Development and validation of knowledge management performance measurement constructs for small and medium enterprises

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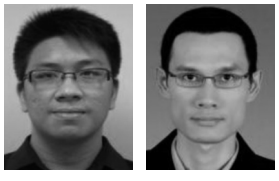

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Abstract

Purpose – *This paper aims to address the lack of previous studies and to propose a reliable and valid knowledge management performance measurement (KMPM) model for small and medium enterprises (SMEs).*

Design/methodology/approach – *A survey instrument containing 13 constructs and 49 items was initially developed and posted to small and medium-sized consultancy firms in Malaysia. Reliability and validity analysis was performed to ensure the quality of the instrument.*

Findings – *The developed survey instrument was shown to be reliable, valid and suitable to be applied in SMEs to evaluate their knowledge management (KM) performance.*

Research limitations/implications – *The present study is limited to SMEs in the service sector. The results are not suitable to be generalized to the manufacturing sector or larger organizations without further research.*

Practical implications – *This study would provide SMEs with a better understanding on KMPM and also a guideline to refer to when measuring their KM performance. Academics can use this study as a basic model to explore KMPM in SMEs and develop new measurement models.*

Originality/value – *This study is believed to be the first that has scientifically developed and empirically tested the constructs that represent a comprehensive KMPM model tailored for SMEs.*

Keywords *Performance measurement, Measures, Factors, Knowledge management, Small and medium enterprises, Constructs*

Paper type *Research paper*

Introduction

At present, knowledge management (KM) has been widely used by companies ranging from large multinational corporations to small and medium enterprises (SMEs) in managing their knowledge assets. Its ability in enhancing organizational performance and providing companies with the competitive edge they need is well-established. To ensure the success of KM, its performance has to be evaluated so that decisions can be made on what to continue, what to improve and what to discard (Andone, 2009).

However, knowledge management performance measurement (KMPM) is not an easy task (Kluge *et al.*, 2001). Since the past few decades, various types of models and tools have been proposed by researchers to measure the performance of KM. For example, the Skandia Navigator by Edvinsson (1997), the balanced scorecard (BSC) by Gooijer (2000), the user-satisfaction-based system by Chin *et al.* (2010), etc.

Even though a lot of KMPM models can be found, they are mostly developed based on the needs and characteristics of large multinational companies. SMEs have been neglected, as there is no well-developed KMPM model specifically designed for them. Some researchers argue that KM in SMEs and large organizations is the same and so, it is

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acceptable that they both share the same measurement model. Yet, some researchers such as McAdam and Reid (2001), Desouza and Awazu (2006), Hutchinson and Quintas (2008) and Janet and Alton (2013) have done empirical research to show that KM in large organizations and SMEs is different. These differences are caused by the size of the organization, which then affects its structure and organizational behavior (Rutherford *et al.*, 2001). Thus, the KMPM tools that have been created based on large organizations are not meant to be applied directly to SMEs. Using inappropriate measurement tools may provide inaccurate results, and mislead management in making decisions and taking appropriate actions. Hence, a gap exists where SMEs have been neglected in the KMPM process. There is a lack of a comprehensive KMPM model specifically tailored to meet the characteristics and needs of SMEs. Without measurement, it is unlikely that a company's KM endeavors can be sustained and improved. Thus, the purpose of this study is to address this gap by proposing a KMPM model specifically for SMEs.

This paper begins with a general overview on KM and KMPM. The next section presents the proposed constructs for the model, followed by data collection and analysis. This paper culminates with a discussion on the results together with conclusions.

An overview

Knowledge is a vital resource for any organization. Generally, it can be divided into tacit and explicit knowledge (Nonaka, 1994). The former can be easily codified, transferred and shared, whereas the latter is the skill and experience that cannot be easily shared (Hubert, 1996). As knowledge is valuable, it should be managed and utilized wisely (Birkinshaw and Sheehan, 2002; Zyngier, 2006), thereby making KM an essential requirement for organizations. KM involves the management, exploitation and development of knowledge assets with the aim of enhancing organizational performance.

KMPM is a crucial step after the implementation stage, as it enables companies to keep track of their KM activities. It supports top management and stakeholders in making decisions and taking actions based on solid information obtained from the evaluation process. SMEs need KMPM as much as large organizations do, as it can provide owner-managers with evidence of improvement. This gives managers the drive and confidence to continue supporting and sustaining their KM programs (Wong, 2005; Chong *et al.*, 2011). Therefore, by measuring the outcomes and evaluating the contribution of KM, SMEs can ensure its sustainability and success over time.

Over the past decade, researchers have been stressing on the importance and benefit of KMPM for SMEs (Carneiro, 2001; Hall, 2001). Yet, this is still an under-developed area. The lack of empirical research in this particular area is obvious where limited number of studies can be found in the literature. For example, Montequín *et al.* (2006) proposed a model for SMEs to measure intellectual capital that comprises human capital, structural capital and relational capital. Human capital consists of indicators that measure the tacit knowledge and competencies of an organization's employees. Structural capital measures the explicit knowledge that has been captured and institutionalized within an organization. Relational capital is related to the value of all the external relationships that a company has with its customers, suppliers and other parties.

Chen and Miao (2010) proposed a KM implementation and measurement model for SMEs with the use of BSC. The model focuses on measuring KM processes based on the four dimensions of BSC which are financial, customer, internal business process and learning and growth.

Based on the review, it is felt that both proposed models are not comprehensive, as only some aspects of KM are covered. The first model only covers knowledge resources, and the latter focuses on KM processes. Furthermore, both models have not been empirically tested, where the constructs and indicators used for measurement have not been validated. Hence, it is clear that SMEs lack a well-developed measurement model to help them evaluate their KM performance.

Research constructs

Since the introduction of KM in the late 1980s, it has then bloomed and diversified in the past few decades. Yet, KM initiatives remain vague and ambiguous because there are many interpretations of what KM is (Ndubisi, 2004; Cheng *et al.*, 2014). Through a thorough literature review on this subject, it can be summarized that most of the research, case studies and theoretical constructs are based on three main themes: knowledge resources, KM processes and KM factors.

Knowledge resources refer to the knowledge assets that a company owns, tacit, explicit, internal or external. It is these assets that enable companies to compete and standout from their competitors (Davenport *et al.*, 1998). KM processes indicate various activities that are related to knowledge (Civi, 2000; Hussain *et al.*, 2004), such as the processes of acquiring, creating, utilizing knowledge, etc. KM factors are the critical factors that help to facilitate and enhance KM activities, such as organizational culture, infrastructure, strategy, etc.

Respectively, when it comes to the evaluation process, indicators and metrics should be developed based on these three main themes. After reviewing the work of various researchers in KMPM for the past two decades, Wong *et al.* (2015) proposed a framework that suggests the evaluation of all the three main themes, as each of them plays a crucial part in KM and has an important bearing on its performance.

