INVESTIGATING KNOWLEDGE MANAGEMENT MATURITY LEVEL IN MEDIUM-SIZED CONSTRUCTION COMPANIES

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ABSTRACT

Construction companies are knowledge-intensive industries that operate in a highly competitive environment. They have to utilize their knowledge effectively to maintain their competitiveness. There is extensive literature explaining how large organizations have established effective knowledge management (KM) initiatives, which is in contrast to the little attention given to small and medium construction companies (SMEs). In fact, in East Java Indonesia, SMEs construction companies account for more than 90% of the construction sector. For these companies, to exploit the optimal benefits of KM, knowledge maturity could be used as a way of providing practical decision assistance. Therefore, this study aims to investigate the maturity level of KM in medium-sized construction companies. APO KM assessment tools are employed to address the objective of this study. This research found some areas that need to be improved by small-medium construction companies in order to enhance their knowledge management. It is expected that this study nourishes the existing literature on knowledge management areas.

Keyword : Knowledge, Maturity, Construction, APO KM

1. INTRODUCTION

In today's competitive climate, knowledge is regarded as a resource with equal value to capital [1]. However, unlike physical capital, knowledge is not depleted when employed; rather, it expands and becomes more available for future development and marketability [2]. Knowledge is a valuable asset that is essential for the efficient and successful delivery of organisation [3]. It is also vital for a company's ability to thrive and compete [4], consequently, construction companies need to pay greater attention to their knowledge base as well as how they leverage their knowledge to maintain its competitiveness [5].

As the construction industry is acknowledged as a knowledge-intensive industry that needs substantial input of professional knowledge and problem-solving, the availability of knowledge management is paramount [2]. Effective knowledge management is critical for construction organisation to prevent the loss of knowledge acquired during construction delivery [6]. This is because the characteristic of the construction project is temporary in which project teams are disbanded once the project is completed. As a result, the loss of all tacit knowledge gathered throughout the project may occur if it is not collected and managed correctly.

According to Cantú et al., [7], there is extensive literature explaining how large organizations have established effective knowledge management (KM) initiatives, which is in contrast to the little attention given to small and medium enterprises (SMEs). In agreement, Serenko et.al. [8] stated that one of the under-studied knowledge management areas that should receive special attention is

knowledge management in small and medium-sized enterprises.

In East Java Indonesia, small and mediums (SMEs) companies account for more than 90% of the construction sector [9]. This is similar to the condition in UK in which SMEs account for more than 90% of organisations [2]. For these companies, to exploit the optimal benefits of knowledge management, knowledge maturity could be used as a way of providing practical decision assistance by enhancing decision makers' awareness of the knowledge base and facilitating cross-border dialogues on the perceived maturity of accessible knowledge. By doing so, the assessment provides a reference of the company's position in managing knowledge and helps in identifying and mitigating the impediments [10], [11].

Previous studies have proposed some knowledge management maturity models, however a consistent model that has been empirically tested is lacking [12],[13]. Empirical research is required to demonstrate the utility of using maturity models in different sectors [14]. Therefore, this paper attempts to enrich the existing literature by investigating knowledge management maturity on the medium size of construction companies. This paper aims to investigate knowledge management maturity levels in medium-sized construction companies. The paper is organized as follows, first, the background of the research is described, followed by methodology and empirical result. Next, the findings are discussed and finally, the limitation and conclusions are presented.

2. LITERATURE REVIEW

Maturity is the process or stage-of-growth concept which an object or organisation evolves over time [14]. According to Serenko et.al [14], Maturity models are valuable tools for a number of reasons: (1) Successful knowledge management requires a systematic approach of organizational process. Maturity models assist the manager of knowledge management in carrying out this responsibility; (2) It is important mechanism to monitor knowledge management; (3) It also assist managers in identifying and removing barriers of KM and (4) the use of maturity models enables both short-and long-term planning easier.

The acknowledgment of knowledge management maturity in an organization defines various growth milestones that may be expected by the organization. Maturity model is created in several maturation stages that an organization can attain step by step throughout time. The evolution of an organisation is simplified and defined with a small number if maturity level which typically four to six levels that are arranged sequentially [13].

