

PAPER

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The knowledge competency of civil engineers in construction industry

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Abstract. Construction management's knowledge is basis knowledge for one who works as civil engineer in construction industry. A good construction management will make the progressing of the project is more efficient and follow as in the plan also fulfill the customer needed as in the contract. The weak management will cause problem at site such as the delay, over budgeting and so on. As a civil engineer that involve direct with the site activities, they need to master this knowledge to manage the project. The purposes for this research are to identify and to determine the knowledge that a civil engineer in construction industry should have to be a competent engineer. The data collections are taken from the respondents who work as civil engineer with contractor class G6 and G7 in Penang state. The importance of this research is to determine the best knowledge characteristics that will be used for nowadays civil engineer. They will apply this knowledge during manage any project. The result from the survey will be compared with the data that get from the literature review. This is to identify the latest knowledge to be a guideline to become a competent engineer. From the result of the survey, mostly respondents who are civil engineers that involve in construction activities in Penang agree that have the knowledgeable in technical knowledge, decision making knowledge, teamwork knowledge planning and scheduling knowledge also leadership knowledge is very important to be a competent engineer.

1.0 Introduction

Today's world is fundamentally challenging the way civil engineering is practiced. Complexity arises in every aspect of projects, from pre-project planning with varied stakeholders to building with minimum environmental and community disturbance. The planning, scheduling and control of work is the management or administrative part of the job for civil engineer [1]. The purpose of project management is to predict as many of the dangers and problems as possible and to plan, organize and control activities so that projects are completed successfully in spite of all the risk [2]. This process should start well before any resource is committed and must continue until all work is finished [3]. The primary aim of the project engineer is for the result to satisfy the project sponsor or purchaser and all the other principle stakeholders, within the promised timescale and without using more money and



other resources than those that were originally set aside or budgeted [4]. This research presents a study that focuses on the knowledge competence of civil engineers in the construction industry and how they maintain their professional knowledge in a changing construction environment such as technology, time and cost material for smooth the project schedule. It identifies and determines the areas of knowledge characteristics that are perceived as essential for developing project management competency through a survey of civil engineers in the construction industry.

2.0 Methodology

In order to achieve the objectives of this study, a systematic process of conducting this study had been organized. Basically, this study process comprised of six major stages, first stage is identifying the research issue arises from intensive reading of books, journals and articles which can be attained from the library and internet link [5]. Based on the study issue, the objective of the study has been identified. Second stage is reading the related sources for literature review. Besides, secondary data is collected from reading materials in printing form like books, journals, research paper, senior reports, seminar paper as well as information from internet. It is important to identify the knowledge competency characteristics of civil engineers, as well as the general state of knowledge concerning the subject such as background, definition, type, procedures, characteristics and relevant events [6]. Third stage is data collection. In this stage, after identifying all the background and relevant issues such as history of project management and knowledge characteristics through literature review, which are related to the study issue, questionnaire will prepared referring to related source from literature review. After that, the questionnaire will distributed by post, interview and observation for civil engineer for surveying to collect the data [7]. The questionnaires distributed personally to the target respondents, which are civil engineer in Penang construction industry (contractor class G6 and G7). The agreement of the respondents towards the items that had been chosen in the questionnaire form is represent by the measurement scale, such as (1) Very important, (2) Important, (3) Less important, (4) Not important, (5) Not related. Fourth stage is data Analysis. For this stage, initially I need statistical packages for social sciences (SPSS) software to analyze and draw the graph. The analysis for the graph will involve mean and mode. By using this software, we can determine the mean and mode for the result. Fifth stage is discussion. In this stage, discussion will be on referencing the result after the analysis of data collection. The last stage is conclusion and recommendation. In this stage, reviews on the whole process of the research will be made with the intention to identify whether the study objective has been achieved. After presenting the study findings, recommendations and limitations of the study, topics for further research emerge.

3.0 Results and Discussions

Questionnaire form distributed to 218 respondents which are working as civil engineer with contractor class G6 and G7 in Penang. The sending of questionnaire form is by post to all the companies then follow up by going to the construction site to meet the respondents to fill in the questionnaire form. The data analysis is done by using the scale of the importance chosen by the respondents. From the overall research, only 81 from 218 respondents answered the questionnaire form that had been distributed to them. To get the value of mean and mode for each knowledge characteristics, the frequency from the level of the importance is analyzed. The software that had been used to analysis the data is statistical packages for social sciences (SPSS) where it shows the mean, mode and the frequencies of results chosen by the respondents. Table 1 shows the descriptive statistic of knowledge competency after analysis the questionnaire form. The N column shows the number or frequency of respondents which are 81 persons filled in the questionnaire form and shows the minimum and maximum value from the level of importance. From the Table 1, the most important knowledge characteristics that civil engineer should have nowadays to be competent is various technical knowledge as shows in mean column. Follow by decision making, teamwork, planning and scheduling, and leadership.

