

CRITICAL STEPS TO KNOWLEDGE MAPPING IN FACILITIES MANAGEMENT ORGANISATION

Fadzil Yasin¹ and Charles Egbu

School of Built Environment, The University of Salford, Greater Manchester, M5 4WT UK.

Knowledge mapping is an on-going quest within an organisation to survey, audit and synthesise the knowledge within an organisation. Auditing knowledge within an organisation identifies knowledge gap, classifies, sorts and identifies the knowledge flow within the organisation. Synthesis is the ultimate stage in knowledge mapping where the processes, peoples and knowledge mapping tools are cleverly linked to each other and elucidate the relationship among them. However, the absence of knowledge management approaches in the organisation, arguably, causes deficiency of structured and purposive knowledge mapping. For facilities management organisations, the question of where and how to start and what is needed to commence the knowledge mapping initiative in the organisation leave facilities managers in limbo. Facilities managers in Malaysia realise the importance of their knowledge rich organisations being mapped. This is to ensure that they do well in the competitive business environment and gain recognition of their important role in supporting prime activities of the clients' organisations. The literature review and survey interview amongst facilities managers in Malaysia reveal that it is crucial to identify knowledge assets in an organisation very early on. Through knowledge mapping, expected benefits can be fully exploited.

Keywords: facilities management, information technology, knowledge mapping.

INTRODUCTION

Knowledge mapping is the process of linking different forms of available knowledge in order to identify opportunities, improve efficiency, improve effectiveness and add value to the organisation. Available knowledge in the organisation could be explained as a tacit and explicit knowledge which resides within people, processes, physical documents, software and other information and communication technologies. The processes and application of knowledge mapping have been discussed by a number of authors such as Vail (1999), Wexler (2001), Eppler (2003) Kautz and Hansen (2004) and Folkes (2004).

The approach towards knowledge mapping by practice and academia varies from the understanding of existing processes in organisations, organisational knowledge retrieval, sorting information, and applied tool and techniques. McLennan (2000) suggests that the flow of information in facilities management should have the feedback loop to enable knowledge gain to be quickly dispersed to provide the opportunity for FM to exploit the knowledge through operating buildings. The ability to spot and capture new knowledge, best practice and knowledge gap identification are the opportunities for the organisation.

¹ M.F.MatYasin@edu.salford.ac.uk

It is important to reveal the critical steps in the knowledge mapping process so that the organisation can have an outline idea of where to focus on when initiating a knowledge mapping approach. Critical in this context is the greatest importance placed on the way things might happen, in which the absence of a process could lead to failure in implementing effective knowledge mapping.

METHODOLOGY

Facilities management itself covers a broad area of physical environment, human sciences and business. The facilities management role in one organisation is either carried out by an internally set-up facilities management organisation or alternatively the function could be out-sourced to a facilities management consultant. In both situations, it is important for the organisation to ensure the knowledge is captured through the process, lessons learned and best practices to be retained in the organisation and improved over time. Key papers in the area of knowledge mapping practice and implementation in other areas have been reviewed, a priori similarities with the facilities management area.

UNDERSTANDING THE KNOWLEDGE MAPPING PROCESS

In implementing knowledge mapping, it is crucial to comprehend its fundamental tenet. Through syntheses of the literature of knowledge management (Grey, 1999; Meso and Smith, 2000; White, 2002; Lui and Hsu, 2004; Vestal, 2005) for the context of the present research, key principles of knowledge mapping can be summarised as follows:

- i. Knowledge mapping is about inquiry, education and relationship building rather than about charting or documentation.
- ii. Knowledge mapping involves activities such as coaching, modelling and sharing the knowledge as well as identifying, finding, tracking, discovering, surfacing knowledge in all its forms.
- iii. Recognise and jointly locate knowledge in a wide variety of forms for example tacit/implicit/explicit, formal and informal, codified and personalised, internal and external, individual and organisation, short life cycle and permanent.
- iv. Knowledge found in processes, relationship, policies, people and documents, conversations, links and context.
- v. Concerned with organisational level aggregation, cultural issues and reward systems, timelines, sharing and value, legal process and protection such as patents, trade secrets, trademarks.
- vi. Knowledge is transient and very closely tied to individual and group identity, it is needed to obtain and explain sanctions, establish boundaries and respect personal disclosure.

