Exploring the Alignment of Organisational Goals with KM: Cases in Four Irish Software SMEs

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Abstract: In the anticipation of the knowledge economy and the organisational pursuit of '*knowing what we know'* modern organisations have endeavoured to achieve varying levels of KM. It has typically been larger organisations that have possessed the economies of scale i.e. the financial resources to pursue this strategy, where they perceive they will lose their market share if they do not follow the trend. Smaller organisations have not had the same luxury. Ironically however, it is smaller organisations that have successfully managed knowledge for centuries. However there remains an absence of empirical evidence that highlights how SMEs operationalise their approach to KM, particularly in the high-technology sectors. In view of the current financial instability, never has it been more important to focus on the knowledge capabilities of software SMEs where managing organisational knowledge is essential to the continued success of an SME. Pursuing a qualitative analysis approach using multiple case studies in four Irish software SMEs, this study identifies sources of knowledge and occurrences of knowledge activities (KAs) as a means of understanding the firm's approach to knowledge management (KM) and how this may be closely aligned to the organisation's greater strategic objectives thus providing them with greater flexibility to deal with environmental uncertainty. At the level of the cases, it was evident that software SMEs leverage KAs to serve their knowledge transfer needs. Unexpectedly, the findings from this study indicate that these software SMEs were not good at knowledge creation activity. This may be attributed to the nature of the SME where a small number of key players i.e. founder/manager/head of development assumed responsibility for this type of activity. Fundamentally, these software SMEs choose to leverage knowledge and KAs in order to serve the greater needs of the firm such as the need to develop a new software product, improve their customer relationships or ensure their position as an important cog in a larger organisation.

Keywords: knowledge, knowledge management (KM), small and medium sized enterprises (SMEs), knowledge activity (KA), software, alignment and KM capabilities

1. Introduction

Much of the existing Information Systems (IS) research deals with the phases of Data Processing, Information Processing and Knowledge Management independently, proposing new concepts and information systems at each stage. However, *"knowledge management represents a continuation of efforts begun in other times with other names (or acronyms)"* (O'Dell and Grayson, 1998, p6). Essentially, organisations since the 1950s have sought to improve their reactions to change, with the longer term objective of establishing the capabilities to pre-empt it. Subsequently, defining data, information and knowledge as distinct and independent phenomena is a demanding endeavour. In particular it is noted that many authors use the terms information and knowledge interchangeably, those (Dennis, Earl, El Sawy, Huber) that considered organisational information processing in the 1970s, 1980s and early 1990s now focus their attentions on KM as an organisational strategy. Figure 1 represents data, information and knowledge as a continuum.

In Figure 1, it is evident that the extremes of each phenomenon are distinct however there is significant overlap between data/information and information/knowledge. According to Davenport and Prusak (1998, p147) *"the distinction between knowledge and information is seen as more of a continuum than a sharp dichotomy. Most projects that focus on internal knowledge [repository] deal with the middle of the continuum-information that represents knowledge to certain users".* Alavi and Leidner (2001, p109) posit that *"information is converted to knowledge once it is processed in the minds of individuals"* while "*knowledge becomes information once it is articulated and presented in the form of text, graphics, words or other symbolic forms"*. The point where information becomes knowledge and vice versa is difficult to pinpoint with complete accuracy, however there is no doubt that these phenomena are closely linked. In order to adequately observe and measure knowledge in

an organisation, it is essential that an operational definition is established. Supporting the view of Davenport and Prusak (1998) and the point indicated by the arrow in Figure 1, for this study knowledge occurs when – *Information represents valuable knowledge to a group focused on achieving a particular task.*

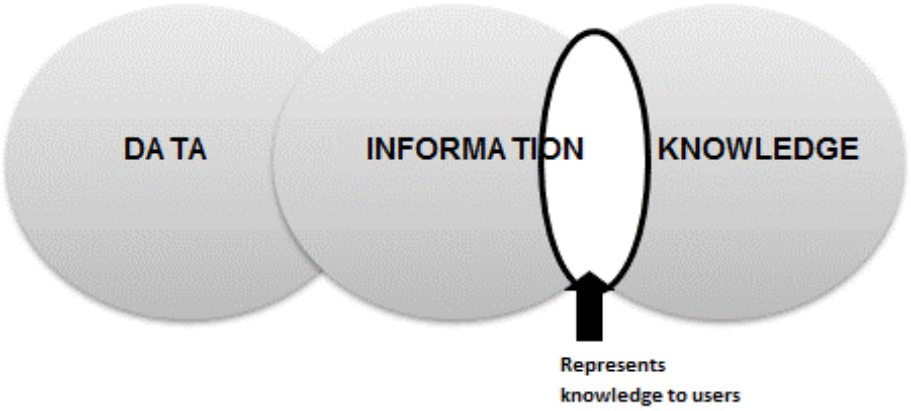

Figure 1: Knowledge continuum (after Davenport and Prusak, 1998; Wurman, 2001)

