



Principal Factors Impacting Labor Productivity in Malaysian Construction Industry: A Survey of Constraints on Klang Valley Non-Residential Projects

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Abstract- The research aims to identify the principal factors affecting labor productivity in Klang Valley non-residential projects and to rank the factors in top five according to the indexes. There were 19 factors identified through a detailed literature review. Factors of similar category were grouped together into three main groups: labor, managerial, equipment and material. The structured questionnaire was used in order to gather sufficient information in an efficient way. A total of 320 questionnaires were distributed and 170 complete sets received back were analyzed and presented in the form of tables. The collected data were analyzed by using severity index, frequency index and important index. The analysis of the identified factors indicated that the top five factors negatively affecting labor productivity in Klang Valley non-residential projects were: equipment and material shortage, poor site management, lack of experience, misunderstanding among labor and superintendent and problems related to drawing and specification. The research was believed to be useful information in improving labor productivity especially in non-residential projects around Klang Valley, Malaysia.

Keywords- *Labour Productivity, Malaysian Construction Industry, Klang Valley, Non-Residential Projects*

I. INTRODUCTION

Labour productivity has become one of the most researched topics among the researchers in the worldwide. Without any doubt, a construction activity is one of the key elements that contribute to the nation's Gross Domestic Product (GDP) [1]. To prove this statement, the American construction industry provides jobs over eight million peoples and has created a 12% of the increment in GDP [2]. While in Britain, the construction industry employed about seven million peoples and recorded 8% increment in the GDP [3]. In Germany and Japan, both have considered into account about 10% and 18% of GDP [1]. When compared to other sectors, the level of productivity in the construction industry showed a decreasing rate [3]. It also happened in Malaysia. The data from National Productivity Corporation of Malaysia showed that construction sector recorded the lowest rate in productivity when compared to other sectors such as manufacturing, agriculture and services. The low level of productivity indicated that construction

industry needs to be more aggressive in adopting new technologies and reduce over-dependence on low skilled labor. It showed that low skilled labors were one of the factors that contribute to the low productivity of construction industry in Malaysia [4].

Improving labors efficiency has become one of the targets for most of the construction companies around the world. This is because they are dynamic and their costs represent almost half of their total construction cost [5]-[6]. Besides that, the profits from construction projects are determined by the productivity of labors [7]. Labor productivity can be measured and analysed at two different levels that are industry and company level. In industry level, it consists of clients' organization, contractors' organization and consultants' organization. While in company level, it consists of either clients' organization, contractors' organization or consultant's organization [8]. In the Eleventh Malaysian Plan, level of labor productivity in the construction sector was targeted at 9.6% and there were some fluctuations in terms of labor productivity for the past few years [4]. Thus, this study was conducted in order to identify the factors impacting labor productivity of Malaysian construction projects and to rank the factors in top five according to indexes. The scope was narrowed to non-residential projects since non-residential projects were recorded the lowest productivity rate at 4.9% in the year of 2016 compared to other sub-sectors in the construction [4]. The results will be useful information to improve construction productivity level in Malaysia.

II. PREVIOUS STUDIES

Factors influencing construction labor productivity can be categorized into two that are external and internal factors. External and internal factors are representing those outside the control of an organization and those originating from the firm itself. In detail, external factors are including the nature of the industry, client knowledge on the construction procedures, weather and level of economic development while internal factors are including management, technology, labor and labor association [9]. According to the structural survey conducted in Kuwait, the findings showed that clarity of technical specifications, the extent of variation/change orders

during execution, coordination level among design disciplines, lack of labor supervision, proportion of work subcontracted, design complexity level, lack of incentive scheme lack of construction managers' leadership, stringent inspection by the engineer and delay in responding to requests for information were the most significant factors that affecting labor productivity [10]. In another research through structured questionnaire with four primary groups, the finding showed that payment delay, skill of labor, a shortage of experienced labor, lack of labor supervision, motivation of labor, working overtime, lack of leadership among construction managers, high humidity, clarity of technical specification and high/low temperature were the main factors that contributed to the labor productivity in Egypt. The research was believed to provide a guide to construction managers for efficient utilization of the labor force and assist in achieving a reasonable level of competitiveness and cost-effective operation [11].