Processes of knowledge mapping have been discussed by various authors such as Rouse et al (1998), Kim *et al.* (2003), Jannings (2005), Egbu (2006), Ebener et.al (2006), Yang (2007), Grey et al (2009) and. The approaches towards knowledge mapping are as shown in the Table 1. The approaches could be classified into three main categories that are i) gathering and capturing knowledge, ii) analysing knowledge and iii) linking the knowledge. However, there are processes that take place before hand, as well as post knowledge mapping activities. As an example, Egbu (2006) suggests, goals for the knowledge mapping activities could be included at the

Table 1: Comparison of approach in knowledge mapping

Author	Precedence	Gather and Capture	Analyse	Link	Beyond	School of thought
Yang (2007)		<ol style="list-style-type: none"> 1. knowledge framework establishment 2. knowledge sources determination 3. knowledge extraction 4. knowledge compilation 	<ol style="list-style-type: none"> 5. knowledge representation 6. Knowledge interpretation 			Knowledge map for construction scheduling technique
Egbu, C. (2006)	<ol style="list-style-type: none"> 1. Set out goals to be achieved through K-mapping 	<ol style="list-style-type: none"> 4. Capture/create appropriate knowledge 	<ol style="list-style-type: none"> 2. Identify knowledge needs 3. Identify knowledge gap 	<ol style="list-style-type: none"> 5. Leverage knowledge 	<ol style="list-style-type: none"> 6. Retain knowledge 	Generic model for a sustainable urban environment : Sue-KM
Ebener <i>et al.</i> (2006)		<ol style="list-style-type: none"> 1- Acquire Data 2- Manipulate data 3- Store data 	<ol style="list-style-type: none"> 4- Process data 	<ol style="list-style-type: none"> 5- Visualise data 		General Adapted from Hujisen <i>et al.</i> (2004)
Kim <i>et al.</i> (2003)		<ol style="list-style-type: none"> 1- Defining organisation knowledge 2- Knowledge extraction 3- Knowledge profiling 	<ol style="list-style-type: none"> 4- Process map analysis 	<ol style="list-style-type: none"> 5. Knowledge linking. 	<ol style="list-style-type: none"> 6. Knowledge map validation 	Industrial case study
Grey (1999)		<ol style="list-style-type: none"> 1. Survey 	<ol style="list-style-type: none"> 2. Audit 	<ol style="list-style-type: none"> 3. Synthesis 		General
Rouse <i>et al.</i> (1998) cited in Yang (2007)		<ol style="list-style-type: none"> 1- Extraction of knowledge 2- Compilation of knowledge 3- Derivation of assertions 	<ol style="list-style-type: none"> 4- Sorting and labelling 	<ol style="list-style-type: none"> 5- Representation of relationships 7. Interpretation and iteration 		R.&D/technology management

earlier stage in the comprehensive programme. Beyond the three activities of knowledge mapping, Kim *et al.* (2006) suggest that knowledge map validation should be included. The discussions of the three main approaches are as discussed in the next section of this paper.

ASCERTAIN ORGANISATIONAL KNOWLEDGE

Organisations should be ready and have a specific plan and intention to implement a knowledge mapping approach in the organisation. Proper planning might ensure the organisation gets the most from the implementation exercise. In assurance that the implementation is effectively reaching its targeted aims, several matters need to be considered in the first place. The pre-requirements for knowledge mapping could precisely lead to the right task for the right people, effectively re-use of information and discover the opportunity of how knowledge sharing could take place.

Organisational knowledge in general, constitutes explicit knowledge and tacit knowledge. Even though the literature also identifies that there is “implicit knowledge” residing between tacit and explicit, the present research look only into the tacit and explicit side of the knowledge so as to enable clearer boundaries between the two. Tacit knowledge is the unarticulated knowledge that is in a person’s head that is often difficult to describe and transfer. It includes lessons learned, know-how, judgment, rules of thumb and intuition (Grayson and O’Dell, 1998).

