Knowledge Management Maturity In Construction Companies

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Abstract- *Knowledge management is a concept of managing of knowledge in the company. The implementation of concept has different levels in each company. Knowledge management maturity is a guide or measure of the company's position in managing of knowledge. The objective of the study is to identify knowledge management maturity in Indonesian construction companies. This study used a survey method and conducted by distributing questionnaires to large construction companies that implement knowledge management activities. Four level of knowledge management maturity was proposed on this study. The results show that 29 contractors at the practiced level, 20 contractors at managed level and 5 contractors at continuously improved level. The Authors. Published by Elsevier Ltd.Peer-review under responsibility of organizing committee of The 5th International Conference of Euro Asia Civil Engineering Forum (EACEF-5).*

Purpose *- This purpose of the paper is to present a maturity model developed to assess Knowledge Sharing (KS) for the Jordanian construction sector.*

Design/methodology/approach *- The research was conducted in three stages. The first stage consisted of the review of literature and documenting variables from the literature that highlight influence on KS in organisations. The second stage was designed for maturity model development by identifying the cultural factors that affect KS in the Jordanian construction sector through questionnaires and interviews. Factor analysis was used to find possible relationships between the cultural variables followed by semi-structured interviews. In the third stage the initial maturity model was refined through another set of semi-structured interviews.*

Findings *– The model presented in the paper includes three levels of maturity. The first level identifies whether the variable barely exists in company's KS practices. The second level shows the occasional techniques which the company uses to increase KS activities. The final level demonstrates the importance of the variable in affecting KS as being fundamentally ingrained in the company's vision, mission, strategy and operations.*

Originality/value *- The research has developed a model that can be used to measure the KS in an organisation. Although the model has been applied to the construction industry, it can easily be modified to fit other sectors.*

Keywords- Knowledge, knowledge management, knowledge management maturity, construction companies

I. INTRODUCTION

Competition among companies in the construction business is growth. It is characterized by the increasing requirements of the customers desired, limited resources, environmental stewardship and increasing competition Now, construction companies must have ability to compete and create new business opportunities Competition between construction companies is more increasing. So, every company is expected have ability to improve the efficiency and effectiveness so that success can be achieved. For long term success, all of construction companies depend on the performance improvements made by absorbing and applying new sciences continuously. It is reinforced by which states that success in business, including the construction business, is highly depend on the quality of human resources. Human resources are unique production factors, if it managed properly so that cangenerate added value to other resources. Another resources are very important too, but many companies are not managing it well is knowledge. Management of knowledge in Indonesian construction companies especially in contractors is unknown. There are some levels in management of knowledge and it called maturity. This study aims to know knowledge management maturity in contractors.

II. METHODS

A questionnaire survey was used to elicit the attitude of contractors towards knowledge management maturity. Questionnaires were sent to selected contractors purposively. Contractors were identified based on contractors that implement knowledge management and just large contractors implement it formally. 100 questionnaires were distributed toward large contractors that implement knowledge management formally. Respondents are first line, middle and top managers of the large contractors. The respondents were

asked to indicate by giving a checklist based on their experience toward knowledge management activities that implemented in the contractors. There are 38 activities of knowledge management maturity and divided into 4 stages, i.e. stage 1 initial has 11 activities. practiced has 10 activities, stage 3 managed has 9 activities, and stage 4 continuously improved has 8 activities. The questionnaire has been validated by four managers who understand about the implementation of knowledge management in CIMB Niaga, Bank Indonesia, Adhi Karya and Wijaya Karya. The respondents were experienced first line, middle and top managers (with average experience of 15 years in the construction companies). 38 activities of knowledge management believed to affect business process in large contractors. In total, 60 large contractors have completed the questionnaire survey, but only 54 completed forms were further analyzed. The others were rejected because of the following reasons:

