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A THEORETICAL MODEL FOR KNOWLEDGE MANAGEMENT SYSTEMS ADOPTION IN MALAYSIAN SMALL AND MEDIUM ENTERPRISES (SMEs)

FINAL PROJECT REPORT

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2009

Abstract

Many large organizations in developed nations are already in their advanced stage of adopting Knowledge Management (KM). In contrast, Small and Medium Enterprises (SMEs) in developing countries such as Malaysia still have the 'wait and see' attitude to embrace this system. This could be due to their lack of knowledge and expertise in KM and the absence of an appropriate model to guide them. In order to fill this void, this research project has developed a model for KM adoption in Malaysian SMEs. A review of the literature was first conducted and then, a survey was launched to identify the critical factors, practices, needs, issues and characteristics of adopting KM in the Malaysian SMEs. Based on the insights obtained, a model consisting of certain constructs or components was developed to facilitate the mechanism of adopting KM. In essence, the model is formulated to meet the situations and needs of SMEs in order to help them accomplish KM.

Abstrak

Banyak organisasi besar di negara-negara maju telah pun berada di tahap yang tinggi di dalam perlaksanaan sistem pengurusan ilmu. Sebaliknya, organisasi bersaiz kecil dan sederhana di negara-negara yang sedang membangun seperti Malaysia masih mempunyai sikap 'tunggu dan lihat' untuk mempraktikkan sistem tersebut. Ini mungkin disebabkan oleh kekurangan kepakaran dan kemahiran di dalam pengurusan ilmu dan ketiadaan satu model yang lengkap untuk memberi bimbangan. Bagi menangani masalah ini, projek ini telah membina satu model pengurusan ilmu untuk organisasi bersaiz kecil dan sederhana di Malaysia. Kajian literatur telah dibuat dan seterusnya, soal-selidik telah dilancarkan untuk mengenalpasti faktor kritikal, amalan, keperluan, isu dan ciri pengurusan ilmu di organisasi bersaiz kecil dan sederhana. Berdasarkan kepada informasi yang diperolehi, satu model yang mempunyai beberapa konstruk dan komponen telah dibangunkan untuk memudahkan mekanisma pengurusan ilmu. Natijahnya, model ini telah dibina untuk memenuhi situasi dan keperluan organisasi-organisasi bersaiz kecil dan sederhana supaya dapat membantu mereka di dalam melaksanakan konsep pengurusan ilmu.

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1.0   Introduction

In the current economy, knowledge has become the primary strategic resource for organisations to achieve and maintain sustainable success. Many large companies are adopting Knowledge Management (KM) to transform themselves into intelligent and knowledge-based enterprises. Due to this, almost all the research in KM has focused on large organisations, with little attention being paid to the Small and Medium Enterprise (SME) sector (McAdam and Reid, 2001; Wong and Aspinwall, 2004). However, assuming that the concepts and theories developed for large companies are suitable for SMEs may be an over simplistic view (Sparrow, 2001; Wong and Aspinwall, 2004), because they are different in terms of size, characteristics, ideals, needs and constraints. As asserted by Welsh and White (1981), SMEs should not be treated like large organisations.

To date, KM research in Malaysian SMEs has been largely neglected (Wong, 2008a). In fact, no appropriate conceptual model exists to guide them in the adoption of KM. SMEs are the major growth engine and backbone of the economy in Malaysia, but they have always been left behind. In an effort to assist them in implementing KM, this project develops a model which is believed to be suitable and helpful to them. Specifically, this project has the following objectives:

i)   To identify the characteristics, needs, issues, practices and problems of adopting KM in SMEs.

ii)   To scientifically investigate the critical factors for adopting KM in SMEs.

iii)   To formulate a model that underpins the adoption of KM in SMEs.

iv)   To evaluate the model for its suitability in this business sector.

The initial part of this report focuses on the literature review, followed by a discussion of the methodology used and the results obtained. The report culminates with a description of the proposed model, and ends with conclusions.

