

An empirical study of the important factors for knowledge-management adoption in the SME sector

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Abstract

Purpose – To investigate the critical success factors (CSFs) for adopting knowledge management (KM) in small and medium-sized enterprises (SMEs) – an area that has, to date, received very little attention in the literature.

Design/methodology/approach – A survey instrument comprising 11 factors and 66 elements was developed. Through a postal survey, data were sought from SMEs in the UK. A parallel one was also administered to a group of academics, consultants and practitioners in the KM field in order to provide a more holistic view of the CSFs.

Findings – The survey instrument was shown to be both reliable and valid. Pertinent statistical analyses were then performed. By integrating the results from both groups of respondents, a prioritised list of CSFs, in order of importance for implementing KM, was generated.

Research limitations/implications – The number of responses received was rather small since KM is a new and emerging discipline, and not many SMEs have formally implemented it.

Practical implications – The results of this study would help SMEs to better understand the KM discipline, to facilitate its adoption and to prioritise its practices. Academics can use the results to build models that would further expand the KM domain.

Originality/value – This study is probably the first to systematically determine the CSFs for KM implementation in the SME sector. It offers a beneficial source of information to SMEs, which are still lagging far behind when it comes to KM practices.

Keywords Critical success factors, Knowledge management, Surveys, Small to medium-sized enterprises

Paper type Research paper

Introduction

The foundation of organisational competitiveness in the contemporary economy has shifted from physical and tangible resources to knowledge. The key focus of information systems has also changed from the management of information to that of knowledge. Businesses that can efficiently capture the knowledge embedded in their organisations and deploy it into their operations, productions and services will have an edge over their competitors. Many organisations are increasingly viewed as knowledge-based enterprises in which formal knowledge management (KM) is essential. Nowadays, KM is rapidly becoming an integral business activity for organisations as they realise that competitiveness pivots around the effective management of knowledge (Grover and Davenport, 2001).

KM can be comprehensively defined as “an emerging set of organisational design and operational principles, processes, organisational structures, applications and technologies that helps knowledge workers dramatically leverage their creativity and ability to deliver business value” (Gurteen, 1998). One of the key concerns that emerges in KM is how to accomplish it. Many companies that are attempting to initiate KM are unsure of the best approach to adopt (Moffett *et al.*, 2002). There seems to be general agreement in the literature that a combined social and technological approach is ideal. Nevertheless, the way

forward will be paved if organisations are aware of the key factors that will make its adoption successful. Therefore, it is crucial to identify these factors as well as to investigate them by empirical means.

The development of the KM field has led to the identification of various critical success factors (CSFs) for its adoption. However, prior research has explored them predominantly from a large company perspective. Without doubt, there is an abundance of literature describing how various large companies are successfully practising KM. To date, little systematic attempt has been made to address the CSFs for KM adoption in small and medium enterprises (SMEs). In addition, the literature is also limited by the scarcity of empirical studies investigating these factors in this particular business sector.

This paper presents the results of a survey on CSFs for implementing KM, which was conducted in UK SMEs. This research differs from a typical survey on CSFs in that it not only solicited the perceptions of companies which are adopting KM, but also the opinions of a group of academics, consultants and practitioners who have contributed to the literature (this latter group will be known as “contributors” throughout the remainder of the paper). The rationale for doing this was to allow cross comparisons to be made on the importance of the factors perceived by both groups. This would enable important insights and results to be gained which would subsequently strengthen the proposition of the CSFs for KM implementation in SMEs. Another reason was that, by involving both “doers” and “thinkers” in the survey, the possibility of achieving a more accurate and holistic view of the CSFs was increased.

The paper begins with a general overview of the important factors for adopting KM, followed by an outline of the methodology employed for conducting the survey. The next section presents the findings of the survey as well as the results of various statistical analyses and tests that were applied. An interpretation and discussion of the overall results gained from the study follows. The paper culminates with the conclusions drawn, together with some indications of the study limitations and proposed future research directions.

An overview of the CSFs for KM adoption

Factors underpinning the success of KM can be identified from authors who have researched and written directly on this subject. At the outset, studies of these factors were mainly exploratory in nature, rooted in what the early adopters of KM, i.e. large companies were doing to leverage their knowledge. One of the earliest sets of CSFs for practising KM was reported by Skyrme and Amidon (1997). They suggested seven key success factors based on lessons drawn from an international study of practices and experiences of leading companies in KM. Aligned with this type of approach, Davenport *et al.* (1998) conducted a study to explore the practices of 31 KM projects in 24 organisations. For those projects that were deemed successful, eight major factors were then inferred to have contributed to their effectiveness.

Similarly, Liebowitz (1999) proposed six key ingredients for making KM successful, based on lessons captured from leading companies in the field. He suggested the need for a KM strategy with support from senior management, a chief knowledge officer (CKO) or equivalent and a KM infrastructure, knowledge ontologies and repositories, KM systems and tools, incentives to encourage knowledge sharing and a supportive culture. A different approach was taken by Holsapple and Joshi (2000) in their study. Their primary aim was to develop a descriptive framework for characterising the factors that influenced the success of KM. These factors were derived theoretically from various literature sources, and a “Delphi” study was used to assess their appropriateness.

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Some critical factors can be extracted from the work of those who have explored KM in general or have addressed a particular factor in detail. Since this study is targeted at SMEs, a review of the SME literature was also vital for identifying attributes that can impinge on KM adoption. An in depth literature review indicated that numerous factors had been identified as important for accomplishing KM. Although different researchers have used different terminologies to indicate these factors, they can be represented by generic themes. In addition, they have also been mentioned in the literature with a mixed extent of emphasis and coverage. Based on the review, the authors hypothesised and proposed 11 CSFs to form the basis for KM adoption in the SME sector: leadership and support; culture; information technology; strategy and purpose; measurement; organisational infrastructure; processes and activities; motivational aids; resources; training and education; and human resource management.