One of the models to assess knowledge maturity is the Asian Productivity Organization (APO) KM Assessment Tool. It is designed to assist organisation in conducting a quick initial assessment of their KM readiness. The APO KM Assessment provides seven audit areas [15]:

(1) KM Leadership: This criterion assesses the organisation's leadership capabilities, including the organisation's KM policies and strategies to build, navigate and maintain KM process.
(2) Process: This criterion evaluates how knowledge is implemented, evaluated, and improved continuously.
(3) People: This criterion assess the ability of the organisation to build and develop organisational knowledge driven and to assess learning culture and knowledge workers' development.
(4) Technology: This criterion evaluates the capability of organisation to develop knowledge-based solutions such as collaboration tools and content management system.
(5) Knowledge Process: The organisation's capability to systematically identify, create, store, share and apply knowledge is assessed.
(6) Learning and Innovation: The organisation's capability to support learning and innovation, also to provide incentives for sharing knowledge are evaluated.
(7) KM Outcomes: This criterion assesses the capability of organisation to add value to customers and community through new and enhanced good and services.

Despite many research have been conducted on KM in large organisation, few studies have investigated KM in small and medium-size enterprises [14]. Furthermore,

little attention is given to assess KM maturity using APO framework in construction sector. Most of the previous study which using APO framework was carried out in non-construction area. Since, more empirical study is required to demonstrate the benefit of using maturity models in various areas [14], including KM in construction sector, therefore, APO framework is adopted in this study to enrich the existing literature.

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3. RESEARCH METHOD

This study employed a survey questionnaire to collect data from medium-sized companies in Surabaya-Indonesia. The purpose of the questionnaire survey was to investigate the knowledge management maturity level of the medium-sized construction companies in Surabaya.

APO framework questionnaire was adopted in this study which consists of seven categories with six questions each to be measured. Those categories are (1) KM leadership, (2) Process, (3) People, (4) Technology, (5) Knowledge process, (6) Learning and innovation; and (7) KM Outcomes. The respondents were asked to rate the score on a Likert scale (1-5) in which 1 refers to doing very poorly/ doing none at all; 2 refers to doing poorly; 3 refers to doing adequately, 4 refers to doing good; and 5 refers to doing very good.

Validity of the instrument was conducted using the Pearson product-moment correlation test at the significant level of 5%. Meanwhile the reliability of the questionnaire was tested using Cronbach Alpha Reliability. SPSS was used to analyse the data statistically.

The assessment result classifies knowledge maturity into five levels of KM: reaction, initiation, expansion, refinement, and maturity level. The reaction level is achieved if the total score is 42-83 points, which indicates that the organisation is unaware of what knowledge management is and its significance in increasing productivity and competitiveness. Meanwhile, the initiation level is achieved if the total score is 84-125 points which indicates that the organisation is starting to understand the need for knowledge management. The expansion level is obtained if the total score is between 126-146 points which shows that the organisation has implemented KM. The refinement level is achieved if the total score is between 147-188 points which indicates that KM implementation is constantly assessed for continuous improvement, whereas maturity level is reached if the total score is between 189-210 points, which means that knowledge management is mainstreamed in the organisation [15].

The questionnaires were distributed to all medium-sized construction companies in Surabaya classified BG004 (commercial building construction services). Only three construction companies were willing to participate in this study and all of those companies are private companies. A total of 18 responses were received in which respondents' positions are project manager/ manager (50%), head of division (44.4%) and staff (5.6%) with experiences around 10-20 years.

In addition, semi-structured interviews were conducted to complement the questionnaire result. This study engaged four managers with the experiences around 15-25 years for the semi-structured interviews.

3. RESULT AND DISCUSSION

All of the questionnaire variables have sig <.05, thus the variables in the questionnaire are valid. The reliability analyses also show that Cronbach's alphas of variables are between 0.7-0.8 which indicates that all of the variables are reliable.

The level of maturity of companies was obtained by calculating the average score in each category of questions. **Table 1** shows the maturity level of medium-sized construction companies in Surabaya.

Table 1 shows that the average KM score obtained by medium-sized construction companies surveyed were 174,67; 170.67 and 178, for company A,B,C, respectively. All of them were in the refinement level in which KM implementation are continuously evaluated and improved. Surprisingly, based on the interviews, they did not aware knowledge

Table 1. Maturity level of Surveyed Companies

Company	Score	KM Maturity Level
A	174.67	Refinement
B	170.67	Refinement
C	178	Refinement

management terminology and think it is part of quality management system. Therefore, these results should be interpreted with caution, and further studies with bigger samples are therefore recommended. With regard to the score in each category of APO are depicted in **Table 2**.

