The Social Sciences 11 (Special Issue 7): 7503-7507, 2016
ISSN: 1818-5800

Estimating the Construction Waste in Malaysia; Is it the Best Practice?

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Abstract: The improper handling of construction waste has become a serious issue contributing to environmental problems. Poor documentation and lack of awareness have resulted in lack of information regarding the types and amount of waste generated at construction sites. Various studies have been done before related to construction waste management but the levels of issues are still worrying. Hence this study intends to investigate the effectiveness of an existing technique and also the viability in the construction industry for estimating the construction waste generated. The structured informational interview has been done with aim to identify the existence of guidelines provided by the government or professional bodies on waste generated estimation in Malaysia. The finding shows that the estimation of waste practice by construction industrial practitioners in Malaysia is only based on their experience and expertise without any guideline or standard value provided by neither government nor related authorities. Therefore, a further study on this finding is important because it is believed that the right quantification of waste can assist to a better waste management.

Key words: Construction waste, construction industry waste estimation, better waste management, right quantification, Malaysia

INTRODUCTION

Construction industry now a days is the surpass industry around the world. It is one of the most profitable industries especially in developing countries which the activities are considered as a continuous developed activity. However, these activities are not only good for the economy but it is also responsible for a substantial amount of utilization of global resources and waste emissions. Previous research by Hendriks and Pietersen (2000) shows that construction industry not only generates the economy but also generates about 35% of waste in the world. Kulatunga *et al.* (2006) cited from Holm stated that almost 40% of the generated waste globally originated from the construction and demolition of the building. Those finding has create perturbing situation since PwC report in 2015 predicted that the industry will grow by more 70% worldwide by 2025. For the growth to be sustainable there is a need for proper management and minimization of construction waste. Hence, this research focuses on determining the effectiveness of an existing technique for estimating. As a rapid growth of economic perspective, Northern region or called as a Northern Corridor Economic Region (NCER) is one of the economic development area. This area consists of high density cluster in the corridor that have benefit in terms of sector and geographic. This Northern region covers the states of Pulau Pinang (1,033 miles), Kedah (9,425 miles), Perlis (995 miles) and four northern districts in Perak (21,005 miles). The rapid development of the construction industry can be seen in percentage of annual growth rate for construction sector from (1%) in the eight Malaysia Plan (8MP) to the (3.7%) in the Tenth Malaysia Plan (10MP). Construction industry contributes significantly to the Malaysian economy where the last two decades showing the increasing occurrence of construction waste in Malaysia and it became an important issue in construction industries (Begum *et al.*, 2009). It was reported in Utusan Malaysia newspaper (29 April, 2014) that there are almost 300 hotspot areas in Kuala Lumpur become as illegal dumping areas and 80% of it comes from construction waste. It was agreed by Malaysian Minister of Urban Welling, Housing and Local Government that improper management of the waste guides to the various issue of environmental in Malaysia.

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This construction waste can be occurred in any projects either in building or civil engineering projects. The trigger for the construction was an improper waste management and as there was a little effort to assess the management of waste on site. This waste generation issues usually will contribute to a reduction value of construction productivity and performance of the projects. The definition of construction waste is always varies and depends on the type of construction and practices on sites (Begum *et al*., 2006). Due to Lau *et al*. (2008) study, the construction waste is defined as the solid waste resulting solely from construction activities in which waste came from demolition, renovation, earthworks and land clearing activities. The varies construction stages which are, design, operational, procurement and material handling activities also lead to waste generation on construction site (Ekayanaki and Ofori, 2000; Hashemi *et al*., 2014). Even the architect believes that waste generated are rarely contributed by the design phase, almost one-third of construction waste are related to the decision made during the design stage (Hashemi *et al*., 2014). Improper design usually became as one of the factor lead to the construction waste generation (Bossink and Brouwers, 1996; Faniran and Caban, 1998; Ekanayake and Ofori, 2000; Osmani *et al*., 2008; Innes, 2004).