The list below presents the factors together with their sources:

1. Management leadership and support (Skyrme and Amidon, 1997; Holsapple and Joshi, 2000; Davenport *et al.*, 1998; Liebowitz, 1999; Hasanali, 2002; American Productivity & Quality Center (APQC), 1999; Ribiere and Sitar, 2003).
2. Culture (Skyrme and Amidon, 1997; Davenport *et al.*, 1998; Liebowitz, 1999; Hasanali, 2002; APQC, 1999; McDermott and O'Dell, 2001).
3. Information technology (Skyrme and Amidon, 1997; Davenport *et al.*, 1998; Liebowitz, 1999; Hasanali, 2002; APQC, 1999; Alavi and Leidner, 2001).
4. Strategy and purpose (Skyrme and Amidon, 1997; Davenport *et al.*, 1998; Liebowitz, 1999; APQC, 1999; Zack, 1999).
5. Measurement (Holsapple and Joshi, 2000; Davenport *et al.*, 1998; Hasanali, 2002; APQC, 1999; Ahmed *et al.*, 1999).
6. Organisational infrastructure (Davenport *et al.*, 1998; Liebowitz, 1999; Hasanali, 2002; Herschel and Nemati, 2000).
7. Processes and activities (Skyrme and Amidon, 1997; Holsapple and Joshi, 2000; Davenport *et al.*, 1998; Bhatt, 2000).
8. Motivational aids (Davenport *et al.*, 1998; Liebowitz, 1999; Yahya and Goh, 2002; Hauschild *et al.*, 2001).
9. Resources (Holsapple and Joshi, 2000; Davenport and Volpel, 2001; Wong and Aspinwall, 2004).
10. Training and education (Horak, 2001; Yahya and Goh, 2002; Mentzas, 2001).
11. Human resource management (Yahya and Goh, 2002; Wong and Aspinwall, 2004; Brelade and Harman, 2000).

Having enumerated the CSFs, a number of representative measurement elements or items were then carefully formulated on the basis of pertinent studies to reflect the meaning and scope of each. A total of 66 elements were assigned to them (details are provided in the Appendix). This resulted in a survey instrument for measuring the relevance of the CSFs for implementing KM in the SME sector. This instrument was repeatedly checked and evaluated, and alterations were made before it was finalised. Its reliability and validity will be discussed later in the paper.

Method and data collection

The method employed in this study for gathering empirical data was a postal survey. This was selected for the following reasons (Chauvel and Despres, 2002):

- a survey brings an issue into focus by defining and specifying its various elements;
- its results are typically quantifiable, and thus amenable to statistical analysis;

- statistical treatment allows the results obtained from a sample to be extended to a larger population, thus enabling the generation of more global statements; and
- it is faster and more direct compared to many other research methods.

Since the aim of this study was to use the experiences and perceptions of SMEs as well as “contributors” to gauge the importance of a set of CSFs for adopting KM, two sets of questionnaire were developed. The one for SMEs was split into 3 main parts. The first explored basic issues and characteristics of the organisations, such as the size of the company, types of industry, confirmation that the company was indeed practising KM, and the level of KM adoption. The second part investigated the 11 CSFs and their elements that were derived from the literature. Respondents were asked to rate the level of importance they placed on each element using a six-point Likert scale (1 = not important at all, 2 = slightly important, 3 = moderately important, 4 = important, 5 = very important, 6 = extremely important). To enable respondents who did not know or were unsure of how to answer, an additional scale of “0” was also provided.

A Likert scale with a midpoint tends to undermine extreme positions (Albaum, 1997). Moreover, respondents are generally reluctant to express a radical view even if they have one, and all too often, they tend to take a reasonable route by offering a “socially acceptable answer” (Lee and Choi, 2003). The use of a 6-point scale helps to alleviate this bias by avoiding a midpoint, thus preventing the occurrence of the central tendency error (Gotzamani and Tsiotras, 2001). A question was also included to ask the participants to rank a set of statements – one for each of the 11 CSFs, from 1 to 11 (1 = the most important, 11 = the least important) in order to prioritise their importance. The third section of the questionnaire dealt with non adopters of KM, in particular examining their reasons for not implementing KM to date and whether or not they intended to do so in the future. The questionnaire for the “contributors” was very similar, except that the first part was aimed at exploring their general demographic information, and the third part was omitted.

The unit of analysis or subject matter for this survey was the organisation or the “contributor”. Hence for SMEs, only one questionnaire was sent to each selected organisation, thereby using a single form approach, rather than a multi-form one. The latter normally suffers from an unequal number of replies from different organisations, while the single form approach helps to eliminate this bias, as well as enabling a more precise “demographic to variable analysis” to be conducted (Thiagarajan and Zairi, 1998). Following the European Union definition, SMEs selected to participate in the survey were those with a total number of employees fewer than 250 (Commission of the European Communities, 2003; Deakins, 1999). No restriction was made in their selection regarding industrial sector. The sampling source for the companies was the FAME database, while the list of “contributors” was obtained from relevant KM journals. The samples were selected randomly, from those for which complete information and contact details were available. This information was then carefully checked and verified in order to ensure that it was correct and up to date.

