CASE STUDY ON RESOURCE MANAGEMENT IN CONSTRUCTION PROJECT

By

Amalina Binti Mohd Pangi
15410

Dissertation submitted in partial fulfillment of
The requirement for the
Bachelor of Engineering (Hons)
(Civil Engineering)

SEPTEMBER 2013

Universiti Teknologi PETRONAS
Bandar Seri Iskandar
31750 Tronoh
Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

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Approved by,

……..
(Ir Idris bin Othman)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH PERAK
September 2013

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgments, and that the original work contained herein have not been undertaken or done by unspecified sources or person.

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(Amalina Binti Mohd Pangi)

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ABSTRACT

Construction projects experience various problems and complex factors such as cost, duration, quality and safety. Construction sector is diverse as it contains sub-contractors, contractors, consultants, architects, owners, and others. The aim of this paper is to identify and analyze resource management issues in construction project and identify significant methods to improve them. Other than that to ascertain the significance of the resource management as one of the key element in construction project success. A literature review and a questionnaire survey will be done for data collection before being analyzed and ranked considering Relative Importance Index and Cronbach's alpha. The questionnaires will be distributed to the team members of KLIA 2 – New Low Cost Terminal Project: Client, Architects, Main Contractor, and Sub-Contractor and the feedbacks obtained will be used for the case study for further clarification. The results of the study will be collected and further discussed during the next academic semester for Final Year Project 2.

ACKNOWLEDGEMENT

These acknowledgements attempt to thank people who in some way supported, guided, and encouraged me along the way to completing this dissertation. I would like to express my sincere gratitude to the following people. Without their assistance, encouragement, suggestions and commitment this dissertation would not have been a reality.

First and foremost, from the depth of my heart I would like to express sincere gratitude and appreciation to my Final Year Project Supervisor Ir. Idris Bin Othman for his continued support, generous academic advice, discussions, suggestions, close attention, encouragement and his incredible understanding and capability to initiate guidelines without being overbearing. Also I would like to thank my Final Year Project colleague Nurhafiza Binti Hasbi @Sebi for her comments, help and support. As well, I would like to thank all the lecturers in the Civil Engineering Department of Universiti Teknologi PETRONAS for their most welcoming support and friendly environment.

I would like also to express gratitude to all my friends and colleagues in Universiti Teknologi PETRONAS for their enormous help and support in completing my Final Year Project. Sincere gratitude and appreciation goes to all Kuala Lumpur International Airport 2 construction team projects who participated in this research.

Finally, to my family, a very special thank you for all their sacrifices, patience, love and support throughout my research studies.

CHAPTER 1

INTRODUCTION

1.1 Background of study

Project management involves managing the resources – workers, machines, money, materials and methods used. Resources are the means of production needed to complete a project. A key idea of managing the overall capacity, availability and allocation of resources on large construction projects is that the perspective is from the level of completion of the project's major features of work. Other matters to be concerned about are individual material or equipment deliveries, small tools, or the productivity of specific workers.

In light of the increasingly challenging construction environment, companies are taking a closer look at their operations, searching for untapped profit-boosting opportunities and new sources of competitive differentiation. Stakeholders are discovering that their process for managing tools/machines/equipment, materials, labor, methods, costs and consumables – a process often referred to as "Construction Resources Management" – is broken. At some point, the traditional way of paper-and-spreadsheet-based approached is no longer effective at preventing loss and employee boarding of these critical construction resources. To make it even worse the realization of mismanagement of tools/machines/equipment and materials runs much deeper than the direct costs of replacing them. These affect every department in every construction organization from accounting department which manage the budget to project managers who strive to avoid delays due to the problem arise. Poor and inefficient Construction Resources Management gives strain to the stakeholders.

One of a must criterion to have a good project management in construction is the resources management must enthusiastically pursue to achieve the efficient utilization of equipment, material, labor and method. The use of new and advance equipment and innovative methods

has made possible wholesale changes in construction technologies nowadays. Material handling including procurement, inventory, shop fabrication and field servicing requires specific attention to reduce cost. As for those who are responsible for cost control of constructed facilities, improvement of labor productivity would be their major and persistent concern.

The success of any construction project highly depends on how proper and effective the management of construction resources flow. Studies show that various resources factors affected cost management and have resulted to significant amount of cost overrun worldwide.

This project will emphasize and discuss on the resource management as the main element to the success of construction project. Hence, this study focuses on analyzing significant factors that influence the resource management performance and also discovering the methods of techniques to improve the resource management.

1.2 Problem Statement

Construction is one of the industries that use large scale equipment, materials and labor compared to other industries. Stakeholders that involved in managing the resource management in construction project all differ in terms of education, experience and view. According to the studies previously done by other researchers on various construction projects worldwide, it shows that problems and issues regarding the resource management in construction project influenced the performance and success of a project. Applicable methods of improvement on these issues are needed in order to improve the performance of the project. This research paper will analyze the resource management issues in construction projects and initiatives to improve them.

1.3 Objectives

1.3.1 To identify and analyze resource management issues in construction project.

1.3.2 To identify and analyze significant methods to improve resource management in construction project.

1.4 Scope of work

The scope of this study is on resource management in the construction site. It covers three (3) components of resources: manpower/labor, machineries/equipment, and material. This study will try to put the resource management in construction project as one of the important element to project performance and success. The study will focus on construction project and a case study will be done at "Kuala Lumpur International Airport 2 – New Low Cost Terminal Project" (Package TB001). The study will also emphasize on issues and methods for improvement in the quality of resource management in construction project.

CHAPTER 2

LITERATURE REVIEW

According to Chris Hendrickson in his book Project Management for Construction, job-site productivity is influenced by many factors which can be characterized either as labor characteristics, project work conditions or as non-productive activities. The labor characteristics include age, skill and experience of workforce; also leadership and motivation of workforce. The project work conditions include among other factors such as job size and complexity and accessibility, labor availability, equipment utilization, contractual agreements, local climate, and local cultural characteristics, particularly in foreign operations. The non-productive activities associated with a project may or may not be paid by the owner, but they nevertheless take up potential labor resources which can otherwise be directed to the project. The non-productive activities include among other factors are indirect labor required to maintain the progress of the project, rework for correcting unsatisfactory work, temporary work stoppage due to inclement weather or material shortage, time off for union activities, absentee time, including late start and early quits, and non-working holidays.