2.0   Literature review

In its broadest sense, KM can be understood as a formalised and active approach to manage knowledge resources in an organisation. It is also often viewed as comprising a series of processes such as creating, acquiring, capturing, organising, classifying, storing, sharing and applying knowledge, to name but a few. Thus, organisations will need to manage not only their knowledge, but also the processes that act upon it. In addition, KM is concerned with the management of technological, cultural, operational, behavioural and organisational factors that could affect its performance. As an integrative concept, KM has been defined as the consolidation of "knowledge-based systems, artificial intelligence, software engineering, business process improvement, human resources management and organisational behaviour concepts" (Liebowitz, 2000) so that the knowledge resources, processes and factors can be optimally managed.

In this section, some of the more prominent and widely published KM models and frameworks are reviewed. Lee and Yang (2000) introduced a knowledge value chain as a KM framework, based on three building blocks; KM infrastructure, KM processes and knowledge performance. They divided the KM processes into five activities, namely knowledge acquisition, innovation, protection, integration and dissemination. These processes are supported by the KM infrastructure, which they have classified into four categories; chief knowledge officer and management, knowledge

worker recruitment, knowledge storage capacity, and customer or supplier relationship. The interaction between the KM processes and the KM infrastructure is what leads to the knowledge performance of an organisation. This framework, however, is incomplete in that it lacks important elements such as knowledge application and use. How can organisations achieve and improve their knowledge performance without actually using their knowledge? Although organisations certainly need to acquire, innovate, protect, integrate and distribute their knowledge in order to maintain their viability, more importantly is the process of applying knowledge into their products, services, processes and practices. All the former processes do not help to realise and create value for an organisation, but applying knowledge does. In addition, other elements, such as culture and strategy are also missing from their framework.

Gore and Gore (1999) proposed a framework which was said to underpin the adoption of a KM approach. Their framework describes how a company can create new knowledge, and convert individual knowledge into organisational knowledge. They pinpointed that the first step in any KM programme was to create a vision and a business case by top management. Coupled with this were the needs to examine the utilisation of current explicit knowledge, to capture new explicit knowledge, and to externalise individual tacit knowledge (articulate it into explicit concepts so that it can be transformed into organisational knowledge). Teamwork is crucial to a KM focused organisation because the interactions that take place within and between groups can stimulate the creation of new knowledge as well as underlie its externalisation. Adopting a management style that provides the freedom to take action and encourages individuals to self organise can also facilitate the knowledge creation process. In spite of

these considerations, there is little mention about the needs to organise and transfer knowledge in the organisation and to measure the outcome of KM.

From a managerial perspective, Wiig (1997) outlined four areas of emphasis for systematic KM. These comprised top down monitoring and facilitation of knowledge-related activities, establishing and updating knowledge infrastructures, creating, renewing and organising knowledge assets, and distributing and applying them effectively to realise their value. Within each of these areas is a set of knowledge-related practices or activities for organisations to pursue. An activity which calls for conducting research and development seems to portray a less relevant picture of the situation in small businesses. Such an activity is more prevalent in large corporate giants and multinationals. Especially in the manufacturing economy, the majority of SMEs act as specialist suppliers of parts, components and subassemblies, and as subcontractors of services to large companies. These large firms (their customers) are the ones who provide them with information on product and process designs, research outcomes and other developments. Another activity pointed out by Wiig (1997), which deals with the building of a corporate university is far from feasible for small firms. Such an activity is clearly directed at large companies which have abundant financial and human resources, time, knowledge and expertise.

A threefold KM framework which was claimed to be unifying and comprehensive was developed by Holsapple and Joshi (2002). Underlying their framework are three main components, namely knowledge resources, KM activities and KM influences. The first component characterises an organisation's reservoirs of knowledge, which can be embedded or stored in one of the following forms;

participants' knowledge, culture, infrastructure, knowledge artifacts, purpose and strategy. The KM activities component denotes the fundamental functions that an organisation performs to operate its knowledge resources. Four such activities are provided; acquiring, selecting, internalising and using (generating and externalising) knowledge. Eventually, the KM influences component represents the factors which can impact the performance of KM in an organisation. They considered resource, managerial and environmental influences as vital. The validation of the framework which was carried out by them revealed that it did possess some limitations. It was mentioned that future improvements should focus on enhancing the accuracy and clarity of the KM resources component, and the completeness of the KM activities component. In contrast, this framework offers an attractive option for small firms to adopt, since it takes resource into account as an influence which can shape the success or failure of a KM programme. In the context of small businesses, this consideration is particularly crucial as they are faced with resource scarcity. However, the framework falls short of describing 'how' a company can actually proceed with those components to implement KM.