Adopting the framework suggested by Wong *et al.* (2015), this section presents the measurement constructs together with their corresponding items which have been identified from the literature based on the three main aspects of KM. A detailed discussion of these constructs and their items is given to substantiate their relevance.

Knowledge resources (a)

Human capital (tacit knowledge) (a_1). Human capital refers to human resources within an organization (owner-managers and employees) and those external to an organization (customers and suppliers). They are considered as a source of knowledge because know-how, ideas, skills and abilities that add value to a company are embedded in them (Ardichvili, 2002; Nunes *et al.*, 2006; Yang *et al.*, 2012). Education is where people obtain their knowledge (uit Beijerse, 1999), and the higher the general education level, the more likely they are able to contribute (Radzeviciene, 2008). On the other hand, experience and knowledge accumulated throughout the working years should also be measured, as they are resources that grow and develop over time (Handzic, 2006).

"SMEs have been neglected as there are no well-developed Knowledge Management Performance Measurement model specifically designed for them."

> **"SMEs need indicators to evaluate how well employees are acquiring knowledge from owner-managers while large organizations emphasize the knowledge retrieval process from their knowledge repositories."**

Customers are the most important element in any business. Good knowledge and understanding about customers is an extremely important premise for SMEs to successfully meet their customers' needs (Radzeviciene, 2008). In addition, suppliers are another important source of knowledge (Chen *et al.*, 2006). It is therefore important to have a smooth flow of knowledge and information between the company and both of these knowledge providers. Accordingly, the following five items were developed to represent human capital:

1. $a_{1.1}$ Owner-manager's education level.
2. $a_{1.2}$ Employees' education level.
3. $a_{1.3}$ Years of experience of owner-manager in the profession.
4. $a_{1.4}$ Years of experience of employees in the profession.
5. $a_{1.5}$ Number of customers/suppliers.

Knowledge capital (explicit knowledge) (a_2). Knowledge capital refers to the quantity and quality of knowledge that resides in a company. Usually, it is stored in a company's data repository in various forms such as reports, documents, images, audios and videos (Choo *et al.*, 2007; Cha *et al.*, 2008; Lee and Van den Steen, 2010).

As compared to large organizations, SMEs rarely invest in advanced information and communications technology (ICT) systems due to resource constraints (Nunes *et al.*, 2006). Many still depend on traditional filing methods or hard drives of computers to store and collect their explicit knowledge (Egbu *et al.*, 2005). Knowledge and information stored have to be relevant and correct to prevent mistakes and errors in the future, as they will be referred or used by other employees. Documents have to be filtered by managers or related personnel before they are stored to maintain the quality of the company's databases (Wong and Aspinwall, 2005b).

Another well-recognized critical knowledge asset is intellectual property, which is viewed as the product or creation of a company (Nonaka and Takeuchi, 1995; Davenport and Prusak, 1998). Increasingly, intellectual properties are being exploited as an organizational resource where knowledge-intensive industries are generating alternative revenue streams through them (Stewart, 1997; Clarke and Turner, 2004). Hence, the following four items were developed to assess the performance of knowledge capital:

1. $a_{2.1}$ Amount of knowledge stored in traditional/manual filing systems and computers.
2. $a_{2.2}$ Quality of knowledge stored.
3. $a_{2.3}$ Number of intellectual properties owned.
4. $a_{2.4}$ Revenue generated from intellectual properties.

KM processes (b)

Knowledge acquisition (b_1). In knowledge acquisition activities, employees are usually sent to attend relevant courses, seminars and exhibitions where they are encouraged to acquire knowledge (Chen *et al.*, 2006; Radzeviciene, 2008). Appropriate and essential training programs are another means for employees to gain new knowledge and expertise

(Gourova, 2010; Lee and Lan, 2011). As the owner-managers of SMEs play the role of knowledge repositories, they are often referred to as the most frequently used source of knowledge (Hutchinson and Quintas, 2008). Due to the friendly organizational culture, employees in SMEs often interact with owner-managers to obtain knowledge (Jones and Crompton, 2009).

SMEs often look outside their organization for knowledge such as from customers and suppliers (Chen *et al.*, 2006; Desouza and Awazu, 2006) because they are considered as vital knowledge providers (Yip *et al.*, 2012). SMEs use information from customers and suppliers to improve their business performance (Chen *et al.*, 2006). Due to the fact that SMEs are scarce in resources and seldom have rich organizational memories, they have to attain their competitive advantage through acquiring knowledge from external sources (Alvarez and Busenitz, 2001; Sheehan *et al.*, 2005; Zhang *et al.*, 2006).

In knowledge-intensive SMEs, the Web has become the primary means for obtaining information (Egbu *et al.*, 2005). Employees rely on the Internet to acquire important work-related knowledge to perform their daily task (Wong and Aspinwall, 2005b; Egbu *et al.*, 2005; Chen *et al.*, 2006; Lee and Lan, 2011).

Another method for employees to obtain knowledge is through their company's knowledge repository where stored knowledge can be retrieved (Gourova, 2010). These considerations led to the following five items to evaluate knowledge acquisition:

1. $b_{1.1}$ Number of times employees attend training/seminars/courses to acquire knowledge.
2. $b_{1.2}$ Number of times employees acquire knowledge from the owner-manager.
3. $b_{1.3}$ Number of times employees contact customers/suppliers to acquire knowledge.
4. $b_{1.4}$ Amount of time spent browsing the Internet/World Wide Web to acquire knowledge.
5. $b_{1.5}$ Number of times employees access the company's knowledge repositories to acquire knowledge.

Knowledge creation and generation (b_2). Knowledge creation is the process where new knowledge, ideas and best practices are generated. Collaboration has been empirically shown to be a significant contributor to knowledge creation (Wong, 2005; Valmohammadi, 2010). It provides opportunities for employees with different background and experience to work together, which facilitates and enhances the creation of new knowledge (Gourova, 2010). Teamwork rather than individual has been continuously emphasized to improve the knowledge creation process (Chong *et al.*, 2011).

Brainstorming is another common method in generating ideas (Hutchinson and Quintas, 2008). It is more effective compared to individuals working alone, as it provides an opportunity for teamwork and it stimulates employees to generate a list of ideas spontaneously either in solving problems or creating new knowledge through intensive interaction and discussion among workers.

It is necessary for organizations to triumph in their knowledge creation process, as it is this new knowledge that gives them the competitive advantage over their competitors.

"This model is able to provide managers and practitioners in SMEs with detailed guidance for establishing their own Knowledge Management Performance Measurement indicators."

