Relationship between Total Quality Management, Knowledge Management, and Innovation in the Construction Sector in Indonesia

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Abstract: The construction sector in Indonesia plays a very important role in global competitiveness. One of the main factors that promote national economic growth is innovation. Unfortunately, innovation performance in Indonesia, including the construction sector, is regarded as low. It is believed that the two main causes of low innovation are lack of knowledge and poor quality management. In light of that issue, this study examined the relationship of Total Quality Management (TQM), Knowledge Management (KM), and innovation in the construction sector in Indonesia. PLS-SEM approach was used to analyze the data obtained from 75 respondents, ranging from staff to managerial positions from 6 property developers in Indonesia. Property developers, who are the clients, are believed to be the most influential actors in increasing innovation in the construction sector. The results showed that TQM practices give a significant influence on KM processes through customer focus, people management, and process management. KM processes then give a significant influence on innovation through knowledge sharing and knowledge application.

1 INTRODUCTION

Indonesia's active role in global competitiveness, especially in the construction sector cannot be denied (Soeparto and Trigunarsyah, 2014). According to Badan Pusat Statistik (2017), as a non-departmental government institute of Indonesia that is responsible for conducting statistical surveys, the construction sector occupies the third position as a driver of economic growth in Indonesia throughout 2017. It is also believed that innovation helps the construction sector to support national economic growth (Blayse & Manley, 2004). Unfortunately, innovation in the construction sector still faces difficulty (Davidson, 2013).

Innovation itself plays a very important role in an organization, by providing a competitive advantage and superior performance (Antunes, Quirós & Justino, 2016). Based on the assessment of Global Innovation Index (2017), Indonesia is ranked 87th out of 147 countries, with a value of 30.01 out of 100. This is certainly very concerning and needs special attention, considering that innovation is a very important element in global competitiveness.

There are two main things that are believed to have a major influence on innovation. The availability of knowledge (Du Plessis, 2007) and the application of quality management practices (Kim, Kumar & Kumar, 2012).

Based on the previous studies, it can be said that the two factors that give significant influences on innovation are Knowledge Management (KM) and Total Quality Management (TQM). Recent studies examined the relationship between KM and TQM, and concluded that TQM practices support KM processes (Rajeshwaran & Aktharsha, 2017; Qasrawi, Almahamid & Qasrawi, 2017). It was also found that the relationship between KM and TQM positively influences innovation (Honarpour, Jusoh & Nor, 2017; Yusr et al., 2017).

In the construction sector, the client has a very important role in determining the performance of innovation (Bengtsson, 2017). Besides that, the championing characteristics of a client are believed to have a positive impact on innovative activities in the construction sector (Kulatunga et al., 2011). Based on these findings, this study was evaluated on property developers in Indonesia, as the clients in the construction sector. Property developers also have the requirement to meet customer needs and expectations, which pushes them to innovate constantly.

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2 LITERATURE REVIEW

2.1 Innovation in the Construction Sector

Construction refers to the process of fulfilling customer needs through a temporary production system (Bertelsen & Emmit, 2005). Characteristics of the client, such as competence, assessment of innovation, a vision of innovation, self-development, and openness to change, give influence on various aspects of innovation (Kulatunga et al., 2011).

According to Dulaimi, Nepal, and Park (2005), innovation in the construction sector develops when companies are faced with challenges, opportunities, and problems, in order to achieve project goals. But, because the development of innovation in the construction sector is still at a very early stage, its development still depends on other sectors (Sexton & Barrett, 2003).

2.2 Knowledge Management

In the course and development of KM, most experts divide KM into 3 stages of the process, namely knowledge creation, knowledge sharing, and knowledge application (the use of terms for each process may be different).

Knowledge creation can be interpreted as a process of turning data into knowledge through various stages of learning (García-Fernández, 2015), while knowledge sharing is the process of transferring knowledge before the knowledge is exploited, through the stages of distribution (Bhatt, 2001). Lastly, knowledge application is a process of transforming existing knowledge into new knowledge by applying and using it, exploiting resources, and developing learning processes (García-Fernández, 2015).

2.3 Total Quality Management

TQM implementation and the development of innovation in organizations provide many benefits for companies, by helping companies to improve quality and facilitating the innovation process (Martínez-Costa & Martínez-Lorente, 2008). Recently, Yusr et al. (2017) conducted a study to examine the relationship between KM, TQM, and innovation in manufacturing companies. They used 6 TQM practices, namely top management commitment, customer focus, supplier management, people management, process management, and quality data reporting.