Designations of the targeted respondents in the SMEs were the Managing Director or the Chief Executive Officer. These were considered to be the best addressees because they are the overseers of their companies’ operations and are likely to be the “thought” leaders of KM. While it is possible to argue that questionnaires should be forwarded to the CKO, the knowledge manager or the like, such positions are still not common in practice (Jarrar, 2002). Finally, questionnaires together with covering letters explaining the purpose of the survey were distributed to a total of 300 SMEs and 100 “contributors”. A larger number of SMEs was chosen on the basis that their data would be used to validate the CSFs’ constructs. While the companies were confined to those within the UK, the “contributors” were not. A fortnight after sending out the questionnaires, follow-up letters were sent to improve the response rate.

Sample characteristics and profiles

In the case of the SMEs, a total of 72 questionnaires (24 per cent) were returned. However, only 26 of them confirmed that they had implemented KM. On the other hand, only 18 were received from the “contributors”. These represent a useable response rate of 8.7 per cent and 18 per cent respectively from the two groups, which were comparable to those of

previous surveys carried out in the KM field, i.e. Khalifa and Liu (2003) – 19.1 per cent, Moffett *et al.* (2002) – 8.8 per cent, de Pablos (2002) – 5.8 per cent, Gimenez and Rincon (2003) – 5 per cent, and to those in other areas, i.e. Lin *et al.* (2002) – 20.3 per cent, Antony *et al.* (2002) – 16.5 per cent, and Rungasamy *et al.* (2002) – 14.1 per cent. The poor level of response from the SMEs was not surprising since earlier work has shown that only a minority of them have adopted formal KM practices (Wong and Aspinwall, 2004; Matlay, 2000).

Tables I-III summarise the descriptive statistics for the 26 respondent companies (adopters of KM) in terms of their number of employees, areas of industry and the number of years for which they have implemented KM. As can be seen, about 42 per cent of the respondent companies have less than 50 employees. The areas of industry were diverse, with the consulting sector being the major respondent. This was expected since it comprises service oriented knowledge intensive firms that develop and sell “know-how”, and so their success is largely dependent on effective KM. Many large consulting firms such as McKinsey, Ernst & Young, and Accenture for

Table I Profiles of respondent companies (adopters of KM): total number of employees

Range	No. of companies	Per cent
Fewer than 10 (micro enterprises)	2	7.7
10-49 (small enterprises)	9	34.6
50-249 (medium enterprises)	15	57.7
Total	26	100.0

Table II Profiles of respondent companies (adopters of KM): types of industry

Main industry	Sub-industry	No. of companies	Per cent
Manufacturing	Chemical	4	15.4
	Electronic	2	7.7
	Automotive	1	3.8
	Machinery/equipment	1	3.8
	Paper/board	1	3.8
Service	Consulting	5	19.2
	Construction	3	11.5
	Information technology	3	11.5
	Communication	2	7.7
	Financing	1	3.8
	Insurance	1	3.8
	Transportation	1	3.8
	Other	1	3.8
Total		26	100.0

Table III Profiles of respondent companies (adopters of KM): number of years implemented KM

Range	No. of companies	Per cent
2 or fewer	4	15.4
3-4	7	26.9
5-6	5	19.2
7-8	4	15.4
9-10	2	7.7
11-12	1	3.8
13-14	2	7.7
15-16	0	0.0
17-18	1	3.8
Total	26	100.0

example, are certainly at the forefront of deploying KM. Chemical, construction and information technology firms were the other main constituents of the respondents.

In terms of the number of years for which KM has been implemented, the average is 6.5, while a closer look at Tables I-III shows that the modal range is three to four years. The KM concept was coined in 1986 by Karl Wiig (Beckman, 1999); it then mushroomed in the mid to late 1990s, with the upsurge of various related academic journals and conferences. Bearing this in mind, the respondent companies were somewhat slow to embrace KM. Interestingly, four of the respondents claimed to have implemented it more than ten years ago. Perhaps they are the more advanced SMEs and have always made KM an integral business function in their organisations.

The involvement of the respondent companies in KM was also verified. They were asked which, from a list of ten KM initiatives they had implemented (obviously they could choose more than one). Table IV depicts the results. None of the respondent SMEs had implemented all of them. The top three initiatives were capturing knowledge in repositories or bases (100 per cent), using information technology to share and transfer knowledge (96.2 per cent) and using the intranet to publish and access information (80.8 per cent). Initiatives like developing strategies for KM, appointing KM leaders and teams, and rewarding employees who exemplify knowledge related behaviours did not feature very highly in these organisations. This may imply that there is still a lot of room for developing and improving their KM practices. The activity with the lowest implementation rate was measuring the value of intellectual capital. This is understandable since this area of activity is still the least developed and under-implemented aspect of KM (Okunoye and Karsten, 2002). The results discussed above are very similar to those of uit Beijerse (2000), who concluded that although various KM tools were applied in SMEs, their strategy, structure and culture were not formalised to support KM.

For those respondent companies that were not practising KM, an interesting feature was to determine why. A list of potential reasons was given and again, respondents could choose more than one. As shown in Table V, almost half of them stated that they were either unsure of

Table IV Types of KM initiative implemented

<i>Initiatives</i>	<i>Frequency</i>	<i>Per cent</i>
Capturing knowledge electronically in a repository	26	100.0
Using information technology to share and transfer knowledge	25	96.2
Using the intranet to publish and access information	21	80.8
Building and maintaining employees' expertise and skills	19	73.1
Identifying internal or external best practices	18	69.2
Creating a supportive environment for knowledge sharing	17	65.4
Developing strategies for knowledge management	14	53.8
Appointing knowledge management leaders and teams	10	38.5
Rewarding employees who contribute and share knowledge	10	38.5
Measuring the value of intellectual capital	5	19.2

Table V Reasons for not practising KM

<i>Reasons</i>	<i>Frequency</i>	<i>Per cent</i>
Unsure of its potential benefits	21	45.7
Have never heard of it	21	45.7
Lack of human resources	10	21.7
Lack of time	9	19.6
Do not understand it	8	17.4
Lack of financial resources	7	15.2
Not interested/not needed	7	15.2
Top management does not support it	3	6.5
Other	1	2.2

its potential benefits or had never heard of it. In addition, 17.4 per cent of them indicated that they did not understand it. These reasons point to the fact that they still lack a sound conceptual foundation in KM. This is consistent with the findings of other studies related to SMEs (Lim and Klobas, 2000; McAdam and Reid, 2001; Wong and Aspinwall, 2004). As such, more effort is definitely needed to make them better acquainted with KM. Lack of human resources and time were also given as reasons for not adopting KM. With respect to the intention of the non-adopter respondents to implement KM in the future, only 15.2 per cent of them said that they would do so.