Employees need to be motivated and capable of contributing to the development of new ideas or generating effective solutions to problems (Altinay *et al.*, 2008). To motivate employees, a reward system is usually used to acknowledge innovative employees who come up with new knowledge, ideas and solutions (Daghfous and Kah, 2006). The rewards given are either monetary or non-monetary incentives, which can help to boost employees' satisfaction. Hence, the knowledge creation and generation process could be measured with the following four items:

1. $b_{2.1}$ Number of times employees work in teams to create new knowledge.
2. $b_{2.2}$ Number of times employees participate in brainstorming sessions to create new knowledge.
3. $b_{2.3}$ Number of new knowledge, ideas and solutions created.
4. $b_{2.4}$ Amount of rewards given to employees who create new knowledge, ideas and solutions.

Knowledge application and utilization (b_3). Knowledge is only valuable when it is used and applied properly. As stated by Omerzel *et al.* (2011), it is only by putting knowledge to practical use that one creates its direct utility value within a company. To support more knowledge experimentation from conceptual ideas to practical actions, new useful ideas should be adopted in existing workflows or business processes (Chan and Chao, 2008).

Knowledge application deals with the fact that employees continually apply their knowledge to their working situation (Chong *et al.*, 2014). Employees are encouraged to apply what they know or learn, or combine various knowledge sources in solving problems, designing new products and reconfiguring business processes (Chan and Chao, 2008; Omerzel *et al.*, 2011).

Through the application of knowledge, it is transformed into visible results such as development of new or upgraded products and services (Grant, 1996). It is important that organizational knowledge is used in a company's products, processes and services (Yip *et al.*, 2012) to fulfill customers' requirements and expectations. Accordingly, the following three items were developed to measure the knowledge application and utilization process:

1. $b_{3.1}$ Number of times employees apply useful proposals/ideas in practice.
2. $b_{3.2}$ Number of times employees apply knowledge to solve problems.
3. $b_{3.3}$ Number of new products/services launched.

Knowledge codification and storing (b_4). Knowledge and experience are embedded in a worker's mind. Therefore, it is essential for employees to spend time codifying their tacit knowledge into an explicit form and store it in the company's knowledge repository (Egbu *et al.*, 2005).

Knowledge is something that is not static, as it is constantly changing, where old obsolete knowledge is replaced by new one that emerges. Besides this, technologies, customers' requirements, the market and environment are always evolving. The addition, deletion and maintenance of knowledge should be performed on a continual basis to ensure that the values of the repositories are up-to-date (Wong and Aspinwall, 2005b). Knowledge needs to be constantly updated and kept relevant, as obsolete knowledge can at times be misleading (Yip *et al.*, 2012).

Knowledge codification and storing are being viewed as extra work that employees are unwilling to perform. Unless adequate rewards are provided, knowledge will not be externalized or traded, as it is scarce and can be considered as personal capital (Chan and Chao, 2008). Thus, employees' willingness to contribute their knowledge plays a crucial role in the knowledge codification and storing process. Accordingly, the following three items were selected to represent knowledge codification and storing:

1. $b_{4.1}$ Amount of time spent codifying and storing knowledge in the company's knowledge repositories.
2. $b_{4.2}$ Amount of time spent updating the company's knowledge repositories.
3. $b_{4.3}$ Employees' level of willingness to contribute to the company's knowledge repositories.

Knowledge transferring and sharing (b_5). Transferring and sharing of knowledge is where tacit and explicit knowledge are being disseminated. In SMEs, informal face-to-face social interaction is the most effective method used in sharing knowledge (Egbu *et al.*, 2005; Chong *et al.*, 2011). Very few SMEs use dedicated communities of practice to share knowledge (Edvardsson, 2006). As compared to larger firms that are stronger in formal discussion (McAdam and Reid, 2001; Edvardsson, 2006), SMEs still rely more on informal knowledge sharing activities (Hutchinson and Quintas, 2008).

Knowledge is also shared through meeting sessions where employees share their knowledge, ideas and information (Egbu *et al.*, 2005; Coyte *et al.*, 2012). Meetings are usually conducted for information updating where employees and owner-managers are kept informed of the progress of their project on hand. Meetings enable managers to keep track of the workflow of their company and to make sure that important deadlines are met.

Another method of knowledge distribution that is frequently used in SMEs is the e-mail system (Fink and Ploder, 2009). It has been widely used to notify and update employees in the information dissemination process.

Coaching and mentoring is a widely established method for sharing knowledge through people (Bodrow, 2006; Cheng *et al.*, 2014). As SMEs thrive in people-based mechanisms, mentoring and coaching is suitable to be used for transferring and sharing knowledge in this business sector. Mentoring can be informal or formal. In an informal effort, individuals are encouraged to approach knowledgeable people to solicit advice and coaching. As for a formal effort, the organization plays matchmaker by pairing up less experienced people with those who are more experienced and knowledgeable.

SMEs are small in size as well as office space, which promotes teamwork and open space concept with high interaction among employees, resulting in substantive knowledge sharing (Daghfous and Kah, 2006; Chong *et al.*, 2011; Janet and Alton, 2013). Communication and knowledge sharing among workers can be improved by locating groups of workers who need to be in regular contact closer together (Wong and Aspinwall, 2005b; Desouza and Awazu, 2006). Accordingly, the following five items were developed to measure the knowledge transferring and sharing process:

1. $b_{5.1}$ Number of times employees participate in informal discussion to share knowledge.
2. $b_{5.2}$ Frequency of having meeting sessions.
3. $b_{5.3}$ Frequency of employees using technological tools (e-mail, etc.) to transfer knowledge.
4. $b_{5.4}$ Number of mentors–mentees paired.
5. $b_{5.5}$ Level of interaction between employees.

KM factors (c)

Culture (c_1). As stated by Davenport *et al.* (1998), organizational culture is a key element to successful KM. A positive culture encourages and supports KM activities in an organization. Trust is a fundamental aspect of a knowledge-friendly culture (Wong, 2005; Bodrow, 2006). High level of trust among employees underlies their willingness to collaborate with each other and contribute to the organization (Janet and Alton, 2013). It also promotes social interaction. The greater the level of trust, the greater the level of

openness, which facilitates the free flow of truthful information to be shared and transferred over time (Steier, 2001; Chirico, 2008).

As KM is about creating an organizational culture that learns from experience, there will have to be tolerance for mistakes (Wong, 2005; Radzeviciene, 2008). Making mistakes is part of the learning process, thus management should avoid penalizing employees if some new ideas do not work as expected. Otherwise, employees will have less motivation to devise innovative endeavors, as there is always a risk of failure. In the long run, employees will retain the old practices to maintain their performance and job security (Chan and Chao, 2008). Hence, employees should not be penalized if they make mistakes when using and applying new knowledge (Omerzel *et al.*, 2011).