According to Ahire and O'Shaughnessy (1998), companies that implement top management commitments well will be able to encourage other TQM practices. Customer focus is also one of the main principles in the TQM system, where the relationship between customer focus and innovation that can be created by the company is positive (Mustafa & Bon, 2012). People management means providing support for each individual who works within the company, such as employee empowerment, employee involvement, and training (Ahire, Golhar, & Waller, 1996). Palmberg (2009) summarizes the results of research from experts and explains that process management is a structured systematic approach that continually improves the performance of certain processes which integrates the entire process that occurs within an organization. Lastly, quality data reporting is about providing information related to existing processes to the right party and at the right time to assist in decision-making activities (Yusr et al., 2017)

2.4 Research Model and Hypotheses

TQM practices and the research model used in this study were adopted from Yusr et al. (2017) who conducted a similar study in the manufacturing sector in Malaysia. But one of the practices, supplier management, was not use in this study because, based on the study of previous researches, supplier management was mostly evaluated in manufacturing companies. According to Malcolm Baldrige National Quality Award (MBNQA) criteria, which was developed to assess the application and implementation of quality in both manufacturing and service organizations (Bon & Mustafa, 2013), there was also no supplier management practice. The use of terms for some KM processes was also adjusted due to the consideration for further development of this study.

Based on the discussion, the research model used in this study is shown in Figure 1 below. This study examined the TQM effect on KM and the KM effect on innovation in the construction sector in Indonesia, evaluated in property developers.

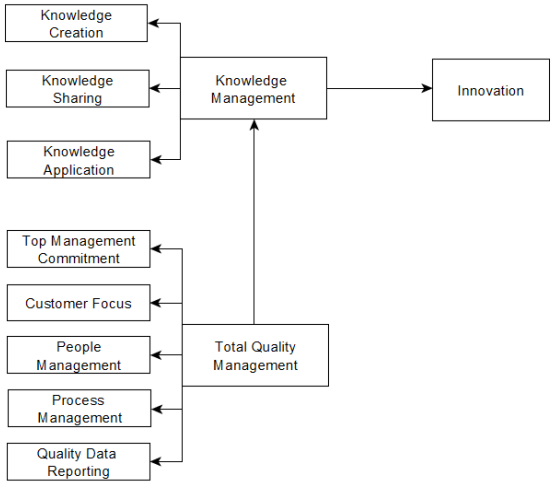

Figure 1: Research Model.
(Adopted from Yusr et al. (2017), with adjustment).

This study proposes the following main hypotheses:

- H1: TQM practices have a significant effect on KM processes.
- H2: KM processes have a significant effect on innovation.

The following sub-hypotheses have also been developed:

- H1a: Top Management commitment practice has a significant effect on KM processes.
- H1b: Customer focus practice has a significant effect on KM processes.
- H1c: People management practice has a significant effect on KM processes.
- H1d: Process management practice has a significant effect on KM processes.
- H1e: Quality data reporting practice has a significant effect on KM processes.
- H2a: Knowledge creation process has a significant effect on innovation.
- H2b: Knowledge sharing process has a significant effect on innovation.
- H2c: Knowledge application process has a significant effect on innovation.

3 RESEARCH METHODOLOGY

3.1 Data Collection

This study used a survey and questionnaire to collect the data needed. With respondents ranging from staff to managers, 90 questionnaires were sent to 6 property developers in Indonesia. There were 78 questionnaires returned, which formed a response rate of 86.67%. It was found that 3 of them were not valid. Therefore, there were 75 questionnaires used in this study.

3.2 Survey Instrument

The instrument used in this study consists of three major parts. The first part contains 28 indicators, adopted from García-Fernández (2015), which were used to assess KM processes. The second part contains 22 indicators to assess TQM practices, adopted from Yusr et al. (2017) and Honarpour, Jusoh & Nor (2017). The third part, which assessed innovation performance, contains 16 indicators adopted from Julison (2014). All items were rated on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The instrument was validated by experts and went through a pilot survey before being used in this study.

From the early homogeneity test, 7 indicators and 7 respondents were removed from the study. An early validity test then showed that all remaining indicators were valid. The result of the early reliability test gave a reliability value of 0.979 that showed a very high reliability level.

3.3 Method of Analysis

To analyze the relationship between variables, the PLS-SEM method was used through SmartPLS software. PLS-SEM is used to estimate the partial least squares of regression models, by combining features from the main component analysis and multiple regression (Sarwono & Narimawati, 2015). The stages in processing data with the PLS-SEM method include outer model analysis, inner model analysis, and hypotheses testing.