In the case of the “contributors” who responded, their characteristics are summarised in Tables VI and VII. As can be seen, the majority of them considered themselves to be academics. Their contributions to the KM field are certainly indicative of their experiences and expertise. In addition to publishing articles in journals, they were active in other areas, e.g. presenting papers at conferences, offering lectures relating to KM, providing consultancy services, conducting research etc. Their years of involvement in the field ranged from six to 27 years, with over 66 per cent of them having been involved for more than ten years. Therefore, this group has a strong background and track record in KM, and so should be very capable of evaluating the CSFs.

Validation of the CSFs

Validating and refining the CSFs is important before any further analysis is conducted. To this end, reliability and validity tests were carried out following the sequence and approach taken by Saraph *et al.* (1989), Yusof and Aspinwall (2000) and Antony *et al.* (2002). The data from the SMEs were utilised for this purpose, as mentioned earlier. In addition, the number of responses received from this group was considerably higher than that of the “contributors”. The two groups were not pooled together for the tests because the authors felt that they were distinct with different characteristics.

Reliability of a scale (factor or construct) is to examine its internal consistency by calculating Cronbach’s alpha. This method indicates the extent to which items (elements) within a scale are homogenous or correlated (Saraph *et al.*, 1989; Badri *et al.*, 1995). It is also reflective of the consistency between different items in a scale, in measuring the same attribute. Generally, alpha values greater than 0.7 are regarded as sufficient (Nunnally, 1994; Cuieford, 1965), although a cut-off value of 0.6 was used by researchers such as Black and Porter (1996), Rungasamy *et al.* (2002) and Antony *et al.* (2002).

Table VI Profiles of contributors: distribution of contributors

Category	No. of contributors	Per cent
Academic	10	55.6
Consultant	6	33.3
Practitioner	5	27.8

Note: The total exceeds 18 because some contributors consider themselves to be in more than one category

Table VII Profiles of contributors: contribution to KM

Involvement	Frequency	Per cent
Writing articles for periodicals	18	100.0
Presenting papers at conferences	16	88.9
Giving lectures on related topics	15	83.3
Providing consultancy services	13	72.2
Conducting research	12	66.7
Writing books	12	66.7
Others	4	22.2

Table VIII summarises the results of the reliability analysis for each factor. As can be seen, the original alpha values for the factors ranged from 0.7113 to 0.8889. Despite this, certain items were deleted from the factors to further improve their internal consistency. For example, the deletion of item 2.5, “encouraging teamwork among employees” from the culture factor, increased its alpha level to 0.8687. The final alpha values after discarding the appropriate items, ranged from 0.7113 to 0.9047. This provides evidence that all the factors have high internal consistency, and are thus reliable.

An instrument has content validity if it has measurement items that adequately cover the content domains or aspects of the concept being measured (Ahire *et al.*, 1996). It is not assessed numerically, but can only be subjectively judged by the researchers (Saraph *et al.*, 1989; Gotzamani and Tsiotras, 2001). The survey instrument used in this study was the outcome of an iterative process of checking and refinement. The basic factors as well as their elements were derived from a comprehensive and extensive review of the relevant literature, as discussed earlier. In addition, many of them were generic factors and followed closely those developed by leading researchers in KM, such as Davenport *et al.* (1998) and Liebowitz (1999). Hence, it is believed that each factor as well as the instrument as a whole have valid contents.

Criterion or predictive validity refers to the degree to which an instrument can successfully predict an independent relevant criterion that is related to the phenomenon being measured. Since this instrument is measuring the importance of a set of factors for effectively adopting KM, it is certainly related to the success of a company’s KM effort. In other words, successful KM should stem from the attention or importance placed on the necessary factors. A question was included in the survey instrument that required respondents to indicate the level of success of their KM effort on a scale from 1 to 6 (1 = not successful at all, 6 = extremely successful). Multiple regression analysis was then employed to determine the extent of the relationship between the “average importance score” for each factor, given by the individual respondents (11 independent variables or predictors) and their score reflecting the level of success of their KM effort (dependent variable). The assumptions made in the multiple regression analysis – normality, constant variance, linearity and independency (Norusis, 1995) – were examined and the results showed no violation. The adjusted R square value obtained for the regression model was 0.420. Although it was not very high, it can be inferred that all the factors when taken together do have a reasonable degree of predictive capability.

