## **RESEARCH PAPER**

# Knowledge management in practice: insights into a medium-sized enterprise's exposure to knowledge loss

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The purpose of our paper is to examine how a medium-sized enterprise characterised by slow executive turnover might identify and manage its critical knowledge. The main interest is in the management's handling of the potential danger of knowledge loss due to turnover or long-term absence. A qualitative research approach is adopted through semi-structured interviews with seven members of top and middle management of a German medium-sized enterprise operating in the printing sector. Our findings contribute to the literature on knowledge management in SMEs and provide fresh insights into the management of knowledge attrition. A knowledge map of the firm is derived and used to demonstrate how smaller firms can identify key organisation members and their relevance to the firm's business model. This may provide a better overview of potential areas of knowledge attrition. The information provided by the knowledge map can raise awareness of the perils of knowledge loss and suggest initiatives that not only help firms defend competitiveness and save financially but also sustain their intangible resources.

## Introduction

Recent management literature stresses the importance of knowledge rather more than in previous decades, though acknowledgement of its significance to firms is not new (Martín-de-Castro et al., 2006). Nowadays a systematic handling of knowledge is viewed as decisive in order to remain competitive (Wiig, 1997). Although many research activities can be observed within the field of knowledge management, its application to small and medium-sized enterprises (SMEs) seems to be underdeveloped (Hutchinson and Quintas, 2008). This is surprising as SMEs might be seen as most in need of such management as it is said that knowledge is kept in the heads of the owners and some key employees rather than being physically stored (Wong and Aspinwall, 2004). Moreover, in SMEs systematic documentation is less of a given (Shelton, 2001). Consequently, these firms rely very much on tacit knowledge and a loss of key employees (i.e. long term, experienced and skilled staff) make this type of company extremely vulnerable. What is more, Lehner et al. (2005) argue that smaller firms are less likely to have an overview of their organisational knowledge, which may result in unanticipated loss of knowledge, intangible resources and relational capital (Lynn, 1998). At its worst, it is possible that the loss of one single key employee will put the SME's survival at risk.

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The aim of our study is to investigate the current state of knowledge management in a German medium-sized enterprise operating in the printing sector. Thereby, our particular interest is in the management's handling of the situation with the constant threat of knowledge attrition due to turnover or long-term absence.

## Theoretical background

## Knowledge management

Bounfour (2003, p.156) defines knowledge management 'as a set of procedures, infrastructures, technical and managerial tools, designed towards creating, circulating (sharing) and leveraging information and knowledge within and around organisations'. According to Fuchs (2003), knowledge management in firms has merely one purpose, namely the creation of more innovation. By systematically managing its knowledge, a company can distinguish itself from its rivals, which may allow the development of a competitive advantage. Although this important role is widely acknowledged by researchers, it is not readily accepted by all managers (Wiig, 1997).

There are a variety of academic approaches to the processes of knowledge management (see, for example, Beijerse, 2000; Wong and Aspinwall, 2004; Egbu *et al.*, 2005). The following explanations are based on the core processes proposed by the *European Guide to Good Practice in Knowledge Management*, developed in the context of a Comité Européen de Normalisation (CEN) Workshop Agreement with a particular focus on SMEs. According to CEN (2004), knowledge management can be divided into five core activities: identification, creation, storage, dissemination, and the use of knowledge.

Knowledge identification focuses on activities that help to identify the knowledge necessary for the firm, as well as sources to acquire this knowledge. This activity also comprises the identification and location of existing knowledge (Egbu et al., 2005). Techniques as knowledge maps, as developed below, may be useful as they enable managers to identify their knowledge and to visualise the relations within and outside the firm (van den Berg and Popescu, 2005). Knowledge creation refers to ways that focus on the construction of new knowledge. This activity is closely related to learning processes within the firm, but importantly people are required to create new knowledge (CEN, 2004). Knowledge creation within firms can be supported by, amongst other measures, allowing organisational members to experiment (Gupta and Govindarajan, 2000). External knowledge sources also demand consideration here. Knowledge storage embraces processes such as documenting and codifying (Wong and Aspinwall, 2004). It can be regarded as critical in firms with scarce resources. Knowledge dissemination comprises the transfer and sharing of knowledge (Egbu et al., 2005) as retaining knowledge in a sole individual runs the risk of costly knowledge loss if the employee leaves voluntarily or otherwise (Lynn, 2000). Finally, the usage or application of knowledge has to follow if value is to be created within the firm (CEN, 2004).

This brief discussion of the individual knowledge management processes underlines their close connection. It can be argued that a systematic approach to managing knowledge can enable firms to identify, exploit and control their knowledge better. This in turn suggests that knowledge management can also be employed for the purpose of firms' succession planning.