Knowledge itself is not tangible, but it is measurable (Bollinger and Smith 2001). Knowledge is an asset to the organisation and as a nonphysical resource and right that have a value to the organisation because they give the organisation some kind of advantage in the market place. Therefore, frequently organisational knowledge is also referred to as knowledge assets. Bollinger and Smith (2001) suggest that organisational knowledge is a strategic asset which possesses four characteristics; it is valuable, rare, inimitable and non-substitutable.

Identifying existing knowledge assets is the key first step to a knowledge management initiative. Therefore, any approach to a knowledge management initiative must first uncover what knowledge already resides in their organisation. Identifying the embedded knowledge in the organisation is perhaps not a one-off exercise for knowledge management. The dynamic character of the knowledge in the organisation requires organisational knowledge to be continuously identified. For an organisation, effective exploitation of knowledge assets could be achieved by effectively identifying where knowledge resides. Vestal (2005) contended that the discussion of organisational knowledge normally emerges from four contexts as follows:

- i- Social/cultural knowledge
- ii- Historical knowledge
- iii- Human knowledge
- iv- Functional knowledge

Cultural knowledge is the context of knowledge which exists within the organisation’s environment, norms, accumulation of standards of behaviour, and hierarchical relationships that are conventionally accepted as part of the value of an organisation. Historical knowledge is the “time line” context of knowledge which draws the history that is relevant to the organisation such as past business deals, legacy system and previous methods of management. Historical knowledge verifies changes, trends, experience and occurrences which have occurred over time.

Human knowledge is the individual's or groups of people's knowledge such as capabilities and skills that resides within the people in the organisation. The individual capabilities, competencies, talents and skills could be stimulated through training, new roles and coaching. Functional knowledge is the context of knowledge related to the processes in the organisation. It constitutes flow of the routine works or tasks such as project management, client response, problem solving and decision making.

Other typologies of organisational knowledge in the literature are by Sanchez and Heene (1997) about know-how (practical knowledge), know-why (theoretical knowledge) and know-what (strategic knowledge). Whitehill (1997) discusses encoded (know-what), habitual (know-how), scientific (know-why) as an organisational knowledge. Bollinger and Smith, (2001) suggested that employee know-how is one of the components in organisational knowledge. Individuals or groups of employees who know about customers, products, processes, mistakes and successes as contended by Grayson and O'Dell (1998) possibly include in the human knowledge context by Vestal (2005). In the same vein, Pemberton and Stonehouse (2000) suggest that knowledge which embodies the organisation's knowledge assets consist of its core competencies, technology, value-adding activities, processes, system, procedures, technology, structures, product and services.

Bollinger and Smith (2001) however argue that the organisational knowledge resides in a database or through sharing of experiences and best practice, or through other sources both internal and external to the organisation. In addition, they suggested that organisational knowledge accumulates over time, and enables firms to attain a deeper level of understanding and perception that leads to business astuteness and acumen, all characteristics of wisdom.

Data is raw and does not have meaning by itself. Data requires explanations and relations between each others to add meaning to be information. Identification of knowledge in the form of data and information is easier than identifying understanding in an organisation. Identification of knowledge and wisdom requires understanding of a complex relationship between knowledge repositories, peoples and processes within the organisation. Logically, the higher the ranking of knowledge understanding, the more challenging the knowledge is to be codified and possibility to be mapped. This complex "terrain" of knowledge at this environment requires an experience and experienced knowledge mapper to identify the main attributes to be mapped, as shown in Figure 1.

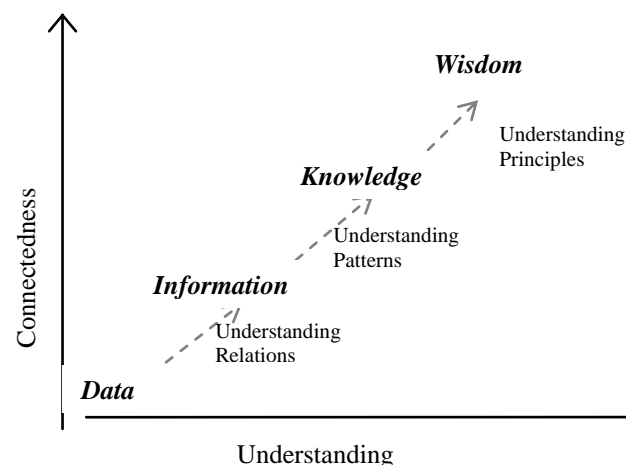


Figure 1: Knowledge Transition (Adopted from Bellinger et al.)