Finally, each factor was individually tested for construct validity. The usual approach is to factor analyse the set of items for each CSF separately to check for “unifactoriality” or “unidimensionality”. A factor is “unifactorial” if all its items estimate only one construct. The number of cases in this study was rather small to perform a good factor analysis. In this respect, many arbitrary “rules of thumb” exist that specify the required number of cases, but there is however, no absolute scientific answer to this issue (Edari, 2004). Nonetheless, the authors felt that conducting the factor analysis was better than not performing any in order to give an indication of the construct validity of the CSFs. The Kaiser-Meyer-Olkin (KMO) value was used to determine the appropriateness of the data sets for the factor analysis; a value

Table VIII Results of reliability analysis

<i>Factors</i>	<i>No. of items</i>	<i>Original alpha value</i>	<i>Item deleted</i>	<i>Final alpha value</i>
Management leadership and support	7	0.7113	–	0.7113
Culture	8	0.8424	2.5	0.8687
Information technology	6	0.8825	–	0.8825
Strategy and purpose	6	0.8623	–	0.8623
Measurement	5	0.8739	5.5	0.9047
Organisational infrastructure	4	0.8507	–	0.8507
Processes and activities	10	0.7411	7.5	0.7533
Motivational aids	5	0.7437	–	0.7437
Resources	5	0.8474	–	0.8474
Training and education	5	0.8889	–	0.8889
Human resource management	5	0.8344	11.3	0.8506

greater than 0.5 represents an acceptable condition (Field, 2000; Black and Porter, 1996). As can be seen in the second column of Table IX, this requirement was met by all the factors.

The results obtained from the first trial of the factor analysis were not satisfactory, as only eight of the 11 factors were shown to be “unifactorial”. Problematic items were identified and eliminated based on the criteria and approach adopted by Yusof and Aspinwall (2000). A secondary factor analysis was then performed on those factors which were not “unifactorial”. The results of this second run showed all the factors to be “unifactorial” and therefore, have construct validity. Table IX presents the final summarised results of the factor analysis. As can be seen, more than 57 per cent of the variance of each set of items was accounted for by its respective factor. In essence, all the tests conducted above proved that the CSFs developed in this study were both reliable and valid.

Analysis of the CSFs

Importance of the CSFs

A mean score was calculated for each factor to examine its perceived importance level. The resultant values for both the SMEs and the “contributors” are summarised in the first two columns of Table X. As can be seen, the values for the SMEs ranged from 3.269 (measurement) to 4.885 (culture), while those for the “contributors” were between 3.833 (measurement) and 5.056 (management leadership and support). Since all the values fell within the range of “moderately important” to “very important”, it can be said that all the factors were perceived by the respondents as playing a vital role in KM adoption.

Table IX Final results of factor analysis

Factors	KMO value	Item(s) deleted	Factor loading	Eigenvalue	Percentage variance explained
Management leadership and support	0.512	1.5	0.604-0.826	3.520	61.997
Culture	0.763	–	0.706-0.870	4.002	57.170
Information technology	0.696	–	0.733-0.872	3.828	63.807
Strategy and purpose	0.677	–	0.597-0.906	3.604	60.067
Measurement	0.808	–	0.848-0.908	3.124	78.100
Organisational infrastructure	0.706	–	0.789-0.906	2.781	69.537
Processes and activities	0.585	7.8, 7.9	0.617-0.803	3.826	60.372
Motivational aids	0.735	8.4	0.583-0.829	2.299	57.476
Resources	0.710	–	0.734-0.865	3.158	63.153
Training and education	0.800	–	0.746-0.896	3.555	71.096
Human resource management	0.640	–	0.743-0.885	2.787	69.675

Table X Mean importance and ordinary comparison *t*-test statistics

Factors	Mean importance		<i>t</i> -test (equal variances assumed)		Result
	SMEs	Contributors	<i>t</i>	<i>p</i>	
Management leadership and support	4.840	5.056	– 1.078	0.287	Not sig.
Culture	4.885	4.857	0.139	0.890	Not sig.
Information technology	3.801	4.148	– 1.377	0.176	Not sig.
Strategy and purpose	4.276	4.759	– 1.971	0.055	Not sig.
Measurement	3.269	3.833	– 1.674	0.102	Not sig.
Organisational infrastructure	3.683	3.861	– 0.472	0.639	Not sig.
Processes and activities	4.418	4.270	0.675	0.504	Not sig.
Motivational aids	3.750	3.931	– 0.576	0.567	Not sig.
Resources	4.400	4.322	0.273	0.786	Not sig.
Training and education ^a	4.062	4.100	– 0.131	0.896	Not sig.
Human resource management ^a	4.183	4.208	– 0.088	0.930	Not sig.

Notes: $\alpha = 0.025$. ^a Mann-Whitney tests conducted on these factors yield the same results as *t*-tests

The respondent SMEs' mean importance for the three factors, culture, processes and activities, and resources were higher than those of the "contributors", while the remainder were lower. Although there were differences between the mean importance values perceived by the SMEs and by the "contributors", a statistical test was needed to determine their significance. Ordinary comparison *t*-tests were utilised for this purpose. The normality assumption (Norusis, 1995) was first examined for each data set. Of the 11 factors, nine were found to conform; training and education and human resource management did not. While the *t*-test is robust and can handle reasonable violation of the normality assumption (Norusis, 1995), nonparametric Mann-Whitney tests were also conducted for these two factors since the sample size was small.

As shown in Table X, the *t*-tests revealed that there was no significant difference between the perceived importance of the two respondent groups for all the factors. The Mann-Whitney tests conducted on the last two factors produced similar conclusions. The results reflect that the importance of the factors perceived by the "thinkers" are commonly shared and agreed by the "doers". In other words, assertions from theory are similar to those from practice. This is considered an essential finding because a more global statement can now be made about the factors that are crucial for KM implementation. The data from the two groups were combined to give an overall mean for each factor (see Table XI). Based on this, all the factors were then assigned an overall importance classification. This categorisation would help SMEs to customise their emphasis and focus when addressing the CSFs.