Another cultural aspect which is crucial for KM is collaboration (Wong, 2005; Hamdam and Damirchi, 2011). High level of collaboration between employees indicates that a friendly culture exists where employees are close to each other. Employees are willing to share their knowledge and experience without the fear of losing their superiority. High level of collaboration also promotes teamwork among employees, which facilitates knowledge creation and generation.

Organizational culture that is open to new ideas and knowledge is important in supporting knowledge generation (Cantu *et al.*, 2009). Employers or employees are more receptive to changes and able to accept new knowledge, following the market trends, customers' requirements, technologies, etc. Hence, the following four items were developed to assess the performance of organizational culture:

1. $c_{1.1}$ Level of trust between employees.
2. $c_{1.2}$ Level of tolerance for mistakes.
3. $c_{1.3}$ Level of collaboration between employees.
4. $c_{1.4}$ Level of openness to new ideas/knowledge.

Management leadership and support (c_2). Top management or leader plays a vital role in providing continual support to initiate and sustain KM efforts (Wong and Aspinwall, 2005a). Many successful KM practices reveal that managers are responsible for encouraging employees to carry out KM processes (Chan and Chao, 2008).

Commitment of upper management is important to facilitate and promote the establishment of a system and environment for KM activities (Daghfous and Kah, 2006). Managers can show their commitment through their active involvement and participation in KM to influence and convince employees about its importance to their company. Commitment shows that management is not taking things lightly and employees should play their part in KM initiatives.

Motivation is another key element in persuading employees to take part in KM activities. It is critically dependent on top management to ensure that employees are motivated (Cormican *et al.*, 2012). The motivation given can be monetary or non-monetary to reflect employees' participation or performance in KM activities. It can also be achievement or growth motivation where employees themselves are driven by their desire to learn and contribute to their company.

As mentioned earlier, owner-managers in SMEs are the prime holder of knowledge. Thus, they should exhibit their willingness to share and offer their knowledge freely in the organization (Janet and Alton, 2013). Willingness to share knowledge with employees exhibits trust between them, which helps to promote a friendly organizational culture (Omerzel *et al.*, 2011). Therefore, the following four items could be used to evaluate organizational culture:

1. $c_{2.1}$ Amount of support given by top management to KM initiatives.
2. $c_{2.2}$ Degree of commitment given by top management to KM initiatives.

3. $c_{2.3}$ Degree of motivation given to employees to participate in KM activities.

4. $c_{2.4}$ Degree of willingness from top management to share knowledge with employees.

Organizational infrastructure (c_3). Infrastructure and information technology (IT) tools are important factors that help to support KM within an enterprise (Montequín *et al.*, 2006). KM activities within SMEs tend to happen in an informal way, rarely supported by advanced and purposely designed ICT systems such as decision support and document management systems (Nunes *et al.*, 2006; Edvardsson, 2006). The majority of SMEs have invested only in basic ICT, such as Internet and intranet. Internet has been incorporated as part of their technology infrastructure (Lee and Lan, 2011), as it is an effective tool for searching and transferring information.

Organizational infrastructure is a necessity in every organization. Venues such as meeting rooms for employees to interact and discuss their work should be provided (Chong *et al.*, 2011). As SMEs are still using traditional filing methods to store their knowledge, a proper filing rack or room is required to keep all documents well-organized to ease the knowledge retrieval process.

After investing in organizational infrastructure, it is wise to maintain it in a good condition to prolong its life span so that unnecessary expenditure can be avoided. Maintenance of IT tools is also important so that they can function smoothly to avoid data loss. Hence, the following three items were created to measure organizational infrastructure:

1. $c_{3.1}$ Investment in basic ICT (computer, Internet, intranet, etc.).

2. $c_{3.2}$ Investment in organizational infrastructure (meeting room, filing rack, etc.).

3. $c_{3.3}$ Frequency of organizational infrastructure maintenance.

Strategy (c_4). A critical starting point for a successful KM initiative is a KM strategy which is aligned with the overall business strategy to ensure the organization's long-term competitiveness and success. Typically, it is the owner-manager's responsibility to align them to achieve optimal results (Bagnoli and Vedovato, 2012). Moreover, an organization needs to determine its current position, consider its motives for KM and determine the expected outcomes and how to verify them (Handzic, 2006).

Another important criterion for effective KM is to have a clear strategy. A rational strategy helps to clarify the business case for pursuing KM, and guide the company toward becoming a knowledge-based organization (Wong and Aspinwall, 2005a). Without a clear strategy, the company's effort will go astray and precious time and resources will be wasted on things that do not add value to the company. In contrast, a clear strategy guides KM activities, ensuring everyone is heading in the same direction to create an effective synergy and momentum. In addition, it provides the essential focus, as well as value for everyone in the organization (Wong and Aspinwall, 2005a; Valmohammadi, 2010).

It is imperative that a KM strategy is clearly laid down to build awareness among employees to avoid any danger of misconception and misunderstanding (Wong, 2005; Handzic, 2006). This requires defining and communicating KM concepts, developing common terminologies and creating a common understanding throughout the organization (Handzic, 2006). Following this is to have employees' support, as they are the ones who will be carrying out the tasks and making KM successful. Accordingly, the following three items were developed to represent strategy:

1. $c_{4.1}$ Degree of alignment between KM strategy and business strategy.

2. $c_{4.2}$ Clarity of the company's KM strategy.

3. $c_{4.3}$ Employees' degree of awareness and support toward the company's KM strategy.

Resource (c_5). In general, SMEs suffer from resource scarcity. Successful KM is highly dependent on resources where financial support is a must if an investment in technological systems or infrastructure is to be made. As resource availability is a primary concern in

SMEs, a proper budgeting of financial resources is crucial for achieving effective KM (Wong, 2005).

Other than financial resources, they also have limited workforce. Due to human resource constraints, employees in SMEs have to take on multiple tasks. As SMEs do not have the lavishness to establish a specific department for KM (Cagarra-Navarro and Martinez-Conesa, 2007), owner-managers or certain employees need to coordinate and manage the implementation of KM as well as to take up knowledge-related roles (Wong, 2005).

It is essential for organizations to free up time for their employees to perform KM activities, as time is also a crucial element in KM (Wong, 2005; Cantu *et al.*, 2009). Daily workload may have consumed most of the working time and employees often use the excuse of "insufficient time" to avoid taking part in KM activities. As a result, the following three items could be used to measure resource:

1. $c_{5.1}$ Amount of budget allocated for KM initiatives.
2. $c_{5.2}$ Number of employees involved in KM initiatives.
3. $c_{5.3}$ Amount of time allocated for employees to perform KM activities.

Human resource management (c_6). Managing people in the sense of recruitment, retention and development is crucial, as through recruitment, knowledge and competencies are brought into the organization (Wong, 2005). When recruiting employees, consideration should be given to candidates who possess the required knowledge and skills that can benefit the company. It is also important to consider if the candidates are able to fit into the company's culture or working environment rather than just matching them to a job specification (Robertson and O'Malley-Hammersley, 2000).