4 DATA ANALYSIS AND RESULTS

4.1 Outer Model Analysis

The first step in the outer model analysis is to determine the number of iteration needed to process the data. Five iterations (out of 300 as the maximum number of iteration) showed that there were no data abnormalities, such as sample sizes that were too small or the existence of data with extreme values.

The next step is to test the reliability for each indicator. After several steps, 12 indicators were

removed, in order to achieve the permitted value of the outer loadings, which is above 0.7. Then, all indicators were found to be valid, through a discriminant validity test that analyzes cross loadings value of each indicator.

Besides indicators, constructs also need to be tested for reliability and validity. Constructs are counted reliable if they have composite reliability values above 0.7 and Cronbach's α above 0.6. To test the ability of a construct to represent the indicators associated with it, constructs need to be examined for convergent validity. If the construct has an AVE value above 0.5, it can be said that the construct adequately represents the indicators associated with it. From table 1 below, we can see that all constructs are reliable and valid.

Table 1: Constructs' Reliability and Validity.

Constructs	Composite Reliability	Cronbach's α	AVE
KC	0.863	0.762	0.678
KS	0.900	0.832	0.752
KA	0.909	0.880	0.625
TMC	0.897	0.857	0.637
CF	0.890	0.835	0.671
PEM	0.912	0.881	0.676
PRM	0.908	0.864	0.711
QDR	0.934	0.894	0.825
IN	0.967	0.964	0.665

KC: Knowledge Creation, KS: Knowledge Sharing, KA: Knowledge Application, TMC: Top Management Commitment, CF: Customer Focus, PEM: People Management, PRM: Process Management, QDR: Quality Data Reporting, IN: Innovation

4.2 Inner Model Analysis

The inner model analysis starts with R^2 analysis, which describes the relationship between one construct and another construct that are connected to it. The R^2 value of ±0.25 indicates a weak effect. The R^2 value of ±0.50 indicates a moderate effect and R^2 value of ±0.75 indicates a substantial effect. For Knowledge Creation (KC), the R^2 value was 0.398. It indicated that the five TQM constructs that affected it explained 39.8% of the construct variance. The value of 39.8% showed that the five TQM practices had a moderate effect on Knowledge Creation (KC). For Knowledge Sharing (KS), the R^2 value was 0.564, and for Knowledge Application (KA), the R^2 value was 0.776. For Innovation (IN), the R^2 value was 0.642. The value of 64.2% showed that the three KM processes had a substantial effect on Innovation (IN).

Table 2: Result of the Relationship between Constructs.

Constructs	Path Coefficients	t-value	Decisions
KC → IN	0.019	0.195	Not Supported
KS → IN	0.224	1.914	Supported
KA → IN	0.610	4.703	Supported
TMC → IN	N/A	0.841	Not Supported
TMC → KC	-0.193	0.995	Not Supported
TMC → KS	0.138	0.735	Not Supported
TMC → KA	0.084	0.795	Not Supported
CF → IN	N/A	1.458	Not Supported
CF → KC	0.196	1.048	Not Supported
CF → KS	0.374	3.253	Supported
CF → KA	0.062	0.635	Not Supported
PEM → IN	N/A	2.525	Supported
PEM → KC	0.216	0.725	Not Supported
PEM → KS	-0.011	0.041	Not Supported
PEM → KA	0.477	4.112	Supported
PRM → IN	N/A	2.875	Supported
PRM → KC	0.198	0.961	Not Supported
PRM → KS	0.344	2.099	Supported
PRM → KA	0.344	2.733	Supported
QDR → IN	N/A	0.071	Not Supported
QDR → KC	0.261	1.342	Not Supported
QDR → KS	-0.004	0.020	Not Supported
QDR → KA	-0.019	0.162	Not Supported

The value of the path coefficient illustrates the influence of one construct on other constructs. The influence can be said to be significant if the value of the path coefficient is greater than 0.1. The greater the value of the path coefficient, the greater the influence is given. As we can see from Table 2, from the results of path coefficients, it can be concluded that all TQM practices have a significant effect on at least one KM process. Knowledge Creation (KC) does not support innovation, but Knowledge Sharing (KS) and Knowledge Application (KA) have significant influences on innovation.

The path coefficients results were then examined further by the structural path significance in bootstrapping method, where the relationship of

influence between constructs was analyzed again. Using the two-tailed t test with a significance level of 90%, the relationship between the two constructs was counted significant if the t-value was greater than 1.668.