2.1 Review of Labor from Previous Study

Manpower is one of the most constrain challenge facing by Malaysian construction industry as it rely too heavy on large number of foreign labor workforce. Economic Report 2011/2012 stated that total employment of foreign labor force was about 12,645,700 while 768,800 were involved in construction sector. There is a heavy

dependency of foreign workers in local construction industry as it has not successful in attracting potential local youth to involve in this sector. This is mainly because of the 'Dirty, Dangerous, Difficult' image of construction industry given to the public (Construction Industry Development Board, 2007). Therefore, the gap has to be filled by foreign workers. High rising in standards of living and economic growth in Malaysian society created a high demand on construction activities (CIDB 2005). At the end, huge amount of foreign workers were imported into our country as unskilled or semi-skilled labor which doing some manually jobs. Total number of foreign workers was increased from 850,000 in year 2001 to 2.05 million in the year 2007 according to statistic in Selected Social Statistics, Series 10, (Department of Immigration Malaysia, 2009).

In Summer 1999 FDU Magazine, Rebecca Maxon wrote in her article that occupational stress has been defined as a "global epidemic" by the United Nation's International Labor Organization. Workplace stress costs United States employers an estimated $200 billion per year in lower productivity, staff turnover, worker's compensation, and medical insurance. According to the Holmes-Rahe Life Events Scale, many of the most stressful events are related to the firings, altered responsibilities, a switch to a different line of work, trouble with bosses, variation in work hours or conditions, retirement and vacations.

Olomolaiye et al. (1998) classified the productivity factors into two categories: external factors the ones outside the control of the organization management and internal factors related to the productivity factors originating within the organization. From their viewpoint, the nature of the industry, usually the separation of design and construction functions, has affected construction productivity through delay in drawings, design changes, and following rework. Construction clients have sometimes been obstructions to construction productivity because of their lack of suitable knowledge about construction procedures. Moreover, being an outdoor industry, construction performance is extremely affected by weather conditions. In addition to the factors disused, health and safety regulations, and codes of practices are other external factors influencing task operations and productivity. In the internal category, management inadequacies could result in a waste of resources with consequent losses in productivity.

Meanwhile, adoption of modern technology and training for the laborer would increase productivity. Shehata and El-Gohary (2011) conducted a case study in construction project in Egypt to provide a guide for necessary steps required to improve construction labor productivity and consequently, the project performance. They stated that "the main problems of the construction industry are: its declining rate of productivity standards. There are numerous factors which have influence on labor productivity. These factors could be classified as: industry related factors, management related factors and labor related factors. Industry related factors are such as design factor (repetition and complexity), building codes, construction technology, laws and regulations, job factors (job duration, size of the job and type of job), adverse, uncertain weather and seasonality and site location. Management related factors are such as planning and scheduling, leadership, motivations and communication. Labor related factors are such as labor skill, motives and labor availability."

Alinaitwi et al. (2007) found that among the top ten factors affecting labor productivity in Uganda are incompetent supervisors, lack of skills from the workers, and poor communication. Thomas and Sakarcan (1994) built an ideal to describe the factors affecting labor productivity. In the model, two groups of factors determine the productivity performance, work environment, and task to perform. Work-environment factors refer to how well a job is organized and accomplished. Work to be done, or work content, relates to work required to perform and includes physical components of work, specification requirements, and design details. Past study showed that task to be completed could affect the labor resources by as much as 15%, whereas work environment can affect labor requirements by an extra 25%. One study suggested that scheduled overtime always leads to efficiency losses because of the inability to deliver materials, tools, equipment, and information at an accelerated rate (Ginther, 1993).

Construction skilled shortage workers have becomes the challenge facing construction industry. There was understood that skilled workers produced from vocational training were not meeting industry's needs. Some of them left construction sector even after undergo training from construction training institutions. Most construction has problems

in the ability to get the source of labor as well as retained skill people and has to depend on foreign worker to respond to the high demand of skilled workers.

The Institute of Management and Administration ("IOMA") writes that, "The skilled craft shortage is a shortage of adequately trained, skilled, and productive workers available for certain jobs." Replacement and recruitment proves to be difficult with the construction industry requiring some of the most highly skilled workers to do some of the most dangerous jobs. Additional reasons for the shortage are a lack of training, an aging workforce, and an industry that doesn't appeal to many youth. According to Wang (2008), The Construction Labor Research Council predicts that "one hundred eighty five thousand new workers need to be attracted, trained, and retained each year up to 2016 in order for the industry to replace expected turnover and to sustain industry growth expectations,". This study by Wang did not have the benefit of knowing the depth of the current economic downturn, but its conclusions are still applicable to long term issues.

Nowadays, there are more and more people who getting a higher educational level like diploma, degree or even master degree. For them, they gain a higher of education level is to avoid themselves from being working on dangerous or high risk jobs, like working in construction site. Therefore, the reducing of local youth to join in construction sector is going less. The construction industry is lacks appeal to young, potentially skilled workers. An increasingly poor image over the last couple of decades has discouraged young people from seeing the construction industry as a viable career path (Tucker, Haas, Glover, Alemany, Carley, Eickmann, Rodriguez, & Shields, 1999). Young people in today's society are being pushed towards college degrees and away from blue collar jobs. According to Carley, Goodrum, Haas, & Borchering (2003), a lack of organizational investment and promotion opportunities by construction companies could also deter potential workers from construction jobs. The industry especially the management team needs to improve in providing platforms for training new and current employees. Without training and opportunities to acquire new skills, the shortage of skilled craft labor will only grow.

(Lim and Alum 1995) conducted a survey of top construction contractors to identify the factors affecting productivity in Singapore. The three items of extreme concern were

identified as difficulty in the recruitment of supervisors, difficulty in the recruitment of labors, and a high rate of labor turnover. Another survey with construction personnel (Hanna and Heale, 1994) was conducted to gauge their opinion about the field of construction, specifically their knowledge about the factors that most affect construction productivity. As a result, a set of comprehensive factors was identified and classified into six groups: contract environment, planning, site management, working conditions, working hours, and motivation. Managers' skill and attitudes have a crucial bearing on productivity. In many organizations, productivity is low even though the latest technology and trained manpower are made available. Low productivity is because of inefficient and indifferent management. Experienced and committed managers can obtain surprising results from average people. Employees' job performance depends on their ability and willingness to work. Management is the catalyst to create both. Advanced technology requires knowledgeable laborers who, in turn, work productively under professionally qualified managers. It is only through sound management that optimum utilization of human and technical resources can be secured. Improper scheduling of work, shortage of critical construction equipment or labor, may result in loss of productivity. Improper planning of project-initiation procedures generally lead to lost labor productivity. Additionally, poor site layout can contribute to a loss of productivity. Laborers have to walk or drive a long way to lunch rooms, rest areas, washrooms, entrances, and exits, affecting overall productivity (Association for the Advancement of Cost Engineering (AACE) International Recommended Practice No. 25R-03, 2004).