Referring from previous findings which related to construction waste, it is shown that there are various studies have been done in order to minimize the issues. However, the awareness is still lack among the contractors where there are reports showing that the numbers of illegal dumpsite of construction waste are still increasing. These noble intention absolutely requires the co-operation and action from all those engaged in constructing and maintaining the structure or building, including those providing design, consulting andconstruction services. This statement can, in fact, be supported by a research done by Danish International Development Assistance (DANIDA) and National Resources Environmental Board (NREB) where 50% of the construction wastes estimated do not leave a construction site. Even if transported away from the construction site, illegal dumping is another matter that should be a cause of concern.

Due to the lack of markets for construction waste recycles in Malaysia, all construction wastes are disposed at a landfill either legally or illegally except for metals, glass, plastic, study and cardboard since the material could transform into various degrees of material.

Hence, finding the sources of construction waste generation is believed can be a critical in understanding how to resolve issues surrounding construction waste management. It is very important to know how the materials are estimated at the early stage of construction because the error of estimating for the percentage of waste can give massive effect to the project itself.

MATERIALS AND METHODS

Methods and procedure: This study focuses on determining the effectiveness of an existing technique and also the viability in the construction industry for estimating the construction waste generated. The aim of this interview is to identify the existence of guidelines provided by the government or professional bodies on waste generated estimation in Malaysia. Five structured interviews with experienced industry practitioners were performed to collect their insights. The qualitative research analytical tool NVivo 10 was used for the data analysis.

A series of structured informational interviews were made with experienced industry practitioners in Penang, to gain insight into their experience and practice in their construction works. The respondents were industry participants at management levels and experienced in construction activities. They were considered more capable of understanding how the planning and management of project construction. Respective respondents were identified from different sources, including the websites of property developers, websites of the contractor's company and list of contractors registered with Construction Industry Development Board Malaysia (CIDB).

The interviews with five respondents from a different job position were successfully conducted. The interview results are representative not only because of the respondent's wide range of backgrounds but also because of the extent of their practical knowledge in dealing with the planning and management of construction project. The profile of the respondents is shown in Fig. 1.

The respondents are involve of project manager, project engineer and also quantity surveyor. Two of the respondents are project manager who had 12 and 24 years of experience in the industry. The other two respondents are project engineer with 7 and 10 years of experience each while another who had 5 year's experience is a quantity surveyor. The experience of all the respondents highlights the depth of knowledge in their field.

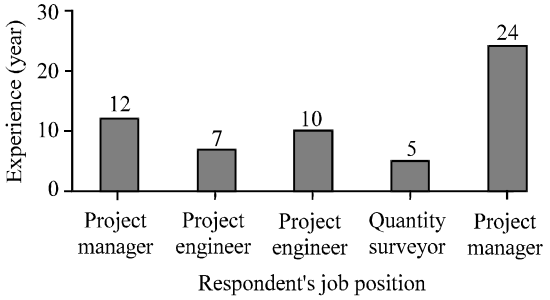

Fig. 1: Profile of the respondents; designation of respondent's

RESULTS AND DISCUSSION

Data analysis: The research analytical computer Software, NVivo 10 was used to assist in analyzing the collected interview data. NVivo is a qualitative research tool that helps organize, classify, summarize and analyze qualitative data such as opinions and comments gathered in interviews or focus group meetings. It offers functions for document preparation; coding; retrieval; dynamic links to memos, documents and nodes and visual representations (Bringer *et al*., 2004). In this study, NVivo was used to facilitate the data analysis by coding and grouping the collected interview data into different categories. The software offers a more natural way of working and facilitating the search for particular features within the data.

Based on respond of the respondent during the interview session, some related and relevant data were recognized. To identify the practicing and how construction industrial practitioners perform their work related to construction waste were classified according to some categories with specified themes. It was classified into six categories which are involvement in construction waste estimation; involvement in construction waste management; involvement in construction waste disposal; estimate waste during tender preparation; measure or record the waste generated during the construction stage; measure or record the total amount of waste generated. A schematic coding tree is shown as in Fig. 2 while the ten subcategories which are most emphasis by frequency count are shown in Table 1.

