes focused on environmental, nutritional, taste or health qualities. Although distinctions can be made between the two above-mentioned food systems from a theoretic standpoint, some case studies do show

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that there are no clear boundaries between them. For example, Murdoch and Miele (1999) provide two case studies that illustrate the complexity of contemporary food production in Italy. The first regards a large egg producer that gradually moved from standardized, generic egg production towards new 'natural' and 'animal-friendly' products dedicated to specific consumer groups. The second case involves a group of small organic producers that partially standardized their production processes. Other authors (e.g. Alfranca et al., 2003) claim that strong differences in terms of profit pools, innovation strategy and implementation exist and call for studies that point to within-industry differences.

Small and medium-sized enterprises (SMEs) dominate the European food industry. Italy exemplifies this situation as 90% of total companies are SMEs and only 7% have more than 20 employees (according to Federalimentare ISMEA, 2005). The food sector in Italy represents the second most important industry in terms of sales, 14% of which refers to export. The food industry is often categorized as a traditional, low-skilled, labour intensive and low-tech sector, where R&D activity is limited and patenting is rare (see e.g. Avermaete et al., 2004; Foresti, 2005).

Most innovations in the food industry come into being by applying and transferring knowledge from other sectors, as also confirmed by the flows of outbound and inbound patents in the sector (see e.g. Baldi, 2005). It is an industry where traditional knowledge (including cultural manifestations, production technologies, agricultural knowledge and literature) has great importance. Moreover, strong efforts are made, sometimes successfully, to use and protect this knowledge. Unfortunately, some contributions (e.g. Occelli, 2005) demonstrate that European policies and programs regarding safety and control, along with the forces of globalisation, seem to have a negative effect on that attempt to preserve knowledge.

This paper aims to offer new insights on how SMEs in the food industry manage, exploit and nourish their knowledge in order to gain a competitive advantage. It is worth noting that the focus here is on the relationship between knowledge management (KM) and competitive advantage, regardless of whether this passes through technological innovation, radical changes or a combination of these factors. The reason for this fine distinction is that the literature on innovation mainly tends to stress that innovation primarily occurs in reference to technology (see e.g. Nelson and Rosenberg, 1993) and that change is more significant than continuity. Contrary to this tendency, food producers are not necessarily avid technology users and they tend to focus mainly on continuous improvements of products, often line-extensions or me-too products, rather than on change. Some authors (e.g. Kanter, 1999) validate this choice by taking an even more cautious view of the impact of innovation on competitive advantage due to the high level of uncertainty involved that does not guarantee success.

This paper will present a brief theoretical background on methods and systems that can help companies in knowledge management, with a special focus on SMEs. Secondly, the research methodology will be described. Thirdly, empirical evidence from the cases will be provided; next, the results will be discussed and, finally, some conclusions will be drawn.

Theoretical background

The framework for knowledge management

In order to investigate how organizations manage, exploit and nourish their knowledge, this paper uses a framework for the analysis of organizations as knowledge systems (Holzner and Marx, 1979) composed of a collection of four knowledge processes: creation and/or acquisition (hereafter creation/acquisition); storage and retrieval; transfer and sharing; and application. The model, even though it dates back to the late 1970s, is still considered as a reference point for the knowledge management literature and provides a starting point for more recent models (e.g. Pentland, 1995; Alavi and Leidner, 2001). In fact, many of the frameworks developed widely overlap.

It is worth underlining that the concepts of knowledge and information tend to be used interchangeably throughout the literature and praxis (Kakabadse et al., 2001). For example, information management captured on corporate databases is often considered an example of corporate knowledge and knowledge management. Although information and data management are important pillars of knowledge management, knowledge management encompasses broader issues — in particular, the creation of processes and behaviors that allow people to transform information within the organization and create and share knowledge. Thus, knowledge management must encompass people, process, technology and culture.

Mindful that data and information management are integral to, but not exhaustive of knowledge management, the knowledge processes introduced above are briefly described here.

- Knowledge creation/acquisition is the process of generating knowledge internally and/or acquiring it from external sources. It is worth noting that the effective acquisition of knowledge from external sources depends on the ability of the firm to recognize the value of new external information, assimilate it and apply it to commercial ends. Cohen and Levinthal (1990) label this capability a firm's absorptive capacity, which is largely a function of the firm's level of prior related knowledge. According to this perspective, what is just information for some constitutes valuable knowledge for others and vice versa.
- Knowledge storage and retrieval refers to the processes of knowledge structuring and storing that make it more formalized and accessible.
- Knowledge transfer and sharing refers to the processes of transferring, disseminating and distributing knowledge in order to make it available to those who need it.
- Knowledge application can be defined as the process of incorporating knowledge into an organization's products, services and practices to derive value from it.

Knowledge management systems

In order to make these knowledge processes possible, different configurations of technical, organizational and managerial choices must be designed. Essentially, this is what is