Jergeas (2009) in his report stated that among specific actions and strategies for labor management in order to improve construction productivity are by providing incentive and recognition programs to the labor, providing training and certification of workforce, providing a better labor supervision and leadership, improving communication between labors and improving job site access for workers.

2.2 Review of Equipment from Previous Study

The selection of the appropriate type and size of construction equipment often affects the required amount of time and effort and thus the job-site productivity of a project. It is therefore important for site managers and construction planners to be familiar with the characteristics of the major types of equipment most commonly used in construction. In order to increase job-site productivity, it is beneficial to select equipment with proper characteristics and a size most suitable for the work conditions at a construction site (Hendrickson, 2008).

Equipment management is one of the most important factors in construction industry. Productivity can be affected if required materials, tools, or construction equipment for the specific are not available at the correct location and time. Selection of the appropriate type and size of construction equipment often affects the required amount of time it is, therefore, essential for site managers to be familiar with the characteristics of the major types of equipment most commonly used in construction. In order to increase job-site productivity, it is beneficial to select equipment with the proper characteristics and a size most suitable for the work conditions at a construction site. Laborers require a minimum number of tools and equipment to work effectively to complete the assigned task. If the improper tools or equipment is provided, productivity may be affected (Alum and Lim, 1995; Guhathakurta and Yates, 1993).

Alinaitwi et al. (2007) found that among the top ten factors affecting construction productivity in Uganda are lack of tools/ equipment, tools/ equipment breakdown and harsh weather conditions. Unavailability of equipment is a procurement problem that can affect the project completion (O'Brien, 1998). Occasionally the lack of equipment may cause major design variations or adjustments to project scheduling to accommodate the replacement.

The size of the construction site and the material storage location has a significant impact on productivity because laborers require extra time to move required materials

from inappropriate storage locations, thus resulting in productivity loss (Sanders and Thomas, 1991).

Andrian (1987) classified one of the productivity factors causing low productivity as management-related factors usually refer to a lack of management for tools or techniques. Equipment logistics, maintenance, and repair are important aspects of construction equipment management. A well-managed equipment fleet helps reduce downtime, as well as total maintenance and repair costs. Most large contractors have increased their investment in maintaining, updating, and replacing their equipment fleet to satisfy the needs of project construction (Stewart 2000). However, in managing construction equipment, contractors are invariably plagued with several difficulties such as huge capital investment in the acquisition phase, which usually constitutes a major financial burden. Procurement of major construction equipment not only costs as high as 36 per cent of the total construction project cost, but also causes a high delivery time uncertainty, which may disrupt the construction schedule (Yeo and Ning, 2006). Procurement delays have various effects o other processes in the construction cycle (Fisk, 1997). Occasionally, the procurement delay may cause an entire change or replacement for originally specified equipment for the project (Arain et al. 2004). This may therefore cause a need for project activities to be reworked. Delay in long lead procurement is a common cause of delays in building projects (Assaf et. Al 1995)

Effective management of equipment is crucial for the success of construction firms. Inadequate manual processes of equipment management and the subjective decisions of equipment managers usually result in major losses in construction firms, hence, the economy. In the maintenance phase, proper maintenance management of construction equipment is never over-emphasized since the cost and time that exceed the designated budget or schedule on projects are often resulted from poor machine maintenance practices. However, over-maintenance of equipment is undesirable as well (Vorster and De La Garza, 1990; Edwards et al., 1997). Effective equipment management practices not only increase production time and equipment availability, but also maximize the

company profit by reducing several costs such as those from costly downtime (Edwards et al., 1998a).

2.3 Review of Materials from Previous Study

Materials management is an important element in project planning and control. Materials represent a major expense in construction, so minimizing procurement or purchase costs presents important opportunities for reducing costs. Materials management is not just a concern during the monitoring stage in which construction is taking place. Decisions about material procurement may also be required during the initial planning and scheduling stages. The availability of materials may greatly influence the schedule in projects with a fast track or very tight time schedule: sufficient time for obtaining the necessary materials must be allowed. In some case, more expensive suppliers or shippers may be employed to save time. (Hendrickson, 2008).

The main objective of any construction project organization is to utilize the resources to the optimum level. The availability of certain resources may fluctuate due to various reasons. The intention is not to waste the resources. Hisham (2010) stated that "Material procurement and storage on construction sites need to be properly planned and executed to avoid the negative impacts of material shortage or excessive material inventory on-site." Deficiencies in the supply and flow of construction material were often cited as major causes of productivity degradation and financial losses (Thomas et al. 2005). Efficient planning of materials procurement and storage on construction sites can lead to significant improvements in construction productivity and project profitability. Overlooking these critical interdependencies between material procurement and site-space availability can lead to serious project problems including material shortages, improper storage, poor and unsafe site layout, and productivity losses (Bell and Stukhart 1987; Thomas et al. 1989; Jang et al. 2007).

Completion of a construction project at maximum efficiency of time and cost requires proper planning and constant follow up. It also requires the availability of resources like man power, equipment, and materials, and the proper resource allocation of resources

and their availability in time. The non-availability of resources in time may cause project delay. The project manager is responsible to identify and schedule future job needs so that the most efficient use is made out of the resources available. The project manager must determine long range resources for general planning and short term resources for detailed planning.

Koskela and Howell (2002) recognize that maintaining a comprehensive up-to-date plan is difficult. Therefore, being based on an out-of-date plan, the tasks pushed to execution often cannot be performed, as they lack either predecessor tasks or other inputs. From the supply chain point of view however, this management approach including last-minute improvisation leads to inefficient practices to guard against material shortages. Materials are often ordered either very late leading to buffering at supplier to guarantee service level, or too early leading to buffering at the site (Vrijhoef and Koskela, 2000).