1) the form was not fully completed;
2) the form was completed not by leading executives;
3) the form was completed by managers not from business companies;
4) the company may not be defined as a knowledge organization. Activities of knowledge management that implemented in large contractors were summarized and collected according to stages of knowledge management ma

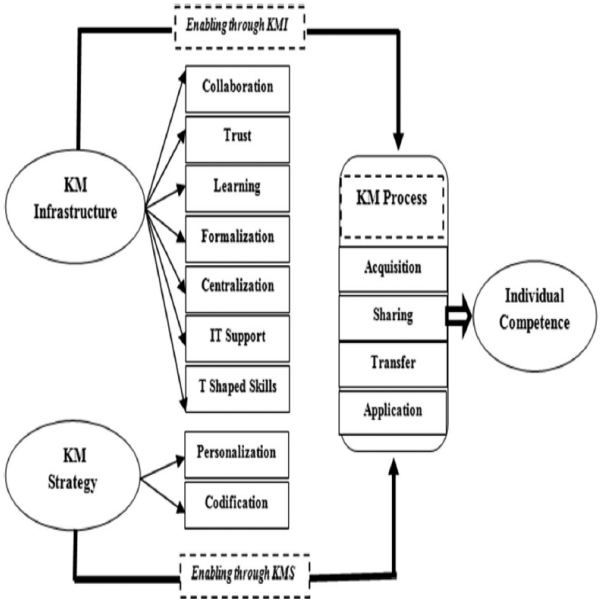
III. KNOWLEDGE MANAGEMENT COMPANIES

Bushuyev et al. (2015, 781) propose a project success analysis framework, which includes defining critical success factors (CSFs), key performance indicators (KPIs), measuring and documenting project success according to the KPIs. Critical success factors (CSF) are factors that measure specific areas, and if the result is satisfactory it provides successful competitive performances for the organization. (Bushyev et al. 2015, 774) Ika (2009, 9) has divided CFSs to three project phases as: project planning phase, project execution and project closing phase. In the project planning phase the CSFs are project mission, client acceptance, top management support and urgency. In the project execution phase the CSFs are project mission, project team leader characteristics, troubleshooting, project schedules and plan, technical task, and client dialogue. At the project closing phase the CSFs are as follows: technical tasks, project mission and client dialogue. It should be mentioned that project success is different from project management success, which measures the time, cost and quality -triangle (Ika, 2009, 8). In other words, the process can be managed successfully, but the results might not be satisfactory, and vice versa. But it can be said that when the quality of project management in large infrastructure projects is high, the greater the chance that the project is also successful (Staal-Ong, Kremers, Karlsson & Baker 2016, 93).The main drivers behind organizations' desire to digitalize their processes is making information more accessible and transparent. When digitalization has made information available for all personnel, it allows employees at lower levels of the organization to make better informed decisions. This in turn could break down knowledge silos in knowledge intensive organizations, which tend to form knowledge silos. A knowledge silo is an organizational unit that is very good at something but cannot pass on the information or perform tasks outside of their core function. Digitalization is said to change organizations in a way that breaks down knowledge silos. (Kuusisto 2017, 347-348) Ambrosini and Venkitachala (2017, 192) highlight the importance of technology in knowledge management; realizing that technology and knowledge management are interlinked yields to better results, if not realized the effect will be the opposite. Negative consequences include inadequate capturing and codification of knowledge, lack of management for codified knowledge in terms of how it is saved, how it can be used and stored. Other problems include duplication of knowledge, which leads to unnecessary work and poor knowledge transfer between functions. (Ambrosini & Venkitachala 2017, 192) Organization's knowledge creation contributes the organization's level of organizational learning (OL) (Kuusisto 2017, 348). Organizational learning occurs when individuals within an organization face a problem and investigate it on behalf of the organization (Argyris & Schön 1996, 16). Intermediate outcomes of such investigations are considered to be products of organizational learning, when they are paired with changes in behavior. organizational theory-in-use. Such outcomes are interpretations of past success or failure, assumptions of causal connections between actions and outcomes, the implications of causal connections for the future, explanations of changing organizational environment, critical consideration of organizational theories-in-use, submitting ideas for restructuring organizational theories-inuse, and looking for experiences from other organizations (Argyris & Schön 1996,17). Kuusisto (2017, 348) states that organizational learning can be divided to sub-categories as: internal learning and external learning. Internal learning refers to knowledge, which is created within the organization. Thus external learning is knowledge that comes from outside of the organization. (ku to 2017, 384) Internal learning can be affected by digitalization, as it enables codification (Ku to 2017, 348). Kuusisto (2017, 349) reminds that attention should be paid to tacit knowledge, when implementing digital assets, such as databases or business intelligence programs, because tacit knowledge is not easily transferred to digital form. In addition, the interaction of tacit