After the analysis, the upper five levels of knowledge characteristics are different between the literature review and project research. This is because most of the characteristics from literature review are more concentrate for project manager, while our targeted respondent is civil engineer in construction industry. The technical knowledge still is the very important characteristics for civil engineer to be competent in construction industry. This is because the civil engineer must provide technical advice to all parties involved with the project. With the good technical knowledge, it will help the engineer to work more excellent while doing their job such as preparation the proposal and understanding the engineering and architecture plan. Decision making is the second important of characteristics for civil engineer. This is because the construction projects involve the higher cost. The true of decision making will avoid the company from loss and maximize the profit. For example, the good decision making to choose the right materials will reduce the cost of the project. This statement is also in line with [8].

Table 1. Descriptive statistics of knowledge competency

Knowledge characteristic	N	Min	Max	Mean	Std. Dev.
1. Various technical knowledge	81	1	2	1.198	0.401
2. Decision making	81	1	2	1.309	0.465
3. Teamwork	81	1	4	1.383	0.624
4. Planning and scheduling	81	1	4	1.420	0.649
5. Leadership	81	1	4	1.457	0.690
6. Communication	81	1	4	1.469	0.572
7. Safety and health	81	1	4	1.481	0.615
8. Technical specialization	81	1	4	1.654	0.655
9. Negotiation	81	1	3	1.667	0.671
10. Budgeting	81	1	4	1.704	0.766
11. Design activities	81	1	4	1.778	0.806
12. Project software	81	1	3	1.827	0.587
13. Technical writing	81	1	4	1.901	0.663
14. General legal background	81	1	5	2.062	0.764
15. Tools	81	1	3	2.062	0.713
16. Public policy	81	1	4	2.099	0.816
17. Conflict resolution	81	1	5	2.123	1.077
18. Globalization	81	1	5	2.321	0.920
19. Marketing	81	1	5	2.506	0.839
20. Political issue	81	1	5	2.827	0.972
Valid N (listwise)	81				

The third important characteristic to be a competent civil engineer is knowledge of teamwork. Positive characteristic for civil engineers to possess is good teamwork knowledge. Although civil engineers may complete a number of their specific job tasks alone, there are other job duties where they must rely on a team in order to properly complete them. By being a good team player, the civil engineer will be able to work in harmony with others around them and make the job that much easier. The gathered data was in agreement with [9]. In general, a civil engineer is responsible for the planning and scheduling of the construction project. This includes conducting surveys, engaging in research, analyzing results, planning the construction and overseeing it along the way. The civil engineer will also provide information to the pertinent parties and general public to keep them informed and in the case that any issues arise before, during and after the construction. A construction engineer is the one who plans the project and advises the workers. The knowledge of leadership is also very important to civil engineer in their career. The reason is working in a large group need the engineer to lead the worker to perform better in their work. This will reduce the period of the project if the good leader

give a right command and can be done by the worker as in order. A civil engineer is the individual who directs a construction project so the good roles will make a good team. They will handle everything from the site clearing of the construction project to being on hand during the daily construction activities to make sure that everything is going as planned. So, the leadership knowledge is important for them to manage any construction project. This is with agreement to [10].

After the analysis, two characteristics that have a conspicuous changing. The characteristics are safety and health and budgeting knowledge. Nowadays, safety and health is a current issue in the construction site. There a lot of news reported the accident in the construction site that cause by the human careless. For example, statistic by Department of Occupational Safety and Health Malaysia, there are three cases of permanent disability accident in construction site were reported in Penang for January 2009. So with the good management in safety and health, the number of accident cases can be reducing. This is also in line with Dosh requirement that to promote safety and health [11].

Budgeting knowledge also have a conspicuous changing between the literatures reviews with the project research. With the unstable economy now, the budgeting knowledge is very important for civil engineer to make sure the project is going on without financial problem. This is because most of civil engineer must determine the costs of their construction projects by done the proposing bids and determining the costs of labor and materials to ensure that the project can be carried through in keeping with the budget that has been set aside. The issue on budgeting is in agreement with [12].

4.0 Conclusion

As a conclusion, there are many of knowledge characteristics to be a competent civil engineer in construction industry. For this research, only top twenty knowledge characteristics had been discussed. The most important characteristics are obtained by the analysis from the answer chosen by the 81 respondents who are working as civil engineer with contractor class G6 and G7 in Penang. After the analysis, this characteristic is a bit different compare with the literature review. There are changing in position of the level of the importance knowledge because the literature review are more concentrate to project manager, while our respondents are civil engineer. Although they are more to project manager characteristics, this characteristics is useful to civil engineer because this research looking in project management areas especially in construction industry.

Based on the result of this research, to be a competent civil engineer, good in technical knowledge is the most important characteristic. Follow by knowledge of decision making, teamwork knowledge, planning and scheduling knowledge and leadership skill. With these knowledge characteristics, the risk of problems at site construction such as delay, over budget and low quality work can be reduce. This is important because the problems will affect the time, cost, workers morale, the quality of completed project and the industry reputation. Civil engineer will not facing a bigger problem if they have this knowledge. Generally, the objectives of this research had been achieved.

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