Wiig et al (1997) presented a KM framework which was used as a basis to suggest a set of methods and techniques for performing KM tasks. It comprises a cycle of four KM stages; conceptualise, reflect, act and review. Conceptualising implies discerning the state of knowledge in an organisation and analysing the strengths, weaknesses, opportunities, threats and problems of the knowledge 'household'. Once this is achieved, organisations can proceed to the reflect phase. It deals with identifying and selecting improvement ideas, translating those selected into improvement plans and assessing their associated risk before execution. In the act phase, organisations carry out

the improvement plans. Generally, this involves developing, distributing, combining and consolidating knowledge. Ultimately, the review stage refers to the comparison of the old with the new situation, and monitoring and evaluating the performance of the actions taken. In essence, it can be inferred that these four stages are more inclined towards a problem-solving cycle which aims to improve the knowledge 'bottlenecks' or problems in an organisation. Their approach does not actually provide concrete guidelines to assist a company in starting a KM initiative or in implementing one.

Jarrar (2002) suggested a framework based on a systematic analysis of 40 cases of KM applications in organisations that have reported success in their initiatives. His framework can be summarised as comprising four main building blocks. They are setting a strategic priority and gaining management commitment for KM, defining and understanding organisational knowledge, managing knowledge, and building a knowledge environment and culture. Each of the building blocks is presented with a set of proposed best practices for successfully implementing KM. In one of the best practices in his framework, 'employ a special team to design and manage the overall process', he cited the activity of developing multiple levels of new organisational roles, such as Chief Knowledge Officer (CKO), Chief Learning Officer (CLO), knowledge champion, director of KM, knowledge project manager, knowledge report editor and knowledge network facilitator. Clearly, such an approach is suitable for organisations having a large number of employees, which can create numerous specialist job functions to cope with KM, but not for small firms. This comes as no surprise because he has obtained the information and derived his framework from the study of KM applications in predominantly large corporations such as DHL International, IBM, Skandia Life, Xerox, Rolls Royce, Honda Motor Europe, Chevron and Dow Chemical, among others.

In large companies, the responsibility for KM can be devolved and delegated to various teams of people, whereas in small firms, it is likely to be left to the owner-managers or a small group of people.

A framework together with an implementation method that facilitates the structured planning and operation of a KM project were presented by Apostolou et al (2000), Mentzas (2001) and Mentzas et al (2001). Their framework comprises the following elements; knowledge assets, strategy, structure, processes, systems and knowledge interaction networks at the individual, team, organisational and inter-organisational levels. Their implementation method is simple and modular based on three main stages; plan, develop and operate. In the plan stage, an organisation determines the vision, scope and feasibility of a KM initiative, whereas in the develop phase, the structure and layout of a KM solution is developed, tested and reviewed. The final stage calls upon an organisation to roll out a company-wide implementation of the KM initiative. Measuring its outcome and level of performance is also covered in their approach. Together with these, they considered the issues of gaining awareness of KM as well as providing training to employees in working with new technologies and in taking up new knowledge related roles. Despite its modularity, their approach still possesses certain limitations in that some of its features are more applicable to large firms, than to small ones. For example, rolling out a company-wide implementation following the develop stage seems to point in the direction of implementing a KM initiative rigorously and fully in an all out manner. This can be overwhelming in terms of resources and organisational changes that are needed for beginners of KM. A 'blanket' approach towards KM implementation may be suitable for large organisations that have ample resources, but not necessarily for small ones.

McCampbell et al (1999) recommended a guide to implementing KM practices in an organisation. It provides thirteen consecutive steps and three ongoing steps for organisations to follow. However, the approach tends to be very tool-driven, with major steps being centred on technological issues such as 'design a technological structure to warehouse knowledge', 'test, maintain and retest the technology', and 'initiate the use of the system'. Unlike some of the frameworks, soft aspects of KM such as cultural issues, reward and incentive systems, and motivational factors are not mentioned. An overly inclined approach towards an exclusive technological view that ignores the people issues can be problematic in accomplishing KM. Organisational issues such as obtaining employees' willingness to use the KM system, and gaining voluntary participation and trust in building a mutual community for knowledge sharing cannot be readily solved by information technology. Successful KM should consider both the technological and social view, implying that both hard tools and soft aspects need to be optimised. In fact, it has been asserted that KM should be 90% people and 10% technology (Jarrar, 2002).