#### Knowledge management in smaller firms

Knowledge management takes on a subtly different role in SMEs. Smaller firms must allocate scarce resources with care as erroneous decisions will have more serious complications and may be more difficult to reverse than in larger businesses (Amelingmeyer and Amelingmeyer, 2005). In addition, in many smaller firms the owner-manager takes on a central position (Bridge *et al.*, 2003). This centrality includes responsibility for recognising the contribution of knowledge management and in supporting and implementing the structures and systems necessary. However, day-to-day business operations require constant attention (Hofer and Charan, 1984) which, in conjunction with a lack of financial resources and knowledge, occupies the owner and key employees (Wong and Aspinwall, 2004). Moreover, the smaller the company, the less likely it is that someone has an overview of the firm's knowledge (Lehner *et al.*, 2005).

The studies available on knowledge management practices in SMEs conclude that they are less advanced than in larger firms (Wong and Aspinwall, 2005). Furthermore, they have '... a more mechanistic approach to knowledge construction and relying less on social interaction' compared with large businesses (McAdam and Reid, 2001, p.240). Beijerse (2000) studied 12 Dutch firms (of which 10 were SMEs) and showed that not a single company had a recognisable knowledge management strategy in place. On the other hand, it appeared that the companies use a variety of instruments to evaluate, to acquire, to develop, and to share knowledge. Yet, these tools are often not considered to be instruments for knowledge management. A similar result was obtained by Desouza and Awazu (2006), who further found that the SMEs involved had the tendency to put knowledge generated immediately into practice instead of storing it. Moreover, their study showed that smaller firms make themselves less susceptible to loss of knowledge when it does not reside solely in the brain of one employee. Nunes et al. (2006) conducted a study that was targeted to obtain data about the knowledge management awareness, perceptions, and requirements in SMEs. The results showed that these companies do not see knowledge management as a crucial function. Nevertheless, guidelines and other procedures set to deal with knowledge management issues have been observed. Hutchinson and Quintas (2008) found that certain processes within SMEs indicate a sort of knowledge management, but that these are mostly informal. Though few firms adopted formal knowledge management processes, interviewees themselves still used the term 'knowledge management' for their activities. Based on these insights, the authors concluded that the concept and vocabulary of knowledge management, if not its formal techniques, are increasingly acknowledged and applied in SMEs, albeit inconsistently.

The studies reviewed have suggested that a systematic approach to knowledge management in smaller firms is missing and practices to deal with their knowledge are adopted in a sporadic way. Moreover, the finding that knowledge is seldom stored or shared places such firms 'at the mercy of their own health or the career decisions of their staff' (Shelton, 2001, p.431).

#### Critical organisation members in smaller firms

A huge amount of knowledge is personalised; it is in the individual's head. If this knowledge is critical, in terms of company performance, the possessor of it also takes on a critical position within the firm. Such people have competences, professional experience, or access to business networks that can be viewed as fundamental for the

firm to operate effectively. In smaller firms, these include the business owner and employees responsible for such business functions as sales. Their knowledge and expertise may be the vital source of the firm's competitive advantage (Barney, 1991). Consequently, in order to benefit from this knowledge, appropriate structures need to be established in the firm (Trevinyo-Rodríguez and Tàpies, 2006).

The business owner takes a central role, as she/he possesses most of the human capital and relational capital (Bracci and Vagnoni, 2005), particularly in the smallest firms. Consequently, the exit of a dominant owner will have negative implications for the future productivity and even the continuity of the firm (Ballarini and Keese, 2006). It is not uncommon for successors to learn everything again (Wong and Aspinwall, 2004); accordingly, valuable resources needed for other more important business activities are lost. The same can be expected in the case of the loss of other key persons of the firm.

#### Reasons for knowledge loss

Knowledge loss in firms is closely related to employee turnover, which can be divided into voluntary and involuntary turnover (Shaw *et al.*, 1998). Voluntary turnover occurs when members resign, whereas involuntary turnover is associated with the dismissal of organisation members (Stovel and Bontis, 2002). With voluntary turnover, the vital question would be whether the decision to leave is avoidable as it may well be unwanted (Morrell *et al.*, 2004).

Turnover is not the only source of knowledge loss. SMEs are also vulnerable to such unexpected crises as disease, accident and death. Short term as well as long term absence can raise existential threats to firms short of labour that cannot substitute for absence in the ways that larger firms might. A further reason, albeit often underestimated, is the loss of knowledge due to simple neglect (Gueldenberg, 2003).

#### Effects of knowledge loss in smaller firms

The retention of organisation members who possess critical knowledge should be one of the key tasks of companies (Hislop, 2005). That said, the retention of organisation members is not possible forever; the firm's management should plan for staff replacement in due time. The problem is more acute in smaller firms; as Roos *et al.* (2005) note, critical dependency on knowledge assets is highest in the smallest firms.