This definition is used to identify instances or occurrences of individual knowledge types. From a practical perspective, it is essential that an enterprise knows the type of knowledge that they need to focus on (Zhao *et al*., 2012). Using the definition presented here, the aim of this study is to understand how software SMEs utilise their knowledge capabilities to achieve their organisational goals. It is important to state from the outset that factors such as leadership, culture, people, organisational structure, technology and business processes are fundamental to a successful KM approach (Hasanali, 2002; McDermott and O'Dell, 2001; Storey and Barnett, 2000; Sunassee and Sewry, 2002) however they were considered as part of a larger study and are not the core focus of this paper.

This paper is structured as follows; the subsequent section briefly outlines the benefits reaped by companies in pursuing KM. Next a classification of KA is defined followed by a rationale for aligning a firm's business objectives with their KM approach. Then, the importance of leveraging KM to deal with environmental uncertainty is discussed and the research methodology is outlined. In addition, the background to each case is presented and the findings are considered. Finally, the authors consider the research findings and present the conclusions.

2. Harvesting the benefits of KM

Knowledge has become the source of competitive advantage and the source of organisational empowerment. Nonaka (1994) maintains that organisations must realise the importance of knowledge in order to survive in a highly competitive market place. He postulates that "*in an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge*" (Nonaka, 1994, p14). Stewart (1997) further argues that knowledge has become the most important factor in economic life. He acknowledges that knowledge is the chief ingredient in what organisations buy and sell, and the raw material with which organisations work. Intellectual capital, not natural resources, machinery or even financial capital, has become the one indispensable asset of corporations (Stewart, 1997). With due consideration, the capacity to incorporate and apply the specialised knowledge of organisational members is fundamental to a firm's ability to create and sustain competitive advantage (Drucker, 1993). This focus has forced organisations to re-think the way they manage their business since the emphasis is no longer on tangible assets but on people's abilities and experiences (Sunassee and Sewry, 2002). As a result organisations are identifying the strategies and technologies to manage this knowledge with the objective of gaining maximum benefits from an organisation's knowledge pool (O'Dell and Grayson, 1998; Sunassee and Sewry, 2002). However, organisational knowledge is of limited organisational value if the knowledge is not shared and managed (Alavi and Leidner, 1999). Alavi and Leidner (1999) maintain that KM has emerged as a new philosophy to control and support the flow of knowledge in an organisation. In addition, Bansler and Havn (2002) purport that KM contributes to improved organisational productivity, flexibility and innovation capabilities by enabling employees to share, integrate and reuse knowledge more

effectively. Sunassee and Sewry (2002) further suggest that companies which have implemented KM solutions are better equipped to deal with business situations, as these companies have access to previous know-how. As a first step, the nature of organisational knowledge activities (KAs) is considered as key components of KM.

3. Classification of knowledge activities

For the purpose of this research, a definition of KA proposed by Kraaijenbrink *et al*., (2006, p23) is adopted as *"transactions or manipulations of knowledge where the knowledge is the object not the result"*. It is evident that multiple researchers use different terms for the same/similar activity. Many of these definitions share common verbs such as storing, creating and applying knowledge in an organisational context. This research takes a balanced view of KAs, discounting the activities proposed by Leonard-Barton (1995), as they have a sole technical focus. This research summarises the terms widely used to describe KAs including *knowledge acquisition* (Alavi and Leidner, 2001; Huber, 1990; Holsapple and Joshi, 2004; Kraaijenbrink *et al*., 2006), *codification* (Davenport and Prusak, 1998; Faran *et al.,* 2006; Kraaijenbrink *et al*., 2006; Nevo *et al.,* 2007), *storage* (Alavi and Leidner, 2001; Huber, 1991), *maintenance* (Conway and Sligar, 2002; Holsapple and Singh, 2004; Holsapple and Whinston, 1996), *transfer* (Alavi and Leidner, 2001; Huber, 1990; Nonaka and Takeuchi, 1995) and *creation* (Davenport and Prusak, 1998; Kayworth and Leidner, 2004; Nonaka and Takeuchi, 1995; Pentland, 1995).

A review of the literature revealed little empirical research to support a single classification of KAs. This dearth of empirical support provided the opportunity for this research to establish a set of KAs including knowledge acquisition, codification, storage, maintenance, transfer and creation. Defining these activities formulates the basis for an organisation's approach to KM, thus facilitating a more tangible way of observing and measuring an organisation's approach to managing knowledge, providing a foundation to clearly identify and understand the individual activities and their potential relationships.

