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A RESEARCH ON CRITICAL FACTORS THAT INFLUENCE CONSTRUCTION PRODUCTIVITY RELATED TO HUMAN POWER IN GAMBANG AND KUANTAN

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ABSTRACT

Factors affecting the construction productivity are one of the most frequently researched topics in our country. In comparison with rapidly growing economies, we need to increase the productivity level. Our productivity level or output per employee was at 5.8% which is lower than Organisation of Economic Cooperation and Development (OECD) countries. As we know, we need to facing many challenges in order to be a develop nation but the most important is low productivity. The objective of this research is to identify factors that influence the productivity that related to human power, to identify the impact of factor influence to construction productivity and to determine the critical factors that influence the construction productivity related to human power. To achieve this objective, those factors can be identifying through a series of statistical analysis (SPSS) based on collected data of questionnaire survey. From the findings, top ten factor that influenced the productivity were identified such as worker skills, a real construction experience in construction field, change of worker (not loyal to the company), relationship between contractor and worker, communication with foreign worker, worker attitude and morale, labour absenteeism, working overtime, direct supervisor (daily interaction with labourers) and delay in responding to request for information. The most critical factor that influenced the construction productivity related to human power also identified which are worker skills. The result obtain from this research can be used as a guideline in producing the productivity rate which it can help the scheduling of construction production in order to increase our economies.

ABSTRAK

Faktor yang menjejaskan produktiviti pembinaan adalah salah satu topik yang paling kerap dikaji di negara kita. Berbanding dengan negara-negara yang pesat membangun, kita perlu meningkatkan tahap produktiviti. Tahap produktiviti bagi setiap pekerja adalah pada kadar 5.8% yang lebih rendah berbanding dengan Pertubuhan Kerjasama Ekonomi dan Pembangunan negara (OECD). Seperti yang kita tahu, kita perlu menghadapi pelbagai cabaran untuk menjadi sebuah negara membangun tetapi yang paling penting ialah penurunan kadar produktiviti. Objektif kajian ini adalah untuk mengenalpasti faktor-faktor yang mempengaruhi produktiviti yang berkaitan dengan kuasa manusia, untuk mengenal pasti kesan pengaruh faktor produktiviti pembinaan dan untuk menentukan faktor-faktor kritikal yang mempengaruhi produktiviti pembinaan yang berkaitan dengan kuasa manusia. Untuk mencapai objektif kajian ini, faktor-faktor yang boleh mengenal pasti harus melalui beberapa siri analisis statistik (SPSS) berdasarkan data yang dikumpul daripada kajian soal selidik. Daripada penemuan ini, sepuluh faktor yang mempengaruhi produktiviti telah dikenal pasti seperti kemahiran pekerja, pengalaman pembinaan sebenar dalam bidang pembinaan, perubahan pekerja (tidak setia kepada syarikat), hubungan antara kontraktor dan pekerja, komunikasi dengan pekerja asing, sikap pekerja dan moral, ketidakhadiran pekerja, kerja lebih masa, penyelia langsung (interaksi harian dengan buruh) dan kelewatan dalam bertindak balas untuk meminta maklumat. Faktor yang paling penting yang mempengaruhi produktiviti pembinaan yang berkaitan dengan kuasa manusia juga pasti yang kemahiran pekerja. Hasil daripada kajian ini boleh digunakan sebagai garis panduan dalam menghasilkan kadar produktiviti yang mana ia boleh membantu penjadualan pengeluaran pembinaan untuk meningkatkan ekonomi kita.

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CHAPTER 1

INTRODUCTION

1.0 BACKGROUND OF STUDY

There are two important groups to have effective study of construction productivity. The first is the consistent productivity across the scheduling of project. The second is the identification of the critical factors that influence the productivity. Improvement of productivity in construction of our country has been a major industry challenge, given its high impact on project schedule and results (Rivas, R., Borcherding, J., Gonzalez, V., and Alarcon, L. 2011).