A framework together with a very elaborate methodology on how to implement KM have been developed by Rubenstein-Montano et al (2001) based on the notion and ideal of systems thinking. In particular, systems thinking is said to promote the consideration of the entire KM domain. Their approach comprises five general phases, strategise, model, act, revise and transfer, hence its name SMARTVision. It is considered very prescriptive and complex because, within each general phase, there are still many specific procedures and sub-procedures that need to be addressed when conducting KM. Even some of the sub-procedures are further decomposed into different

steps to be initiated. One of the procedures which requires organisations to establish a motivation and reward structure to facilitate knowledge sharing has been prescribed in the strategise phase, which is a bit early. It is even before organisations start to determine their knowledge assets, plan their KM strategy, model their KM initiative and portray its expected benefits. It is very difficult, but not impossible for top management to set up a reward structure or to reshuffle one, without first building evidence of what KM will do for the organisation and what potential benefits it will achieve. Top management need to be presented with plans and evidence, and be convinced before they are willing to bring about new organisational systems or changes. Besides providing procedures and sub-procedures for implementing KM, Rubenstein-Montano et al (2001) also laid down the outputs that ought to be achieved in completing each of the phases. Most of them are in the form of documents that should be generated such as business needs analysis document, cultural assessment and incentives document, knowledge audit document, knowledge-acquisition document, and evaluation and results document. Too extensive documentation may discourage small businesses from pursuing KM, since most of their activities and operations are governed by less formal and standardised mechanisms (Ghobadian and Gallear, 1997; Spence, 1999).

Apostolou and Mentzas (1998) developed a framework to analyse and compare KM efforts of some global and large management consulting companies in order to identify results attained and to draw useful conclusions. The framework considers in an integrated manner, the drivers and thrusts that give rise to the initiation of a KM effort, its goals and objectives, the strategies to pursue it and the ways to proceed with it. The main components portrayed in the framework can be broken down into the following; context, goals, strategy, culture, KM processes, organisational infrastructure,

technological infrastructure, results obtained and lessons learned. The KM processes consist of generating, organising, developing and distributing knowledge. Applying or using knowledge which requires more attention is not included in their framework.

Similarly, a framework was generated by Lai and Chu (2002) to be used as an analytical basis to comparatively examine KM in practice. Their investigations involved companies such as HP, Microsoft, IBM and Arthur Andersen, thus clearly depicting a focus on large organisations. Their framework entails three main aspects; knowledge resources, KM activities and KM influences. Human capital, structural capital and customer capital form the core of the knowledge resources aspect. They believed that these three types are complete, in a sense that they comprised every knowledge resource in an organisation. Seven key activities, which range from 'initiation' to 'retrospect' are included as KM activities in their framework. Influences that can affect the conduct of KM encompass elements such as culture, leadership, values and norms, reward and incentive systems, leadership, organisational adaptability and measurement.

Another framework within a concentric circle was presented by the American Productivity and Quality Centre (APQC) (1999). The centre of the circle denotes the organisational knowledge that a company possesses. However, the types or nature of the organisational knowledge to be managed are not delineated in the framework. It can be argued that it presupposes organisational knowledge as a uniform entity, with little say on the different knowledge types that exist, although this may not be intended. Surrounding the organisational knowledge are seven key KM processes; create, identify, collect, adapt, organise, apply and share. At the outer boundary of the circle are four major enablers which include strategy and leadership, culture, technology and

measurement. Again the *raison d'être* of this framework was to be used as a basis to benchmark the conduct of KM in organisations.

uit Beijerse (2000) constructed a conceptual model to delineate the important elements that play a role in KM. He then used it to analyse KM practices in 12 innovative Dutch companies. His approach can be summarised as comprising 3 important aspects; KM goal, KM processes and organisational means. The primary goal for the conduct of KM in an organisation is to make the knowledge factor productive. Nine possible knowledge processes or streams within an organisation are identified as being important for the management of knowledge. The first three include determining the necessary knowledge, the available knowledge and the knowledge gap, while the remainder are developing, acquiring, locking, sharing, utilising and evaluating knowledge. In order to facilitate the execution of these processes, four organisational means are laid out; strategy, structure, culture and systems. In this respect, systems are said to be central to all KM activities, whereas strategy, structure and culture, can each play a significant role in particular processes.