By referring the schematic coding tree and the most emphasize ten subcategories, it can be figure out that there are no records of waste were done by the respondents even they are responsible to estimate the percentage of waste at the early stage. It is clearly reflects that there are no records regarding the cost have been spent on the waste disposal. Nevertheless, the record or the amount of waste might help in predicting the lifespan

Table 1: Most emphasized subcategories of views by frequency

Categories	Subcategories	Frequency
Measure or record the total amount of waste generated	Not record the amount of waste generated	5
Involvement in construction waste management	Involved in management	5
Estimate waste during tender preparation	Allow percentage amount of material waste	5
Involvement in construction disposal	Not involve in disposal	4
Involvement in construction disposal	Allocate work to subcontractor	
Estimate waste during tender preparation	Involved in the prediction amount of waste	4
Involvement in construction waste estimation	Not involved in estimation	3
Involvement in construction waste management	Control and monitor the waste	3
Measure or record the waste generated during construction	Control the usage of material	3
Measure or record the waste generated during construction	Manual calculation and recalculate amount of material use during construction	2

of the landfill and also in foreseeing the best management methods of different types waste. Other than that, with the highest frequency also the respondents agree that there are "allowable of percentage for estimation amount of material waste" during the tender preparation. Based on the respondent's experience, percentage estimation of waste depends on the types of materials. Usually, the allowable values are 3-5% of material referring to the standard calculation in taking off calculation by quantity Surveyor. However, they were agreed that the range of the percentage are only based on their experience without the standard guideline provided by the government or related authorities as shown in Fig. 3.

By referring Fig. 4 based on respondent's experience, the actual amount of waste generated during the cons truction phase are not equal to the estimate calculated when doing the taking off. According to their observations, about in range 1-5% approximately different with the estimated value. The project manager with 24 years of experience in industry mentioned that approximately percentage different is about 5% while 3% approximately different is counted by project manager with 12 years of experience in industry field. Both of the project engineer with 10 years of experience and quantity surveyor with 5 years of experience in industry indicate the approximately percentage different is about 2%. While, the project engineer with 7 years of experience approximate only 1% different. It shows that, all the respondents with different years of experience in industry has different perception and opinion regarding this matter but it can be said that the difference might cause by the various percentage practice by the contractors.