Particularly in SMEs, employees are reservoirs of knowledge and when they leave the company, the knowledge they have will leave with them. One way to preserve this knowledge from being lost is by retaining employees in the company (Wong, 2005; Montequín *et al.*, 2006). To retain employees, it is important to provide opportunities for them to grow and advance their career (Wong, 2005; Valmohammadi, 2010).

Furthermore, it is the responsibility of a company to provide appropriate professional development activities for their employees to further develop their skills and competencies (Wong, 2005; Montequín *et al.*, 2006). Professional development is seen as a way to develop and enhance their personal value so that they can contribute more to their company (Wong, 2005). Hence, the above considerations led to the following three items to evaluate human resource management:

1. $c_{6.1}$ Level of effort put into recruiting employees.
2. $c_{6.2}$ Level of effort put into retaining employees.
3. $c_{6.3}$ Number of professional development activities organized for employees.

Survey and data collection

The definition for SMEs is different for every country. In Malaysia, SMEs can be grouped into three categories: micro, small or medium. These groupings are decided based on either one of the two specified qualifying criteria, namely, sales turnover or number of full-time employees, whichever is lower (SME Corporation Malaysia, 2013). The categories of SMEs are shown in Tables I and II.

For this research, data were gathered through a survey, as 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, enabling the generation of a more global statement. Survey is also faster and more direct compared to many other research methods (Chauvel and Despres, 2002).

Table I Categories of SMEs based on the number of full-time employees

Categories	*Manufacturing*	*Services and other sectors*
Micro	Less than 5 employees	Less than 5 employees
Small	Between 5 and less than 75 employees	Between 5 and less than 30 employees
Medium	Between 75 and not exceeding 200 employees	Between 30 and not exceeding 75 employees

Source: SME Corporation Malaysia (2013)

Table II Categories of SMEs based on annual sales turnover

Categories	*Manufacturing*	*Services and other sectors*
Micro	Less than RM300,000	Less than RM300,000
Small	Between RM300,000 and less than RM15 million	Between RM300,000 and less than RM3 million
Medium	Between RM15 million and not exceeding RM50 million	Between RM3 million and not exceeding RM20 million

Source: SME Corporation Malaysia (2013)

A questionnaire was constructed based on the information gathered from the literature review. The questionnaire consisted of five sections. The first explored the company's background, and the second, third and fourth investigated the aforementioned measurement items for knowledge resources, KM processes and KM factors, respectively. Each item was measured on a five-point Likert scale (l = very low, 2 = low, 3 = moderate, 4 = high and 5 = very high) that represents the level of applicability. A five-point scale is commonly used and may produce slightly higher mean scores relative to the highest possible attainable score, compared to a ten-point scale (Dawes, 2008). The last part consisted of a few general questions regarding the benefits of KM and barriers of KMPM.

Before conducting the actual survey, a pilot test was carried out to check the appropriateness of the developed questionnaire. For this purpose, five academics (who have conducted research in KMPM) and five practitioners (owner-managers in SMEs which have adopted KM) were invited to review the questionnaire. Correspondingly, three academics and four practitioners responded. Their remarks and suggestions were obtained and further improvement was made.

Based on the feedback from the pilot test, a better five-point Likert scale (1 = not applicable, 2 = slightly applicable, 3 = moderately applicable, 4 = applicable and 5 = very applicable) was used to replace the previous scale to avoid confusion. The feedback was positive, and the respondents mentioned that the proposed constructs and items are suitable to be applied in SMEs. Overall, there were only some minor issues regarding the format and structure of the questionnaire.

For the survey, only one questionnaire was sent to each selected SME, thereby using a single-form approach, rather than a multi-form method, to prevent unequal number of replies from different organizations, thus enabling a more precise "demographic to variable analysis" to be conducted (Thiagarajan and Zairi, 1998). SMEs selected to participate in this survey were restricted to the consultancy sector only, as they are the knowledge-intensive firms that rely heavily on specialist technical knowledge for the creation of customized solutions to clients' problems.

The questionnaires together with covering letters explaining the purpose of the survey were sent to 350 randomly selected small and medium-sized consultancy firms that have complete information and contact details from SME Corporation Malaysia database. The questionnaires were addressed to the owner-managers of the selected SMEs. They were considered to be the best respondents, as they are the overseer of their company and most likely the core driver of KM (Wong and Aspinwall, 2005a; Zhang *et al.*, 2006).

The survey was conducted from December 2013 to April 2014, over a period of five months. As the response rate was low, a second batch of questionnaires was posted to a new set

of 250 SMEs during the third month of the survey period. Extra efforts such as follow-up calls and personal visits to the companies were made to increase the response rate. As a result, out of the 600 questionnaires sent, a total of 105 questionnaires were returned, yielding a 17.5 per cent response rate. Out of the 105 questionnaires, four were discarded because the responded firms have not implemented KM, and this would affect the accuracy of the results. The analyses of the remaining usable 101 questionnaires using SPSS version 19 will be discussed in the following section.

Data analysis

Companies' profiles

Tables III and IV show the number of employees, and number of years implemented KM for the 101 respondent companies. Referring to Table III, most of the respondents were micro and small enterprises, where only 7.9 per cent were medium enterprises. From Table IV, 51 per cent of the respondents were at the intermediate stage of KM implementation and the rest were almost equally distributed between the beginner and advanced stages. As KM was introduced to SMEs around the late 1990s, it is not surprising that only 23 per cent have implemented it for 10 years or more.

Instrument's applicability

In this study, the respondents were asked to judge the applicability or relevance of the proposed constructs in measuring their companies' KM performance based on a five-point Likert scale, as mentioned earlier. Table V shows the average mean value for each construct. As can be seen, all the average mean values were higher than 3, hence it can be concluded that the proposed constructs are applicable and relevant to be used as an indicator to measure KM performance in SMEs.