meant by so-called knowledge management systems (KMSs). Previous years have witnessed the proliferation of classifications, definitions and methodologies for knowledge management and different approaches have been developed on the basis of varying degrees of importance given to the three elements. As an example, Hellstrom et al. (2001) distinguish between centralized and decentralized KMSs, the former mainly based on ICT (information and communication technology) solutions, the latter on human resources interactions. De Carvalho and Ferreira (2001) argue that, although technology is not the main component of a KMS, it would be ''a naive attitude'' to implement a KMS without any technological support, whereas Walsham (2001) claims that leveraging knowledge through ICT is often hard to achieve. Shin (2004) introduces a five cluster KMS classification: technological, intellectual asset, organizational learning, process and philosophical. These approaches can be classified into two broad types: soft and hard. The soft type is mainly focused on tacit knowledge and on the difficulties in sharing it between people. The hard type is focused on developing tools for storage and distribution of explicit knowledge. In the same vein, Hansen et al. (1999) distinguish two main approaches: the explicit approach and the tacit approach. The first mainly focuses on the storing and sharing of explicit knowledge, essentially by means of ICT (data warehousing, data mining, knowledge mapping, Internet, networks, etc.). The second is mainly based on the valorisation of tacit knowledge, essentially by means of social mechanisms (communities of practice, discourse, story-telling, etc.). Explicit knowledge is codified and communicated in symbolic forms or languages, while tacit knowledge resides in individuals' experiences and actions (Shin, 2004). Explicit and tacit are two coexisting dimensions of knowledge (Polanyi, 1967) and introducing them as two distinct kinds of knowledge is expedient to simplify modelling the concept (Nonaka and Takeuchi, 1995). It is worth noting that there is no consensus about the ''right'' balance between tools and practices for managing either explicit or tacit knowledge in KMSs. According to a main current in the literature, in line with Nonaka and Takeuchi (1995), tacit knowledge is the critical dimension knowledge inside organizations. Therefore, effective KMSs should focus on tacit knowledge, emphasizing knowledge sharing by interpersonal interaction. On the contrary, some authors (e.g. Choi and Lee, 2003) claim that both tacit and explicit knowledge may impact on corporate performance and thus they propose that companies manage explicit and tacit knowledge simultaneously (e.g. Jordan and Jones, 1997). Others still (e.g. Swap et al., 2001) suggest that companies should choose whether to pursue either explicit or tacit knowledge.

Knowledge management systems for small and medium enterprises

As noted by Wong (2005), most discussions on KMSs concern large organizations and little attention is paid specifically to SMEs. However, it can not be assumed that KMSs developed for large companies are suitable or readily transferable to SMEs (Wong and Aspinwall, 2004). What primarily emerges from the relatively scarce literature on the topic is that SMEs often have a limited vocabulary and understanding of knowledge management and often employ less systematic approaches (McAdam and Reid, 2001). Furthermore, they tend to adopt more operational rather than strategic instruments (uit Beijerse, 2000) and lack the adoption of computer based systems and techniques, both for storing (Lim and Klobas, 2000) and acquiring knowledge (Wickert and Herschel, 2001). Matlay (2000) claims that SMEs rarely manage their knowledge proactively in an attempt to enhance their competitive advantage. In addition, the majority of attention has been paid to SMEs in knowledge intensive sectors (for a definition of knowledge intensive sectors see Smith, 2002) assuming that the management of knowledge is more critical in those sectors due to a need for increased innovativeness (see e.g. Ruiz Mercader et al., 2006). Nevertheless, Alavi and Leidner (2001) underline that KMSs are appropriate not only for knowledge intensive SMEs, but also for a wider range of organizations.

Research methodology

This paper compares two case studies of localized, specialized small food producers in Italy in order to investigate how they manage, exploit and nourish their knowledge. In accordance with several authors (e.g. Swan and Scarbrough, 2001), who underline that KMSs need to be developed according to the purpose for which knowledge is ''being managed'', the knowledge domain in which companies target themselves has been investigated. Several knowledge domains have been suggested in the literature. Alavi and Leidner (1999) introduce marketing and sales, competition, human resources, customer service, internal company operations, suppliers, and business partners. Holtshouse (1999) speaks about 10 knowledge domains, such as building and mining customer knowledge bases and mapping networks of experts, among others. The present paper has adopted a classification suggested by uit Beijerse (2000) which includes the three broader knowledge domains of organization, marketing and technology.

Two companies have been selected: the first focuses on marketing, while the second focuses on the technology knowledge domain. It is worth noting that, in principle, companies should have knowledge in all the three domains; however, when investigating the organizations, it is expedient to define the knowledge domain in which they mainly target themselves.

Data collection was based on semi-structured interviews with the entrepreneurs and other informants considered as being knowledgeable about these areas (such as marketing or commercial managers, R&D managers, quality control managers, human resources managers and information system managers). Individual interviews lasted from 1 to 2 h and, whenever possible, they ended with group discussions. Moreover, site visits were performed and company documents (e.g. Internet web pages, balance sheets, internal reports) were examined. This study thus incorporates Kanter's (1977) suggestion that different sources of data be used to validate each other. Data collection was conducted over a period of six months and standard techniques for case studies were followed (Yin, 2003). After the transcription of the interviews, data was coded to identify themes, recurring

comments, and parameters that could be analysed with respect to the research issue.

In order to investigate the companies' knowledge management approaches, the actual existence of a systematic, explicit and deliberate KMS was verified. This does not mean that the paper adopts the view of those authors (e.g. Sveiby and Lloyd, 1987; Wiig, 1997; Lee and Yang, 2000) claiming that companies can be defined KM adopters only if they develop a set of systematic and explicit approaches and processes. On the contrary, in the present paper, also the companies that do not develop a systematic approach to KM are considered. In fact, in many cases, their strategies, structures and cultures unconsciously satisfy the most important requirements for KMSs. Determining the existence of a deliberate KM strategy in the company allowed the interview to be conducted with appropriate questions and wording. Secondly, the four knowledge processes pertaining to organizations were investigated, with close examination of the solutions that firms adopted. In particular, configurations of technological, managerial and organizational levers applied to perform each process have been discussed, while also taking into consideration suggestions from literature. Indeed, several authors provide summaries of tools derived from both empirical studies and literature reviews that can be used for managing the four knowledge processes (Hoegl and Schulze, 2005; Darroch and McNaughton, 2002; uit Beijerse, 2000). In particular, Hoegl and Shultze provide guidelines for the process of knowledge creation; uit Beijerse suggests tools that can be used for the nine knowledge phases mentioned in his work,[1] Darroch and McNaughton suggest tools for the three knowledge phases identified in their work to define knowledge management orientation.[2] Based on such references, Table 1 presents the checklist used for the interviews. It is worth noting that the instruments have been clustered on the basis of the knowledge process they mainly support, with the awareness that they may support several knowledge processes in reality. Clustering is useful in practice, but boundaries between clusters certainly may blur. For example, ''creating an open culture'' could support any knowledge process, but in this framework it has been considered, not without some arbitrariness, as an instrument to support knowledge creation.