3.0   Methodology

Basically, the methodology used in the project is summarized in Figure 1.
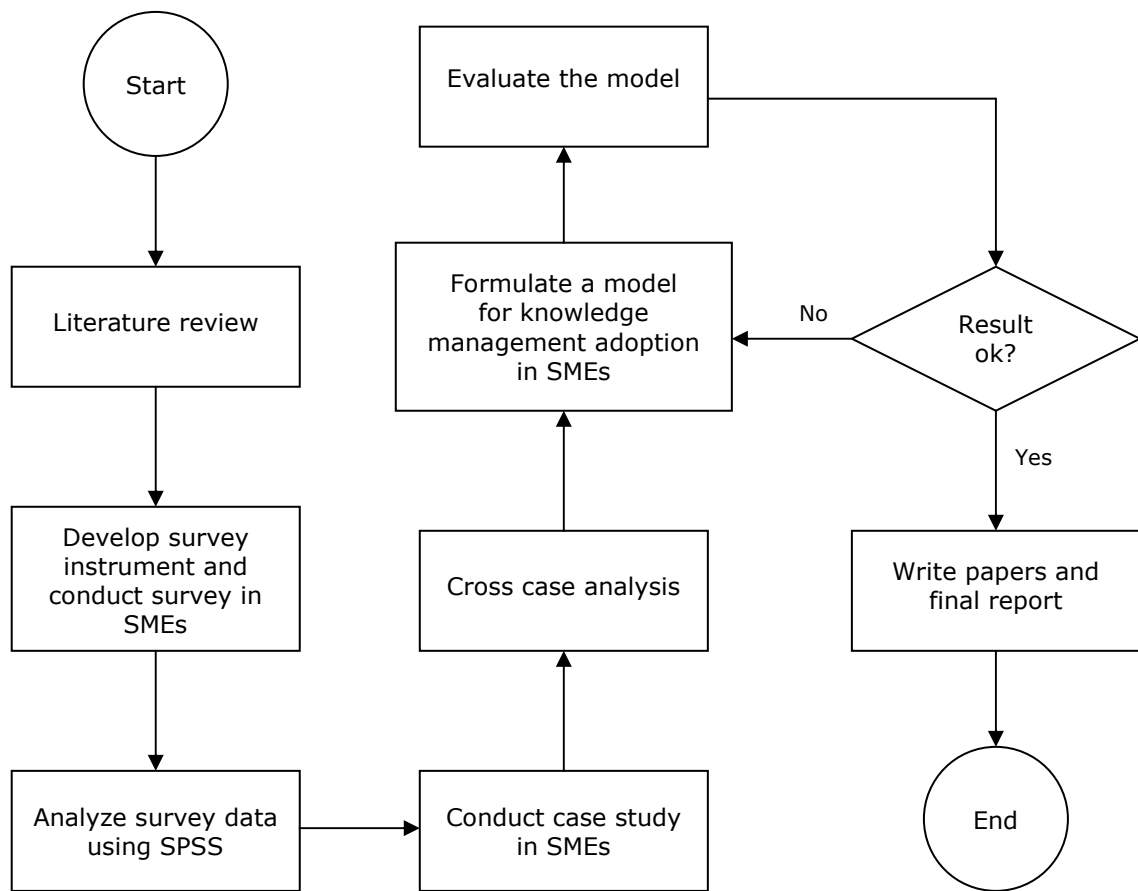
Figure 1: Project methodology

As can be seen, the project consists of the following main activities:

- Literature review will be first conducted to obtain a thorough understanding of the subject matter and to probe deeper into previous research.

- Following this, a survey will be administered to a selected sample of SMEs to determine their KM practices and critical factors.

- Survey data will be analyzed using SPSS version 14 software package.

- Case study will then be conducted in a few SMEs (adopters of KM) to investigate their characteristics, needs and issues in adopting KM.