4. Aligning KM to the Organisation

KM may be achieved if it is closely aligned with the strategic needs of the organization. This approach seeks to identify the organization's requirements and evaluate a knowledge strategy based on the business's strategic vision (Carlsson, 2001; Duffy, 1999; Pillania, 2008). In a software development company one organisational objective may be to improve the efficiency of the software developers as a means of increasing profits on individual projects. As a result an organisation's knowledge strategy may be to 'avoid reinventing the wheel' leveraging existing programming code in new projects (Davenport and Prusak, 1998). Davenport and Prusak (1998, p178) state that *"knowledge and learning should always serve the broader aims of the organisation. Otherwise it [KM] becomes at worst a liability and at best a distraction"*. A commonly understood and agreed rationale for pursuing KM should positively impact the success of the approach.

While knowledge is recognized as a critical resource for sustained competitive advantage (Davenport and Prusak, 1998; Grant, 1996a; Grant, 1996b; Nonaka and Takeuchi, 1995; Teece, 1996; Wiig, 1997), successful KM requires vast amounts of organisational resources, diverse techniques, and associated tools, and this requires a solid and deliberate plan from the beginning (Davenport and Prusak, 1998). In formulating and pursuing a successful KM approach, it is imperative that senior managers support a long term strategic view in order to derive the real and lasting benefits resulting from the KM strategy addressing the organisations' immediate and emerging needs (Liebowitz, 2008; Ruikar *et al*., 2007). In addition, Chourides *et al.'s* (2003) study found that organisations, which did not develop a separate KM strategy to control the required resources were more susceptible to failure. From a number of case studies, Chourides *et al.* (2003) identified that organisations pursue different KM strategies. However, the need for a formal approach to KM remains. This includes reorganising employees, allocating financial resources for new technology and training requirements as well as outlining formal KM objectives (Chourides *et al.,* 2003).

Research (Tiwana, 2000; Zack, 1999) purports that KM approaches differ across organisations due to the difference in culture, organisational structure and organisational objectives. This implies that KM varies across organisations; therefore organisations need to identify a unique strategy that suits their needs. Hansen *et al.* (1999, p109) state that, "*a company's knowledge management strategy should*

reflect its competitive strategy" and this is supported in literature (Davenport and Prusak, 1998; Hasanali, 2002; Sunassee and Sewry, 2002). Aligning KM strategy to the business strategy seeks to clarify what the company must know to in order to realise what the company can do. It is well supported that organisations, which did not develop a separate KM strategy typically end up with their KM initiative losing focus, priority and impact (Chourides *et al.,* 2003).

5. Building Organisational Knowledge Capabilities

Organisations are cognitive in nature; as a result they learn and develop knowledge (Argyris and Schön, 1978). Hedberg (1981) defines organisational learning as a two pronged process, the firstwhere organisations adjust themselves to deal with reality and the second where they effectively leverage knowledge to improve their fit with the external environment. In order to achieve this *"the organisation must have mechanisms to learn about and interpret external events"* (Daft and Lengel, 1986, p566). In order to maintain and develop organisational memory it is essential that an organisation learn from both its internal context and external environment (Bennet and Bennet, 2004).

"Organisations have no other brains and senses than those of their members" (Hedberg, 1981, p6). Considering this perspective, an organisation as an entity is completely reliant on the quality and expertise of the sum of its employees. However, Argyris and Schön (1978) suggest that organisations often know less than the sum of their members. This may be due to communication issues e.g. information filtering, distortion and channel overload (Argyris and Schön, 1978). The lack of a formal learning/knowledge repository can contribute to this. Huber (1989) points out that if knowledge is not formally stored, it may be lost on three counts, firstly through staff turnover, secondly through an organisation not knowing what to store based on future needs and finally through an inability to share knowledge. One example of the benefits that may be derived from maintaining a knowledge repository is Chrysler automobile company. They used an *"Engineering Books of Knowledge"* to store an *"electronic memory"* of engineer's past experiences (Davenport and Prusak, 1998). This repository was actively leveraged to inform engineer decision making in future development projects.

In terms of problem solving, organisations build an advantage in boom times however, slack reduction acts as an environmental indicator of crisis which can activate problem solving mechanisms, and this in turn can lead to organisational learning (Hedberg, 1981). In addition, Pounds (1969) considers management learning through 'problem finding'. Where Hedberg (1981) presents slack as a trigger, Pounds (1969) suggests that problems can be triggered through discrepancies in historical models. These models act as an archive of past experience to estimate the short term future, though Pounds (1969) admits in some cases that these models were carried in the heads of management supported by routine reports. However, opportunity triggers are less evident as problem triggers are more common (Hedberg, 1981). Yet, organisations may identify new opportunities in the market, which in turn, facilitate learning. Together KM, organisational learning and memory influence how organisations deal with knowledge and its impact on organisational effectiveness (Jennex and Olfman, 2002).