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[1] uit Beijerse introduces nine possible knowledge streams within the organization: (1) determine the knowledge necessary, (2) determine the knowledge available, (3) determine the knowledge gap, (4) knowledge development, (5) knowledge acquisition, (6) knowledge lock, (7) knowledge sharing, (8) knowledge utilization and (9) evaluate (utilized) knowledge. These knowledge streams are included in the four knowledge processes adopted in this paper. In particular: streams 1—5 are included in the knowledge creation/acquisition process; stream 6 in knowledge storage/retrieval; stream 7 in knowledge transfer/sharing and streams 8—9 in knowledge application.

[2] Darroch and McNaughton identify three knowledge management components: (1) knowledge acquisition, (2) knowledge dissemination and (3) responsiveness to knowledge. In this paper, component 1 is included in the knowledge creation/acquisition process; component 2 in knowledge transfer/sharing and in storage/retrieval and component 3 in knowledge application.

The cases

This paper compares company C, which is mainly focused on the marketing knowledge domain, and company S, which is mainly focused on the technology knowledge domain. The two cases are part of a larger dataset that consists of several case studies in the food sector. These cases have been purposefully selected for this research in order to provide information-rich cases that describe KM in companies focused on different knowledge domains. The cases are comparable by number of employees and turnover, and both of them can be considered successful firms. As with most companies in the food sector (see e.g. Harmsen et al., 2000), both the companies are facing several challenges: internationalization, increasing power of food retailers (as will be clear in the following, this is not the case of C), changes in political environment, such as the introduction of ISO 9000 standards and HCCP (hazard analysis and critical control points) system, and changes at the consumer level, both in terms of demographic and social structure and in terms of needs and wants. Tables 2 and 3 summarize the main figures of these two firms: turnover, ROE, ROI and ROS.

It must not be surprising that the following subsections about the different knowledge processes are not uniform in length both within and between the two cases. In fact, as will be clear in the discussion, the companies focus on different knowledge processes, due to different purposes for which knowledge is ''being managed''. Thus, the most critical knowledge processes are treated in a more detailed manner than those considered as less important.

Case C

The setting

Company C is located in a small town on the northern coast of Italy and produces olive oil (virgin and extra virgin), preserves obtained from traditional recipes (vegetables in oil and sauces) and a line of cosmetics.

Company C is a family business that started in 1911 as a typography business and quickly started producing oil from local olive production and distributing it by mail. The typography activity continued along with the oil production, and it has persisted to the present. It is mainly dedicated to advertising the olive oil, printing price lists and communicating with customers. After some years the company started to buy olives and olive oil from selected producers in the Mediterranean area in order to face the increasing demand. Olives and oil purchased from external producers are accurately selected, processed, melted, refined, stored in large silos and bottled ''just in time'' in order to obtain top-quality oil. The process is strictly controlled and expert tasters are involved. Several years ago the cosmetic line was introduced. It now includes products such as soaps, shampoos, hair care products, moisturizing creams, etc. that make use of the oil's beneficial properties. These products are made by a specialized firm and are branded and distributed by Company C.

Until 2005, Company C used to distribute its products exclusively by mail, apart from their shop beside the plant. Recently, new rules to guarantee privacy have created

Table 1 Checklist for the interviews (based on uit Beijerse, 2000; Darroch and McNaughton, 2002; Hoegl and Schulze, 2005)

Creation/acquisition	Doing market research (or have it done)
	Doing research and development (or have it done)
	Doing a customer satisfaction study
	Involving knowledge of customers and suppliers
	Being market-oriented by obtaining customer and industry information;
	being sensitive to information about changes in the marketplace
	Working in partnership with international customers; and getting information from market surveys
	Experimenting, ''trial-and-error''
	Excusing employees for a certain amount of time to let them work out their ideas
	Hiring know-how
	Valuing employees' attitudes and opinions and encouraging employees to up-grade their skills
	Employing and retaining a large number of people trained in science, engineering or math
	Creating an open culture
	Creating organizational cultural conditions for the introduction of knowledge management
	Taking some time to read a trade journal
Storage	Databases
	The central archiving of projects of which the results are easily accessible for everyone
Transfer/sharing	Readily disseminating market information inside the organization
	Disseminating knowledge on-the-job
	Using technology (such as teleconferencing, videoconferencing and groupware)
	to facilitate communication;
	Facilitating a ''consultation culture''
	Facilitating private chats (informal events)
	Organizing after work get-togethers
	Creating work groups
	Intranet and other information technology
	Product and sales meetings
	Job rotation
	Electronic networks
	Using specific techniques such as quality circles
	Mentoring and coaching and written case notes
Application	Responding to knowledge about customers
	Responding to technology about competitors
	Responding to knowledge about technology

Table 2 Main figures of C

	2003	2004	2005
Sales	€107,582,048	€107,708,523	€110,986,769
ROE[a]	1.75%	7.41%	2.22%
ROTA[b]	0.79%	4.81%	2.98%
ROS[c]	0.57%	3.50%	2.06%

[a] Net income/shareholder equity.
[b] Income before interest and tax/(fixed assets + current assets).
[c] Income before interest and tax/sales.