From the result of the t-value presented in Table 2, we can see that Knowledge Sharing (KS) and Knowledge Application (KA) have a significant effect on Innovation (IN), while Knowledge Creation (KC) does not have a significant effect on Innovation (IN). For TQM practices, it was found that Top Management Commitment (TMC) does not have a significant effect on any KM processes, but Customer Focus (CF) supports Knowledge Sharing (KS) and People Management (PEM) supports Knowledge Application (KA). It was also found that Process Management (PRM) supports both Knowledge Sharing (KS) and Knowledge Application (KA) processes. Lastly, Quality Data Reporting (QDR) was found to not have a significant effect on any KM processes.

5 DISCUSSION

Based on the results of the study, out of three KM processes, only Knowledge Sharing (KS) and Knowledge Application (KA) have an influence on Innovation (IN). This finding is in line with the results of the research conducted by Yusr et al. (2017), who explained that if knowledge management process only stops at knowledge creation, it will not have a major influence on innovation, until the knowledge is shared and applied.

The significant effect of Knowledge Sharing (KS) on Innovation (IN) also supports the previous study conducted by Yusr et al. (2017), Honarpour, Jusoh & Nor (2017), and Lee et al. (2013). Based on the discussion with experts from a property developer, it was also explained that brainstorming and discussion between employees lead to the creation of innovation. And, if the knowledge sharing process is facilitated properly, for example by the existence of a company database where employees can store and access information, repetition of the same mistakes can be minimized. By the existence of the database, employees will also be able to find new alternatives that are better in terms of quality, time, and cost, which of course leads to the emergence of innovation.

In line with the previous study conducted by Yusr et al. (2017), it was also found that Knowledge Application (KA) has a significant influence on innovation (IN). Experts explain that teamwork forces each individual to communicate with each other, which then provides a great opportunity for knowledge to be discussed and support the creation of innovation. Training can also increase employees' ability to innovate.

Top Management Commitment (TMC) was found to not have a significant effect on KM. This finding supported by previous studies conducted by Ooi (2014) and Wickramasinghe & Widyaratne (2012). Top management commitment talks about managers' awareness of the importance of acquiring knowledge to assist them in decision making (Yusr et al., 2017). Then, it can be said that in property developers, the managers' awareness of that important issue is still relatively low.

In line with a previous study conducted by Ooi et al. (2010) who said that customer needs and expectations encourage employees to share knowledge, it was found that Customer Focus (CF) has a significant effect on Knowledge Sharing (KS) process. Experts said that analysis of customer and measurement of customer satisfaction need to be kept and accessed as a consideration and standard in various stages of a construction project. With this explanation, it can be said that customer focus has a very important influence on the knowledge sharing process.

It was also found that People Management (PEM) has a significant effect on Knowledge Application (KA). According to García-Fernández (2015), the knowledge application process consists of teamwork, empowerment, and commitment to knowledge. From the discussion with experts, aspects of people management such as well-maintained bottom-up and top-down communication, training, and a supportive work environment are the things that strongly support teamwork and give employees the opportunity to provide advice and input for the company. Good people management practices also help employees to have an awareness to develop themselves. This thing greatly affects the commitment to knowledge, where the company provides guidance and training to employees.

For Process Management (PRM), it was found to have a significant effect on Knowledge Creation (KC) and Knowledge Application (KA) process. This finding was contradictory with the finding of Yusr et al. (2017), where process management does not create a significant effect on any KM processes in the manufacturing sector. According to Yusr et al. (2017), this is due to the characteristics of manufacturing companies where the existing operating activities tend to be short of achieving certain goals during the production process, while the KM process depends on the accumulation of a long

process. But, in the construction sector, especially in property developers, the existing processes have a fairly long cycle, so it can be agreed that process management has an influence on the KM process. In this case, the process of knowledge sharing and knowledge application.

Lastly, for Quality Data Reporting (QDR), it was also found in this study that it does not have a significant effect on any KM processes, which was contradictory with the finding of Yusr et al. (2017). Experts explained that in the construction sector, each project is unique. The decisive aspect in decision making in the construction sector is not only quality, but also time, cost, security, comfort, aesthetics, environmental factors, and risks that may be caused. Therefore, in the construction sector, quality data cannot be a single source in decision making, and the finding that it did not provide a significant influence in the KM processes was acceptable.

6 CONCLUSION

From this study, it can be concluded that several TQM practices have a significant effect on KM processes in the construction sector in Indonesia, namely customer focus, people management, and process management. In order to increase innovation, knowledge sharing and knowledge application were found to give positive support. Improving the implementation of TQM and KM will increase innovation in the construction sector in Indonesia.

Due to the limitations of this study, it is recommended to evaluate the study in other sub-sectors of the construction sector, such as contractors. Developing a more complex relationship between variables and adding more suitable TQM practices is also recommended.

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