The aim of this research is to investigate the factors influenced the construction productivity in Malaysia in order to increase the productivity rate. Productivity is one of the factors that affect our competitive position. The more productive we are the better we are able to fight on world markets (Roubini and Backus, 1998). Industry Minister Datuk Seri Mustapa Mohamed (2012) said that productivity was a gauge of performance which measured the output per employee.

Labour cost is regarded as one of the project components carrying the most risk (Hanna 2001). Construction labour productivity is perceived in the United States as an economic variable that has gradually declined since the 1960s (Dai *et al.* 2009). In Malaysia, our construction productivity level or output per employee was at 5.8% which is US$13,577.

The productivity growth at the USA is 2.2%, Japan is 1.2%, Canada 1.1%, the UK is 1.3, Germany is 0.9%, France is 1.0% and last but not least Italy the lowest is

0.1% has been shown in Figure 1.1. Although our productivity growth was higher than Organisation of Economic Cooperation and Development (OECD) which is the average is at 2.3% but our output per employee was lower than OECD countries. In Japan, the US and the UK, output per employee were at US$80,307, US$80,284, US$59,276 which were about four to six times that of Malaysia (Mustafa, 2011).

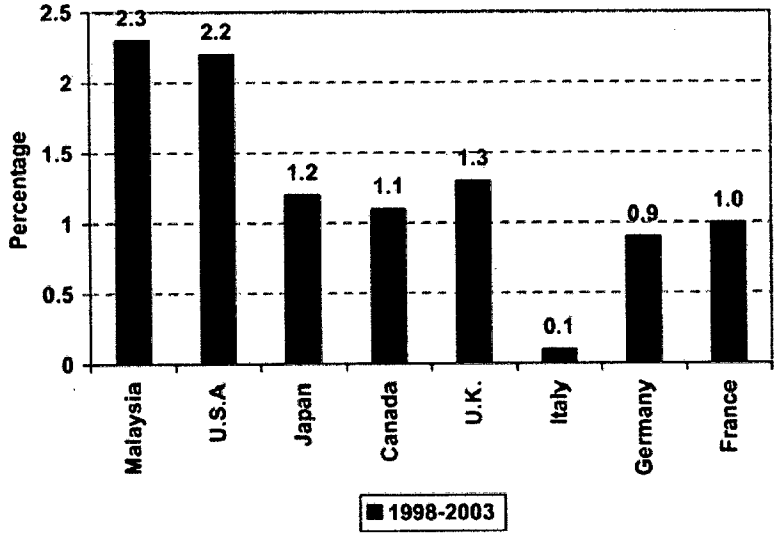

Figure 1.1: Comparison of productivity growth between Malaysia and selected OECD countries for year 1998-2003

Source: national Productivity Corporation (2003)

The evidence seems to show the labour construction performance in our country. Identifying and implementing management actions to improve construction labour is not desirable but also necessary (Rivas, R., Borcherding, J., Gonzalez, V., and Alarcon, L. 2011) to increase the construction productivity and identifying the factor influence and impact to the industry is the first step in finding opportunities for human power improvement.

There are some primary groups such as management, technological and human power. From this primary group, the factor influenced productivity will be identifying. The factor of construction productivity is importance because it can affect the project

cost and time overruns (CIDB, 2005). In most countries, labor cost comprises 30 to 50% of the overall project's cost, and thus is regarded as a true reflection of the economic success of the operation (Jarkas, A. and Bitar, 2012).

This research focus more on the factors that influence the productivity related to human power in Gambang state and Kuantan. At the end of this research, the critical factor that influenced will be identifying. The identifying critical factors can be used as a guideline in producing the productivity rate to avoid delays in a project. After the factor have been identify, the contractor can effectively act upon them to lower costs, enhance scheduling, and eventually obtain a more accurate productivity prediction when estimating construction costs (Borcherding and Alarcon 1991; Edmondson 1974).

1.1 PROBLEM STATEMENT

Data that we computed from Economic Report of Productivity Growth (2011), Ministry of Finance, Malaysia shows that construction industry has growth 3.51% which is lower than agriculture 4.78%, manufacturing 5.33% and services 4.30%. For the example in this situation when there was a slight delay because of the contractor's poor handling of the project on the progress of the second phase of the East Coast Highway, it had been scheduled to be completed in 2011 but was only expected to be completed in 2012 (Shaziman, 2010). The factor influences the productivity play a main role in increasing the productivity growth. Figure 1.2 proved that the lower productivity performance of civil engineering compare with residential and non residential of construction sector.