Table 3 Main figures of S

	2003	2004	2005
Sales	€93,118,970	€113,278,125	€111,730,870
ROE	6.92%	7.83%	6.63%
ROTA	5.50%	5.84%	4.97%
ROS	3.22%	3.38%	3.02%

serious problems with regards to mail-order selling. In fact, on one hand, they impede contacting prospective customers by phone and, on the other, they block further communication with current clients, unless they explicitly manifest their desire to be contacted by the company. As a consequence of terminating phone campaigns, the company estimates losing 15,000—20,000 customers per year. For these reasons, the company is testing a new sales channel. On

December 2005, the company's first shop opened in the north east of the country. The shop is located in the centre of a medium-sized town and it looks like a ''food boutique''. The shop is managed like a showroom for the company's products: it intends to be a vehicle for knowing the company's products without becoming the main channel, which is to remain mail-order. Therefore, only small quantities of each item can be bought in the shop; for larger orders, the mail channel must be used. The marketing department head (hereafter C_Mkt) gives his opinion concerning the shop experiment: ''I am opposed to the shop

because it misleads sales. At the moment I prefer not to advertise the shop. Of course it was promoted locally but, for example, it is not mentioned on the web site. That's because an important element of our company's image is that you can't find our products in the shops''.

Company C is extremely focused on its customers, as the adoption of a direct channel demonstrates and permits. In fact, the choice of keeping direct contacts with customers, receiving orders and sending goods directly to homes, means building an exclusive relationship with them, based on loyalty and care. Moreover, the direct channel offers the opportunity to get to know customers better. For example, such knowledge can be used to improve products and services, as well as to design and measure the effectiveness of marketing campaigns.

The visit at Company C started with a sort of ''tour'' of the offices, the typography and the production plants. The setting was reminiscent of a long-established firm, steeped in traditions and experience. This impression is conveyed by floors and furniture made of olive tree wood, old geographic maps on the walls, a collection of ancient presses, jars and mills positioned in well-kept gardens, where two impressive old olive trees, dating back to 1000 years ago, make a fine show of themselves. The factory is open for visitors with two guided tours per day. In 1992, an Olive Tree museum, overlooking the luxurious garden, was inaugurated. It receives an average of over 30,000 visitors each year and it was granted the 1993 European Museum of the Year Award.

Knowledge creation/acquisition

Company C acquires knowledge from customer focus groups as well as through direct contacts with customers (mails, phones, contacts at fairs, etc.). As C_Mkt affirms: ''Our company has a hypertrophic correspondence department: eight full-time employees who have been in the company for a long time''.

Moreover, Company C acquires knowledge about market trends and competitors from several marketing research institutes and from the main sectorial publications and trade journals.

Knowledge storage and retrieval

The company has a data warehouse (DW) containing customer and sale data for the domestic market. It is an entity relationship-based DW focused on marketing functional area — which is recognized as the most strategic one. ''Before the introduction of the DW'', the ICT department head (hereafter C_ICT) explains, ''data had to be extracted by technicians through complex procedures: moreover, reports were available only in paper format. Now report design, data extraction, and marketing activity can all be carried out in the marketing department''. As regards the work in progress, the ICT Department is working at developing an intranet portal to archive and index documents such as emails and postal correspondence to and from customers, press articles, etc. As C_ICT reports: ''In order to develop a KM system, even informal documents, such as customer communications should be archived. In fact, customers are used to communicating with us by several means such

as email, mail, and phone in order to make complaints, express appreciation, offer suggestions, etc. This represents an incommensurable value for us and it would be worth recording this information effectively so it can be utilized as a future knowledge resource. Moreover, archiving all customer contacts in a database is essential to avoid a customer relation being in the hands of one single key employee''. In fact, C develops a customer relationship management (CRM) strategy for achieving stronger relationships with customers as well as for developing continuous learning through the collection and analysis of knowledge from customers. According to C_Mkt: ''There are many technological components to CRM, but thinking about CRM in primarily technological terms is a mistake. CRM, for us, is: emphasis on quality and investment in front-end people able to dialogue with customers!'' The position of C Mkt is in line with the extant literature which includes emphasis on quality and investing in human resources as among the most important components of CRM (for a review see Osarenkhoe and Bennani, 2007).

Knowledge transfer and sharing

The foundations for effective knowledge transfer and sharing in C are laid from the first time newly hired employees enter the firm. In fact, they have to spend their first 6 months in C visiting the various staff departments to come in contact with the firm in its various aspects, from production to marketing, and with the C way of doing business. According to the interviewees, this phase is very important to absorb the tacit knowledge permeating the firm and to build the basis for subsequent knowledge transfer and sharing.

Apart from interpersonal contacts, the company intranet is the main knowledge communication channel in the firm, where company and industry news are published, such as a press review on the oil sector, on C and its competitors, market trends, harvest information and awards received.

Knowledge application

Company C exploits the knowledge from its customers in order to create a company image that can fully meet customer expectations. For example, C_Mkt affirms that the company is perceived as a small olive oil producer that you can call to receive oil at home. Such an image is so deeply-rooted that company C frequently is not perceived as a mail-order selling company (in Italy the concept of mail-order selling is frequently associated with low quality, mass market products). In fact, a customer in a blind focus group declared that he had never bought anything by mail-order. Of course it was not true but, subsequently, the customer explained that he had not realized that purchasing oil from company C was considered mail-order. Another important aspect of the company image that incorporates knowledge of customers' expectations is its localness. As C_Mkt declares: ''Our customers really want to believe we produce oil locally even if they should know that only a minimal part of the national olive oil comes from our region''. Customers seem to attribute great importance to localness, as a recent episode showed clearly. Company C was planning to intro-

duce a new line of products, namely espresso coffee machines and the relative coffee capsules. This business seemed to be interesting for company C because channel synergies could be exploited. Therefore, the marketing department decided to test the idea in a customer focus group. C_Mkt reports: ''The customers expressed their utter disappointment. They couldn't accept that we wanted to sell coffee, which was perceived as unrelated to the territory where the company is located. The customers were worried that we could loose our typicality. As a consequence, we put a stop to the project''.

