**UNIVERSITI PUTRA MALAYSIA**


**A FRAMEWORK FOR MANAGING KNOWLEDGE AND
COMPETENCIES IN A GROUP PROJECT IMPLEMENTATION**


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By

**MARZANAH BINTI A.  JABAR**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirement for the Degree of Doctor of Philosophy**

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*I have learnt silence from the talkative,*
*toleration from the intolerant,*
*and kindness from the unkind;*
*yet strange,*
*I am ungrateful to these teachers.*

**Kahlil Gibran**

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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**Chairman:** **Associate Professor Hj. Mohd. Hasan Selamat**

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Every organisation realizes that its organisational knowledge which resides in individual brain or stored in organisational processes, products, facilities, systems and documentation is quickly becoming a sustainable competitive advantage.  This growing attention has lead to the idea that these resources must be protected, cultivated and shared among its members.  As organisation's knowledge is built upon these human resources, and effective way of managing these resources is a challenge.  The challenges poses problems  such as when knowledge can be lost when people leave the organisation, problem in difficulties to manage tacit knowledge and also in managing the competencies, expertise and capabilities of the organisation. The research has explored and proposed a framework to achieve its objectives, in capturing, and structuring knowledge in acquiring competitiveness edge in an organisation.  KEPSNet (**K**nowledge **E**xtract,

**P**rofiling, and **S**haring **Net**work), has approached the problems in managing knowledge and competencies based on three key elements of people-process-product, conceptual theory and by prescribing a knowledge model of five layers: knowledge object, agents, knowledge functionalities, knowledge services and knowledge application. KEPSNet provided a practical application of knowledge capture and reuses of relevant know-how, experiences, best practices from a group project implementation. KEPSNet implementation as a Portal provided functionalities, for group project to capture and retain their knowledge in group repository with the use of concept maps, thus providing facilities for retrieving and sharing knowledge, structured and retained in the group knowledge repository. Two software agents introduced in KEPSNet implementation: the Profile Agent and Knowledge Agent has shown that it has adopted an autonomous way of managing knowledge, maintaining competency profile to reflect the level of knowledge of the expertise and to support knowledge sharing during group project implementation. KEPSNet Portal and agents were developed on Domino Lotus Notes, while Cmap Tool was used as the knowledge modeling tool for knowledge capture in this research.

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Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

# A FRAMEWORK FOR MANAGING KNOWLEDGE AND COMPETENCIES IN A GROUP PROJECT IMPLEMENTATION

Oleh

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**Oktober 2007**

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Setiap organisasi menyedari yang pengetahuan yang dimiliki oleh setiap individu di dalam organisasi tersimpan didalam kemahiran/pengalaman individu, berada di dalam proses-proses organisasi, produk, sistem dan dokumentasi yang mana ia merupakan satu kelebihan untuk bersaing bagi organisasi tersebut. Ini mencetuskan kepada satu keperluan supaya sumber-sumber ini mesti dilindungi, dan di kongsi di kalangan ahli-ahlinya. Mengurus sumber pengetahuan organisasi yang terbina dari sumber manusia ini, secara efektif adalah merupakan satu cabaran. Cabaran ini terdiri dari masalah seperti pengetahuan dan kepakaran yang hilang apabila individu meninggalkan organisasi tersebut, masalah dalam kesulitan untuk mengurus pengetahuan yang tersirat serta masalah dalam menguruskan kecekapan, kepakaran dan kemampuan yang ada di dalam sesebuah organisasi. Penyelidikan ini telah meneroka dan mencadangkan satu