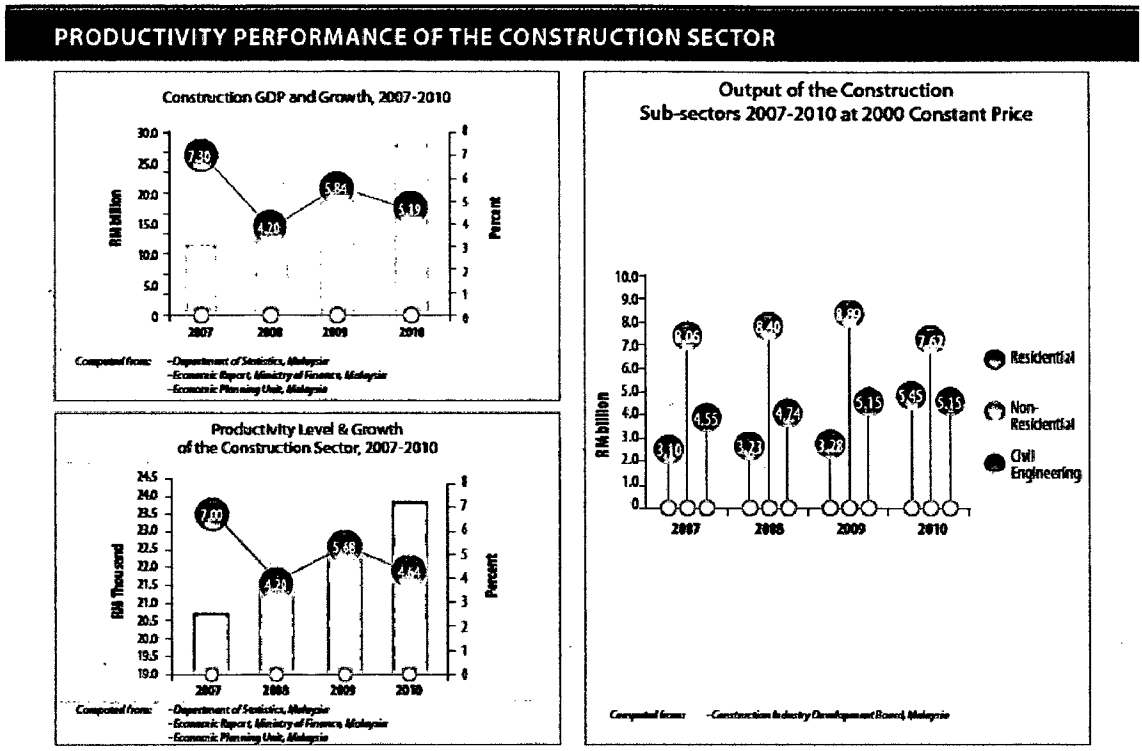

Figure 1.2: Productivity performance of the construction sector

Source: Economic Report Ministry of Finance Malaysia

Productivity in the construction industry in Malaysia is not only influenced by labour, but also influenced by other factor such as equipment or machineries, materials and construction methods. However, most researches and construction practices to date has primarily concentrated on workers' productivity (Alwi, 2003). If we observe the trends in construction management it has shown a very mixed picture of labour, equipment or machineries, materials and construction methods and indeed they solely depend on labourer's performance to increase construction productivity (Alwi, 1995).

The use of new technology and innovative methods has made great improvement in construction productivity. The improvement of labour productivity and quality of material should be a major and continual concern of those who are responsible for cost control of construction productivity.

Productivity in construction is defined as output per labour hour. Labour is a major part of construction project cost and the quantity of labour hours in performing a work in construction is main influence to management. Since labour is a major part, we need to know its characteristic in improving the factors. The labour characteristic include the age, skill, leadership, motivation and the most important is experience of workforce. The contractor needs to observe and measure the workers quality or performances over a period of time in avoid the worse impact to the productivity.