A further aspect that contributes to conveying the image of a company strictly linked to traditions and never forgetful of its origins is the typography activity. The typography represents the company's first set of competencies which has been dynamically reconverted to support the current core business. In fact, the marketing function takes great advantage of the flexibility and customization potential that internal typography services guarantee.

The company image is also conveyed through the frontline personnel, which is composed of call centre staff and the correspondence department, as well as the delivery service. It is not surprising that these kinds of personnel are directly and carefully selected by C_Mkt. In particular, the delivery personnel have to follow certain behavioral rules — which are formalized in a pamphlet — and also has to wear the company uniform. Call centre personnel receive orders and therefore they are also carefully selected. In fact, even though internet orders are on the rise, they continue to represent a fraction of the total (about 6%).

Company S

The setting

Company S is located in northern Italy and produces rice and a large variety of rice-based products, which are mainly distributed through large retailers. The company is a family business that started processing and commercialising raw rice from local growers in 1860. Taking advantage of technological innovation, the firm was able to enlarge its production. The current CEO is a member of the fifth generation of the family involved in the rice business. The company's focus on rice is strong, as the company mission clearly affirms with the words of its president and CEO: ''We are a company of dedicated people who create culture and value with rice''. The main goal declared by the firm is: ''To be, and to be recognized as, the best rice group in Europe''. What seems to best represent the recent company trend is their slogan: ''Reshaping rice''. The aim to give new shape and new fashion to rice is pursued through a new range of products that have been created to satisfy the growing attention of the consumers towards tasty and healthy delicacies. The product portfolio includes Italian rice selections, rice pasta, ready-made first courses (traditional ''risotto'' recipes), a seasoning line (rice oil and rice vinegar), a rice bread line (rice bread, rice crackers, rice breadsticks, salted rice snacks, etc.), a quick-cooking rice line (microwaveable rice), rice drinks and rice-based delicacies (rice milk, rice biscuits, rice flakes, etc.). The diversification of rice is obtained through a technological

breakthrough both in terms of using the most advanced machines and of a completely new approach to rice processing. In fact, rice waste, which is generated at every stage of the process, is reused for maximum efficiency and environmental preservation. Any waste from the production cycle becomes a key raw material for further processes. Hence, the outer shell of the grain is burnt in a unique power plant that generates energy. Similarly, rice bran, which is the external portion of the grain and which is very rich in fat, is used to produce rice bran oil. In addition, broken grains are puffed and are used as ingredients for other rice-based products. In 2004, the company CEO was deemed ''entrepreneur of the year — innovation sector'' for his commitment to innovation.

The head of marketing (hereafter S_Mkt) explains the genesis of the company's strong orientation towards innovation. ''It was the 1990s and the problem of business sustainability started to emerge, especially concerning certain factors. First, retailers were starting to merge and were becoming more and more powerful. Consequently, we couldn't even consider maintaining prices and profits on the commodity. Second, protectionism was reducing at the European level. Third, segmentation analysis of the rice business showed the growth of ''prime price'' products and private labels and the stake of the branded products. To face these criticalities, company strategy was to focus strongly on the core business, which was rice, but, at the same time, changing its shape and ensuring the high quality of the raw material''. The goal of the firm is to make unique products to suit consumer needs. To be ''unique'' sums up the company ambition.

The offices where the interviews took place are located in the old factory premises, whilst all production is now concentrated in a large state-of-the-art plant which occupies a total area of 10 hectares and processes 11,000 MT raw rice/month.

The setting is familiar and friendly: the walls showcase pictures of the company's conventions (walks in the mountains, etc.) and the shelves contain samples of the company's newest products (with a post-it message: ''Please, advise the secretary when you take a product'').

Knowledge creation/acquisition

Knowledge creation in Company S means continuously generating new insights and ideas to apply in the latest product development projects. When asked how new ideas are created, the head of research and development (hereafter S_R&D) answers: ''There is a product committee that develops the ideas. The committee includes the president and CEO, the head of marketing, the head of purchasing, the communications manager and myself. The committee meets twice a month. Ideas are generated in varied ways. Innovation is frequently inspired by things we notice during our travels around the world. Moreover, I can say, ideas derive from our employees, from their experiences and feelings: we don't have a creative genius hidden in the labs. It's the creativity of everyone that makes the difference!''. When asked how the company keeps its talents, S_Mkt answers: ''We don't have any secrets. We have an extremely low personnel turnover. There is a person that has been

working for the company for 58 years. People in key positions have very long company lives: I have been in the company for 12 years, the head of sales for 18 years, the head accountant for 26 years. It's a healthy environment where people are used to working a lot. The company requires total abnegation. We can speak of a sort of extremism: devotion from the company vertex to the lowest levels. Everyone takes advantage of the company's success as everyone has a part of his or her salary that varies with the company results. Turnover is low, but if someone doesn't integrate into the system, he is naturally expelled: in this way, it's a "killing" environment''.

Knowledge acquisition processes in company S do not use any ''ad hoc'' technology to collect and manage information about markets and customers. S_Mkt affirms: ''We need little but accurate information. Collecting and managing a lot of information would require dedicated staff. When we need information about our markets and customers, we prefer to rely on marketing research institutes''.

Knowledge storage and retrieval

Company S stores information about production procedures and formulae, as well as sale data in the company information system. The firm's main ''storage device'' seems to be human memory, as the long company life of key personnel testifies.

Knowledge transfer and sharing

Knowledge transfer and sharing happens primarily in informal ways. This is favoured by the firm's ''communication culture'' which tends to be verbal and social in nature. Social events are periodically organized in order to reinforce interpersonal relationships and a collaborative environment. A more formal knowledge sharing opportunity can be identified in the product committee, where communication is the basis of generating new ideas.