Validation of constructs

Unidimensionality analysis

To verify a set of constructs, the normal practice is to perform reliability and validity analysis. However, before its reliability is analyzed, the unidimensionality of the constructs must be checked (Anderson and Gerbing, 1991), as lack of unidimensionality can lead to artificial correlations among developed constructs (Ahire *et al.*, 1996). To check for unidimensionality, principal component analysis with varimax rotation was performed on each set of constructs separately. Eigenvalue is the most commonly used technique for factor extraction, where factors having eigenvalues greater than one are considered

Table III Number of employees

Range	*Frequency*	*(%)*
Less than 5 (micro)	48	47.5
5 to less than 30 (small)	45	44.6
30 to not exceeding 75 (medium)	8	7.9
Total	101	100.0

Note: This study was based on the number of full-time employees in defining SMEs, as it fulfills the requirement set by SME Corporation Malaysia

Table IV Number of years implemented KM

Range	*Frequency*	*(%)*
Less than 5 (beginner)	27	26.7
5 to less than 10 (intermediate)	51	50.5
10 and above (advanced)	23	22.8
Total	101	100.0

Table V Applicability of the instrument

Constructs	*No. of items*	*Mean*
a_1 Human capital	5	4.022
a_2 Knowledge capital[a]	4	3.710
b_1 Knowledge acquisition	5	3.648
b_2 Knowledge creation and generation	4	3.542
b_3 Knowledge application and utilization	3	4.026
b_4 Knowledge codification and storing	3	3.462
b_5 Knowledge transferring and sharing	5	3.572
c_1 Culture	4	3.817
c_2 Management leadership and support	4	3.963
c_3 Organizational infrastructure	3	3.937
c_4 Strategy	3	3.386
c_5 Resource	3	3.248
c_6 Human resource management	3	3.719

Note: [a]This was later divided into two constructs called knowledge capital and intellectual property, and their average mean values were 3.955 and 3.465, respectively

significant and those with less than one are considered insignificant and are disregarded (Hair *et al.*, 2005). The results obtained were not satisfactory, as one of the 13 constructs (Knowledge capital) was not unidimensional. So, it was split to create another new construct (Intellectual property) and both constructs have two items each. It seems that there is a distinct difference between knowledge capital and intellectual property from the respondents' point of view. A secondary analysis was then performed to check the unidimensionality of both constructs, and the results showed all 14 constructs to be unidimensional.

Reliability analysis

Reliability analysis was conducted using the Cronbach's alpha model, as it tests the internal consistency of a construct based on the average inter-item correlation (Lee and Lan, 2011). It is considered to be the most important reliability index and is based on the number of items in a construct, as well as on the correlations between the items (Nunnally, 1978). It is able to assess the equivalence and homogeneity of the items in a construct (Forza, 2002). The alpha value obtained is regarded as acceptable if it is greater than 0.7 (Nunnally and Bernstein, 1994). The results are shown in Table VI where all 14 constructs surpassed the cut-off point of 0.7 for the alpha value, thus confirming the reliability of the constructs.

Content validity analysis

For validity analysis, five types of validity, which were content, construct, convergent, discriminant and criterion, were evaluated. The content validity of an instrument can only be subjectively judged by researchers (Gotzamani and Tsiotras, 2001) whether it has measurement items that adequately cover the content domains or aspects of the concept being measured (Ahire *et al.*, 1996). As the constructs and items have been derived from a comprehensive and extensive review of relevant literature published by researchers in the field of KM for SMEs, covering all the three main aspects of KM, it is believed that the instrument developed has content validity.

Construct validity analysis

In terms of construct validity, factor analysis was conducted. For factor analysis, the sample size should be 100 or greater to obtain trustworthy results (Comrey and Lee, 1992; Hair *et al.*, 2010). Kaiser–Meyer–Olkin measure of sampling adequacy was used to determine the appropriateness of the data sets for factor analysis. High values (between 0.5 and 1.0) indicate that factor analysis is appropriate, whereas values below 0.5 imply that it may not

Table VI Reliability analysis

Constructs	*No. of items*	*Alpha value*
a_1 Human capital	5	0.768
a_2 Knowledge capital	2	0.740
a_3 Intellectual property	2	0.898
b_1 Knowledge acquisition	5	0.705
b_2 Knowledge creation and generation	4	0.766
b_3 Knowledge application and utilization	3	0.760
b_4 Knowledge codification and storing	3	0.858
b_5 Knowledge transferring and sharing	5	0.726
c_1 Culture	4	0.809
c_2 Management leadership and support	4	0.880
c_3 Organizational infrastructure	3	0.794
c_4 Strategy	3	0.903
c_5 Resource	3	0.828
c_6 Human resource management	3	0.793

be suitable (Field, 2000). As can be seen in the second column of Table VII, this requirement was met by all of the constructs. Each construct was then individually tested for construct validity. According to Hair *et al*. (2005), factor loadings greater than 0.30 are considered to meet the minimal requirement, loadings greater than 0.40 are considered more important and if the loadings are greater than 0.50, then they are considered highly significant. In this study, a factor loading of 0.50 was used as the cut-off point. The third column of Table VII indicates that all 14 constructs have factor loadings higher than 0.5. Streiner (1994) suggested that the percentage of variance explained should be at least 50 per cent of the total variance. As can be seen, each construct explained more than 50 per cent of the variance in its corresponding items, except for constructs b_1 and b_5, with 47.760 per cent and 47.930 per cent, respectively, which were still acceptable, as they were close to the cut-off point of 50 per cent.

Convergent validity analysis

Convergent and discriminant validity can be considered as subcategories of construct validity. Convergent validity shows the unity of the items in a construct. It is a measure of the strength of the relationships between the items that are predicted to represent that single latent construct (Brown, 2006). To estimate the degree to which the items are related to each other, correlation coefficients can be used to look at the patterns of inter-correlations among items. High inter-correlations show that the items are related and converged to the *same* construct, hence providing evidence of convergent validity. It can also be determined by examining the factor loading of an item where 0.5 or more shows

Table VII Factor analysis

Constructs	*KMO value*	*Factor loading*	*Eigenvalue*	*Percentage of variance explained*
a_1 Human capital	0.698	0.636-0.801	2.619	52.372
a_2 Knowledge capital	0.500	0.891	1.589	79.443
a_3 Intellectual property	0.500	0.953	1.816	90.778
b_1 Knowledge acquisition	0.723	0.523-0.787	2.388	47.760
b_2 Knowledge creation and generation	0.637	0.629-0.887	2.411	60.284
b_3 Knowledge application and utilization	0.620	0.694-0.906	2.097	69.886
b_4 Knowledge codification and storing	0.708	0.858-0.920	2.352	78.397
b_5 Knowledge transferring and sharing	0.697	0.622-0.761	2.397	47.930
c_1 Culture	0.778	0.766-0.874	2.574	64.349
c_2 Management leadership and support	0.754	0.831-0.921	2.944	73.592
c_3 Organizational infrastructure	0.664	0.769-0.899	2.164	72.132
c_4 Strategy	0.736	0.904-0.938	2.513	83.756
c_5 Resource	0.720	0.851-0.878	2.236	74.517
c_6 Human resource management	0.661	0.776-0.896	2.130	71.005

good convergent validity (Ghozali, 2008). The correlation matrices provided in Tables VIII-X for each of the 14 constructs show high inter-correlations among items, and Column 3 in Table VII also indicates that all the items have a factor loading higher than 0.5. Hence, it is clear that these constructs have convergent validity.