1.2 RESEARCH OBJECTIVE

i. To identify factors that influence the construction productivity related to human power
ii. To identify the impact of factor influence to construction productivity
iii. To determine the critical factors that influenced the construction productivity estimation related to human power in Gambang state and Kuantan.

1.3 RESEARCH QUESTION

i. What are the factors that influence the construction productivity estimation related to human power
ii. What are the impact factor influence to construction productivity
iv. What are the critical factors that influenced the construction productivity estimation related to human power in Gambang state and Kuantan.

1.4 SCOPE OF STUDY

In order to have a detail result of my research, a bunch of effort has been made to systematically identify and determine the critical factor that influence the construction productivity estimation related to human power in Gambang and Kuantan. Source from Pusat Khidmat Kontraktor,Kementerian Kerja Raya Malaysia mention that there are 50 registered Malay contractor class A in Kuantan. Civil engineering conquers

this contractor field with 42 numbers of contractor and 8 contractors from electrical. The scope of my research will cover the mining projects with class A contractor's.

It shown in this situation how important the factors influence the construction productivity estimation and their impact to future when there was a slight delay because of the contractor's poor handling of the project on the progress of the second phase of the East Coast Highway, it had been scheduled to be completed in 2011 but was only expected to be completed in 2012 (Shaziman, 2010).

It can be stated that the literature generally defines "leaders" as persons who recognize the need for and implement change, establish direction, align people, motivate and inspire, give away as opposed to hoard power, communicate a vision of where the organization is headed, build teams and share decision making, mentor and coach subordinates, and demonstrate a high degree of integrity in their professional interactions (Zenger and Folkman 2002; Bass 1990; Tichy and Devanna 1990; Kouzes and Posner 2002). Structured questionnaire will be distributed to the top management level in organization, the worker, site supervisor and the contractors as well at least three existing or on schedule projects at Gambang state and Kuantan, at different location and with different features.

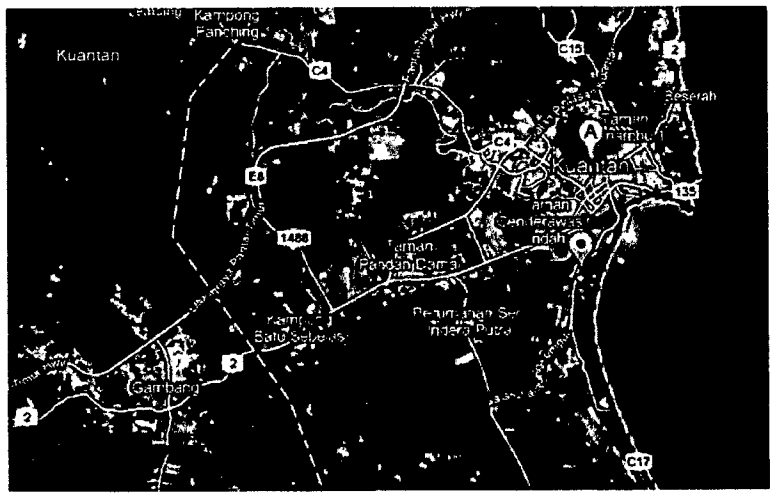

Figure 1.3: Research area Gambang state and Kuantan

Source: Google Map

With the result obtain from this research it will fill a gap in knowledge in determination of critical factors affecting the construction productivity related to human power in engineering industry. This critical factor also can be used by industry practitioners to develop a wider and deeper perspective of the factor influencing and also provide guidance to construction manager to improve the labour productivity in achieving a reasonable level of competitiveness and cost-effective operation (Jarkas, A and Bitar, C, 2012).

1.5 SIGNIFICANT OF THE PROPOSED RESEARCH

1.5.1 Labour performance

To know what is the level of labour performance including the contractor's performance and how their limited skill use in industry in improving the construction productivity.

1.5.2 Factor influence

To know and explore the factor influence the construction productivity estimation related to human power and produces the statistical result.