6. Research approach

This study pursued a qualitative analytical approach (Ägerfalk and Fitzgerald, 2008) using multiple case studies, each case was selected using purposeful sampling (Patton, 1990). The cases were selected based on their size and industry sector. The software industry *"is a knowledge industry. Its major product is knowledge itself and its major output is research which translates into new products and services"* (p562) (Bernroider, 2002) Software development may be characterised as knowledge work (Schönstrom and Carlsson, 2003). As the objective of this study was to explore the knowledge approach leveraged by small software development firms, the focus of the study was on the two core business processes of sales and software development. Based on a selection strategy, positional methods were used to uncover sales and technical managers while other respondents were selected based on reputation (Knoke, 1994). Twenty two individuals were interviewed; each interview was approximately one hour in duration. Interviews were taped and transcribed. The exploratory nature of the study coupled with the *"thick transcripts"* (p56) (Miles and Huberman, 1994) meant that qualitative analysis could be conducted through the use of coding techniques (Miles and Huberman, 1994). The classification of KAs was used for the purpose of data analysis in this study (see Table 1).

Table 1: Classification of Knowledge Activities with Codes

Knowledge Activity (KA)	Code	Definition
Acquire	A	Identify and capture knowledge from source to a company. Sources include written form, physical objects, people, courses, cooperation between source and recipient, and outsourcing
Codify	CO	Assess the value of knowledge, distil, refine and assemble into comprehensive format
Store	S	Store knowledge in an artefact e.g. system, document
Maintain	M	Update on continuous basis, as a result of additional acquisition activities
Transfer	T	Identify receiver, organize channel of communication and send
Create	C	New knowledge cultivated through knowledge transfer. Acquisition activities come into play as new knowledge is acquired

Each KA was assigned a code and this code was utilised to classify the nature of KAs, these categories were then assigned chunks of data derived from the interview transcripts. Each transcript was analysed using the KA codes and a memo was generated at the level of the interview.

6.1 Background to cases

Case 1 (Employee Headcount 50): HelpRead Ltd. produces a suite of assistive software solutions to support learning disability, government and general education needs primarily in the UK and US markets. The complexity of the software product offering means that a deep understanding of customer requirements is essential to build a useful product. The complex customer requirements coupled with innovative management initiatives, such as brainstorming, provided rich insights from a KM perspective.

Case 2 (Employee Headcount 70): TravelSoft Ltd. was established in the early 1990s. Their core offering at that time was the provision of leisure/travel technologies to one main customer, who was also the company's main shareholder. In 2004, TravelSoft Ltd. took greater financial control of the organisation; while continuing to provide software to their former parent organisation. Change processes such as hiring new managers, pursuing new product development, increased process development and attracting 'third party customer' offered significant opportunities to study KM.

Case 3 (Employee Headcount 70): Systems Solutions Ltd develops bespoke software application and data warehousing solutions as well as software resale to client server market. Software consulting companies have been known to pursue formalised approaches to KM (Hansen *et al*., 1999), in Systems Solutions Ltd. this is not the case. While significant KA was required to support the four autonomous divisions (Business Intelligence, Application Development, Business Service Management and SAP solutions independently, as well as the transfer activity across divisions, much knowledge activity was informal and ad-hoc in nature, primarily driven by focused sales activity.

Case 4 (Employee Headcount 7 (Ireland) and 250 worldwide): Doc Man (Ireland) Ltd. is a small satellite single function (component development) operation for an edocument management software developer based in Givisiez, Switzerland. From a KM perspective, the size, location and functional specialization of the site presented unique characteristics for consideration.

7. Findings

The efficacy of the empirical findings derived from the four organisations considered provided tangible and objective measures (Tan *et al.,* 2009) for the qualitative notion of knowledge and knowledge activity. Using the classification of KAs, Table 2 provides a synthesis of the knowledge focus by KA identified in each of the four cases.