Ranking of the CSFs

Finally, participants were asked to rank 11 statements, which represented the CSFs (but were worded slightly differently), in order of importance from 1 to 11. The mean rank of each statement for the two respondent groups is presented in the upper part of Tables XII and XIII. The top three factors according to the SMEs were "senior management support and leadership", "a knowledge-friendly culture" and "a clear strategy for managing knowledge", while the bottom three were "development of a technological infrastructure", "incentives to encourage KM practices" and "measuring the effectiveness of KM". With regard to the "contributors", "senior management support and leadership", "a clear strategy for managing knowledge", and "a knowledge-friendly culture" were ranked the highest, while "roles and responsibilities for KM", "development of a technological infrastructure" and "measuring the effectiveness of KM" were the least critical.

An aspect of interest here was whether there was any agreement or similarity between the mean ranks of the two respondent groups. Spearman's rank correlation coefficient was used since the sample size was relatively small (11 statements or factors), and the data were categorical, with meaningful orders. Its value was 0.909, thus providing good evidence that both groups were in agreement with their rankings of the 11 statements.

Table XI Overall mean importance of the CSFs

<i>Factors</i>	<i>Overall mean</i>	<i>Importance classification</i>
Management leadership and support	4.948	A
Culture	4.871	A
Information technology	3.975	B
Strategy and purpose	4.518	A
Measurement	3.551	B
Organisational infrastructure	3.772	B
Processes and activities	4.344	A
Motivational aids	3.841	B
Resources	4.361	A
Training and education	4.081	A
Human resource management	4.196	A

Note: A = important-very important; B = moderately important-important

Table XII Ranking of CSFs: statements

<i>Statements</i>	<i>Mean rank</i>	
	<i>SMEs</i>	<i>Contributors</i>
Senior management support and leadership	1.885 (1)	1.944 (1)
A knowledge-friendly culture	3.500 (2)	3.611 (3)
Development of a technological infrastructure	7.231 (9)	7.944 (10)
A clear strategy for managing knowledge	3.731 (3)	2.722 (2)
Measuring the effectiveness of KM	9.385 (11)	8.889 (11)
Roles and responsibilities for KM	7.154 (8)	7.556 (9)
Systematic KM processes and activities	6.231 (6)	4.778 (4)
Incentives to encourage KM practices	9.231 (10)	7.111 (7)
Allocation and provision of resources	5.154 (4)	6.056 (5)
Effective people management practices	5.962 (5)	6.944 (6)
Appropriate training for employees	6.538 (7)	7.500 (8)

Note: The numbers in parentheses denote the actual rank of the statement based on its mean rank value

Table XIII Ranking of CSFs: factors

<i>Factors</i>	<i>Rank of importance score</i>	
	<i>SMEs</i>	<i>Contributors</i>
Management leadership and support	2	1
Culture	1	2
Information technology	8	7
Strategy and purpose	5	3
Measurement	11	11
Organisational infrastructure	10	10
Processes and activities	3	5
Motivational aids	9	9
Resources	4	4
Training and education	7	8
Human resource management	6	6

Another area worth exploring was the ranks of the factors based on their mean importance scores (see the lower portion of Tables XII and XIII). It is also visible that there are some similarities between the two groups. For example, management leadership and support, and culture were the two most critical factors. At the other end of the spectrum (the least important) were motivational aids, organisational infrastructure and measurement. Spearman's rank correlation coefficient was again calculated and its value of 0.945 showed good agreement for the two groups.

By putting the four sets of rank together (statement ranks and factor ranks for both groups), more generic commonalities and synonyms became readily apparent. For instance, it could be observed that the top five factors for adopting KM revolve around management leadership and support, culture, strategy and purpose, resources and processes and activities.

It is believed that the similarities seen thus far are not coincidental, but they represent the reality of the SME sector. In order to generalise the findings of this survey, an overall mean rank was computed for each factor, based on the 4 sets of rank. The results are shown in Table XIV.

Discussion

As evident from the analysis conducted above, the CSFs, in order of importance (ranked from the highest to the lowest) for implementing KM in the SME sector are:

Table XIV Final ranking of CSFs

<i>Factors</i>	<i>Overall mean rank</i>	<i>Final rank</i>
Management leadership and support	1.25	1
Culture	2.00	2
Information technology	8.50	8
Strategy and purpose	3.25	3
Measurement	11.0	11
Organisational infrastructure	9.25	10
Processes and activities	4.50	5
Motivational aids	8.75	9
Resources	4.25	4
Training and education	6.50	6
Human resource management	6.75	7

Note: The overall mean rank is calculated as the average of the statement actual ranks and the factor ranks

1. management leadership and support;
2. culture;
3. strategy and purpose;
4. resources;
5. processes and activities;
6. training and education;
7. human resource management;
8. information technology;
9. motivational aids;
10. organisational infrastructure; and
11. measurement.

Based on qualitative observations of KM projects in large organisations as well as intuitive feeling, Davenport *et al.* (1998) hypothesised that the most important factors were culture, organisational infrastructure, motivational aids and management support. However, the findings of the authors' study revealed a slight departure from this; motivational aids and organisational infrastructure were shown to be less important. In addition, resources, training and education, and human resource management, which have received little attention as CSFs in previous studies in large organisations, were also shown to be imperative in SMEs. This suggests that there are differences in the perceived importance of factors for adopting KM, between large and small businesses. The authors believe that the results of this study are convincing since they are founded on a thorough quantitative and statistical analysis, not merely on observation.