Ogunlana (1996) suggested that one of the main reasons for project delays on housing projects in Thailand were material management problems, shortages of construction materials. Dey (2000) also suggested that delays in materials supply was a major cause of time overrun. Materials management is an important function in order to improve productivity in construction projects. The result of improper handling and managing materials on site during a construction process will influence the total project cost, time and the quality (Che Wan Putra et al. 1999). Proverbs et al. (1999) stated that costs for materials handling may range from 30-80% of total construction costs. In addition, Dey (2001) indicates that almost 60% of the total working capital of any industrial organization consists of materials costs. Therefore, there is a need for efficient materials management in order to control productivity and cost in construction projects.

There are many issues which contribute to poor materials management in construction projects. Zakeri et al. (1996) suggested that waste, transport difficulties, improper handling on site, misuse of the specification, lack of a proper work plan, inappropriate materials delivery and excessive paperwork all adversely affect materials management. Furthermore, Dey (2001) noted that the common issues related to materials management

such as receiving materials before they are required, causing more inventory cost and chances of deterioration in quality; not receiving materials at the time of requirement, causing loss of productivity; incorrect materials takeoff from drawing and design documents; subsequent design changes; damage/loss of items; selection of type of contract for specific materials procurement; vendor evaluation criteria; and management of surplus materials. Portas and AbouRizk (1997) undertook a questionnaire of superintendents and project managers to determine all possible factors affecting productivity. An interview conducted with contractors showed that weather and material delivery were the main adverse factors for site productivity (Hassanein and Melin, 1997). A questionnaire identified rework, material problems, tools, heavy-equipment availability, crew interference, overcrowded work areas, instruction, quality-control inspection, and management interventions as the main factors affecting craftsman productivity and motivation (Chang and Borcherding, 1985).

Abdul Kadir et al. (2005) concluded that the top five factors affecting construction productivity for Malaysian residential projects are material shortage at site, non-payment to suppliers causing the stoppage of material delivery to site, change order by consultants, and incapability of contractor's site management to organize site activities.

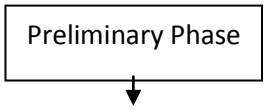
CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter outlines the research methodology of this study. The research was conducted in two phases. Data in the first phase were collected by literature review followed by the second phase by data collection using questionnaires. The author is focusing on the construction project point of view, and a case study at the airport construction project as suggested by her supervisor, Ir Idris Bin Othman.

The research starts with the first phase, the literature review on resource management in construction projects. Before proceeding with the second phase, a pilot survey will be conducted to identify the weaknesses and making sure the effectiveness of the questionnaire survey. The questionnaire survey will be started after the questionnaire has been improvised based on the pilot survey. A case study will be carried out on an airport construction site in Selangor. However, there will be some data constraint due to confidential information and also time and money limitations. The work sequence for this project is shown in Figure 1.



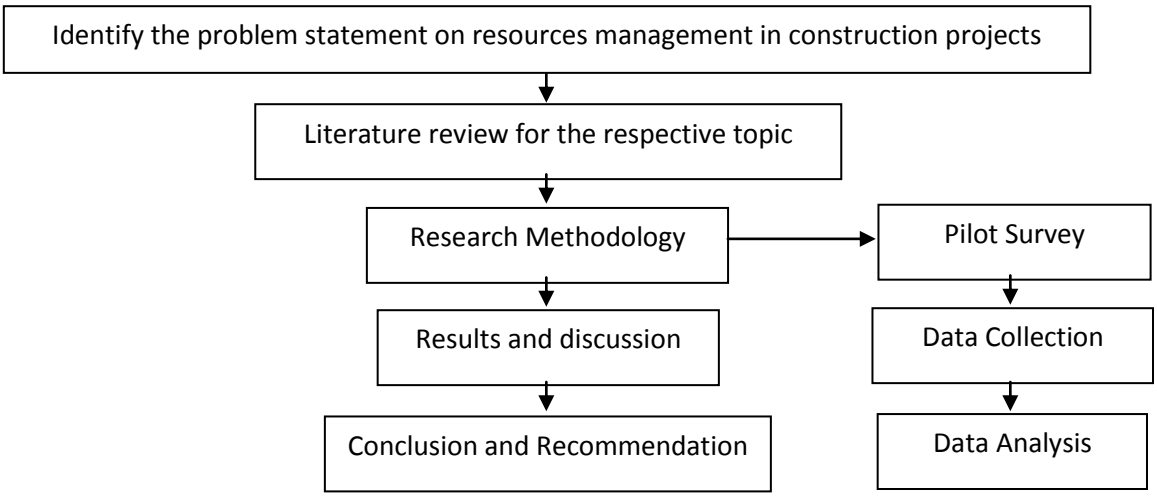


Figure 1: Work sequence for Final Year Project

3.2 Literature Review

The literature review is the first phase of research in order to obtain the information and knowledge of the resource management in construction project. It is done based on the past researches and case studies done by the previous researchers. At this first phase, research will be carried out based on documentation research such as books, conference tests, bulletin, project papers and mostly journals. Literature review stages is significant for author's research paper in order to help her to have the general ideas and better understanding about the past and current situation of resource management in construction projects, not to forget the future changes and development in this scope. The author will mainly focused on researches on the problem or issues and methods or changes that have been done in the past in order to improve the construction resources management.

3.3 Pilot Survey

Pilot survey also known as feasibility study is a small experiment designed to test logistics and gather information prior to a larger study, in order to improve the latter's quality and efficiency. A pilot study can reveal deficiencies in the design of a proposed experiment or procedure and these can then be addressed before time and resources are expended on large

scale studies. One of the intentions to carry out pilot survey is to get information to improve the efficiency of the main survey. Based on the pilot survey, revision and amendment can be done to the main survey. At the same time, surveyor will learn and prepare to any difficulties that might occur during conducting the main survey such as managing the time taken for one to complete the questionnaire and to determine the size for the sampling unit. The pilot survey for this research paper will be conducted among professional members of Universiti Teknologi PETRONAS. The feedbacks will be used for the amendment of the questionnaire for the survey.

3.4 Data Collection

For this research paper, data collection will be done using qualitative research which concerned with testing the theory as per stated in the objective. The aim of data collection is to gather the information regarding the topic, resources management and the resources itself in construction projects. There are two ways to do the data collection:

Questionnaire

Questionnaire is the main alternative to get information for this research paper. The author will let respondents to choose either they want to be anonymous or not. In return, the author will get have a more honest and transparent response. The questionnaire will be conducted by hand and online. It will be distributed to the construction project team members from the case study chosen.