Table 2: Overview of Knowledge and Knowledge Activity in Four Software SMEs

KA/ No. of KAs (%)/Knowledge Focus by Activity	HelpRead Ltd. Total KAs 82	TravelSoft Ltd. Total KAs 147	Systems Solutions Ltd. Total KAs 105	DocMan (Ireland) Ltd. Total KAs 60
Acquire	17 (21%) 53% Product Knowledge (9 of n=17 activities)	16 (11%) 44% SW Dev Knowledge (7 of n=16 activities) 25% Travel Industry knowledge (4 of n=16 activities)	16 (15%) 44% Product Knowledge (7 of n=16 activities) 31% Customer Knowledge (5 of n=16 activities)	7 (12%) 57% SW Dev Knowledge (4 of n=7 activities) 43% Customer Knowledge (3 of n=7 activities)
Codify	11 (13%) 90% SW Dev, Project and Product Knowledge (10 of n=11 activities)	30 (20%) 36% SW Dev (11 of n=31 activities) 32% Process/Product Knowledge (10 of n=31 activities)	14(13%) 86% SW Dev and Project Knowledge (12 of n=14 activities)	11 (18%) 64% SW Dev and Project Knowledge (7 of n=11 activities)
Store	24 (29%) 71% SW Dev, Product, Project Knowledge (17 of n=24 activities)	31 (21%) 41% SW Dev and Project Knowledge (12 of n=29 activities) 41% Process/Product Knowledge (12 of n=29 activities)	27(26%) 67% SW Dev and Project Knowledge (18 of n=27)	9 (15%) 67% SW Dev and Project Knowledge (6 of n=9 activities)
Maintain	8 (10%) 63% Project and SW Dev Knowledge (5 of n=8 activities)	20 (14%) 40% SW Dev and Project Knowledge (8 of n=20 activities) 40% Process/Product Knowledge (8 of n=20 activities)	13 (12%) 38 % Sales Knowledge (5 of n=13 activities) 23% Project Knowledge (3 of n=13 activities)	7 (12%) 57% SW Dev and Project Knowledge (4 of n=7 activities)
Transfer	17 (21%) 83% Product, Project and SW Dev Knowledge (14 of n=17 activities)	41 (28%) 68% SW Dev and Project Knowledge (28 of n=41 activities)	30(29%) 60 % SW Dev and Project Knowledge (18 of n=30 activities)	24 (40%) 79% SW Dev and Project Knowledge (19 of n=24 activities)
Create	5 (6%) 80% Product Knowledge (4 of n=5 activities)	9 (6%) 56% Product Knowledge (5 of n=9 activities)	5 (5%) 80 % Project Knowledge (4 of n=5 activities)	2 (3%) 100% SW Dev and Project Knowledge (2 of n=2 activities)

7.1 HelpRead's KM Strategy

HelpRead was focused on building a collective organisational memory that facilitates continued growth through the introduction of new hires and new products. This was particularly important in terms of acquiring external knowledge to inform new product development. Table 2 identifies *82 instance of KA* at HelpRead; the majority of activities presented themselves through knowledge acquisition, storage and transfer. One hundred and thirteen instances of knowledge types were uncovered. The may explained by single KAs leveraging multiple knowledge types in some instances, thus increasing the instances of knowledge types identified in the analytic memos. It is also important to note that, at the time, HelpRead Ltd. was not in a new product development phase. Using Table 2, the difference in intensity between these types of activities is indicative of HelpRead's position as a growing organisation. Knowledge acquisition intensity at 21 percent (n=82) showed that fifty three percent of all knowledge acquisition activity was focused on gathering product knowledge supporting Groen's (2006, p124) view that in high-technology SMEs require knowledge from external sources to support new product development.

At 13 percent (n=82) codification activity was relatively low intensity, this was reflective of the uncertainty around what the company needs to know in the future. This is predominantly evident with the Technical FAQ, which lacked buy-in from the entire development team. The Development Manager admitted that as a team *"they didn't know what they should know".* Most codification activity was directly related to refining the discussions at group meetings into documents which are made

available over the Intranet. Over 90 percent (n=11) of all codification activity identified in Table 2 was related to product development knowledge. Codification was largely not a sales related activity. The well-defined scope of the *Goldmine*^{TM} sales system meant that no KA was required to support the refinement and distillation of sales related knowledge. In addition, the experience of the sales team meant they know what important customer and sales related knowledge should be stored for future use.

The high occurrence of storage activities at 29 percent was indicative of the importance placed on storing knowledge in the new Intranet-based quality system - approx 74 percent (17 of n=24 storage activities) of storage activity involved the Intranet. These activities primarily included storing software project documents and employee skills documents, in line with the compliance requirements outlined by IS9001:2000. The codification intensity also included the level of customer information captured and stored by the sales team. This 29 percent reflected the move to store the knowledge gathered from acquisition, codification and transfer activities. Maintenance activities at 10 percent highlighted the company's focus on maintaining software and product development knowledge. Unexpectedly, transfer activity was high intensity at 19 percent - with closer inspection; the role of the Technical Director (TD) was integral to this. Without the TD as a pivotal player, these activities may not be as successful or may not even occur. In order to leverage the full potential of their approach; it is imperative that responsibility for KA is disseminated to all levels of the organisation.