rangkakerja untuk mencapai objektif, dalam penyimpanan, dan mengstruktur pengetahuan dalam menyelesaikan masalah tersebut untuk memperolehi kelebihan untuk bersaing. KEPSNet (Mengekstrak pengetahuan, membentuk profil, dan rangkaian perkongsian maklumat), telah melihat permasalahan dalam menguruskan pengetahuan dan kecekapan-kecekapan berdasarkan tiga elemen penting iaitu menerusi pendekatan individu-proses-produk dan menterjemahkan pendekatan ini menggunakan lima lapisan pengetahuan: objek pengetahuan, ejen, fungsi pengetahuan, perkhidmatan pengetahuan dan aplikasi pengetahuan. KEPSNet menyediakan satu amalan pengurusan pengetahuan, penggunaan semula pengetahuan berdasarkan pengalaman lalu, amalan terbaik daripada pelaksanaan projek. Portal KEPSNet telah menyediakan fungsi pengurusan pengetahuan untuk implementasi projek kumpulan untuk mengekalkan pengetahuan kumpulan ke pangkalan data pengetahuan untuk kumpulan tersebut menggunakan peta konsep. Ia juga menyediakan kemudahan dapatan semula pengetahuan dan perkongsian pengetahuan. Dua ejen perisian telah diujudkan dalam perlaksanaan KEPSNet: Ejen Profil dan Ejen Pengetahuan dalam membuktikan bahawa ia telah menggunapakai satu kaedah mengurus yang 'autonomous', sebagai satu cara baru menguruskan pengetahuan, memelihara profil kecekapan bagi mencerminkan tahap pengetahuan kepakaran dan menyokong perkongsian pengetahuan untuk kumpulan pelaksanaan projek. Portal ini telah dibangunkan menggunakan perisian Lotus Notes Domino manakala penyimpanan pengetahuan dilaksanakan

menggunakan CMAP Tool sebagai permodelan pengetahuan untuk penyimpanan maklumat.

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| | |
|---|---|
| e-SPRINT2 | Sistem Pengurusan Rangkaian Integrasi Talian Terus |
| AR | Action Research |
| DB | Database |
| CSCW | Computer Supported Coorperative Work |
| IC | Intellectual Capital |
| ICT | Information Communication Technology |
| IR | Information Retrieval |
| IS | Information System |
| IT | Information Technology |
| KA | Knowledge Asset |
| KAP | Knowledge Activity Profile |
| KEPSNet | Knowledge Extraction Profiling and Sharing Network |
| KM | Knowledge Management |
| PP | Project Profile |
| R&D | Research and Development |
| RDF | Resource Description Framework |
| TFIDF | Term Frequency Inverse Document Frequency |
| XML | Extensible Markup language |
| UPM | Universiti Putra Malaysia |
| URL | Uniform Resource Locator |

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

According to Nonaka and Konno (1998), knowledge is created in a knowledge platform emerged in individuals, working groups, project teams, informal circles, meetings, virtual groups and when in contact with the customer. As organisation's knowledge is built upon these human resources, and effective way of managing these resources is a big challenge. In an information era, where these knowledge-based core competencies are key organisational assets, restructuring or high rate of turnover can lead to problems of knowledge retention. Knowledge management has emerged as a mechanism for an organisation to remain intelligent and competitive in the current turbulent market (Davenport and Prusack, 1998). Organisations are realizing how important it is to "know what they know" and be able to make maximum use of the knowledge. The field of knowledge management (KM) is exploring methods of discovering, codifying, storing, and automating knowledge. (Alavi and Leidner, 2001), stressed that knowledge that cannot be spread within an organisation remains the property of a few people, rather than of the organisation and will have limited impact on the organisation's ability to create value. As the objective of an enterprise today is to increase its productivity through an improvement in its organisation, one way to

achieve this is by reducing overheads by reusing its knowledge and the competencies of its employees, and setting up a system for bringing the right information at the right time to the person who needs it to make a decision, is regarded as a goal. In addition, if such a system were available, it could be used to store the enterprise knowledge considered as intangible assets.