Table 1 KM Category Score Based on APO

Category	A	B	C	Mean
KM Leadership	26.67	24.22	26.00	25.63
Process	25.33	25.56	26.00	25.63
People	26.00	23.67	24.33	24.67
Technology	22.83	23.44	25.33	23.87
Knowledge Process	25.67	24.11	24.33	24.70
Learning & innovation	26.67	25.44	23.33	25.15
KM Outcomes	24.83	24.22	25.33	24.80

The mean score for KM leadership is 25.63 equal to the mean score of process. The mean score of people is 24.67 ; technology is 23.87; learning and innovation is 25.15 and KM outcomes is 24.80. APO suggests that the average score for each category is tabulated and shown as a radar chart. **Figure 1-4** shows the actual scores obtained for each category in comparison to the category's maximum score.

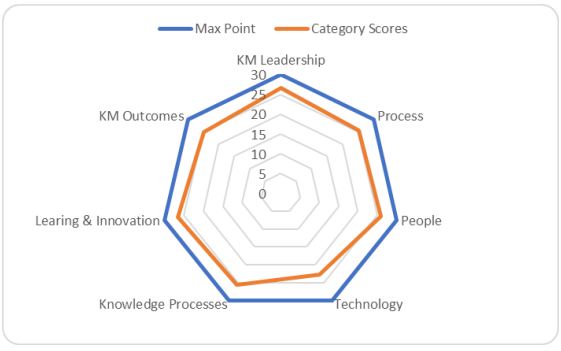

Figure 1 KM Category Score in Company A

APO explains that the 'KM leadership' category evaluates the organization's KM policies, strategies, and organization's efforts to initiate, guide, and maintain KM processes. In this criterion, respondents gave relatively low ratings to the financial resources that are allocated for KM initiatives, giving an average rating of 3.65. This result may be explained by the fact that financial is one of the barriers that hinders growth of small and medium scale construction companies [16]. This finding suggests the companies to invest funding in KM in order to reap the benefit in the future.

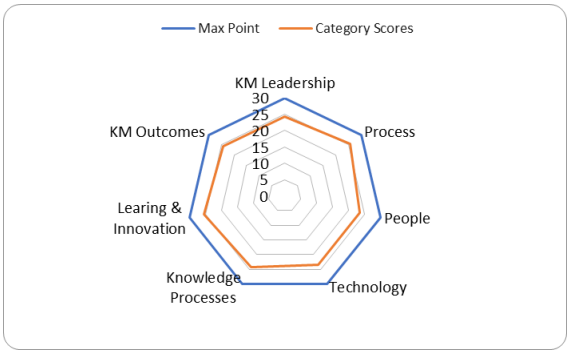

Figure 2 KM Category Score in Company B

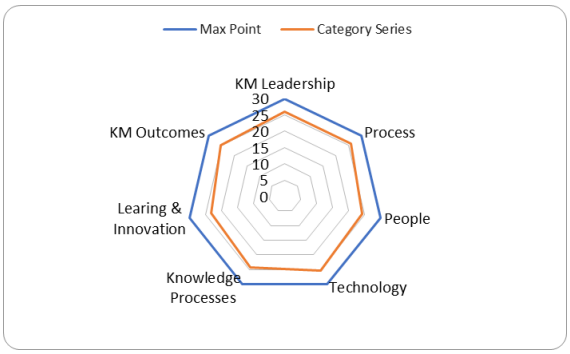

Figure 3 KM Category Score in Company C

Moreover, respondents studied also placed the second-lowest score on the availability of a policy for knowledge protection with an average rating of 3.78. This explains the need for organisation to pay attention to the policy for enhancing knowledge management in their organisation. The importance of policy on knowledge management has been emphasized in many previous studies as an important part of successful knowledge capture in organisation (i.e. [6], [17)].

With regards to the 'Process' criteria, respondents perceived that the organisation has a well-organized system for handling unexpected incidents in order to assure continuous operation, giving an average rating of 4.07. Meanwhile, concerning the 'People' criteria, the ranking shows that the lowest rating is given to the availability of formal mentoring, coaching and tutoring process,

giving an average rating of 3.78. An interviewee stated:

> "*The employees with high prospective talents, originality and loyalty are eligible to be recommended for [formal] training*" (Interviewee 3).