At 6 percent, knowledge creation was very low. While Table 2 shows that 80 percent of knowledge creation activity was focused on product knowledge, in line with company strategy, the lack of other types of knowledge creation may be explained by the pressures associated with the recent rapid growth in employee headcount and the increased product portfolio.

7.2 TravelSoft's KM Strategy

At the time of interview a new Application Solutions Manager had been in place at TravelSoft for approximately eight months. From a Telecoms background, he implemented a number of organisational strategies to develop embedded processes and most importantly to bring a new product to the travel software marketplace. It is primarily these management initiatives that contributed to the high number of KAs, *147 instances* presented in Table 2.

The KAs identified used more than one type of knowledge during a single KA, consequently providing the rationale for the 211 instances of knowledge types identified for TravelSoft. The knowledge focus at TravelSoft was quite consistent and reflected the company's strategic objectives. The emphasis on software development, project, process and product knowledge was marked. Knowledge of the travel industry made up a quarter of the knowledge acquisition activity.

At HelpRead Ltd. 82 instances of KAs were observed, KA at TravelSoft was considerably higher at 147 instances. This intensity may be explained by a number of factors. Knowledge acquisition activity at 11 percent (16 of n=147) was due to the acquisition of consultant knowledge on new product development, employee training, relevant books, journals and travel conferences. In terms of codification at 20 percent activity, project related knowledge was refined and stored. At 21 percent activity, storage activity was almost in line with the volume of codification activity. This shows that TravelSoft were good at following through on this type of activity. For example the steering committee refine and store the new Adept framework templates in the relevant artefacts. R&D acquisition, codification, storage and maintenance of knowledge contribute to the dense volumes of KA. Activities such as Internet research in the travel area added to the level of knowledge acquisition activities, while refining and storing this knowledge contributed to the volume of codification and storage activity. At 14 percent, maintenance activity was lower than knowledge codification and storage activity. This could be owing to the fact that some of the knowledge stored did not require updating, for example conference and journal papers on the travel industry will not be changed although new papers may be added over time resulting in increased storage activity.

Knowledge transfer at 28 percent (41 where n=147) represented the highest volume of KA. This organisation encouraged knowledge transfer at all levels of the organisation. Knowledge creation was much lower at 9 instances (6 percent where n=147). These activities were all generated around new product and process development placing these initiatives at the core of all KAs of TravelSoft at that time. Table 2 shows a spread of 66 percent of KA at TravelSoft across knowledge acquisition,

codification, storage and maintenance activity, while transfer and creation activity account for 34 percent of all KA. By comparison, the distribution at HelpRead for the same activities was 73 percent and 27 percent respectively. This shows that through their change process, TravelSoft were good at leveraging the more 'valuable' types of KA.

7.3 Systems Solution's KM Strategy

KA at Systems Solutions was mostly characterised by its informal nature. The Managing Director admitted that when he is involved with requirements analysis for the business intelligence division the knowledge is documented and stored in a notebook. One Project Manager from the Application Division admitted that it was not uncommon to calculate a project price on the back of a piece of paper in the car park before attending a meeting with a prospective customer. Table 2 illustrates a total of *105 KAs* identified.

One hundred and thirty one instances of knowledge type were identified across the KAs; this indicates that some KAs leveraged multiple knowledge types. It is apparent that knowledge acquisition and maintenance were exceptions in terms of their knowledge focus. Knowledge acquisition was focused on product and customer knowledge, these knowledge types were largely relevant to the Business Service Management and SAP Solutions divisions focused on software resale. Knowledge maintenance activity was focused on sales knowledge at 38 percent. The emphasis on sales primarily reflects the knowledge requirements of these two divisions. From Table 2, the other KAs were focused on software development and project knowledge serving the knowledge needs of the Business Intelligence (data warehousing) and Application Development divisions.

Project related knowledge was codified, stored and maintained in order to meet the requirements of pharmaceutical customers who must abide by Food and Drugs Authority (FDA) regulations. From Table 2, it is evident that at 26 percent, storage activity was higher than both codification and maintenance activity together at 21 percent. This may mean that Systems Solutions store large volumes of documentation without refining and formatting it, and in the longer term, without updating it. As a result, it seemed that they hold large these volumes for the sole purpose of protecting themselves from external threats such as possible audits. At 15 percent, knowledge acquisition appeared important, however more than half of this activity is attributed to sales and customer interaction.