Knowledge application

Company S applies its specialized knowledge of rice to create continuously new rice-based products. A deep knowledge of the properties and production process of rice allows the company to develop breakthrough innovations, thereby creating a competitive advantage. As S_Mkt states: ''Our products must be good, pose high technological barriers, give high profit margins and be sold in the large market (pasta, milk, bread...). Niche markets are too dangerous. This type of innovation requires a good profitability on products and its great value must be communicated to the customers. Communication is in the company DNA''. When asked to cite some successful elements of company products, S_Mkt answers: ''Our products have a very precise concept and a clear positioning. They aim to be healthy products targeted towards a consumer that requires something more from food''.

Knowledge of market trends and consumer behaviors is leveraged to identify new needs and opportunities that can guide innovation activity. Understanding the market is considered ''vital'' to creating innovation but, as S_Mkt af-

firms, ''the company's core competence regards the production process which must be able to exploit new opportunities and trends. That's why we prefer to leave marketing studies to specialized service providers''. For example, S_Mkt goes into details of recent consumer trends that, in his opinion, can help shed light on the company's innovative projects: ''Nowadays, consumers seem to be turning away from standardized and commoditized industrial food and are moving instead towards products that are able to satisfy emerging needs regarding, for example, health care (functional foods) and time or money saving (convenience foods)''. S_R&D gives some details of the company's innovation projects (a complete list is available in Table 4): ''As regards convenience foods, we introduced a new generation of rice-based ready-made meals in microwaveable doypacks, the so-called Rapid line. Our microwavable packs have been created with a new and advanced technology developed in Japan, which can guarantee absolute preservation of the product inside, keeping it totally sterilized as if it were in glass jars. Moreover, for a few years now, we have been producing the traditional ''risotto'' ready mixes made with rice and mixed with natural ingredients; there are no preservatives added and they are packed in a modified atmosphere. As regards functional foods, we have worked for two years at carrying out the production process to obtain pasta from rice. Our efforts were aimed at maintaining the look and feel of traditional pasta but eliminating gluten, which is responsible for allergies and intolerances. At the moment we are working at improving the organoleptic features of our rice drink to make it increasingly similar to milk, especially as regards its vitamin content. At the moment, it is a light and pleasant rice drink, made exclusively out of rice; therefore, it is cholesterol-free, gluten-free, and lactose-free. Actually, it has been created not only for people with some sort of food allergy, but also for people who must follow a diet that is particularly poor in protein, sodium and phosphorous, as well as for people who like a healthy and balanced diet''.

Knowledge derived from partnerships with selected large retailers is used to test and improve new products. S_Mkt underlines the extreme rapidity of the process of how a new product gets on the market. The product is made, packed and, as soon as possible, tested in a limited number of shops. Refinements are postponed. According to S_Mkt: ''The power exercised by large retailers undoubtedly leads to an inequitable distribution of the returns, but it is also true that we can benefit from exposure to a large and demanding retail customer. As a matter of fact, we can learn from our ''preferred'' large retailers by acquiring knowledge on our newly introduced products in a fast and effective way. The partnership with large retailers allows us to achieve the first mover competitive advantage''.

Discussion

Although these case studies refer to firms that are similar in dimension and settings, they represent two rather different ways of managing, exploiting, and nourishing knowledge in order to achieve a competitive advantage. Basically, it can be observed that neither of the companies has developed a deliberate policy for KM. Indeed, both of them are aware

Table 4 Innovation projects of S

	Innovation type	Description
Rice pasta range	New product — functional	Rice-based pasta gluten-free
Panriso line	New product — functional	Rice-based bread, crackers, breadsticks etc. gluten-free
''Risotto'' line	New product — convenience	Traditional ''risotto'' ready mix
Rapid rice range	New product — convenience	Microwaveable rice, ready to eat in 2 min
Seasoning range	New product — functional	Rice oil, rice vinegar etc.
Breakfast and snacks	New product — functional	Rice drink and rice-based delicacies
Danubio project	Agro-industrial internationalization project	The company first subsidiary opens in Romania, involving the whole rice production cycle from rice cultivation to rice commercialisation
Chemistry project	New distribution channel	Rice pasta range products are sold in the chemistries and are in charge of the National Sanitary System for celiac consumers
E-shop	New distribution channel	Company product are sold online
Ice cream project	New product/new distribution channel	The company introduced a new ice cream line made from rice milk. They are gluten, cholesterol and lactose-free and reduced fat. They are distributed through traditional ice cream parlours

of the importance of knowledge as a competitive factor. Furthermore, their strategies, structures and cultures satisfy, sometimes unconsciously, the most important requirements for effective KMSs. Therefore, in the following, the term KMS is used to describe the mix of organizational, managerial and technological levers activated inside the companies for managing knowledge. It is worth noting that these levers are not perceived inside the companies as instruments for KM. This is in line with previous research on the topic (see e.g. KPMG, 1998), where the same lack of awareness on KM issues among SMEs was detected. The KMSs emerging from the case studies include different mechanisms and different levers for managing the four key knowledge processes: creation/acquisition, transfer and sharing, storage and retrieval, and application. The differences between the KMSs can only be partly explained by referring to the different dominant knowledge domains in the two firms. What seems to emerge from the cases is that another element should be considered in order to explain such differences: the company's innovation behavior. In the following section, innovation behavior is defined and described in both cases. Subsequently, discussion involves the differences in KMSs, respectively, due to the dominant knowledge domain and to innovation behavior.