Discriminant validity analysis

Discriminant validity refers to the extent to which constructs are distinct and uncorrelated. The rule is that variables or items should relate more strongly to their own construct than to another (Brown, 2006). Discriminant validity can be determined by examining the correlation matrix. From the correlation matrix, correlations among constructs should be low to show discriminant validity (Kline, 2005). Fornell and Larcker (1981) also presented a method for assessing discriminant validity where the average variance extracted (AVE) of each construct is compared with the shared variance between constructs. If the AVE of each construct is greater than its shared variance with any other construct, discriminant validity is supported. AVE is the average amount of variation that a latent construct is able to explain in the observed variables to which it is theoretically related. AVE is the average squared value of factor loadings for the observed variables that the construct accounts for. Shared variance is the amount of variance that a construct is able to explain in another construct. It is represented by the squared of the correlation coefficient between any two constructs. This study used the latter method and Table XI shows the AVE (in bracket) and shared variance values for the 14 constructs. Clearly, the discriminant validity of the constructs is secured, as all the AVE values were greater than their respective shared variances.

Criterion validity analysis

Criterion validity is concerned with the degree to which an instrument can successfully predict an independent relevant criterion that is related to the phenomenon being measured (Wong and Aspinwall, 2005a). Taking into consideration that the instrument was to determine the applicability of a set of constructs to measure the performance of KM in SMEs, thus it is expected that organizational performance would be improved as a result of a successful evaluation. Therefore, a question was included in the questionnaire that required respondents to indicate to what extent KM performance measurement could help in improving their company's performance on a scale from 1 to 5 (1 = Not at all, 2 = Little, 3 = Somewhat, 4 = A lot, and 5 = To a great extent). Multiple regression analysis was then used to determine the extent of the relationship between the 14 independent variables or predictors and the perceived level of improvement in organizational performance of SMEs (dependent variable). The assumptions of normality, constant variance, linearity and independency required in multiple regression analysis (Wong and Aspinwall, 2005a; Siegel and Renko, 2012) were examined and the results showed no violation. The adjusted *R* squared value obtained from the regression model was 0.543 as shown in Table XII.

Table VIII Correlation matrix for knowledge resources

Items	$a_{1.1}$	$a_{1.2}$	$a_{1.3}$	$a_{1.4}$	$a_{1.5}$	$a_{2.1}$	$a_{2.2}$	$a_{3.1}$	$a_{3.2}$
a1.1	1								
a1.2	0.682**	1							
a1.3	0.247*	0.383**	1						
a1.4	0.330**	0.408**	0.587**	1					
a1.5	0.400**	0.350**	0.321**	0.312**	1				
a2.1						1			
a2.2						0.589**	1		
a3.1								1	
a3.2								0.816**	1

Notes: **Correlation is significant at the 0.01 level (2-tailed); *correlation is significant at the 0.05 level (2-tailed)

Table IX Correlation matrix for KM processes

Items	$b_{1.1}$	$b_{1.2}$	$b_{1.3}$	$b_{1.4}$	$b_{1.5}$	$b_{2.1}$	$b_{2.2}$	$b_{2.3}$	$b_{2.4}$	$b_{3.1}$	$b_{3.2}$	$b_{3.3}$	$b_{4.1}$	$b_{4.2}$	$b_{4.3}$	$b_{5.1}$	$b_{5.2}$	$b_{5.3}$	$b_{5.4}$	$b_{5.5}$
b1.1	1																			
b1.2	0.384**	1																		
b1.3	0.302**	0.341**	1																	
b1.4	0.228*	0.418**	0.106	1																
b1.5	0.400**	0.434**	0.242*	0.538**	1															
b2.1						1														
b2.2						0.735**	1													
b2.3						0.376**	0.575**	1												
b2.4						0.485**	0.347**	0.231*	1											
b3.1										1										
b3.2										0.769**	1									
b3.3										0.444**	0.403**	1								
b4.1													1							
b4.2													0.738**	1						
b4.3													0.695**	0.592**	1					
b5.1																1				
b5.2																0.455**	1			
b5.3																0.234*	0.368**	1		
b5.4																0.319**	0.393**	0.193	1	
b5.5																0.207*	0.371**	0.496**	0.430**	1

Notes: **Correlation is significant at the 0.01 level (2-tailed); *correlation is significant at the 0.05 level (2-tailed)

Table X Correlation matrix for KM factors

Items	$c_{1.1}$	$c_{1.2}$	$c_{1.3}$	$c_{1.4}$	$c_{2.1}$	$c_{2.2}$	$c_{2.3}$	$c_{2.4}$	$c_{3.1}$	$c_{3.2}$	$c_{3.3}$	$c_{4.1}$	$c_{4.2}$	$c_{4.3}$	$c_{5.1}$	$c_{5.2}$	$c_{5.3}$	$c_{6.1}$	$c_{6.2}$	$c_{6.3}$
c1.1	1																			
c1.2	0.445**	1																		
c1.3	0.573**	0.642**	1																	
c1.4	0.470**	0.450**	0.555**	1																
c2.1					1															
c2.2					0.785**	1														
c2.3					0.511**	0.699**	1													
c2.4					0.575**	0.658**	0.649**	1												
c3.1									1											
c3.2									0.727**	1										
c3.3									0.474**	0.534**	1									
c4.1												1								
c4.2												0.785**	1							
c4.3												0.697**	0.785**	1						
c5.1															1					
c5.2															0.625**	1				
c5.3															0.643**	0.585**	1			
c6.1																		1		
c6.2																		0.686**	1	
c6.3																		0.448**	0.552**	1

Note: **Correlation is significant at the 0.01 level (2-tailed)

Table XI AVE and shared variance

Constructs	a_1	a_2	a_3	b_1	b_2	b_3	b_4	b_5	c_1	c_2	c_3	c_4	c_5	c_6
a1	(0.5237)													
a2	0.015	(0.7938)												
a3	0.009	0.049	(0.9082)											
b1	0.158	0.076	0.001	(0.4776)										
b2	0.026	0.001	0.035	0.179	(0.6025)									
b3	0.063	0.032	0.094	0.047	0.183	(0.6987)								
b4	0.061	0.110	0.112	0.261	0.105	0.051	(0.7844)							
b5	0.147	0.012	0.012	0.220	0.309	0.147	0.103	(0.4792)						
c1	0.148	0.012	0.001	0.082	0.127	0.082	0.038	0.162	(0.6434)					
c2	0.046	0.025	0.001	0.089	0.087	0.096	0.073	0.097	0.147	(0.7354)				
c3	0.031	0.047	0.019	0.085	0.022	0.049	0.065	0.068	0.042	0.132	(0.7211)			
c4	0.030	0.003	0.026	0.149	0.161	0.042	0.151	0.104	0.063	0.155	0.079	(0.8380)		
c5	0.027	0.006	0.014	0.139	0.122	0.061	0.023	0.176	0.106	0.164	0.156	0.306	(0.7448)	
c6	0.132	0.090	0.078	0.177	0.132	0.181	0.132	0.181	0.155	0.126	0.235	0.134	0.137	(0.7051)

Table XII Multiple regression analysis

R	R^2	*Adjusted* R^2	*SE of the estimate*
0.876	0.767	0.543	0.478

Therefore, it can be inferred that collectively, all the variables do have a reasonable degree of predictive capability.