Case study

The research will be done by distributing questionnaire regarding the topic. This type of data collection will have a distinct advantage of enabling the researcher to establish understanding with potential participants and then gain their cooperation.

3.5 Data Analysis

The data analysis will be done after the data collection is finished. All the data gathered from the questionnaires will be entered into Microsoft Excel Spreadsheet and SPSS Software Version 17 to analyze the data. Relative Importance Index (RII) are calculated to rank the items in the questionnaire while the value of Cronbach's Alpha are viewed for internal consistency.

Relative Importance Index (RII)

The Relative Importance Index (RII) was used to decide various professionals' opinions of the RII in construction projects. RII is calculated as stated below (Cheung et al., 2004; Iyer and Jha, 2005; Ugwu and Haupt, 2007):

Relative Importance Index Formula:

$$\mathrm{RII} = \frac{\sum W}{(A * N)}$$

Where,

W = weights given to each factor by the respondents and will ranges from 1 to 5
where '1' is less significant and '5' is extremely significant

A = highest weight

N = total number of respondents

Whereby the application of average index in questionnaire for instant would be:

W_1 = 1, frequency of "Strongly Disagree" response

W_2 = 2, frequency of "Disagree" response

W_3= 3, frequency of "Neutral" response

W_4 = 4, frequency of "Agree" response

W_5 = 5, frequency of "Strongly Agree" response

Besides, they can be presented as well as:

1 = Very Low Degree of Consideration

2 = Low Degree of Consideration

3 = Neutral Consideration

4 = High Degree of Consideration

5 = Very High Degree of Consideration

Cronbach's Alpha using SPSS Software

Cronbach's alpha is a coefficient that describes how well a group of items focuses on a single idea or constructs (Cronbach, 1951). It is calculated among the set of variables used in the factor analysis to determine the reliability of those questions for measuring a single construct. For this paper, Cronbach's alpha analysis will be done using Statistical Package for the Social Sciences (SPSS) software.

3.6 Data Limitations

The author is given approximately 28 weeks to finish this project. There are limitations in this research paper due to time and money. There are limitations of information from the construction site due to its confidentiality.

3.7 Gantt Chart of Key Milestone and Study Plan

The Gantt Chart of Key Milestone and Study Plan are prepared by the author to ensure the work progress for this research paper is done on track.

No.	Details/ Week	1	2	3	4	5	6	7		8	9	10	11	12	13	14	15
1	Project Work Continues																
2	Submission of Progress Report																
3	Project Work Continues																

4	Pre – SEDEX																
5	Submission of Draft Report																
6	Submission of Dissertation (Soft Bound)																
7	Submission of Technical Paper																
8	Oral Presentation																
	Submission of Project Dissertation																
	Project Process																
	Project Milestone																
	Semester Break																

Figure 2: Key Mileston

STUDY PLAN FOR FINAL YEAR PROJECT 2 (CASE STUDY ON RESOURCE MANAGEMENT IN THE CONSTRUCTION PROJECT)

NO	ACTIVITIES / WEEK	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11	WEEK 12	WEEK 13	WEEK 14
1	Research for journals and materials related to topic							SEMESTER BREAK							
2	Questionnaire Pilot Survey														
3	Questionnaire Survey														
4	Consultation with Supervisor														
5	Progress Report														
6	Pre - SEDEX														
7	Draft Report														
8	Final Report and Technical Report														
9	VIVA														

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Questionnaire Survey

This chapter will discuss the questionnaire survey findings. Twenty organizations that involved in construction of Kuala Lumpur International Airport 2 – New Low Cost Terminal Project were contacted out of which twenty eight individual respondents responded. Only respondents with minimum qualification of Diploma were approached for answering the questionnaire. This was done to preserve the quality of the opinion gathered in the survey.

The questionnaire was prepared in four parts: -

Part 1: General Information

Part 2: Resource Management Issues in Construction Project

Part 3: Significant Methods to Improve Resource Management in Construction Project

Part 4: Open Ended Section.

4.1.1 Part 1: General Information

This part contains six important questions about the respondent's background that are relevant to the author's project title. Among the questions are:

- Years of working experience
- Number of project involved
- Any involvement in airport construction before

The years of working experience of the respondents in construction projects will reflect the reliability and the accuracy of the feedbacks. The author had divided the respondents into two groups: - the group of respondents with less than 5 years of working experience and the other group of respondents with more than 5 years of working experience. 46.5% of the respondents falls into the group with less than 5 years of working experience and can be considered as young or junior engineer while the other 53.5% with more than 5 years of working experience can be considered as senior engineer. Figure 4 below shows the percentage of these two groups.

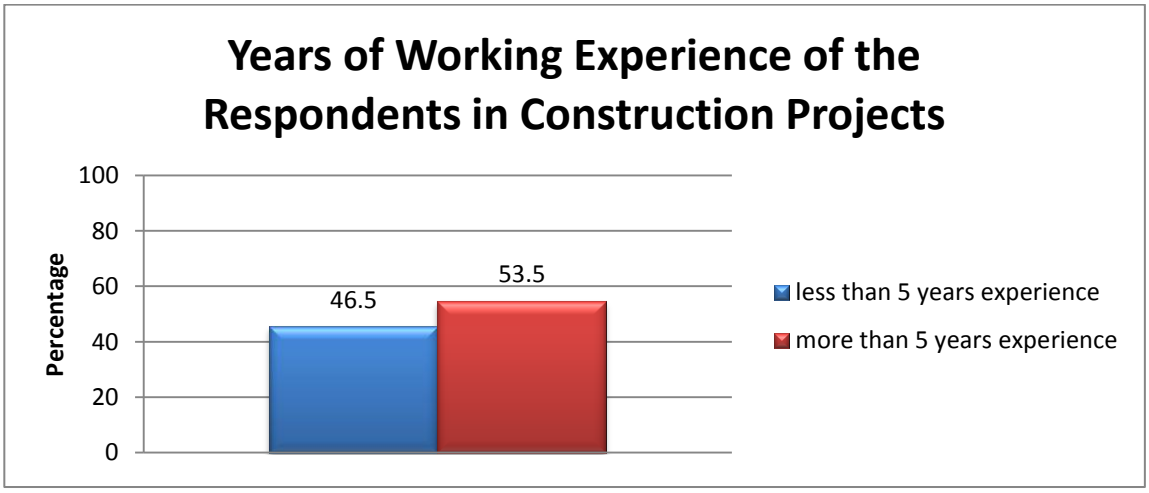


Figure 4: Years of Working Experience of the Respondents in Construction Projects

To add the validity to the feedbacks, a question of the number of project involved by the respondents had been asked. The percentage of the respondents that had involved in 1 to 10 projects is 82.1% while the other 17.9% the respondents that had involved in 11 to 20 projects. Figure 5 below shows the percentage on the number of projects that the respondents had been involved with.