In smaller firms, critical tacit and explicit knowledge is held mainly in the minds of a few staff members; consequently, these firms are more dependent on those individuals than larger companies (Hofer and Charan, 1984). Their exit could result in a lack of essential know-how important for company success, and which is usually not able to be replaced short term (Hall, 1992). Thus, the stock of human capital and relational capital of such a firm will be at risk (Jääskeläinen, 2007). According to Lampikoski (2005, quoted in Jääskeläinen, 2007), it is estimated that the loss of one key employee may lead to direct costs of over 100,000 euro. The figure very much underlines the explosive nature of this issue. Different aspects can be listed that may lead to these costs, such as the costs associated with the recruiting process [i.e. performing of a job analysis, searching for new employees, selecting the right employee, training the employee (Zimmerer *et al.*, 2008)]. In particular, smaller firms might find it difficult to attract qualified personnel (O'Gorman, 2006) as they are not able to pay the wages or provide the job security usually found in larger companies. The resignation of one employee could exacerbate resource scarcity, and consequent costs related to lower productivity and disruptions of the workflow must not be underestimated (Jääskeläinen, 2007).

Over and above the overt financial costs, the intangible effects of knowledge attrition may be yet more harmful. The departure of a critical staff member may lead to considerable gaps in the firm's intellectual capital. For example, relational capital represents a type of capital that can be assigned to the firm's intellectual capital only as long as the external party confirms this relationship. Consequently, when an employee leaves the firm, it is not uncommon that this capital is reduced or completely lost as the individual may take the business contacts with him/her. In terms of the human capital, it could be that the departure of a key employee, such as the owner, will cause a decline in motivation among the remaining staff members (Ballinger *et al.*, 2009), which may in turn lead to a weakened company performance.

The preceding discussion of direct and indirect financial cost and weakening competitiveness underline, once more, the significance of appropriate processes to prevent knowledge loss. Yet, in business practice, it is not uncommon for firms to underestimate the implications of turnover or long term absence (Kransdorff, 1996). As a result, the effects of knowledge loss are perceived only when an organisation member has already left the company (Lynn, 1998) or is forced to stay absent for a long time.

Although many authors emphasise the importance of knowledge retention to avoid these problems (Hislop, 2005), the topic seems to be under-researched in smaller firms. Research activities in this area tend to focus on knowledge intensive smaller firms. Certainly, these firms are important in terms of their contribution to a nation's prosperity; however, the majority of firms in most countries are traditional SMEs. Consequently, current research activities fail to capture the significance of knowledge management in general and particularly in SMEs. Our study is intended to make a small contribution to filling this gap.

#### **Research methodology**

Given the exploratory nature of our study, a qualitative research approach is apt as it allows the researchers to get close to participants and their thinking in order to scrutinise the entire research problem (Maykut and Morehouse, 1994). The company selected for our study is a German medium-sized enterprise active in the printing sector. This industry relies heavily on constant product improvement/innovation. The medium size of the firm allows them to develop management systems not affordable in smaller companies, yet small enough to respond swiftly to changing market conditions. Access to the company was established through a former work relationship of one of the authors.

The company designs and manufactures printing machines. It is located in southern Germany and was founded in 1953. In 1991, the company was sold to an American printing press manufacturer. The purchase of the company was highly leveraged and the interest and debt repayments destabilised it over subsequent years. The company was eventually forced into administration, and a buyout by the management and indeed the workforce was affected in 2003. As a result, the company is managed and run by three directors of equal standing. In total, the company currently employs 80 members of staff. The organisational chart is displayed in Figure 1 and the selected interviewees are highlighted in black.



Figure 1. Organisation chart of the firm surveyed

The company operates internationally and has a worldwide network of sales representatives. Approximately 75% of the company's turnover is generated from international customers. The company specialises as a system supplier for narrow web printing machines and has expertise in developing customised solutions. The company produces printing machines for different product areas, such as labelling and packaging.

The unit of analysis was the critical organisation member of this firm. 'Critical' meant that the person was viewed as relevant to the firm's success. Accordingly, an exit or long-term absence would be dangerous for the firm. In order to be chosen, the individual had to fulfil the following criteria: experienced and knowledgeable in the field of activity, and operating in a business department of importance to the firm, i.e. to ensure the firm's survivability. We selected the individuals together with the managing director of the firm. In total, seven critical people fulfilled these criteria and were involved in the study. The small number of people allowed a greater depth of research. Data were collected through semi-structured interviews with the seven critical staff members of the firm. The semi-structured approach is regarded as appropriate when very little is known about the subject in hand (Maykut and Morehouse, 1994) and is consistent with previous research in this field, e.g. Nunes *et al.* (2005), Egbu *et al.* (2005) and Hutchinson and Quintas (2008).

An interview guide helped in the interview process. The guide consisted of four parts. In the first part, general information about the interviewees was collected. The purpose of the second part of the interview was to determine the critical members within the company. The interviewees were asked not only to name important firm members, but also to give the reason for their selection. The third section examined cooperation between the critical staff members. The interviewees were asked to explain how they related to, and cooperated with, the selected key persons. The final part of the interview focused on the potential damage the company would suffer if one of the critical staff members were to leave. All questions were open ended, underlining the paper's explorative character. The application of an interview guide gave a uniformity which facilitated the comparison of the interviews conducted (Guion, 2006). Having developed the first draft of the interview guide, a pilot interview was conducted with an individual who fulfilled the criteria, but was working in a different industry. This led to some amendments to the way the questions were worded. Emphasis was placed on the viewpoints of the interviewees and not on any predetermined views held by the authors. The interviews lasted for between one and two hours and took place in the interviewees' offices. They were tape recorded and later transcribed, and took place between April and June 2009. The characteristics of the interviewees are summarised in Table 1.