and explicit knowledge over time can lead to superior performance, thus enhancing such synergy between the two is beneficial, and critical for organizational learning and innovative capability (Lam 2000, 490-491). BIM revolves around digital information, which can be used throughout the lifecycle of the construct. While product model and BIM are used as synonyms, BIM has gained a status as a general term representing product models. The infrastructure industry has been using also the term infraBIM, Infra Built

Environment Information Model, when referring to a certain infrastructure project. (buildingSMART Finland) Both theory and practice have provided evidence of how BIM adds value to collaborative processes. BIM provides higher efficiency and effectiveness, it reduces time and errors, and improves quality. (Sebastian, van Berlo 2010, 254) Roughly half of the respondents, from AECO industry, in McGraw-Hill's (2009, 36) SmartMarket Report claimed to be using BIM or BIM-based tools in 2009, meaning a 75% growth from 2007 .

Organizations To analyze knowledge transfer patterns, a knowledge network analysis [KNA] tool is often used. It maps out actors and relationships, tracing down networks of knowledge transfer. It determines the extent of knowledge sharing, resource dependencies and single point of failures, among other measures. From the KNA teams are evaluated, and their knowledge conversion spiral is assessed. The conversion spiral includes four processes as 1) Socialization (tacit to tacit), 2) Externalization (tacit to explicit), 3) Combination (explicit to explicit), and 4) Internalization (explicit to tacit). (Chandra, iyer & Raman 2015, 96-97) The above process is the base for all knowledge transfer, which is based upon Nonaka's (2003) SECI model, seen in explain that knowledge creation process starts with *socialization*, where tacit knowledge is converted through shared daily social interaction experiences. By nature, tacit knowledge is hard to formalize, thus is can be only acquired by direct shared experience, such as spending time together in the same environment, or through apprenticeship. Routines are also part of tacit knowledge, because they develop through interaction and over time. Living in the same environment enables to see how things are, and the members of the socialization process accumulate and share tacit knowledge of the environment through their practical experience. The process of how, the previously introduced tacit know ledge, is then transferred into explicit form is called externalization. In externalization tacit knowledge is made explicit, for it to be shared and to become the basis for new knowledge, e.g. written documents. In the extern alization phase turity.



IV. RESEARCH RESULTS

Data of knowledge management maturity analyzed descriptively. Descriptive analysis is intended to provide an overview of the number of activities carried out contractors in each stage of knowledge management maturity. Number of activities that implemented by large contractors at each stage of knowledge management maturity is different. Total of activities of knowledge management maturity that implemented by contractors at each stage and the maturity that can be reached by contractors.