As with other change initiatives, successful KM requires proactive entrepreneurial support and leadership from top management. Besides its importance, the fact that this factor was ranked the highest probably means that it should be addressed first, before dealing with the other CSFs. Top management or leaders should devote themselves to promoting a corporate mindset that emphasises co-operation and knowledge sharing across the organisation. They should also contribute to the creation of an environment in which knowledge creation and cross-boundary learning can flourish. More essentially is for them to provide continual support and commitment to initiate and sustain the KM effort. The second most important factor, culture, indicates that a knowledge-friendly cultural foundation is certainly more important than the deployment of information technology in KM. In fact, it has been asserted that the success of KM is 90 per cent dependent on building a supportive

“A rational strategy helps to clarify the business case for pursuing KM, and steers the company towards becoming knowledge-based.”

culture (Liebowitz, 1999). Important facets of a knowledge-oriented culture include such attributes as trust, collaboration and openness, to name but a few.

Another important criterion for effective KM is to have a clear strategy and purpose. A rational strategy helps to clarify the business case for pursuing KM, and steer the company towards becoming knowledge-based. In addition, it provides the essential focus, as well as values for everyone in the organisation. SMEs differ from large companies, because in general, they suffer from resource scarcity (Organization for Economic Co-operation and Development, 2002). Consideration of resources' availability as well as their proper allocation and management are therefore of prime importance for SMEs in adopting KM. This point alone is sufficient to justify the high ranking of resources as a CSF. Processes and activities was ranked fifth in the list of CSFs. It is not surprising that this was the case, since processes such as knowledge acquisition, organisation, sharing and application (Wong and Aspinwall, 2003) are what lie at the heart of KM. Hence, appropriate mechanisms and interventions should be in place to ensure that these processes are properly addressed.

On the other hand, it is also crucial not to overlook those factors which were ranked to be less important such as information technology, motivational aids, organisational infrastructure and measurement. It is indisputable that information technologies such as document management systems, information retrieval engines, relational and object databases, groupware and workflow systems, push technologies and agents, and data mining tools (Offsey, 1997) can facilitate KM. However, technology should not be seen as an absolute answer to KM, since it is only a tool. This may help to explain why it has been perceived as less important. It is quite surprising to find that motivational aids was not rated as a more important CSF by the respondents, especially when incentives are needed to encourage people to exemplify positive knowledge oriented behaviours. It may be that incentives to employees can be provided at a later stage in the adoption process, when many of the more critical issues of KM have been addressed.

Developing roles and positions for KM or in other words, an organisational infrastructure also received a low importance ranking. This could be because the respondent companies were not very keen to develop too many KM roles, such as a CKO, a knowledge project manager, a knowledge report editor and a knowledge network facilitator, since they are limited by their resources. However, a smaller group of people would be needed to plan, organise, coordinate and work out the details of KM, as well as to perform knowledge-related tasks. As the development of KM matures in organisations, it would probably become everyone's responsibility and an integral part of employees' daily work practices and activities. Measurement was the least important of the 11 CSFs. This is probably because measuring is for monitoring purposes that is usually done after an organisation has implemented KM. In addition, establishing measures to assess KM is not easy (APQC, 2000). The respondent SMEs might lack the necessary knowledge, skills and expertise to perform this activity and were thus inclined to rate it as less important.

One subtle issue worth mentioning is the difference between the importance of the CSFs and the initiatives implemented by the respondent SMEs (refer to Table IV for the types of initiative). For instance, while information technology was not perceived as being a very

important factor, the top three initiatives implemented by the respondent SMEs were all associated with it. Likewise, culture and strategy were highly ranked, but these aspects were not widely implemented. Perhaps, the companies have realised the importance of certain factors, but have yet to practise them or have failed in their efforts. The exact reason for this gap would be an interesting area to explore in the future.

Limitations of the study and directions for future research

Although the results of this study are interesting, they should be viewed in the light of its intrinsic limitations. First, the number of responses obtained from the survey was rather small. However, this was inevitable since KM is a new and emerging field, and not many SMEs have formally initiated it. As was apparent in the earlier part of the paper, many SMEs were unsure of what it is and what it will do for their organisation. Ignorance and reluctance to participate in the survey were also evident in this research. A larger number of responses would probably yield a more accurate finding and so, future research could replicate this study, with the hope that more SMEs have implemented KM.

Second, the immaturity of this field invoked the authors' anxiety regarding the level of knowledge and experience SMEs possessed in completing the questionnaire. Therefore, the authors had also sampled a group of "contributors" in order to provide support and backup to the results of the survey. When the KM field has matured, research work could then be targeted at best practice organisations. This would mean involving a sample of best practice SMEs to agree on a set of CSFs for successfully implementing KM in their own organisations.

Another limitation was that the survey was aimed at exploring the perception of the respondents with respect to the importance of the CSFs. It would be interesting to expand this study in the future by investigating the practice of these factors. Hence, the emphasis would shift from "perceived importance" to what organisations do in practice in order to make their KM initiative successful. In addition, the findings of this study were the results of a "snapshot" survey that did not take into account feedback effects. A longitudinal study, that involves say, semi-structured interviews with the respondents, would give a better comprehension of these CSFs.

Conclusions

Benefits such as better decision making, faster response time, increased profit and improved productivity have been reported for firms that have adopted KM (KPMG, 1998). Recognising its merits as a foundation for improved performance and competitiveness, many large organisations have thus formally implemented it. With a focus on these early adopters, different sets of CSFs have been suggested in the literature. However, very little previously published research has either developed or empirically investigated a comprehensive list of CSFs for implementing KM in the SME sector. This paper has presented the results of a postal survey to determine the CSFs for KM adoption in UK SMEs.