- Cross case analysis will be carried out on the case study in order to generate a more convincing result.

- On the basis of the survey and case study results, a model that characterizes the adoption of KM in SMEs will be formulated.

- An assessment will be done to evaluate the suitability of the model.

- Finally, dissemination of the research findings will be made through journal publications, conferences, and project reports.

4.0   Results and discussion

For the purpose of the survey, questionnaires were developed and they were posted to a total of 400 SMEs in Malaysia. The sampling sources for the companies were the Small and Medium Industries Development Corporation Directory, and Federation of Malaysian Manufacturers Directory. Various techniques such as providing self-addressed stamped envelopes, making telephone calls, and sending follow-up letters were employed to increase the response rate. These resulted in a final useable response rate of 21.5%, which was deemed to be reasonable (Jugdev, 2007) for exploratory survey. Statistical analyses were conducted using the SPSS Version 14 statistical package, and the results obtained have already been published in Wong (2008a) (please refer to this article for a detailed discussion of the survey results).

The main finding from the survey is that the following critical factors are shown to be important for adopting KM in the SME sector:

i)   Management leadership and support

ii)   Culture

iii)   Information technology

iv)   Strategy and purpose

v)   Measurement

vi)   Organisational infrastructure

vii)   Processes and activities

viii)   Motivational aids

ix)   Resource management

x)   Training and education

xi)   Human resource management

Coupled with the survey, case studies were also conducted to examine the needs, characteristics, issues etc of KM implementation in SMEs. Two companies in Malaysia participated in the case studies, but for anonymity purposes, their identities are not revealed in this report. Some important points can be deduced from analysing the case study results. Firstly, employing a hybrid human-technology perspective towards embracing KM is apparent. Besides relying on technological systems, the importance of people is recognised by the companies. Both hard and soft tools are utilised by them to support KM. Another point is that an incremental and gradual approach to implementing a KM initiative is favoured. The strategy is to tackle the initiative by starting small, getting it right and then expanding it. Resource scarcity is a concern in SMEs, and so they could not afford to roll out KM using a blanket approach. The two companies pointed out that a model which gives guidance on how to adopt KM would be useful for the SME sector. At the same time, the model should be simple and informative.

By soliciting the insights and information obtained from the survey and case studies, a model for adopting KM in SMEs has been formulated and it is shown in Figure 2.

KM Coordinating Group

Assess the knowledge domain
Develop vision and strategy
Communicate KM
Identify initiatives/programmes
Prioritise and select initiatives
Allocate resources
Develop a technological infrastructure
Build a supportive culture/environment
Measure and monitor performance

BLOCK A

Translate into

Initiatives/Programmes /Projects/Activities

Create, acquire, codify, organise, store, share, apply knowledge etc.
(*tacit & explicit knowledge*)

BLOCK B

General Guide

Plan
Launch pilot/trial
Review
Expand
Formalise

BLOCK C

Critical Success Factors

Management leadership & support
Culture
Information technology
Strategy & purpose
Measurement
Organisational infrastructure
Processes & activities
Motivational aids
Resource management
Training & education
People management

BLOCK E

Tools and Techniques

Hard tools
Knowledge bases, collaborative tools, expert & intelligent systems, workflow systems, search engines, e-learning systems, content management systems etc.