K 1 Practiced 1 0 7 1 0	
K 2 Practiced 9 6 0 0	
K 3 Practiced 8 6 1 0	
K 4 Practiced 7 7 0 0	
K 5 Practiced 8 8 1 0	
K 6 Practiced 9 7 0 0	
K 7 Practiced 7 6 1 0	
K 8 Practiced 9 9 0 0	
K 9 Practiced 7 7 1 0	
K 10 Practiced 9 8 0 0	
K 11 Practiced 9 8 1 0	
K 12 Practiced 7 6 0 0	
K 13 Practiced 10 8 1 0	
K 14 Practiced 8 5 1 1	
K 15 Practiced 7 6 1 1	
K 16 Practiced 7 7 0 0	
K 17 Practiced 9 8 1 0	
K 18 Practiced 7 7 0 0	
K 19 Practiced 8 8 1 0	
K 20 Practiced 9 9 0 0	

K 21	Practiced	9	8	1 0
K 22	Practiced	9	7	0 1
K 23	Practiced	8	8	1 0
K 24	Practiced	8	8	0 1
K 25	Practiced	8	6	1 1
K 26	Practiced	8	5	0 0
K 27	Practiced	7	6	1 0
K 28	Practiced	7	7	1 0
K 29	Practiced	7	5	0 0
K 30	Managed	9	7	7 1
K 31	Managed	8	7	6 1
K 32	Managed	7	6	7 0
K 33	Managed	6	5	5 0
K 34	Managed	9	8	7 0
K 35	Managed	9	8	7 0
K 36	Managed	8	7	7 0
K 37	Managed	7	7	7 0
K 38	Managed	6	6	6 0
K 39	Managed	7	7	7 1
K 40	Managed	8	7	7 1
K 41	Managed	9	7	7 1
K 42	Managed	7	7	7 1
K 43	Managed	6	6	6 1
K 44	Managed	8	5	6 0
K 45	Managed	9	5	5 0
K 46	Managed	7	6	6 0
K 47	Managed	8	7	5 0
K 48	Managed	8	7	7 0
K 49	Managed	8	7	6 0
K 50	Continously Improved	8	8	7 5
K 51	Continously Improved	9	8	7 6
K 52	Continously Improved	8	6	6 5
K 53	Continously Improved	7	7	5 5
K 54	Continously Improved	7	7	6 6

1. Contractors K1 until K29 are at knowledge management maturity ‘practiced’. Contractors K1 until K29 carry out many activities of knowledge management in stages 1 and 2. There are 7 until 10 activities carried out from 11 activities in phase 1 and 5 until 9 activities carried out from 10 activities in phase 2, while on stage 3 and 4 only 1 activity carried out and there is not. This shows that the contractor K1until K29 in carrying out the activities of knowledge management only up to the stage 2 or stage practiced and 29 contractors are at knowledge management maturity 2 'practiced'.

2. Contractors K30 until K49 are at knowledge management maturity 'managed'. Contractors K30 until K49 carry out many activities knowledge management from the stage of 1 until 3. There are 6 until 9 activities carried out from 11 activities in phase 1, 5 until 8 activities carried out from 10 activities in phase 2, and 5 until 7 activities carried out from 9 existing activities stage 3, stage 4 while the few activities that are carried out at only one activity. This shows that the contractor K30 until K49 in carrying out the activities of knowledge management only up to the stage 3 or stage managed or as many as 20 contractors are at knowledge management maturity 3'managed'.

3.Contractors K50 until K54 are at knowledge management maturity 'continuously improved'. Contractors K50 until K54 carry out many activities knowledge management from the stage of 1until 4, there are 7 until 9 activities carried out from 11 activities in phase 1, 6 until 8 activities carried out from 10 existing activities phase 2, 5 until 7 activities carried out from 9 existing activities stage 3, and 5 until 6 activities carried out from 8 activities in stage 4, or in other words all the stages in the knowledge management maturity properly implemented. This shows that the contractor K50 - K54 implement all stages in knowledge management is to stage 4 or stage continuously improved and 5 contractors are at knowledge management maturity 4 'continuously improved'.

V. CONCLUSION

The results of this study show that 29 contractors at the practiced level, 20 contractors at managed level and 5 contractors at continuously improved level. There are 29 contractors implement activities of knowledge management until stage 2, 20 contractors implement activities of knowledge management until stage 3 and 5 contractors implement all activities of knowledge management in four stages.

VI. ACKNOWLEDGMENT

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