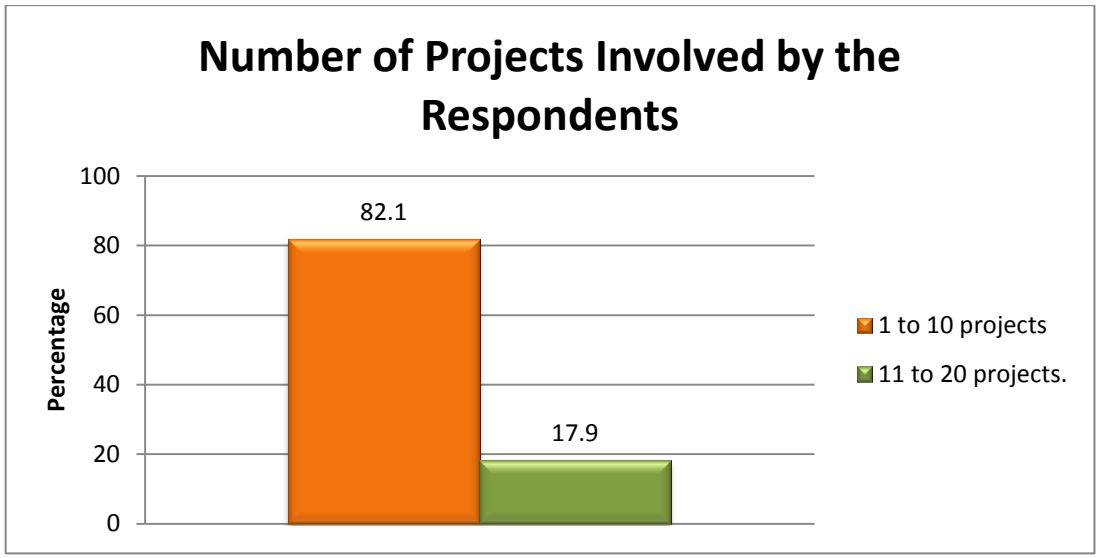


Figure 5: Number of Projects involved by the Respondents

In this General Information part, a question if the respondents had involved in the airport construction before had been asked. 53.5% of the respondents had involved in the airport construction before while the remaining 46.5% were not. Figure 6 below shows the percentage on respondent's involvement in the airport construction before.

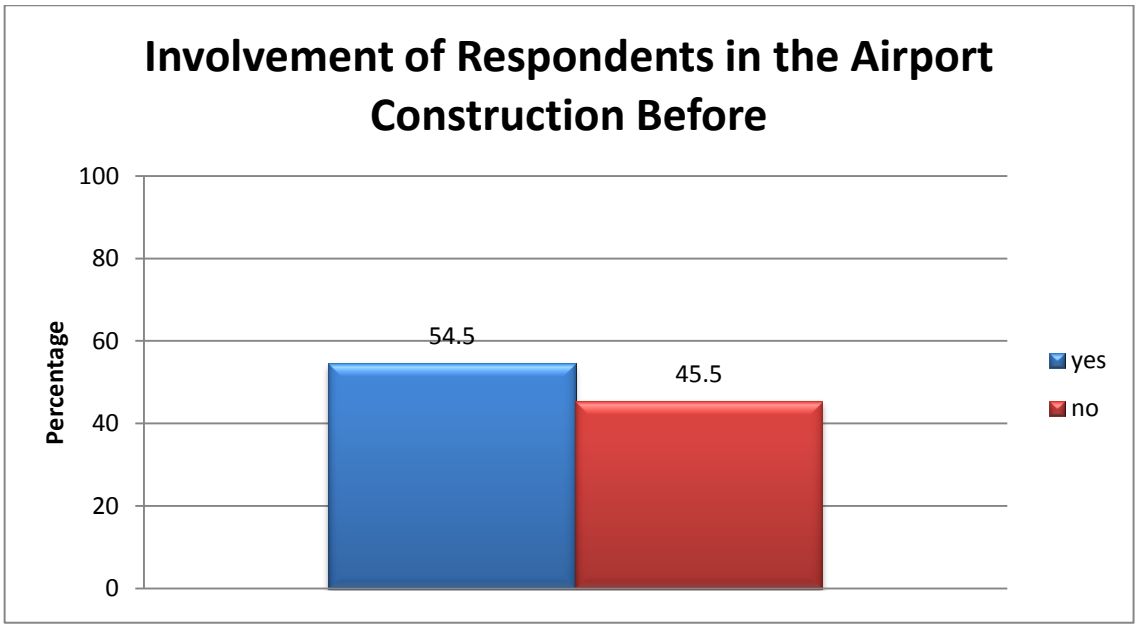


Figure 6: Involvement of Respondents in the Airport Construction Before

4.1.2 Part 2: Resource Management Issues in Construction Project

The second part of the questionnaire is based on the resource management issues in construction project. The issues identified in research articles are collated and categorized into three groups: -

A) Manpower/ Labor

B) Machineries/ Equipment

C) Materials.

The responses of Part 2 questionnaire are used for revealing the most frequent resource management issues in construction project. Ugwu and Haupt (2007) used the relative importance index method which also adopted to analyze the data collected from the survey.

For manpower/ labor scope, most of the respondents agreed that construction has to depend on foreign workers to respond to the high demand of skilled workers while least agreed that lack of skill and low level of initiative - labor-related factors causing low productivity. Table 1 shows manpower/ labor issues in construction project as ranked per relative importance index analysis.