Almost all selected interviewees are either members of the management board or of the second level of management. In the context of our findings' discussion, it is necessary to mention that Interviewee D is not in an executive position, but his knowledge about the prototype assembly is important for the research and development (R&D) department. The participants' length of service varies from 15 to 40 years, and they have therefore proved themselves to be very loyal to the company. Turnover is low, the newest recruit having some 15 years' service. Thus, it can be expected that the participants have accumulated a lot of in-house experience and know-how during the length of their long service.

Data analysis was conducted by applying Miles and Huberman's (1994) data display and analysis approach. Our data analysis process involved three sub-processes comprising data reduction, data display, and drawing and verifying conclusions. The

Interviewee	Position	Job description	Age	Length of service
А	Head of Process Planning Department	Computer systems expertise	50	25
В	Group Leader – Electrical Engineering Department	Expert in organisational flow Expertise in Electrical Research and Development	46	30
		Knowledge of regulations		
С	Head of Production Department	Production organisation	31	15
		Manufacture of components		
D	Group Leader – Prototype Assembly	Prototype installation as per drawings	39	24
Ε	Sales and Finance Director	Thorough knowledge of printing machines	57	30
		In depth knowledge regarding competitors and their products		
		Held in high regard by both sales agents and customer end users		
F	Production and Purchasing Director	Highly knowledgeable regarding the production line	53	38
		Expertise in the coordination of the purchase of raw materials and parts		
G	Research and Development Director	Development of prototypes and individual elements of existing machines in production	56	40

Table 1. Characteristics of interviewees

primary task of the data reduction process was to select and simplify the collected data. This reduced set of data was then displayed with the help of figures and matrices. Using the data displayed and the literature enlisted, it then became possible to draw conclusions.

We are aware that our research method has several limitations. First, our findings are based on a single medium-sized firm. Thus, in order to test the findings and diagnostic tools developed, further research should be undertaken, for example with firms working in the same industry or of a similar company structure. Secondly, the fact that the interviews were conducted at an executive level might have led to a single-sided perspective and might have excluded non-executive criticality (although the research findings do not suggest this). Finally, the fact that the selection of interviewees was discussed with the managing director may have led to another slightly biased outcome. An examination of these limitations could positively influence the design of future studies.

#### **Presentation of findings**

#### Identification of critical members

Our findings suggest that the sales and finance director (Interviewee E) and the R&D director (Interviewee G) take important positions within the firm. According to the interviewees involved, Interviewee E's main strength is the quality of relationships he has with the sales agents and the customers. His strengths in these areas are perceived as crucial for the firm. The interview findings gave the impression that this person possesses most of the firm's relational capital. The interviewees further agreed on Interviewee G's know-how and experience in developing and producing new prototypes.

The production and purchasing director (Interviewee F) is on the management board and thus should hold a key role in the company by definition. However, the interviews implied that he is not regarded as crucial for the success of the firm, since his expertise and skills are not considered unique and he could be replaced relatively easily. However, in the context of turnover, his loss could lead to an impairment of the business operations as he is responsible for the production process and the materials administration. On the other hand, taking into consideration the length of service to be found among the participants, it is reasonable to infer that the firm would be exposed to high (direct and indirect) costs with regard to the recruiting process as the particular expertise is missing. Moreover, the current organisation chart (Figure 1) indicates a specific relevance of this person with regard to his relations with different departments of the firm. Finally, as he is in charge of purchasing, a certain relational capital with key suppliers is likely as well.

Besides the members of the management board, further relevant staff members were identified. For example, Interviewee A has knowledge and experience in the process planning department, as well as the company's IT system, which appears to be crucial. The interview findings indicated that there are no other individuals in the company with similar knowledge of the particular IT system that the company operates. Accordingly, in the case of this person's resignation, the operation of the firm's IT system would be affected. This, in turn, would influence the entire workflow of the firm. The interview findings further suggested that the service department is (currently) inadequately staffed. An important member of staff of this department is regularly away working on special projects and visiting customers.

This affects the workflow not only of this particular department, but also that of the firm as a whole as the printing industry is a very service driven business. The assistants of Interviewees E and G also play important roles within the company. Both of them deal with simple problems and with routine work within the sales department and R&D department. Thus, by taking on operative tasks, the assistants are supposed to ensure that the directors have sufficient time to deal with strategic aspects. For Interviewee G, the group leader for prototype assembly (Interviewee D) represents a critical organisation member as he is accountable for the assembly and testing of prototypes. Thus, Interviewee D has a critical position within the firm as any mistake will be very costly.

From time to time, the R&D department requires assistance from external experts in that field to help in the development of new prototypes. These external experts include members of a construction firm and a retired former research manager. The company relies on advice from consultants on strategic business issues. These findings clarify the critical role of external sources in knowledge creation in the firm.