The innovation behavior in C and S

Innovation behavior is intended here both in terms of innovation culture and in terms of innovation output. The definition of innovation culture as introduced by Herzog and Leker (2007) has been adopted. Innovation culture is defined as organization-wide shared basic values that support innovation, organization-wide norms for innovation, and perceptible innovation-oriented practices. Practically speaking, literature refers to innovation culture as a firm's internal environment that, for instance, encourages risk taking (de Brentani and Kleinschmidt, 2004), supports openness to new ideas (Zaltman et al., 1973), tolerates failures (van de Ven and Chu, 2000), fosters learning (Hurley and Hult, 1998), and promotes constructive dissent (Capon

et al., 1992). As regards innovation output, the number of ''new'' products, processes, systems, markets, suppliers and packages introduced in the last five years is considered (see e.g. Avermaete et al., 2003). The term ''new'' here ranges from what is new within a particular setting (e.g. a firm or a place) to what is new to everyone (Nelson and Rosenberg, 1993).

A few examples of the differences in innovation behavior in C and S are now considered. Company S perceives its innovation capability as its main competitive advantage, while company C essentially innovates because of impelling traits (both at normative and consumer levels). In company S, as noted by one interviewee, innovation can derive from anyone in the organization, even though employees with a chemistry or food science and technology background are recognized as the best innovators. In any case, and as already underlined in the empirical findings, when selecting new employees, company S managers mainly look for social traits, essentially trust, ability to handle responsibility and time flexibility, more than specific skills.

Making mistakes is seen as a ''necessary'' or, at least, unavoidable step in the learning process. The way a new product is developed, introduced and interactively tested on the market is an example of this trial and error approach. The main perceived competitive advantage consists in being the first mover. In this case, innovation is really what Drucker (1985, p. 32) states, i.e. ''the specific tool of entrepreneurs''.

The introduction of new products/services in company C is meticulously planned and requires a considerable amount of time: consumers are involved in the process, small pilot projects are launched and long testing periods are planned. The company introduces only incremental product innovation or ''new combinations'' and not radically new products that traditionally don't originate from customer needs. Such a conservative approach is well testified by the C_Mkt attitude towards the opening of the shop described in the case section.

KMS features related to the knowledge domain

Several differences between C and S KMSs are connected to the relative dominant knowledge domain, i.e. marketing for C and technology for S.

The marketing knowledge domain is nourished by a variety of external knowledge sources, mainly connected to customers and market trends. Customer preferences, purchasing behaviors, profiles, etc. are systematically investigated and information about market trends is analysed in order to maintain a solid knowledge base to support decision-making. Therefore, the knowledge process that is mainly supported by the KMS is essentially knowledge acquisition. Company C collects stimuli from outside by means of frequent focus groups with customers and key informants, fairs, events, complaints desks, etc. For example, the rather unexpected decision of not entering the coffee machine business simply derived from an open and free-flowing discussion with customers. Focus groups, participation at fairs, other events, etc. allow aspects of a tacit nature to emerge, such as feelings and needs, and more generally knowledge residing in customers. This knowledge derives from customer experience as consumers and from their satisfaction or dissatisfaction with products and services. Company C strongly relies on this knowledge that is leveraged to build and provide a company image that is fully responsive to customer expectations. This knowledge is defined as symbolic knowledge (Asheim et al., 2007).

Such knowledge differs from knowledge about customers that is traditionally prevalent in works on KM and CRM (Gibbert et al., 2002) and that is explicit in nature. Company C does not neglect the importance of this kind of knowledge and acquires information on competitors and market trends from specialized companies. The focus on external knowledge sources does not imply that mechanisms aimed at developing an internal culture for fostering knowledge creation are neglected as demonstrated by the many narratives about employees' past experiences emerged from interviews. As argued by Weick and Roberts (1993), in fact, shared individual experiences are important to the development of the ''collective mind because stories organize know-how, tacit knowledge, nuance, sequence, multiple causation, means-end relations, and consequences into a memorable plot''.

The technology knowledge domain is informed by a relatively small number of external knowledge sources, as it relies mainly on internal competences that are enhanced by appropriate organizational levers. External knowledge sources for technology knowledge domain can be, for example, selected research centres or universities, technology providers, etc. Given the relatively small number of external knowledge sources and the importance of the internal resources, the process that is mainly supported by KMS is no longer knowledge acquisition but knowledge creation. Company S relies heavily on internal mechanisms to create knowledge, such as enhancing dialogue among its members by means of tightly scheduled meetings (twice a month) and informal events (mountain trips, BBQs, camping, etc.). These mechanisms are meant to encourage conversation, open communication and knowledge sharing. This is a cost for the company, but the benefits deriving from building personal networks and the resulting knowledge sharing are considered worthwhile. As noted in the literature, a certain level of personnel intimacy is necessary to establish comfortable communication of tacit knowledge, while the role of communication technology is completely neglected. The aim is to create a collective intelligence that fosters proactive and intuitive behaviors. In fact, according to Matlay (2000), in medium-sized businesses, skilled employees are often the locus of knowledge creation. Managers of company S are aware of the importance of their employees' creativity and accordingly they try to encourage and exploit it by means of a motivating culture.

KMS features related to innovation behavior

Several differences between the KMSs of C and S are connected to innovation behavior: conservative behavior for C and proactive behavior for S.

Given the importance of knowledge accumulated year after year for the development of incremental innovations, the main process supported by C's KMS is storage and retrieval. Company C has recently developed a data warehouse to manage large amounts of data concerning their domestic customers and sales. In contrast, Company S believes that knowledge deriving from the employees' experience in rice production is the pivot of success and consequently it is often hard to translate into a codifiable form. This explains why company S is not currently putting any effort in developing a data warehouse or any other system for storing massive amounts of data. This is in line with Johannessen et al. (2001) claiming that the role of ICT in making tacit knowledge explicit is rather limited and that unilateral investments in ICT may lead to a dangerous de-emphasizing of tacit knowledge.