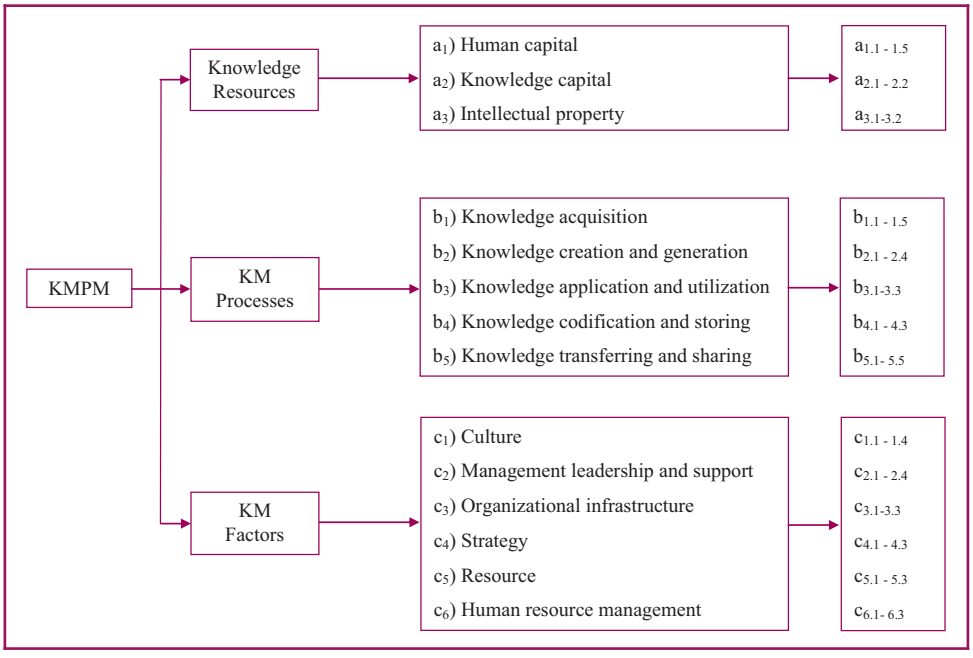
Discussion and implications

The results of this study are reliable and valid, as they have been empirically tested, and not merely based on observation. The instrument shows good reliability, as the Cronbach's alpha value obtained for each construct ranged from 0.705 to 0.903. As for validity analysis, content, construct, convergent, discriminant and criterion validity were tested and the results were satisfactory. In terms of applicability, all of the proposed constructs were perceived to be relevant by the respondents, as the average mean score obtained for each construct was above 3. The measurement model was finalized to measure the three main aspects of KM with 14 constructs and 49 items as shown in Figure 1.

It is believed that the proposed measurement model is more comprehensive and complete for SMEs compared to the previous models suggested by other researchers such as Montequín *et al.* (2006) and Chen and Miao (2010). The proposed KMPM model covers all the three important aspects of KM, whereas only one or two aspects are covered in the previous approaches. All three facets of KM should be taken into consideration when evaluating its performance, as each of them contributes to its success extensively. Knowledge resources account for the growth and development of a company's knowledge assets (tacit and explicit), and KM processes show the efficiency and participation of employees in carrying out knowledge-related activities, transforming knowledge from one form to another. As for KM factors, they illustrate a company's norm, characteristic, structure, facility, etc., in supporting KM.

Comparing the KMPM model developed in this study with those designed for large organizations, differences are evidential based on the indicators used. Looking at knowledge resources, owner-managers in SMEs are regarded as a prime source of knowledge, whereas they have never been included as part of the measurement indicators for large organizations. Besides this, SMEs highly appreciate and depend on external knowledge obtained from customers and suppliers, as they have limited organizational memories. On the other hand, large companies focus more on their own corporate databases due to the fact that they usually have well-developed data repository systems, supported by advanced technological tools. Comparing KM

Figure 1 KMPM model



processes, SMEs need indicators to evaluate how well employees are acquiring knowledge from owner-managers, while large organizations emphasize on the knowledge retrieval process from their knowledge repositories. As for knowledge transferring and sharing, SMEs excel in informal knowledge sharing activities, while large organizations have to rely more on formal knowledge sharing activities among employees due to their competitive nature. In terms of KM factors, large organizations invest in advanced technology, while SMEs usually utilize only basic ICT. Large companies usually have indicators that evaluate the performance of a chief knowledge officer and KM department, whereas in SMEs, limited resources restrain them from having such a facility. Either the owner-managers or certain employees are responsible for their KM initiatives.

In terms of implications, this model is able to provide managers and practitioners in SMEs with detailed guidance for establishing their own KMPM indicators. It can also be used as a checklist for SMEs to ensure that important items are covered and not missed out when developing their measurement model. It is hard for improvement to take place if weaknesses and errors cannot be pointed out clearly. Therefore, it is crucial for SMEs that have implemented KM to have a sound model to evaluate their KM performance, providing accurate and constructive information on what to continue, improve or discard.

On the other hand, this paper can provide researchers with a head start to conduct studies in this field. The proposed model provides the basic guidelines and future directions for researchers to further explore and expand this domain.

Conclusions

For the past decades, the field of KMPM has been vastly explored by researchers with the goal in mind to help organizations excel in managing their knowledge assets and related activities. However, the focal point is on large organizations, leaving SMEs unattended. KMPM in SMEs has received little attention from researchers. Even after more than a decade of exploration, researchers are still dwelling on the implementation stage. Without measurement, SMEs that have implemented KM may not be able to make sound judgment in improving their KM initiatives.

Therefore, this paper intends to break the barrier by proposing an integrative and inclusive measurement model for SMEs that has been empirically tested through a survey of 101 consultancy firms in Malaysia. A total of 14 constructs, comprising 49 items which were tested and analyzed using SPSS version 19 were shown to be applicable, reliable and valid. This model is believed to be comprehensive, covering most of the important elements of KM based on three main aspects which are knowledge resources, KM processes and KM factors.

In terms of limitations, this study does not permit the generalization of the results obtained to larger firms. In addition, a larger number of responses would probably yield a more accurate finding and so, future research could replicate this study, with the hope to obtain more feedback from SMEs. As this study has focused on the service sector, further research can be conducted in the manufacturing sector to see if the findings differ between both sectors. This would contribute to a better understanding of KMPM in SMEs.

Finally, it is hoped that this study will provide researchers with a substantial guideline and drive to further explore KMPM in SMEs.

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