Some interviewees named the CNC programmer as a critical organisation member. According to them, the knowledge of the CNC programmer is based on long term experience of the firm's machines. Moreover, Interviewees E and G both mentioned the group leader of the electrical engineering department (Interviewee B) as a critical staff member as he has important electrical in-house knowledge.

#### Collaboration among critical members

The members of the management board appear to be in constant contact. For instance, a management board meeting usually takes place once a week. In these meetings, Interviewees E, F and G exchange and discuss general and organisational information about the company, e.g. the *status quo* of the prototype development. In addition, the findings indicate a strong and intensive collaboration between the sales and finance director (Interviewee E) and the R&D director (Interviewee G). Their relationship and the communication between them seem to be very strong. They have been working together for a very long time and over the years have built up a good and trusting relationship. They constantly exchange information about suppliers, new and old customers, new markets and new products. On that matter Interviewee E stated:

The most important person in the company is the research and development director (Interviewee G). Issues around the development, research, sales activities will be discussed and evaluated between him and me.

Interviewee G frequently collaborates with the group leader of the electrical engineering department (Interviewee B), as the former has little expertise in this field. Issues within this department will be coordinated and agreed by Interviewee G. Additionally, Interviewee G is in contact with external experts in the engineering field or with people who have retired so that he can exchange ideas between them. These exchanges represent the basis for product development, product improvement or the identification of new business opportunities. Relationships with the external partners have been formed over many years and are based on trust and experience. Also, Interviewee G has an excellent relationship with the group leader for prototype assembly (Interviewee D). They regularly exchange ideas and information about the development process. Interviewee G describes the relationship:

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The group leader has to make sure that each prototype is assembled and tested properly. During that time frequent contact is maintained between us and the relationship becomes like father and son.

In the production department, Interviewee A and his supervisor (Interviewee F) need to communicate frequently. During their meetings, they discuss the current production organisation (e.g. operational planning of the employees, problems in the production line and decisions over which parts need to be manufactured). The reason for this is that they calculate the delivery time for the sold machine after they have checked the inventory. The collaboration between the group leader in the electrical engineering department (Interviewee B) and the remaining employees is mainly based on informal communications. Interviewee B described the collaboration with other colleagues as follows:

The communication process inside the company is a sort of corridor management by which I mean that not every little detail has to be discussed with the superiors of the company.

The implication is that within the firm different communication flows take place depending on the level of staff concerned.

## Effects of turnover in terms of knowledge loss

The findings revealed a strong dependency of the firm on the three members of the management board. If one of them were to leave the firm is likely to suffer considerably as there is no person who could take over the position in the short term. For example, Interviewee G viewed a departure of Interviewee E as a problem because this person enjoys an excellent relationship with both customers and sales agents. According to Interviewee G, nobody else in the company possesses this relational capital. Thus, in his opinion, the departure of Interviewee E would have a negative impact for the development process of prototypes. Interviewee E believed the worst case scenario for him would be if Interviewee G were to leave as the company would then struggle to cope with problems within the product development area and with customers who have special demands. Furthermore, the prototype assembly would suffer under these circumstances because no one else in the R&D department has this know-how. With regard to Interviewee G, Interviewee B stated:

I am not sure what would happen if the R&D director (Interviewee G) were to leave. Even if he were to be absent for a long time it would be difficult for the company. He is the mastermind and innovator behind the printing machines and without him new ideas and new developments would most probably not happen.

The study also reveals the firm's dependency on the relationship between Interviewees E and G, a long term relationship which they regard as ideal because there is blind trust between them on a range of issues within the company. Despite the company size and age, it is still run in a very centralised manner. The impression is that both interviewees still act like new founders of a company where the business operations are structured around the founders, and not like managers of an established medium-sized business that is run in a professional way in terms of decentralised decision-making. The analysis of the staffing situation within the service department seems to identify not only a possible problem, but a current one. The head of the process planning department (Interviewee A) stated the following:

At present we have no proper contact in the service department. When the previous head of the department resigned a lot of expertise was lost. The workforce in that department lost focus and was, and is still, not sure what exactly has to be done.

It appears that Interviewee A is not satisfied with the current situation. The resignation of the former head of the service department has already led to knowledge attrition in respect of both business activities and processes. Apparently nobody is taking charge of structuring the workflows in this department. This may be the consequence of the particular focus on R&D within the firm.

Interviewees C and A are concerned about the CNC programmer. According to them, he is the only person within the company who is able to write a software programme. Although it is perceived that the resignation/retirement of the CNC programmer would not have a serious effect on the company's competitive edge, it could lead to temporary problems in the production process as no other member has the ability to produce a software programme. This thinking might be naive as it is very questionable whether the firm would be able either to recruit a suitable person on short notice, or to instruct this person as it seems there is nobody in the firm who has adequate software skills to do so.