Given the importance of newly created knowledge for the development of radical innovation, the main process supported by S's KMS is knowledge application. In fact, company S strongly relies on its specialized knowledge in rice production which enables it to exploit new opportunities in the rice business. The potential benefits of such new opportunities are assessed by using an existing framework to interpret data (Venkataraman, 1997), which is represented by the shared culture in S. S is actively engaged in promoting a strong sense of belonging and commitment in its employees. This allows them to interpret the outside world according to knowledge corridors shared inside the organization. S applies knowledge coming from several sources mainly to new product development processes. Stimuli, both from inside and outside the company, are translated in new products.

Table 5 summarizes the features of the two KMSs. It is organized according to the three KM levers introduced in the theoretical section.

Implications

Through the in-depth analysis of two case studies, the following implications can be drawn.

The cases confirm the basic assumption of the paper, which is widely recognized in the literature, that effective KMSs are likely to vary according to the different purposes for which knowledge is being managed. More precisely,

Table 5 The KMSs

	Technological	Managerial	Organizational
Company C	Customer data mart, DW	Customer focus groups	Interface roles for better exploiting DW
	Business intelligence	Marketing research services exploitation	
	In progress: data mining and electronic document management	Training, career path, rewarding system aimed at enhancing employees' involvement	
	Intranet based system	Mentoring and story-telling	
	Internet, e-commerce	Instruments aimed at favouring collaborative behaviors	
		CRM	
Company S	Internet, e-commerce	Employee focus groups	Teamwork, product committee
		Marketing research services exploitation	
		High commitment, informal events that are meant to encourage conversation, open communication and informal knowledge sharing	
		Mentoring and story-telling	
		Creating an outstanding corporate culture and sense of belonging	
		Collaboration with selected research centres, universities, technology providers	
		Partnership with selected customers (large retailers)	
		Employing and retaining talents	

knowledge domain and innovation behavior seem to be the contingencies that mostly impact on KMSs. In fact, the different combinations of the two variables have deeply different requirements in terms of the management of knowledge.

Companies focused on marketing and characterized by scarcely innovative behavior, like C, need a KMS that is mainly oriented to managing marketing knowledge and exploiting past knowledge. As a result, the emphasis is on capturing external knowledge and making it explicit so that standard procedures can be developed to improve efficiency and effectiveness. Therefore, the KMS should primarily support the following two knowledge processes: knowledge acquisition and knowledge storage and retrieval. For this kind of KMS, the technological lever is central (in case C, the data warehouse). However, such a KMS should also include managerial mechanisms to extract tacit knowledge from customers (in case C, customer focus groups).

On the contrary, companies focused on technology and characterized by highly innovative behavior, like S, need a KMS that is mainly oriented to managing technical knowledge and exploring new possibilities. As a result, the emphasis is on creating new knowledge and applying it to generate a variety of new products. Therefore, the KMS should primarily support the following two knowledge processes: knowledge creation and knowledge application. For this kind of KMS, organizational and managerial levers are central. In fact, even though technical knowledge has frequently been considered by previous research as highly codifiable, it often involves tacit knowledge and experience that are difficult to codify (Weick, 1990). As noted by Swart and Kinnie (2003, p. 63), technical knowledge is often difficult ''to write down or capture'' and it can ''be taught only through shared

practice''. Furthermore, the process of knowledge creation is widely recognized as a social process based on personal interactions and relationships (Glynn, 1996). Thus, the KMS should typically include mechanisms such as cross-functional meetings, voluntary membership in committees, conversations and participation in frequent social events. It is worth noting that such ''soft'' mechanisms are only adequate for one-site SMEs. It is easily predictable that the need for ICT tools for communication purposes increases as an organization grows, until they become indispensable for large, multi-site firms. Moreover, motivating employees, namely the knowledge owners, to share knowledge is another crucial aspect. It is important to note that tacit knowledge held by employees is usually part of a long-term learning process in a specific context, embodied in the structure of thinking, the way of thinking, and therefore it may act as a conservative element in relation to innovation (Johannessen et al., 2001). This aspect can be seen as a potential Achilles' Heel: novel and unfamiliar pieces of information are not allowed to enter one's analysis of the world (Weick, 1995), consequently lowering the capacity to classify information in knowledge structures and, even, to adequately update knowledge content. In order to overcome this drawback, the KMS should include levers that allow external knowledge to filter into the company. These levers could comprise: nourishing a non change-adverse culture, fostering stable relationships and collaborations with selected customers and research centres, as well as using Internet technologies. In addition, careful employee selection and retention policies are essential to favour a sort of cultural homogeneity inside the organization. This creates an environment where common frames of understanding are developed and knowledge sharing is facilitated.

What emerges from the descriptions of the two kinds of KMSs is that the former should be more oriented at managing explicit knowledge and the latter more oriented at managing implicit knowledge. However, it is evident that effective KMSs should always consider both dimensions, involving an appropriate blend of mechanisms and configuration of levers that facilitate the management of both tacit and explicit knowledge.

Future works

Future research will be aimed at developing an interpretive framework, derived from case studies, that connects knowledge domain and innovation behavior with the appropriate KMS type. Further research is also needed to describe organizational, managerial and technological levers in greater detail that fit each category. In fact, as noted by Gray (2001), frameworks suggested in the literature, while undoubtedly valuable for analysis at the organizational level, often provide little guidance for implementing and integrating a set of knowledge management practices. Further research must also prove whether these findings can be replicated in other contexts.

As regards limitations, the study attenuates some of the reliability problems that are inherent to qualitative research interviewing with multiple informants from different positions inside companies. Triangulation using different types of data sources and systematic data analysis serve to attenuate many of the problems with reliability as well. Indeed, generalizability remains more of an issue. Notwithstanding these limitations, the research provides various insights into new ways of conceptualizing KMSs.

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