There is an increasing interest in the capitalization of know-how of groups of people in an organisation. This know-how may relate to problem solving expertise in functional disciplines, experiences of human resources, and project experiences in terms of project management issues, design technical issues and lessons learned. Managing knowledge in a group implementation is the process to be able to reuse in a relevant way, the knowledge of the group domain previously stored and modeled in order to perform new tasks

Knowledge in the form of skills and competencies can only be transferred from one person to another through interaction. Information management on the other hand deals with knowledge that can be captured, processed and managed. Sveiby in (1997) proposed the Information Technology (IT) track and the People Track approach to knowledge management. The IT track focuses on the management of information. The knowledge management activities comprise the construction of information management systems, artificial intelligence, data mining and other enabling technologies. In this case knowledge can be treated as objects that can be identified and handled in an information system. The People Track focuses on the management of

people, and activities that encompasses of assessing, changing and improving human individual skills and or behavior. Therefore KM can be seen as an approach for handling knowledge in an organisation, which addresses not only the culture, the dynamics of the organisation and Information Communication and Technology (ICT) infrastructures.

## 1.2    Problem Statement

Utilizing knowledge accumulated and generated within the organisation can be a strategic way to acquire the competitiveness edge for an organisation. Organisations have numerous kinds of knowledge resources which can be categorized into two categories: explicit or tacit. Explicit Knowledge can be easily communicated and shared, while tacit knowledge is highly personal, available within the individual and difficult to capture and manage. Tacit knowledge within the organisation when captured and processed into knowledge is important as it formed the knowledge capital of the organisation. Organisations need to react to the organisational changes when people leave the organisation as they are the people with knowledge of the organisation, and people attrition contributes to knowledge loss in the organisation. Nordhaug (1992) has conceptualized competencies as concepts of knowledge, skills and aptitudes. Competencies as abstraction of task related have emerged as a concept for making human abilities and knowledge manageable and addressable.

### 1.2.1  Organisational Changes

Valuable human and knowledge resources will be wasted unless management openly accepts and supports efforts to gather, sort, transform, record and share knowledge.  Tacit knowledge can be lost through outsourcing, downsizing, mergers and terminations.  According to Rus and Lindvall (2002) in a knowledge intensive environment, there is a need to build structures and frameworks for capturing key information that can help retain some knowledge when employees leave or become unavailable.

### 1.2.2  Difficulties in Managing Tacit Knowledge

Difficulties in managing tacit knowledge are due to the reason of tacit knowledge that is inherently elusive, and in order to capture, store, and disseminate it, it is argued that it first has to be made explicit.  According to Stenmark (2001) such a process is difficult, and often fails due to three reasons that:

1.  People are not necessarily aware of their tacit knowledge,

2.  People do not need to make it explicit in order to use it, and

3.  People may not want to give up a valuable competitive advantage.

In our daily work, our tacit knowledge informs our activities without us thinking it as knowledge, as it is manifested through our actions.  Tacla

(2001) in his work in knowledge management systems has discussed the limitation of current technologies in managing tacit knowledge. According to him the tools used while performing regular activities is not adequately taken into account, though this may be an important source of tacit knowledge. It may not have an intelligent behavior, to suggest some action or propose a service to the user, with limited pro-activity and autonomy.

### 1.2.3 Building Organisation Competencies Capabilities

Another problem that initiated the research is to provide a guide to human knowledge resources in the organisation as mentioned by Lindgren et al (2003). The concern is how to create a manageable list of knowledge categories in that will be widely understood and will accurately reflect organisational broad universe of knowledge. Most of the contributions have dealt with knowledge in a broad sense or with expertise, which is individually held work-related knowledge. According to Nonaka (1994) the competencies of an organisation include tacit and explicit knowledge, and should be conceived of as a mix of skill and technologies. Haerem (1998), Lindgren and Stenmark (2002) and Lindgren et al. (2003) stressed that knowledge and competencies are closely related and not much and little attention is being paid for managing competence, therefore there is a need for additional research addressing the support for managing competence.