Our findings also suggest that the exit of the assistant to the R&D director would have a direct impact on the head of process planning as the assistant takes care of the daily routine work. On that matter, Interviewee A said:

If the assistant of the R&D director were to leave the company, then we have to contact him directly about the daily routine business. This will leave him with less time to concentrate on developing and researching new products.

The findings further suggest that the resignation of Interviewee D would have serious implications for the firm as he constitutes the critical interface to the R&D department. As he is responsible for the assembly and testing of prototypes, it is to be assumed that this individual disposes of very specific knowledge and skills. Accordingly, he would be very difficult to replace, particularly against the background of his apparent position within the firm's product development process.

Interestingly in this context, the interviewees were primarily focused on internal persons when considering possible effects of turnover. The external partners seemed to be neglected in the interviewees' considerations. This can be classified as dangerous as the findings suggest that the firm is highly dependent on these external sources with regard to knowledge creation. Thus, a loss of one of these partners would expose the firm to a problem that would not be solved quickly as the building of trust takes time.

#### The knowledge map and discussion

Our study's findings are summarised in a knowledge map (Figure 2). This map displays internal and external members and their impact in terms of know-how, expertise and relational capital on the firm's value chain.



Figure 2. Knowledge map Legend: A – Head of Department – Process Planning B – Group Leader – Electrical Engineering D – Group Leader – Prototype Assembly E – Managing Director – Sales

F - Managing Director - Production and Purchasing

symbols are equal to those given to the interviewees.

G – Managing Director – Research & Development

Assistant – Assistant of G

CNC – CNC Programmer The different activities of the firm are represented by oval shapes. The size of each shape is determined by the activity's relevance in terms of the firm's value chain. Relevant activity coming from outside the firm is shown as a dashed oval shape. In this case, they are the external R&D partners. The arrows show the flow of knowledge. The dotted arrow highlights a broken flow of knowledge or information. In this case, the missing personnel in the service department prevent the R&D department obtaining feedback from customers at short notice. The letters used with the 'people'

The map clearly shows that central expertise and skills are predominantly held by a few members of staff, which renders the firm highly dependent on these individuals (Hofer and Charan, 1984), particularly given that the firm seems to be ill-prepared should they exit. The map clarifies that much of the important know-how and skills is grouped around R&D activity. This may be understandable as the outcomes of R&D are an important part of the firm's success. However, our findings imply that this strong emphasis on R&D leads to neglect elsewhere, as in the staff shortage in the service department.

The map also helps illustrate the dependency the firm has on external partners with regard to knowledge creation. Accordingly, it can assist in broadening the management's perspective when looking at the company and its processes along the value chain. In addition, the map indicates that the larger a company becomes, the smaller the relevance of the management over time. Our findings suggest that this conclusion has not yet reached all members of the management board.

Using the map, management should be able to identify those key staff whose resignation or departure would cause the company considerable difficulty. This offers the opportunity to use the map as an early warning system to help the firm save direct and indirect costs at an early stage. This information might be of greater importance for a firm with low employee turnover, where little attention is consequently paid to succession planning. The map not only shows the critical members and their meaning to the firm, but also the firm's risk position with regard to knowledge attrition. Moreover, the map allows information to be gathered about the types of knowledge that exist in the firm, enabling the company to identify the areas where knowledge gaps may need to be filled.

Overall, our findings indicate that there is not one person within the company who takes responsibility for ensuring that possible knowledge attrition is identified in advance and that effective contingency plans are put in place. Instead, the findings imply that these problems are only addressed if and when they arise. Such behaviours reflect the prominent position of day-to-day operations in smaller firms (Hofer and Charan, 1984), as well as inadequate planning (Ibrahim and Ellis, 1990).

#### **Conclusion and implications**

Our study's aim was to gain better insights into how a medium-sized company manages its knowledge. Our particular interest here was to find out how the firm handles knowledge attrition caused by staff turnover or long term absence of critical staff members. Understanding the potential danger of knowledge attrition is important because it can cause immense direct and indirect costs. Particularly in smaller firms, it may determine their survival.

From the findings of our study, we conclude that the firm's members are aware of the potential danger of knowledge attrition. However, there are no measures, such as substitution arrangements, put in place that may help the firm anticipate and ameliorate resulting problems. Besides, the current management appears to be too busy with the day-to-day running of the business to give this potential risk a high priority. This behaviour seems to be caused by a rather low staff turnover, which not only maintains the firm's value chain, but also seems to give the management a false sense of security. Awareness seems to be mainly limited to 'obvious' persons highly involved with the firm's R&D process. Important contributions to other parts of the firm's value chain (e.g. the CNC programmer and the service department) or to knowledge creation (e.g. external partners) are not considered in the process.