Soft tools
Collaborative teams, communities of practice, mentoring, job rotation, training, debriefing etc.
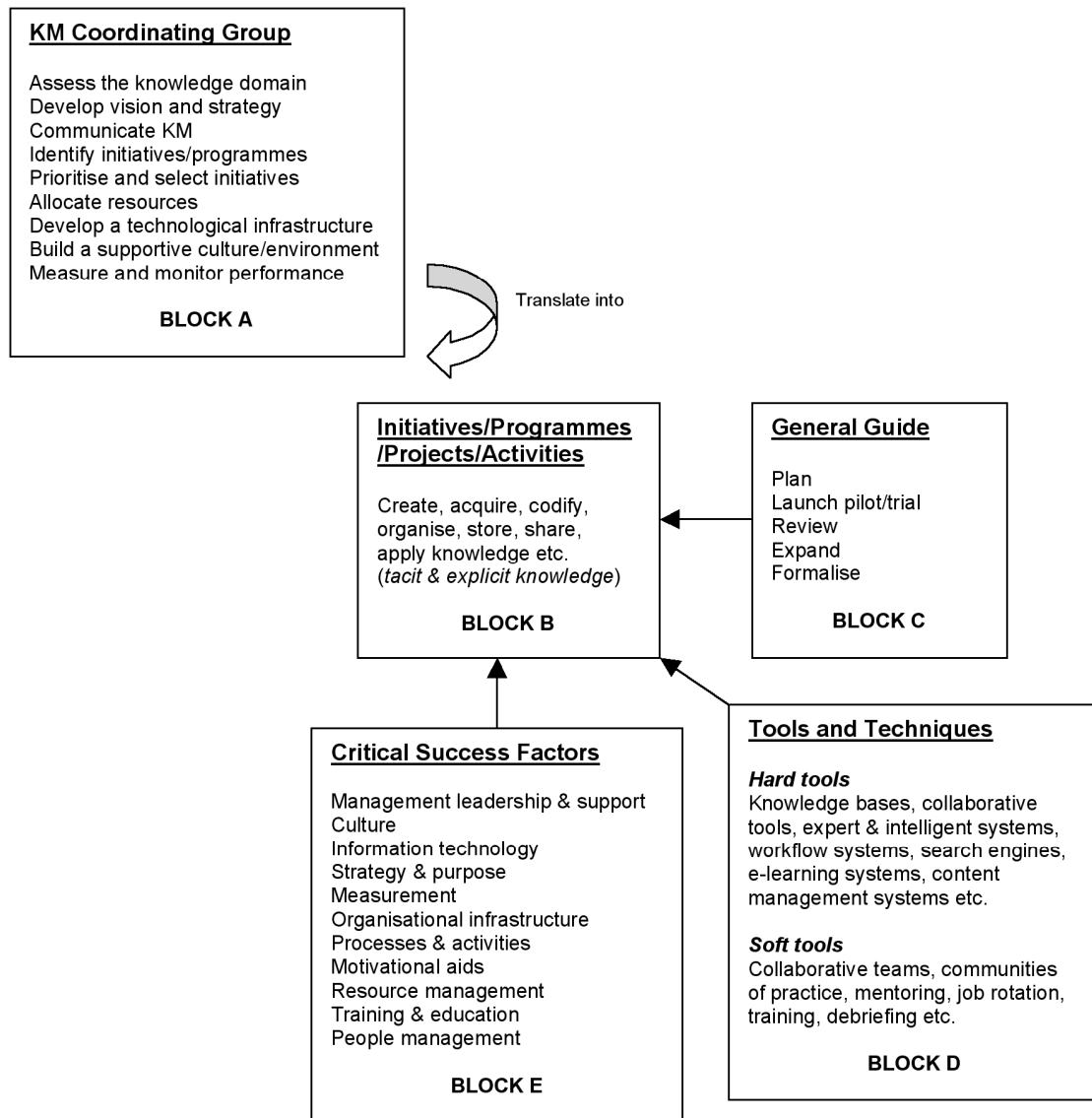
BLOCK D

Figure 2: A model for KM adoption in SMEs

Descriptions of the components that make up the model as well as its overall working mechanism have been published in Wong (2008b) (refer to this article for more details). The two companies that participated in the case studies were asked to evaluate and assess the model. They favourably agreed that the model is indeed feasible and applicable. They also acknowledged that it provides guidance for implementation as well as being comprehensive. Overall, the evaluation results were positive, thus showing that the model has been appropriately developed.

5.0   Conclusions

In summary, SMEs in Malaysia have not been given the adequate attention that they deserve in the pursuit of KM. This project has achieved its objective by developing a working model to assist them in the adoption of KM. The model is developed to fit the situations, characteristics and needs of SMEs. Nevertheless, more studies need to be conducted in the future to apply the model in real-life. Through such studies, the model could be further improved and refined to eradicate any weaknesses or problems that may arise when using it.

References

Apostolou, D. and Mentzas, G. (1998), "Managing corporate knowledge: a comparative analysis of experiences in consulting firms", *Paper of the Second International Conference on Practical Aspects of Knowledge Management*, Basel.