1.5.3 Impact to industry

To know the impact of all these factor to our industry and we should hang on in the hope that with the finding of the factor influence will be guidance to our local contractor in improving the productivity and no need to conquer by foreign contractor. The World Bank's Report (1984) in the book " The Construction Industry" conclude that due to the limited skills and resources on developing countries, a large amount of projects were won by foreign contractor.

1.5.4 Critical factor

To determine the critical factor that can help to improve the labour's performance to increase the construction productivity. They solely depend on labourer's performance to increase construction productivity (Alwi, 1995).

1.6 EXPECTED OUTCOMES

1.6.1 Identifying and ranked the factor influence productivity

The relationship between influencing factors and productivity for estimating purposes is very important in industry and a number of modelling techniques have been introduced. I hope at the end of this research, all the factor influence construction productivity estimation related human power will be identifying. So that the respondent can rank these following factors and it will help companies gain operational insight and thus improve productivity and profitability (Chang,A And Lbbs,W ,2006).

1.6.2 Revelations of factor's impact on construction productivity

There are many causes and factor that can affect the construction productivity estimation, including the difficulty in predicting the future and the uniqueness of each project. Direct labour cost of the project may be increase and make the project slow in progress, the schedule delay and increasing overhead costs thus make the project cost may subsequently be increase. And since the workers comprises different backgrounds and thus, different working methods which may affect the performance and construction productivity level of the respective trade among the various nationalities surveyed, and therefore the perceived important of the factor explored (Jarkas,A and Radosavljevic, M, 2012), it becomes necessary to normalize such an influence by collecting a large, yet balance and sample of respondent's feedback (Jarkas, 2012).

This situation can reduce or eliminating the contractor's profitability and impairing the owner's return on investment or project utility (Lbbs, W, 2012). So in achieve the second objective, at the end of this research we can see the effect of the factor influenced on the construction workforce.

1.6.3 Determination of critical factor

Measuring productivity for construction project is a complex problem (Alwi,S 2003). Each project is different in terms of delivery methods, administration, design specifications, and participants. If the critical factor influencing in any contracting organisation are identified, then measure can be taken to apply them in order to upgrade the contractors' performance (Ofri and Chan, 2001).

After the first objective achieve which is explore, identify and rank the factor influence the construction productivity estimation related to human power the critical factor will determining. At the end of this research, alternatives solution are provided to assist construction managers or contractor to achieve better productivity performance by providing them information on which factors they need to focus.

1.6.4 Provide leader skills to have better worker performance

Hanna *et al*, 2005 investigated the schedule acceleration problem, studied the impact of change orders on labour productivity and focusing on the effect of shift work on labour productivity. The impact of management practices related to reliability on labour productivity planning has also been studied as a relevant factor (González et al. 2008; Liu and Ballard 2008). A good understanding of the factor affecting labour productivity can be obtained through the viewpoint of those factors related on- site production in construction projects. This also can enable site managers or contractor to make decisions more effectively to improve labour performance (Dai *et al*, 2009).

Although so many researchers have been done, there is a lack of detailed research on the factors influence the construction productivity related to human power in our industry. Leader skills will be provided to have a better worker performance when analyzed these entire factor.

1.7 CONCLUSION AND SUMMARY OF THE CHAPTERS

This research consists of five (5) chapter and need to be completed. Introduction is the first chapter; in this first chapter it describes the background of the study, the research objectives and question, scope of study, the significant of the proposed research, expected outcomes and the summary of the chapters. The second chapter which is chapter two discuss on the literature review for the factor of influence productivity of construction, the impact that affect the productivity and the critical factor influence the construction productivity estimation related to human power and last but not least the literature review for the leader skills for labour improvement.

In chapter three I will represents a research methodology applied in this research consists of the collection of data, data sampling techniques, tools to collect data, all the respondents and method to analysis all the data of collected questionnaire. Chapter Four shows the details on data analysis and finding of factor that influence the construction productivity estimation, impaction of the factor affect to industry and the determination of the critical factor influence the productivity of construction.

Last but not least, Chapter Five would be the conclusion the overall of this research and some recommendation for future research.