A total of 11 factors, comprising 66 elements were considered in the survey instrument, which was shown to be both reliable and valid. Data were elicited from SMEs as well as a group of "contributors" who have a very well-established background in the field. The importance as well as the rankings of the CSFs were analysed, and the results from the two groups of respondents were found to be in agreement. This permitted a more global and valid conclusion to be drawn from the survey. The main contribution of this study is a prioritised set of CSFs for implementing KM in the SME sector, arranged in order of importance. It was found that management leadership and support was perceived to be the most critical factor, whereas measurement was the least.

“Technology should not be seen as an absolute answer to KM, since it is only a tool.”

From a practical standpoint, this set of CSFs as well as the instrument itself will be useful to both managers and researchers. Since companies may not be able to manage all aspects of KM at the same time, an ordered list of CSFs will provide a clue to SMEs to prioritise and adjust their KM practices accordingly. The instrument developed in this study provides a realistic checklist to, for example, assess the perceptions of KM within an organisation, or measure the level of understanding among the workforce. It could also be used as an assessment tool to evaluate the status of KM implementation and thus, help to identify areas for improvement. Academics could use it to better understand KM practices and to build models that would further expand the domain. Finally, it is hoped that this study will provide the momentum for future research aimed at gaining a better understanding of the CSFs for KM adoption in SMEs.

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Appendix. List of CSFs and their items or elements

1. *Management leadership and support:*
 - 1.1 Leaders act as catalysts for KM.
 - 1.2 Management establishes the necessary conditions for KM.
 - 1.3 Management acts as role model to exhibit the desired behaviour.
 - 1.4 Leaders encourage knowledge creation, sharing and use.
 - 1.5* Management recognises KM as important to business success.
 - 1.6 Management demonstrates commitment to KM.
 - 1.7 Management demonstrates support for KM.

2. *Culture:*
 - 2.1 A culture that values knowledge seeking and problem solving.
 - 2.2 High level of trust among employees in sharing knowledge.
 - 2.3 Sharing of mistakes openly without the fear of punishment.
 - 2.4 Extent of collaboration among employees.
 - 2.5* Encouraging teamwork among employees.
 - 2.6 Empowerment of employees to explore new possibilities.
 - 2.7 Extent to which individuals are encouraged to ask.
 - 2.8 Acceptance of knowledge sharing (not hoarding) as a strength.
3. *Information technology:*
 - 3.1 Use of an appropriate KM system.
 - 3.2 Application of technological tools (collaborative tools, knowledge bases, searching tools, document management systems, intelligent systems etc).
 - 3.3 Utilisation of the intranet or internet.
 - 3.4 Appropriate knowledge structures or categories for a repository.
 - 3.5 Ease of use of the technology.
 - 3.6 Suitability of the KM system to users' needs.
4. *Strategy and purpose:*
 - 4.1 A common vision that people support.
 - 4.2 Development of a KM strategy.
 - 4.3 Clear objectives and goals for KM.
 - 4.4 Alignment of the KM strategy with the business strategy.
 - 4.5 Extent to which the KM strategy is supporting a vital business issue.
 - 4.6 Identification of the potential value to be achieved.
5. *Measurement:*
 - 5.1 Measuring the benefits of a KM initiative.
 - 5.2 Tracking the progress of a KM initiative.
 - 5.3 Evaluating the impact of KM on financial performance.
 - 5.4 Development of indicators (both hard and soft) for measuring KM.
 - 5.5* Measuring the value of intellectual capital.
6. *Organisational infrastructure:*
 - 6.1 Appointment of a knowledge leader (knowledge officer or manager, etc.).
 - 6.2 Establishment of a knowledge team or group.
 - 6.3 Specified roles and responsibilities for performing KM tasks.
 - 6.4 Clear ownership of a KM initiative.
7. *Processes and activities:*
 - 7.1 Creating new ideas and knowledge.
 - 7.2 Documenting key knowledge and lessons learned.
 - 7.3 Efficient processes for classifying and storing knowledge.
 - 7.4 Efficient processes for finding the required knowledge.
 - 7.5* Sharing knowledge using both electronic and face-to-face approaches.

- 7.6 Effective communication among employees.
- 7.7 Applying the best knowledge to an organisation's products and services.
- 7.8* Encouraging continuous learning at all levels.
- 7.9* Protecting knowledge assets from unauthorised exposure or being stolen.
- 7.10 Ensuring the validity and relevancy of knowledge.
- 8. *Motivational aids:*
 - 8.1 Providing the right incentives to encourage the behaviour for KM.
 - 8.2 Motivating employees to seek for knowledge.
 - 8.3 Visibly rewarding employees who share and use knowledge.
 - 8.4* Rewarding employees with an emphasis on group performance.
 - 8.5 Tying motivational approaches to job performance assessment system.
- 9. *Resources:*
 - 9.1 Consideration of resources availability when investing in KM.
 - 9.2 Proper budgeting and allocation of resources for KM.
 - 9.3 Sufficient financial resources for building a technological system.
 - 9.4 Sufficient human resources to support a KM initiative.
 - 9.5 Providing time to employees to perform knowledge related activities.
- 10. *Training and education:*
 - 10.1 Training on the concepts of knowledge and KM.
 - 10.2 Building awareness of KM among employees through training.
 - 10.3 Training on using the KM system and tools.
 - 10.4 Training for individuals to take up knowledge related roles.
 - 10.5 Training in skills development such as creative thinking, problem solving, communication, soft networking, team building, etc.
- 11. *Human resource management:*
 - 11.1 Recruitment of employees to fill knowledge gaps.
 - 11.2 Hiring people who have a positive orientation to knowledge.
 - 11.3* Professional development activities for employees.
 - 11.4 Retaining employees to work for the company.
 - 11.5 Providing career advancement opportunities to employees.

Note: * Denotes items that were discarded to improve the reliability or validity of the factors.