Our findings suggest that if the above-mentioned staff were to leave, the company's entire workflow would be affected, as well as the firm's human and relational capital. This seems to be in line with previous research by Lehner *et al.* (2005) highlighting the missing overview of smaller firms with regard to their knowledge. It also confirms Shelton's (2001) assessment of the vulnerability of this type of company. Our findings further corroborate the downside of dominant managers (Interviewees E and G) who have trouble realising that their individualistic behaviour can cause the firm problems once they reach retirement. The managers in our case revealed a behaviour pattern that indicated that they want to oversee all aspects of the

business and that they regard themselves as the main drivers of the entire firm. Such behaviour might be possible in very small firms; however, in a medium-sized company with 80 employees it suggests underutilised management and leadership qualities (Churchill and Lewis, 1983; Ibrahim and Ellis, 1990).

Our research stresses the importance of the identification of organisation members' expertise and skills and their impact on the firm's value chain. With this identification, the risks of damage to the firm can be reduced should staff members leave or external partners end the business relationship. This also emphasises the importance of implementing suitable measures to deal with planned and unplanned exits. In our case study, the focus is very much on people suggesting that the emphasis should be on the implementation of people-orientated measures, such as the development of back up for each member. This, in turn, would reduce the firm's dependence on certain individuals and secure the firm's uninterrupted workflow. The proposed knowledge map might be used as a diagnostic tool which visualises not only relevant members (internal and external) and their relevance with regard to the firm's workflow, but also any potential knowledge risks related to it. Thus, it shows the firm's knowledge risk position.

We also conclude that knowledge management in smaller firms should be looked at in terms of persons rather than their roles/positions. This means that it is people, rather than their positions, who are responsible for performing tasks within a company. As a result, the different activities have a human face. Knowledge management in smaller firms can hardly be analysed without taking this into consideration and research requires techniques other than those routinely employed to study knowledge management in larger firms.

From a theoretical point of view, our findings suggest some techniques to overcome the problem of knowledge attrition and its likely influence on human, relational and financial capital of smaller firms. Accordingly, our research looks at knowledge (i.e. human capital and relational capital) as something positive (an asset), but also as something precarious (underlining the risk character) too, which in turn establishes the close connection between knowledge management and succession planning. From a practical point of view, our findings help to create a stronger awareness among practitioners of not only the peril of knowledge loss and its implications for a company's success, but also of the need for action.

#### References

- Amelingmeyer, J. and Amelingmeyer, G. (2005) 'Wissensmanagement beim Führungswechsel in KMU' in Meyer, J.-A. (ed.) Wissens- und Informationsmanagement in kleinen und mittleren Unternehmen, Josef EUL Verlag, Lohmar, Cologne.
- Ballarini, K. and Keese, D. (2006) 'Unternehmensnachfolge' in Pfohl, H.-C. (ed.) *Betriebswirtschaftslehre der Mittel- und Kleinbetriebe*, Erich Schmidt Verlag, Berlin, pp.439–64.
- Ballinger, G., Schoorman, F. and Lehman, D. (2009) 'Will you trust your new boss? The role of affective reactions to leadership succession', *Leadership Quarterly*, 20, pp.219–32.
- Barney, J. (1991) 'Firm resources and sustained competitive advantage', *Journal of Management*, 17, 1, pp.99–120.
- Beijerse, R. (2000) 'Knowledge management in small and medium-sized companies: knowledge management for entrepreneurs', *Journal of Knowledge Management*, 4, 2, pp.162–79.
  Bounfour, A. (2003) *The Management of Intangibles*, Routledge, London.
- Bracci, E. and Vagnoni, E. (2005) 'Managing intellectual capital in small-medium family business succession: an integrated framework', working paper presented at the *1st EIASM*

Workshop on Visualising, Measuring, and Managing Intangibles and Intellectual Capital, Ferrara, 18–20 October.