At 5 percent, knowledge creation activity was very low. The Managing Director was the main source of the knowledge creation activity at Systems Solutions. It seems that the time pressures associated with meeting project deadlines meant that there was little time for knowledge creation activity amongst the divisions. In the case of Systems Solutions knowledge creation was not the responsibility of those at an operational level. Knowledge acquisition, codification, storage and maintenance account for 66 percent of all KAs while knowledge transfer and creation amount to 34 percent. This was consistent with TravelSoft though it differed in the case of HelpRead whose focus on knowledge storage activity through the new company Intranet tips the balance of KA distribution towards the earlier activities.

7.4 DocMan's (Ireland) KM Strategy

At DocMan (Ireland) the total volume of KA was low in comparison to the other cases considered. This may be endorsed by the nature of the well-defined work on software development components at the DocMan site in Ireland. The operations at the Irish site are part of a larger document management software component and the output from DocMan (Ireland) was integrated by the software integrator at the Swiss headquarters. As a result of this task specificity, there was a set of core KAs from which there was minimal diversification at the Irish site. The breakdown of KAs for DocMan (Ireland) Ltd. is presented in Table 2.

Table 2 illustrates a significant level of knowledge consistency across all of the KAs. Software development and project knowledge represented at least 57 percent of the knowledge focus for all six KAs. This uniformity across activities also supports the task specialisation activity at the DocMan (Ireland) site. DocMan (Ireland) leveraged some external knowledge resources at 12 percent (7 where n=60) knowledge acquisition, however the main source of knowledge is the headquarters in Switzerland and this was achieved through knowledge transfer activity which was very high at 40

percent (24 where n=60) of total activity. It is from here that the majority of customer requirements were received as well as any new product knowledge.

Knowledge creation activity was very low at 3 percent (2 where n=60). This may be the result of the location of this development team with most new ideas being generated at a higher level at company headquarters. Although the total volume of KA was low, the split between the acquire, codify, store and maintain KA at 57 percent and the knowledge transfer and creation activity at 43 percent is more evenly balanced than that observed at HelpRead Ltd., at 73 percent to 27 percent respectively. The geographic location, the task specialisation and the maturity of the parent organisation may be attributed to the knowledge transfer capabilities identified at DocMan Ireland. In contrast to the other firms considered in this study, DocMan's (Ireland) KM capabilities were largely determined by their Swiss parent company. Perhaps this subsidiary should consider developing their own knowledge creation independent capabilities with the objective of feeding new ideas back. This strategy could further secure their position as a core component in the companywide strategy.

8. Discussion

The previous section explores the distribution of KAs across four software SMEs. As part of this consideration, it is imperative to take a closer look at the firm's motivation for pursuing different KAs in terms of their wider organisational objectives. This is even more crucial in the case of an SME where their ability to leverage the resources available to be them, enabling them to be flexible enough to pursue alternative organisational goals is essential, as they are more susceptible to external forces. Table 3 provides a sample of the organisational goals pursued by the SMEs. Each goal is characterised by the knowledge types and KAs used to achieve the objectives of the firm at a particular time.

Table 3: Achieving organisational goals through knowledge activity

Company	Knowledge Focus	Organisational Goal	Knowledge Activity
HelpRead	Software Development Product Project Customer	✓ New Feature Development ✓ New Product Development ✓ Meet Customer Needs ✓ Industry Accreditation	✓ Transfer and Creation ✓ Acquisition, Transfer and Creation ✓ Acquisition ✓ Codification and Storage
TravelSoft	Software Development Project, Product, Process, Travel Industry	✓ New Product Development ✓ Establish a customer base ✓ New Business Process Development	✓ Acquisition, Transfer and Creation ✓ Acquisition ✓ Codification, Storage and Maintenance
Systems Solution	Project, Sales, Customer, Software Development	✓ Compliance ✓ Attract new customers	✓ Storage ✓ Acquisition
DocMan (Ireland)	Software Development, Project, Customer	✓ Serve the needs of the parent organisation	✓ Transfer

Table 3 highlights that the KM approaches differ across organisations. Knowledge specialisation was evident, particularly in organisations where new product development initiatives were a high priority for the organisation e.g. learning disability (HelpRead) and travel sector (TravelSoft) In this study, knowledge transfer generates the highest volume of knowledge activities, closely followed by knowledge storage. This was a common characteristic across the cases; this could be attributed to the close proximity of employee**s** or, in the case of DocMan (Ireland), the high dependency on the parent organisation. While knowledge creation presents the lowest volume of knowledge activity, it is possible that this statistic represents the nature of an SME, where decisions and initiatives are mostly driven by the founder and senior management.