Rank	Resource Management Issues in Construction Project	RII
1	Construction has to depend on foreign workers to respond to the	0.771

	high demand of skilled workers.	
2	The construction industry lacks appeal to young, potentially skilled workers.	0.714
3	Shortage of skilled workers.	0.700
4	Occupational stress/Workplace stress – influence in labor performance. (Example of stressful events: firings, altered responsibilities, trouble with bosses, variation of working hours or conditions, retirement and vacations).	0.686
5	Communication between labors – different spoken language causes misinterpretation of information.	0.643
6	Lack of skill and low level of initiative - labor-related factors causing low productivity.	0.629

Table 1: Ranking of Resource Management Issues in Construction Project for Manpower/ Labor

As for machineries/ equipment scope, most of the respondents shared the same opinion that weather factor can be affecting machineries/equipment-work-related performance and efficiency, and financial burden happened in the acquisition phase where contractors are invariably plagued with huge capital investment. Least agreed that poor machine maintenance practices cause cost and time exceeds the designated budget or schedule on projects. Table 2 shows machineries/ equipment issues in construction project as ranked per relative importance index analysis.

Rank	Resource Management Issues in Construction Project	RII
1	Weather factor – effecting machineries/equipment-work-related	0.714

	performance and efficiency.	
2	Type and size of machineries/equipment – appropriate selection in accordance to works to be executed.	0.700
3	Financial burden in the acquisition phase - contractors are invariably plagued with huge capital investment.	0.671
4	Procurement of major construction machineries/equipments - causes high delivery time uncertainty, which disrupt the construction schedule.	0.657
5	Equipment mobility - machineries/equipments are not available at the correct location and time.	0.629
6	Poor machine maintenance practices – causes cost and time exceeds the designated budget or schedule on projects.	0.614

Table 2: Ranking of Resource Management Issues in Construction Project for Machineries/ Equipment

For materials scope, most of the respondents agreed that weaknesses in quality assurance where deficiencies in the supply and flow of construction material causes productivity degradation and financial loss. Slightest agreed that material shortages – due to being based on an out of date plan, including last minute improvisation is a serious issue. Table 3 shows materials issues in construction project as ranked per relative importance index analysis.

Rank	Resource Management Issues in Construction Project	RII
1	Quality assurance - deficiencies in the supply and flow of construction material causes productivity degradation and financial loss.	0.771

2	On site managing - improper handling and managing materials on site during a construction process influence the total project cost, time and the quality.	0.700
3	Material supply - required materials are not available at the correct location and time.	0.686
4	Incompetence suppliers – affect materials delivery and quality.	0.671
5	Material shortages – due to being based on an out of date plan, including last minute improvisation. (material ordered very late – buffer at supplier, material ordered very early – buffer at site)	0.643
6	The size of construction site and material storage location - labors require extra time to move materials.	0.629

Table 3: Ranking of Resource Management Issues in Construction Project for Materials

4.1.3 Significant Methods to Improve Resource Management in Construction Project

The third part of the questionnaire is based on the significant methods to improve resource management in construction project. Similar to part 1, the author identified and gathered the methods in research articles and categorized into three groups: - A) Manpower/ Labor, B) Machineries/ Equipment, C) Materials. Similar to the part 2 questionnaire, the data received in the part 3 questionnaire was analyzed by Relative Importance Index method to determine the most frequent significant methods to improve resource management in construction project.

For manpower/ labor scope, most of the respondents agreed that significant methods to improve resource management in construction project are employer to provide healthy working environment and adaption of modern technology and training for labor. Minimum respondents agreed that by highlighting factors to control labor productivity such as organized work-environment and task-to-perform would work. Table 4 shows methods to improve manpower/ labor management in construction project as ranked per relative importance index analysis.

Rank	Significant Methods to Improve Resource Management in Construction Project	RII
1	Employer to provide healthy working environment.	0.857
2	Incentives and benefits - improvisation of organizational investment and promotion opportunities by construction companies to enhance potential workers.	0.829
3	Adaption of modern technology and training for labor.	0.800
4	Platforms for training - to be improved in providing new and current employees.	0.771
5	Experienced and committed management team -create the environment that enhances labor abilities and willingness to work.	0.757
6	Highlighting factors to control labor productivity - organized work-environment and task-to-perform.	0.743

Table 4: Ranking of Significant Methods to Improve Resource Management in Construction Project for Manpower/ Labor

For Machineries/ Equipment scope, most of the respondents agreed that efficient planning especially for major construction machineries/equipment procurement to be based on up-to-date work planning is a significant method to improve resource management in construction project. Least agreed with machines maintenance management policy – to be revised in term of logistics, maintenance, and repair as a method to improve. Table 5 shows methods to improve machineries/ equipment management in construction project as ranked per relative importance index analysis.

Rank	Significant Methods to Improve Resource Management in Construction Project	RII
1	Efficient planning - for major construction machineries/equipment procurement to be based on up-to-date work planning.	0.800
2	Bad weather backup plan – to prepare work to be done and work content if actual task-to-perform plan could not be done.	0.714
3	Site managers to be familiar with the characteristics of	0.700

	machineries/equipments most commonly used in construction.	
4	Maximum utilization of machineries/equipment - project manager to determine long range use for general planning and short use for detailed planning.	0.614
5	Dedicated maintenance team – to be allocated on site to take care of machineries/equipments maintenance.	0.586
6	Machines maintenance management policy – to be revised in term of logistics, maintenance, and repair.	0.543

Table 5: Ranking of Significant Methods to Improve Resource Management in Construction Project for Machineries/ Equipment

As for materials scope, most of the respondents share the same opinion that smart material management to control productivity and cost in construction projects is a significant method to improve. Minimum respondents agreed that dedicated site team that allocated on site to ensure efficient use is made out of the materials available is the appropriate method for improvement. Table 6 shows methods to improve materials management in construction project as ranked per relative importance index analysis.