- Bridge, S., O'Neill, K. and Cromie, S. (2003) Understanding Enterprise, Entrepreneurship and Small Business, Palgrave Macmillan, Basingstoke.
- Churchill, N. and Lewis, V. (1983) 'The five stages of small business growth', *Harvard Business Review*, 61, 3, pp.30–50.
- Comité Européen de Normalisation (CEN) (2004) European Guide to Good Practice in Knowledge Management, CEN, Brussels, available from ftp://cenftp1.cenorm.be/PUBLIC/ CWAs/e-Europe/KM/German-text-KM-CWAguide.pdf [accessed November 2007].
- Desouza, K.C. and Awazu, Y. (2006) 'Knowledge management at SMEs: five peculiarities', Journal of Knowledgement Management, 10, 1, pp.32–43.
- Egbu, C., Hari, S. and Renukappa, S. (2005) 'Knowledge management for sustainable competitiveness in small and medium surveying practices', *Structural Survey*, 23, 1, pp.7–21.
- Fuchs, M. (2003) 'Wissenskultur auch in kleineren und mittleren unternehmen? Über die neue rolle des personalmanagements in erfolgreich im schatten der grossen' in Stahl, H.-K. and Hinterhuber, H.-H. (eds) Wettbewerbsvorteile für kleine und mittlere Unternehmen, Erich Schmidt Verlag, Berlin.
- Gueldenberg, S. (2003) *Wissensmanagement und Wissenscontrolling in Llernenden Organisationen. Ein Systemtheoretischer*, Ansatz, Deutscher Universitäts-Verlag, Wiesbaden.
- Guion, L. (2006) Conducting an In-depth Interview, available from http://edis.ifas.ufl.edu/ FY393 [accessed August 2006].
- Gupta, A. and Govindarajan, V. (2000) 'Knowledge management's social dimension: lessons from Nucor Steel', *Sloan Management Review*, 42, 1, pp.71–80.
- Hall, R. (1992) 'The strategic analysis of intangible resources', *Strategic Management Journal*, 13, pp.135–44.
- Hislop, D. (2005) Knowledge Management in Organizations, Oxford University Press, Oxford.
- Hofer, C. and Charan, R. (1984) 'The transition to professional management: mission impossible?', *American Journal of Small Business*, 9, 1, pp.1–11.
- Hutchinson, V. and Quintas, P. (2008) 'Do SMEs do knowledge management?: or simply manage what they know?', *International Small Business Journal*, 26, 2, pp.131–54.
- Ibrahim, A. and Ellis, W. (1990) *Entrepreneurship and Small Business Management*, Kendall/ Hunt Publishing, Dubuque.
- Jääskeläinen, A. (2007) 'How to measure and manage the risk of losing key employees?', paper presented at the *IC Congress 2007*, 3–4 May, Haarlem.
- Kransdorff, A. (1996) 'Succession planning in a fast-changing world', *Management Decision*, 34, 2, pp.30–34.
- Lehner, M., Gerner, M. and Müller, C. (2005) *Transfer von Expertenwissen. Ein Leitfaden für Kleinunternehmen*, Wissenschaftlicher Verlag, Berlin.
- Lynn, B. (2000) 'Intellectual capital unearthing hidden value by managing intellectual assets', *Ivey Business Journal*, 64, 3, pp.48–52.
- Lynn, B. (1998) 'Intellectual capital', CMA Magazine, 72, 1, pp.10–15.
- Martín-de-Castro, G., Navas-López, J., López Sáez, P. and Alama-Salazar, E. (2006) 'Organisational capital as competitive advantage of the firm', *Journal of Intellectual Capital*, 7, 3, pp.324–37.
- Maykut, P. and Morehouse, R. (1994) *Beginning Qualitative Research. A Philosophic and Practical Guide*, Falmer Press, London.
- McAdam, R. and Reid, R. (2001) 'SME and large organisation perceptions of knowledge management: comparisons and contrasts', *Journal of Knowledge Management*, 5, 3, pp.231–41.
- Miles, M. and Huberman, A. (1994) An Expanded Sourcebook, Qualitative Data Analysis, Sage, Thousand Oaks, CA.
- Morrell, K., Loan-Clarke, J. and Wilkinson, A. (2004) 'Organisational change and employee turnover', *Personnel Review*, 33, 2, pp.161–73.
- Nunes, M.-B., Annansingh, F., Eaglestone, B. and Wakefield, R. (2006) 'Knowledge management issues in knowledge-intensive SMEs', *Journal of Documentation*, 62, 1, pp.101–19.
- O'Gorman, C. (2006) 'Strategy and the small business' in Carter, S. and Jones-Evans, D. (eds) *Enterprise and Small Business*, Pearson, Harlow.

- Roos, G., Pike, S. and Fernström, L. (2005) *Managing Intellectual Capital in Practice,* Butterworth-Heinemann, Burlington, MA.
- Shaw, J., Delery, J., Jenkins, G. and Gupta, N. (1998) 'An organization-level analysis of voluntary and involuntary turnover', *Academy of Management Journal*, 41, 5, pp.511–25.
- Shelton, R. (2001) 'Helping a small business owner to share knowledge', *Human Resource Development International*, 4, 4, pp.429–50.
- Stovel, M. and Bontis, N. (2002) 'Voluntary turnover: knowledge management friend or foe?', *Journal of Intellectual Capital*, 3, 3, pp.303–22.
- Trevinyo-Rodríguez, R. and Tàpies, J. (2006) Effective knowledge transfer in family firms' in Smyrnios, P. and Klein, S.-B. (eds) *Handbook of Research on Family Business*, Edward Elgar, Cheltenham.
- Van den Berg, C. and Popescu, I. (2005) 'An experience in knowledge mapping', Journal of Knowledge Management, 9, 2, pp.123–28.
- Wiig, K. (1997) 'Knowledge management: an introduction and perspective', Journal of Knowledge Management, 1,1, pp.6–14.
- Wong, K. and Aspinwall, E. (2004) 'Characterizing knowledge management in the small business environment', *Journal of Knowledge Management*, 8, 3, pp.44–61.
- Wong, K. and Aspinwall, E. (2005) 'An empirical study of the important factors for knowledge-management adoption in the SME sector', *Journal of Knowledge Management*, 9, 3, pp.64–82.
- Zimmerer, T., Scarborough, N. and Wilson, D. (2008) *Essential of Entrepreneurship and Small Business Management*, Pearson Prentice Hall, Upper Saddle River, NJ.