In the facilities management area, the factors such as business competitiveness, higher expectation of facilities services by clients/users, rapid development in ICT, competitive business and the organisation's self awareness of the importance of knowledge management contributes significantly towards the rise in the role of knowledge mapping in the management of facilities. Facilities management organisation have embedded explicit knowledge management activities into their operations. These activities connect people to people and to the knowledge and information they need to act effectively and to create new knowledge. Capturing lesson learned, reusing designs, transferring best practices and enabling collaboration and access to expertise are a few approaches that organisations are adopting as part of their knowledge management initiative.

The discussion of type and scope of knowledge and skill in one facilities management organisation depends largely on the facilities management service they provide as agreed in the service level agreement that is mutually agreed between the FM service provider and client or top management/parent organisation. Obviously, the derivation of a service level agreement provides ideas for facilities managers to plan for staff qualification and requirements, trainings required, types of information and knowledge they require to meet the SLA's requirements.

Nutt (1999) proposed, that in one facilities management organisation there are three main sources of knowledge i.e. knowledge of property and construction, FM knowledge and knowledge of facilities design and use. Kincaid (1994) however viewed facilities management knowledge as emerging from the integration of three main strands of facilities management activities: property management, property operations and maintenance and office administration.

In the context of individual facilities managers in practice, RICS categorised 2 types of competencies for facilities managers: (i) technical competencies and (ii) mandatory competencies for the individual embarking on a facilities management career. The former is the technical knowledge gained through formal education and/or working experience in the area of facilities management such as analysis of clients requirements, contract practice, procurements and tendering, project financial control and reporting, property management and supplier managements. The latter are the soft skills that enable the individual facilities manager to work in a team in the organisation, meet client requirements and work with professionalism, honesty and integrity. These include client care, communication and negotiation, conducting rules, ethics and professional practice, conflict avoidance, data management, health and safety, sustainability and team working. The requirements for the facilities managers as adopted by RICS are based on various scope and roles of facilities management organisation in the business environment. The service provided could include the following:

- i- Business operation
- ii- Business re-location
- iii- Health and safety
- iv- Outsourcing
- v- Performance measurement
- vi- Procurement
- vii- Property management
- viii- Strategic planning and advice; and
- ix- Utilities and services.

As a comparison with how FM is perceived in the United Kingdom as indicated by RICS, similar scopes of facilities management competencies are being implemented in Australia and North America as reviewed by Then (2004) as follows:

- i- Strategic Facilities management (governance and organisational capability)
- ii- Facility Planning (identification of business need and response)
- iii- Facility Creation/Acquisition
- iv- Facility Operation
- v- Facility Maintenance
- vi- Facility Replacement and Disposal
- vii- Facility Management Tools
- viii- Facility Management Systems
- ix- Business Management
- x- Legislation, Codes, Regulations and Standards

ANALYSIS OF KNOWLEDGE AND IDENTIFYING THE GAPS

Another critical process that could emerge from the literature, as shown in **Table 1**, are the analysis of what important knowledge is needed in satisfying the facilities management role and what are the gaps of knowledge which exist. Hence, the available knowledge within the organisation is always too broad, insufficient, redundant, unstructured, overlapped and out of context. Top management should develop a framework of the organisations knowledge body to re-capture knowledge loss, capture new knowledge and retain existing knowledge within their organisation.

The analysis of core information, knowledge needs and use in organisations is also referred to as the knowledge audit (Liebowitz *et al.*, 2000). The knowledge audit is also designed to survey the different aspects of expertise required to perform the task (Klien and Militelo, 2005). In practice, Driessen *et al.* (2007) for example, analysed the organisational knowledge based on practical (real-world) entities and its relationships. The entities are the general entity types that play a role in knowledge within the organisation such as activities, concepts, terms, groups, knowledge items and people. Types of knowledge which are already ranked and sorted into specific categories, types or domains, could be effectively used and linked permanently, or when it is required by the respective user. At this stage, facilities managers have an opportunity to reveal the human resources requirements such as, staffing needs, training and re-training of employees, in-house specialists and the organisation's strengths and advantages.