CHAPTER 2

LITERITURE REVIEW

2.1 INTRODUCTION

There are lot of reference such as conference proceedings, engineering journals, books, the internet and newspaper to complete this chapter two, literature review. For this research, I will provide a literature review of construction productivity, critical factor influencing construction productivity, the impact of the critical factor influencing, and the innovation provided by the company for productivity improvement.

In this chapter, I will convey knowledge that has been already established, comparison of previous studies, current problems and issues in the industry.

2.2 CONSTRUCTION PRODUCTIVITY

2.2.1 Definition of productivity

Different researchers have found different meaning of productivity, such as Paul.K (1994) said that productivity isn't everything, but in the future it is almost everything. A country's ability and performance to improve its standard of living over time depends almost entirely on its ability to raise its output per worker. In other research, productivity can define as works hours divided by the equivalent quantity of work.

In construction, productivity can be define as work quantity per man-hours (or works hours) consumed to accomplish the work. Productivity is the ratio of output to all

or some of the resources used to produce the output (O'Grady, 2005). The productivity can be defined as internal efficiency of the organization or other object to be measured (Uusi-Rauvi and Hannula, 1996). A more accurate meaning of productivity is output divide by the input that is used to generate output. Which is output consists of services or products and input consists of material, labour, capital, energy and etc.

$$\text{Productivity} = \frac{\text{Output}}{\text{Resources Used}}$$

Based on Thomas and Mathew (1986), no accurate standardized productivity meaning had been established in the construction industry. It is difficult to define precise definition of productivity because different company used different method in their productivity measurement.

In addition, Paul.K (1994) said that productivity is analyzed is a key source of economic growth and competitiveness. For example, the productivity data are used to investigate the impact of product and labour market regulations on economic performances. Productivity is one of the factors that affect our competitive position. The more productive we are the better we are able to fight on world markets (Roubini and Backus, 1998) and we need to accelerate our rate of productivity growth to reach this target.

2.3 FACTOR INFLUENCE CONSTRUCTION PRODUCTIVITY

The factor of construction productivity is importance because it can affect the project cost and time overruns (CIDB, 2005). Identifying and analysing the most critical factor influencing construction productivity will lead to the development of more efficient and cost effective ways and strategies to improve the productivity of future construction operations (Markus, Janaka and George 2003). A lot of studies have been done related to construction productivity and more specific to human factors. The factor affected the motivation of construction factor was documented by Dozzi *et al* (2000). And he investigated more on issues that directly related to the worker during shift,

overstaffing, overtime, change of order and multiple shifts. The affect of overtime has been discussed widely today for construction productivity.

Many researchers interested in project schedule delay and labour productivity. It includes Thomas and Raynar (1997), Adrian (1988), and Henry (1991). Olgelsby *et al* (1989) extensively documented the affect of many human factors and external issues although the supporting data for the conclusion were not justifiable. A researched of the impact of change orders on labour efficiency of electrical contractors has been done by Hanna *et al.* (1999).

Lim *et al.* (1995) has studied that factors influencing construction productivity in Singapore show the problems affecting productivity were difficulty with acquirement of supervisors and workers, high rate of labour turnover, communication problems with foreign workers and absenteeism of worker from work site. There are five specific productivity problems in construction industry were identified such absenteeism, rework, lack of materials and lack of equipment and tools. Olomolaiye *et al* (1996) has been done a research that factors affecting the construction productivity of craftsmen in Indonesia. From this research it shows us the findings indicating craftsmen in this construction industry spent 75% of their time working productively.

According to Alwi (2003), he did a research and come out with the comparison between the productivity problems in Indonesia with other countries in terms of factor influencing the construction productivity such as interference, absenteeism, supervision delay and rework. From the previous research, Kaming *et al* (1997) stated that the main craftsmen's productivity problems in Indonesia were identified such as absenteeism, interference, lack of tools and followed by rework. Basically the main causes of rework were found as poor instruction from supervisor or contractor. From all of this research we can conclude that all the problems must related with workers. Mostly in a country, absenteeism must be one of the factors influencing the construction productivity.