Rank	**Significant Methods to Improve Resource Management in Construction Project**	**RII**
1	Smart material management - to control productivity and cost in construction projects.	0.886
2	Up-to-date project planning – operation team to synchronize latest project schedule with material procurement planning.	0.800
3	Materials procurement – efficient planning and material take-off, vendor evaluation, purchasing, expenditure, and shipping.	0.786
4	Constant follow up after a proper planning of materials	0.757

	management is necessary.	
5	Material storage – improvisation on material receiving, warehousing and inventory, and material distribution.	0.714
6	Dedicated site team – to be allocated on site to ensure efficient use is made out of the materials available	0.700

Table 6: Ranking of Significant Methods to Improve Resource Management in Construction Project for Materials

Cronbach's Alpha Analysis

Cronbach's alpha is commonly used a measure of reliability of a set of questions in a survey instrument. Generally a questionnaire with value of 0.8 is considered reliable (Field, 2009). The closer the value to '1', the more reliable the questionnaire is. If it is above 0.7, it is adequate and anything above 0.8 is considered optimal. Using the Statistical Package for the Social Science (SPSS) software, the value of Cronbach's alpha for this questionnaire is obtained as shown in Table 7.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.885	0.887	36

Table 7: Cronbach's Alpha

This questionnaire attained 0.885 which is considered acceptable and reasonably high level of reliability. To prove the reliability or Cronbach's alpha score for particular set of item from the

questionnaire, the Inter-Item Correlation Matrix is referred as per Appendix 1. The correlation above 0.3 or 0.4 between these items can be considered as an appropriate level. If the correlation value is below 0.3 or nearly zero or negative, it is considered unacceptable as the item is not correlating well with the others. Appendix 2 shows the Cronbach's alpha value for the questionnaire if a particular item is removed. For example the original Cronbach's alpha value is 0.885 and the value would be 0.875 if Part 2(A): Question 1: 'Lack of skill and low level of initiative – labor-related factors causing low productivity.' is removed which actually make the reliability of this questionnaire worse. But if Part2 (A): Question 3: 'Construction has to depend on foreign workers to respond to the high demand of skilled workers.' is removed, it would actually improve the reliability to 0.890 which would strengthen the measurement tools.

4.2 Case Study

The case study that the author had done was on the Kuala Lumpur International Airport 2 – A new Low Cost Terminal (LCT). The questionnaire was sent to the owners, contractors and consultants who are actively associated with the construction activities and possessing sufficient experience in the field of construction. This project is situated 2 km from the existing Kuala Lumpur International Airport. Figures below show the perspective views of the respective project. The background of the project is as per stated below:

- Client/ Owner: Malaysia Airport Berhad Holdings (MAHB)
- Contractor: Joint Venture of UEM Construction Sdn Bhd and Bina Puri Sdn Bhd
- Architect: LKMD Architecture Sdn Bhd (Client)
  A. Hanapiah Architect (Contractor)
- Civil and Structural: Ranhill Consulting Sdn Bhd (Client)
  SMA Bersekutu Sdn Bhd (Contractor)
- Mechanical and Electrical: KTA Tenaga Sdn Bhd (Client)
  Sepakat Setia Perunding Sdn Bhd (Contractor)
- Quantity Surveyor: Juruukur Bahan ANNOR

This new terminal with revised Gross Floor Area (GFA) of approximately 257, 000 square meters, with 68 boarding gates, 8 remote stands, 80 aerobridge, plus a retail space of 49, 000 square meters to accommodate 225 retail outlets. The construction of KLIA 2 project is a joint venture between UEM Construction Sdn Bhd and Bina Puri Sdn Bhd with the nature of the contract is design and build. The whole package is divided into seven sectors namely Sector 1(Domestic Piers), Sector 2 (Main Terminal Building), Sector 3 (International Piers) which will be constructed by UEM Construction under work package TB01A, while work package TB01B which will be constructed by Bina Puri covers Sector 4 (Sky Bridge), Sector 5 (International Piers), Sector 6 (Satellite Building) and Sector 7 (International Piers). As a joint venture, UEM Construction work package is under TB01A and Bina Puri Sdn Bhd is under work package TB01B.

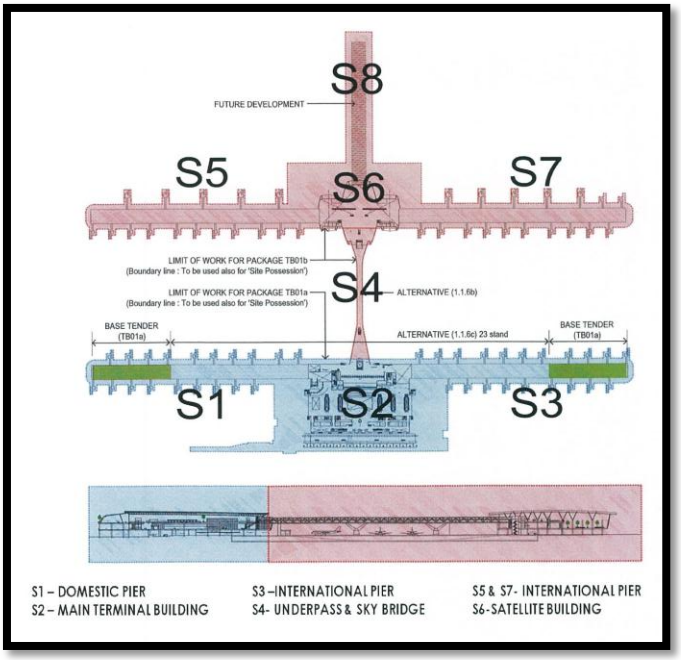


Figure 7: Layout Plan of KLIA 2

Figure 8: Overall view of KLIA 2 from North West

CHAPTER 5

CONCLUSION

Based on the research done, it can be concluded that resource management in construction project need to be further improved and monitored frequently for its effectiveness. From the survey conducted on the case study, the author believed that the members in the project team had the awareness about resource management in construction project. However, improvements in many aspects need to be considered in order to ensure the effectiveness.

The first objective of this paper which is to identify and analyze resource management issues in construction project had been achieved. Responses from the respondents shows various opinion and views towards the subject matter. It helps to rank the most common issues pertaining resource management specifically manpower/ labor, machineries/ equipment and materials management in the construction project. This rank can help future construction project with expected issues that might be faced during the construction work.

As for the second objective, which is to identify and analyze significant methods to improve resource management specifically manpower/ labor, machineries/ equipment and materials management in the construction project, had been achieved. Given that the feedbacks of the survey came from the construction team, all members are aware that the methods are applicable for implementation and effective to improve the human resource management in construction project for the betterment of construction industry.

For the future work recommendation, the author suggested that case study should be done not just in one construction project but the scope should be widen to other construction projects and to various part of the country to add the validity to the study. The results obtained will much more reliable, adequate and applicable towards the

construction project in Malaysia. Besides that, the author also recommended that the survey need to be in a larger scope by distributing the questionnaire survey to larger number of people in the industry.

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