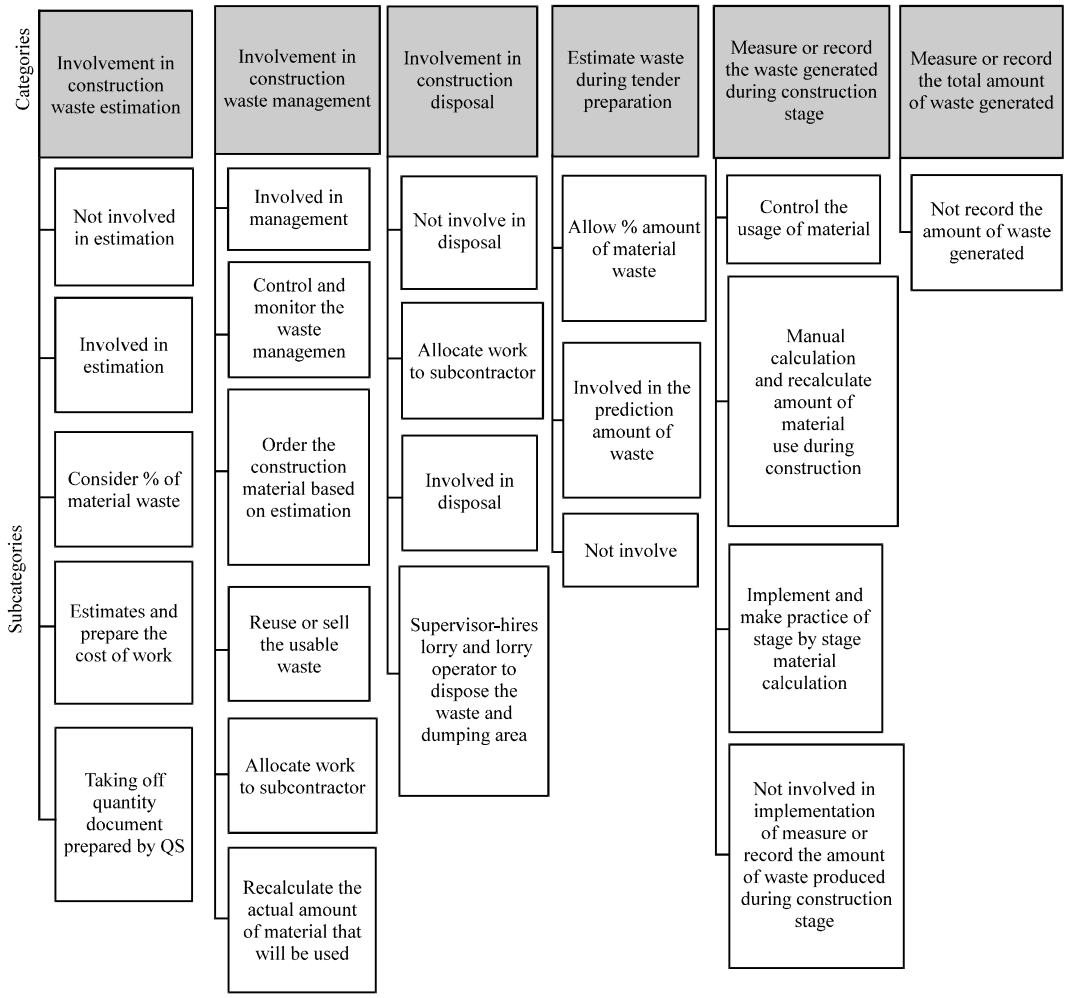

Fig. 2: Schematic coding tree of respondents respond

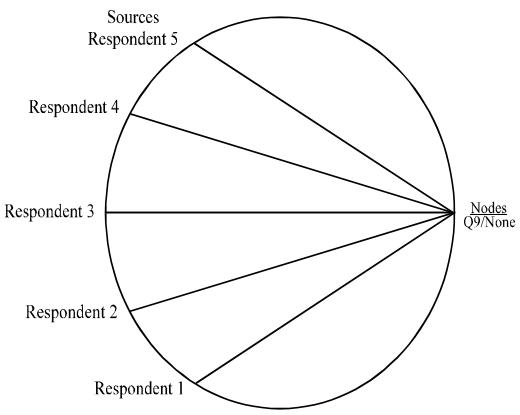

Fig. 3: The connection map of group query; the guidelines or methods previously of currenty used to estimate the amount of waste generated in the projects

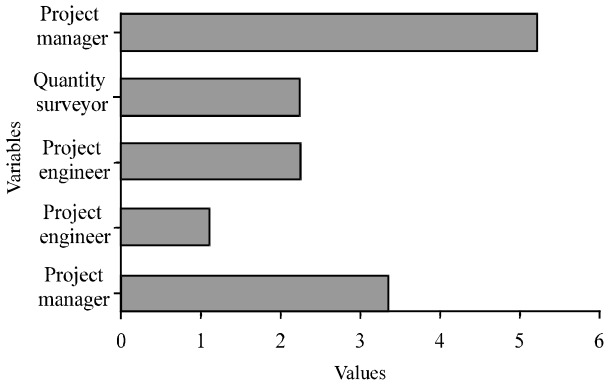

Fig. 4: Approximate percentage different between the actual amounts of waste generated during the construction phase with the estimate waste calculated during the taking off; approximate percentage different (%)

CONCLUSION

By referring based on respondent's experience, the actual amount of waste generated during the construction phase are not equal to the estimate calculated when doing the taking off. According to their observations, about in range 1-5% approximately different with the estimated value. The project manager with 24 years of experience in industry mentioned that approximately percentage different is about 5% while 3% approximately different is counted by project manager with 12 years of experience in industry field. Both of the project engineer with 10 years of experience and quantity surveyor with 5 years of experience in industry indicate the approximately percentage different is about 2%. While, the project engineer with 7 years of experience approximate only 1% different. It shows that, all the respondents with different years of experience in industry has different perception and opinion regarding this matter but it can be said that the difference might cause by the various percentage practice by the contractors.

ACKNOWLEDGEMENTS

The research project referred to in this study is supported by Malaysia ministry of higher education under the Research Acculturation Grant Scheme (RAGS). The acknowledgement is also for respondents who are willing to share their precious experience.

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