According to Thomas and Sanders (1991), they summaries that the types of interruption that can affect the progress of labour productivity such as lack of supervision, overstaffing and rework. A research in Indonesian construction industry

found that poor performance of labour skills contributed 3.2% of the overall project cost. The characteristic of contractor and supervisors include the qualifications indicate especially small contractors. From researches that have been done, it shows that the small contractors experienced waste more than others. The contractor plays main role in each organization looking forward for success or failure.

The incapability of contractor's site management for organize site activities was found to be one of the critical factor in Malaysia (M.R. Abdul Kadir, W.P. Lee, M.S. Jaafar, S.M. Sapuan and A.A.A. Ali *et al*, 2005). An experience contractor is needed in produce an efficient and effective site management team to ensure that all works is on schedule and can completed on time proposed. Many researchers (Nima, Abdul-Kadir et al. 2001; Abdul-Aziz 2003; CIDB 2006; Jaafar, Abdul-Aziz et al. 2007; Ibrahim, Roy et al. 2010; Kamal and Flanagan 2012) summaries that our construction industry still suffers with many problems and being associated with poor quality and low productivity, unskilled workers, poor workers performance and project delays.

Country	Construction	Plantation	Domestic help	Manufacturing	Services	Others	Total	Percentage
Indonesia	92 805	101 521	62 347	16 188	2 063	1 125	276 049	64.96
Bangladesh	26 484	16 416	56	40 996	4 743	416	89 111	20.96
Philippines	1 160	49	26 876	1 298	191	554	30 128	7.09
Thailand	6 342	10 845	3 818	166	1 126	519	22 816	5.37
Pakistan	1 121	183	2	672	67	3	2 048	0.48
Others	2 218	460	83	660	867	574	4 862	1.14
Total	130 130	129 474	93 182	59 980	9 057	3 191	425 014	
Percentage	30.6	30.5	21.9	14.1	2.1	0.8		100.00

Figure 1.4: Number of foreign workers by nationality

Source: Immigration Department

The Malaysian construction industry hire heavily on foreign labour especially from Bangladesh, Indonesian, Nepal and Myanmar (Ernawati, Syarmila, Norhidayah and Faizal Baharum *et al* 2012). Figure 1.4 shows us the statistic of foreign workers by nationality in our country and indicated that construction industry being the most active

in hiring the foreign worker. The Union of Employees in the Construction Industry believe that we can't do without them (Hiebert, 1995).

Constructions employers in our country prefer to hired more foreign worker because they willing to works for extra hours, flexible, willing to accept low wages and obedient (Abdul Aziz, 2001). The wide availability and low wages of foreign worker will give a big impact on construction productivity and quality. The advantages are the contractors will have a little incentive to adopt and implement better quality and performance and safer technologies (Ernawati, Syarmila, Norhidayah and Faizal Baharum *et al* 2012). In another hand, this situation also can affect the contractor's interest in hire highly skilled labour since CIDB records shown that mostly foreign labourers in our industry are general workers and unskilled labour (CIDB, 2006).

2.4 IMPACT OF LOW CONSTRUCTION PRODUCTIVITY

The Malaysian construction industry experiences cost overruns and time due to various project delay factors that affect the construction productivity (A.Kadir, W.P. Lee, M.S. Jaafar, S.M. Sapuan and A. Ali *et al*, 2005). It is important for us to maintain the country's growth in productivity because it is the key determinant of long-run growth which can lead to higher prosperity. As we know the construction industry is an industry of main strategic importance and its productivity performance has a significant effect on national economic growth (C.Chia , M.Skitmore, G.Runeson and A.Bridge *et al* , 2012). Hence in construction industry the productivity increases when times are good and profit is higher and decreases when profit is lower. In the long run, there are very small changes (Runeson, 2000).

There are three common types of indicators of performance in construction projects which are cost, schedule and quality (McKim *et al*, 2009). A research done by Lam and Runeson (1999) and they elaborated that one of the objectives of a construction organization is to have a complete construction projects at maximum efficiency in terms of cost and time by optimizing the use of four resources which is plant, materials, manpower and management. The manpower is one of the important resources in affecting the productivity performance.