LINKING THE KNOWLEDGE

Knowledge could be linked on the permanent basis or on an ad-hoc basis such as on a task/project base. Driessen et al (2007) proposed a framework which listed the entities with a relationship between them that pertain to the knowledge situation such as an individual person "has expertise on" a given subject. Vail (1999) suggest, due to complexity and breadth of knowledge mapping, the framework must be created up-front. Creation, maintenance and user roles must be determined. Knowledge map design characteristics, such as the map's components, relationship definitions and decisions about location and linked data storage should be predefined as much as possible. Consideration should be given to how changes can be most effectively managed.

In the facilities management organisation where entities such as activities, concepts, terms, groups, knowledge items and people could be linked and explained and the relationship which the organisational knowledge pervades could be tailored with distinctive organisations needs. Activities should be linked with immediate activities such as the precedence, next step, the outcomes, the requirements and required expertise. Individual and groups should be linked with their respective skill, expertise, internal and external, and designated task in managing facilities.

The physical outcomes of the mapping exercise could be materialised in various forms with different purpose and uses. Another example of the physical maps and its uses is illustrated by Folkes (2004) as follows.

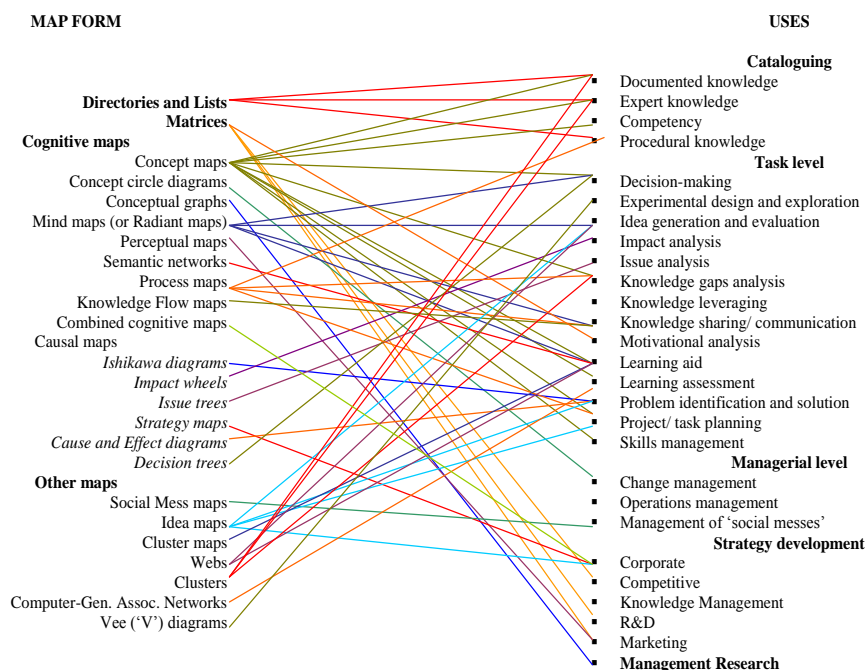


Figure 2: Mapping 'Knowledge Map' Forms and Uses (Source: Folkes, 2004)

This is where the unit of knowledge management, mainly knowledge sharing and knowledge transfer could be beneficial to facilitate the process of the knowledge mapping process.

CONCLUSION AND RECOMMENDATION

Identification of organisational knowledge involves complex and time consuming at the preliminary stage of knowledge mapping. As it is a continuous and ongoing activities, facilities management organisations should maintain a process which is less complex at the later stage. Effective gaps analysis, linkages of knowledge and knowledge mapping representation could be effectively performed with the aid of information and communication technology available.

Understanding the critical process in knowledge mapping could lead to facilities management organisations effectively exploiting the benefits of knowledge mapping and consequently positioning themselves in a more competitive position in the business environment in the context of FM service providers, and being a highly regarded division in the context of the client organisation.

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