Apostolou, D., Mentzas, G., Young, R. and Abecker, A. (2000), "Consolidating the product versus process approaches in knowledge management: the Know-Net approach", *Paper of the Conference on Practical Application of Knowledge Management (PAKeM),* Manchester.

APQC (1999), "Knowledge management: executive summary", *Consortium Benchmarking Study Best-Practice Report*, American Productivity and Quality Center.

Ghobadian, A. and Gallear, D. (1997), "TQM and organisation size", *International Journal of Operations and Production Management*, Vol.17 No.2, pp.121-163.

Gore, C. and Gore, E. (1999), "Knowledge management: the way forward", *Total Quality Management*, Vol.10 No.4&5, pp.554-560.

Holsapple, C.W. and Joshi, K.D. (2002), "Knowledge management: a threefold framework", *The Information Society*, Vol.18 No.1, pp.47-64.

Jarrar, Y.F. (2002), "Knowledge management: learning for organisational experience", *Managerial Auditing Journal*, Vol.17 No.6, pp.322-328.

Jugdev, K. (2007), "Closing the circle: the knowledge management spiral of project management", *International Journal of Knowledge Management Studies*, Vol.1 No.3/4, pp.423-441.

Lai, H.C. and Chu, T.H. (2002), "Knowledge management: a review of industrial cases", *Journal of Computer Information Systems*, Vol.42 No.5 (Special Issue), pp.26-39.

Lee, C.C. and Yang, J. (2000), "Knowledge value chain", *The Journal of Management Development*, Vol.19 No.9, pp.783-794.

Liebowitz, J. (2000), *Building Organizational Intelligence: A Knowledge Management Primer*. Boca Raton: CRC Press.

McAdam, R. and Reid, R. (2001), "SME and large organisation perceptions of knowledge management: comparisons and contrasts", *Journal of Knowledge Management*, Vol. 5 No.3, pp.231-241.

McCampbell, A.S., Clare, L.M. and Gitters, S.H. (1999), "Knowledge management: the new challenge for the 21st century", *Journal of Knowledge Management*, Vol.3 No.3, pp.172-179.

Mentzas, G. (2001), "An holistic approach to realizing the full value of your knowledge assets", *Knowledge Management Review*, Vol.4 No.3, pp.10-11.

Mentzas, G., Apostolou, D., Young, R. and Abecker, A. (2001), "Knowledge networking: a holistic solution for leveraging corporate knowledge", *Journal of Knowledge Management*, Vol.5 No.1, pp.94-107.

Rubenstein-Montano, B., Liebowitz, J., Buchwalter, J., McCaw, D., Newman, B. and Rebeck, K. (2001), "SMARTVision: a knowledge-management methodology", *Journal of Knowledge Management*, Vol.5 No.4, pp.300-310.

Sparrow, J. (2001), "Knowledge management in small firms", *Knowledge and Process Management*, Vol.8 No.1, pp.3-16.

Spence, L.J. (1999), "Does size matter? The state of the art in small business ethics", *Business Ethics: A European Review*, Vol.8 No.3, pp.163-174.

uit Beijerse, R.P. (2000), "Knowledge management in small and medium-sized companies: knowledge management for entrepreneurs", *Journal of Knowledge Management*, Vol.4 No.2, pp.162-179.

Welsh, J.A. and White, J.F. (1981), "A small business is not a little big business", *Harvard Business Review*, Vol.59 No.4, pp.18-33.

Wiig, K.M. (1997), "Knowledge management: an introduction and perspective", *Journal of Knowledge Management*, Vol.1 No.1, pp.6-14.

Wiig, K.M., de Hoog, R. and van der Spek, R. (1997), "Supporting knowledge management: a selection of methods and techniques", *Expert Systems With Applications*, Vol.13 No.1, pp.15-27.

Wong, K.Y. and Aspinwall, E. (2004), "Characterizing knowledge management in the small business environment", *Journal of Knowledge Management*, Vol.8 No.3, pp.44-61.

Wong, K.Y. (2008a), "An exploratory study on knowledge management adoption in the Malaysian industry", *International Journal of Business Information Systems*, Vol.3 No.3, pp.272-283.

Wong, K.Y. (2008b), "A model for knowledge management systems adoption in Malaysian SMEs", *Proceedings of the SME-Entrepreneurship Global Conference*, Melbourne, Australia.