It might imply that employees with a lack of prospective talents have less opportunity to develop themselves through formal training. This might be due to financial reasons as an interviewee stated:

> "*Human resource development must align with [company] target, because the cost of training is expensive*". (Interviewee 3)

The finding suggests the need for financial support for funding human resource development plans and the need for competency development planning for all employees without exception.

Meanwhile, the second lowest perceived by respondents on APO KM Maturity level is the availability of databases of staff competency and reward for knowledge sharing (average rating =3.94 and 3.98 respectively). These findings also suggest the need to provide expertise databases as a part of enhancing knowledge management and providing a reward system to thrive culture that supports knowledge sharing.

In the 'Technology' criteria, the lowest rating is the updating information delivered on the website regularly (average rating=3.74). It seems that medium-sized companies prefer to share knowledge orally instead of updating it on a website or take advantage of technology. An interviewee stated:

> *"If there is a problem, knowledge sharing usually occur through sharing or discussion…Minutes of meeting are rarely archived, but there were trimonthly meetings to share knowledge…" (*Interviewee 4).

Carillo & Chinowsky in 2006 [18] explained that smaller companies find it more cost efficient to rely on local/ accessible pools of knowledge and as a result, do not require the type of IT required by bigger company. However, most of the latest research agreed on the importance of Information, communication and technology (ICT) as enablers for knowledge management practice in this decade (i.e. [19], [20]). Thus, the result in this present study strengthens the need for medium construction company to employ ICT for managing knowledge and updating it regularly to enhance organisation competitiveness.

When it comes to the "Knowledge process' criteria, the lowest score is given to the 'attempt of organisation to retain critical knowledge from employing leaving the organisation'. A respondent informs:

> "*Apart from the troublesome ones, there isn't many [employees] that leaving our company….For those who are going to retire, we have regeneration [process]* " (Interviewees 4).

Although the organisation has an effort to manage this knowledge, but respondents might perceive that this effort may not be sufficiently capture and retain the critical knowledge, giving it an overall average rating of 3.76.

Related to the 'learning and innovation' criteria, the respondents gave particularly low ratings to the organizational support for the incentives given to individual who share information (average rating=3.94). Interestingly, the rating consistent with 'people' criteria on the reward for knowledge sharing criterion. The average rating on the 'KM outcomes' criteria show that all of companies studied are perceived to have an adequate history of effectively implementing KM.

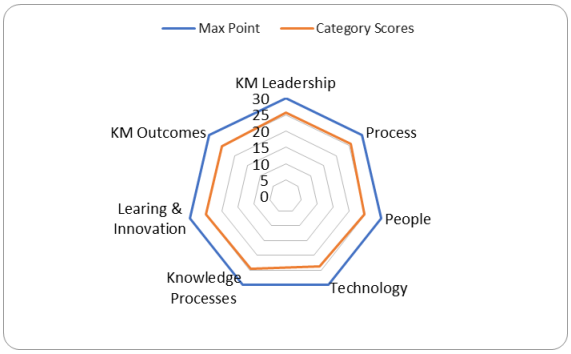

Figure 4 The average Score of KM Maturity in M2 Construction Companies in Surabaya

The average score of KM maturity on all of respondents' companies is depicted in Figure 4, in which shows the actual scores obtained for each category in comparison to the category's maximum score. The figure shows the category

that need to be improved which are KM leadership, process, people, technology, knowledge process, learning and innovation, and also KM outcomes.

6. CONCLUSION AND SUGGESTION

This research has investigated construction companies to understand the level of knowledge maturity in the medium-sized construction companies. The findings suggest that all studied companies need to be improved in all of APO categories. Some important concerns that should be addressed by those companies to enhance knowledge management maturity level are (1) the availability of policy for knowledge protection, (2) the availability of formal mentoring, coaching and tutoring process, (3) updating information on a regular basis, (4) organisation's strategy to retain critical knowledge (5) the availability of incentives to encourage knowledge sharing.

Whilst the study's objective was met, there are some limitations to the inferences that may be derived from the findings. Because the studies were conducted on the small samples, caution is advised when generalizing the results. Furthermore, this study is confines to the perspectives of respondents in medium-sized construction companies in Surabaya. It is recommended to carry out further studies with bigger samples using different knowledge management maturity framework. Despite its limitations, the present study is expected to assist medium-sized organisation to improve knowledge management in their companies.

7. ACKNOWLEDGEMENT

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