Considering the lens (KAs) used in this study to characterise the firms KM approach, Figure 2 below provides a holistic view of the key components examined, these include knowledge type, KAs, the underlying organisational strategy and the benefits derived from the KM approach. Figure 2. illustrates a diagnostic instrument which could provide SMEs with the capability of tangibly measuring their current KM approach. Ideally, in times of uncertainty the firm should be flexible enough to leverage knowledge capabilities in order to pursue the goals of the organisation at that time. This formalised

systematic approach may result in the establishment of knowledge rules which can be followed enabling the firm to develop embedded KAs. By doing this, the organisation can learn from past experience to inform future development.

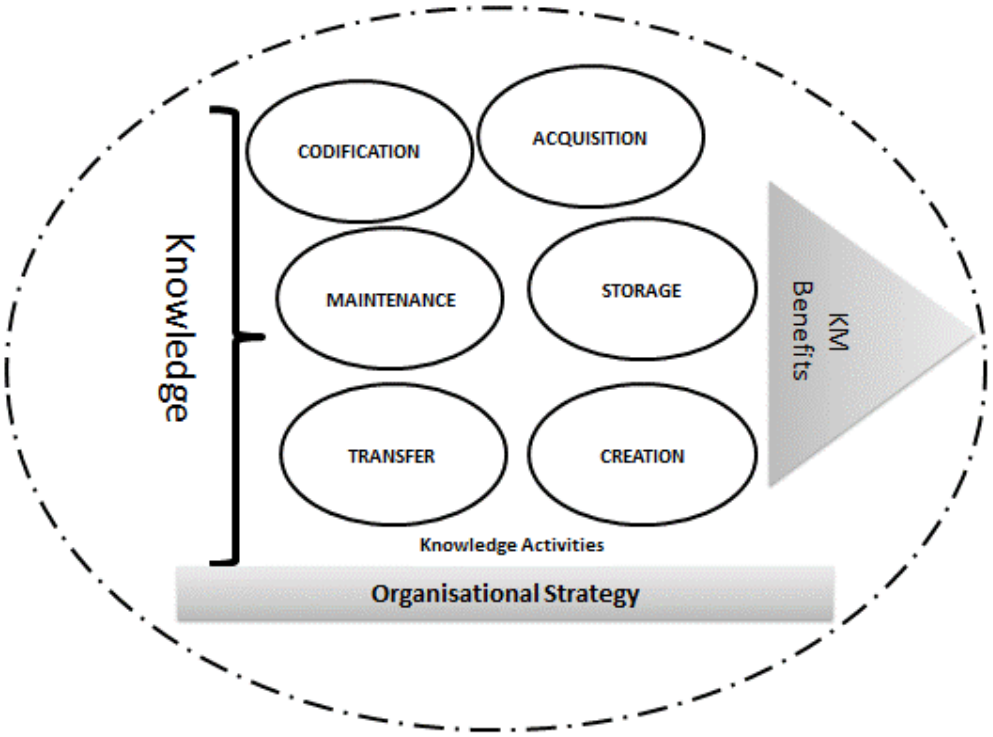

Figure 2: An overview of the KM approach

9. Conclusion

As a result of the within-case analysis, an insight was gained into the rationale for the difference in volume of KAs across the cases. The findings of this research highlight that management led initiatives, such as new product development processes may positively contribute to the volume of KA within an organisation. However, it may be noted that the over reliance on pivotal players at a management level means that their removal from that position could result in significant decreases in KA and loss of knowledge.

While the importance of exploiting KM to suit an organisation's strategy is evident from the four cases conducted as part of this study, additional research should endeavour to understand the rationale for pursuing certain knowledge approaches based on the organisation's goals or objectives (Carlsson, 2001; Duffy, 1999; Davenport and Prusak, 1998), at a particular time or as a result of environmental change. In considering organisational strategy, factors such as management, culture, people, structure and business processes are identified as key to operationalising an organisation's KM approach.

An effective approach to managing knowledge may be realised if it is closely aligned with the needs of the firm. This approach seeks to identify the organisation's requirements and evaluate a knowledge strategy based on the business's strategic vision. If possible the appropriate knowledge capabilities should be in place to respond to the changing objectives of the firm or even support multiple goals e.g. to support new product development activity and a focused sales strategy to improve customer relationship management. SMEs need to give formal consideration to their KM approach, in order to manipulate knowledge in a way that serves their specific decision making needs at a particular time. Essentially, smaller organisations consider the economy of knowledge when they expend resources to manipulate knowledge in a way that is commensurate to the organisational benefits that stand to be obtained from this effort. This principle has clear implications for further research and practice, as the benefits obtained from a firm's KM approach must be in keeping with the efforts of its implementation and daily use.

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