In Malaysia itself, there were several studies that carried out by researchers in order to identify the factors affecting labor productivity. But, none of the research until the year of 2017 was conducted specifically on non-residential projects around Klang Valley, Malaysia. A research on factors affecting construction labor productivity for Malaysian residential projects was conducted. A total of 100 respondents consisting 70 contractors, 11 developers and 19 consultants have participated in the study. The research found out five most important factors affecting labors productivity in Malaysia. Among the factors was the material shortage at the site, non-payment to suppliers causing the stoppage of material delivery to site, change order by consultants, late issuance of the construction drawing by consultants and incapability of contractors' site management to organize site activities [12]. While, in another survey done by [13], it can be concluded that lack of motivation and incentive, lack of equipment, disruption of power and water supply and inspection delay were the most significant factors affecting labors productivity in Malaysian construction industry. A research on factors affecting labor productivity in building projects in the Gaza Strip found out five major factors that negatively affecting labor productively out of 45 factors considered in the survey. The five major factors were the material shortage, lack of labor experience, lack of labor surveillance, misunderstandings between labor and superintendent and drawings and specification alteration during execution [14].

A structured survey was done on factors influencing craftsmen productivity in Indonesia. In this study, 243 workers participated and most of them were working as bricklayer, carpenter and steel fixer. The research was conducted over the period of four months and found out five specific productivity problems which were lack of materials, rework, absenteeism, lack of equipment and tools and gang interference [15]. According to United Nation Report, there were two major sets of factors that affect the site labor productivity requirement. The two factors were organizational continuity and execution continuity. Under the organizational continuity, it encompasses physical component of work, specification requirement and design details while execution continuity encompasses work environment and how effectively a job is organized and

managed. Management aspects mostly include weather, material and equipment availability, out of sequence work and congestion [14][16]. Factors influencing site productivity were classified into three main groups. Among the group of factors were labor characteristics, project work conditions and non-productive activities [17]. Technological and administrative were the main factors affecting construction productivity. The design of the project was mostly related to the technological factors while the management and construction of the projects were related to the administrative group of factors. Under the technological factor, it comprises several sub-groups such as design factors, material factors and location factors while under the administrative factors, it comprises sub-groups such as construction methods and procedural factors, labor factors, social factors and equipment factors [18]. A research on factors affecting productivity in the construction industry was conducted in Singapore. Based on findings, the most important problems affecting productivity in Singapore were difficulty in recruitment of supervisors, difficulty with the recruitment of workers, high rate of labor turnover, absenteeism from the work site and communication problems with foreign workers [19].

III. METHODOLOGY

This study was based on the structural survey designed in order to gather sufficient information in an effective way. A total number of 19 factors that might affect the labor productivity in Malaysian construction sector generated on the basis of literature review. Then, the factors were tabulated in a questionnaire form. The structure of questionnaire was divided into two parts. Part I was related to the general background of the respondents. Several questions related to the experience of the respondents in handling non-residential projects were asked. While part II consists of the list of identified factors that might affect labor productivity in non-residential construction projects. The contractors were asked to answer questions based on real experience in handling non-residential projects around Klang Valley. Factors of the similar category were grouped together, giving rise to three main groups: equipment and material, labor and managerial. Two questions were asked of each group: "The severity level of this factor on labor productivity of non-residential projects" and "The frequency of occurrence of this factor". Five-points of Likert scale were used to categorize the severity level. Among the points were very high, high, moderate, low and very low. While for the frequency index, it was also categorized on five-points of Likert scale as follows: always, often, sometimes, rarely and very rarely.

A. Population and Sampling

In this study, the target populations were G7 contractors that registered and handling projects in Klang Valley. A total number of 1917 G7 contractors were registered under the CIMS until the year of 2017 [20]. A systematic random sampling method was used in this study. From 1917 contractors, 320 samples were chosen to complete the research. The total number of sample size was calculated by using the formula as below [21]:

$$s = (X^2 NP (1 - P)) / (d^2 (N - 1) + X^2 P (1 - P)) \quad (1)$$

Where:

S = Required Sample size

X = Assumed 1.96 for 95% confidence level

N = Population Size

P = Population proportion (expressed as decimal) assumed to be 0.5 (50%)

d = Degree of accuracy (5%), expressed as a proportion (0.05). It is margin of error.

The questionnaires were sent out to 320 contractors asking their opinion in the ranking of the identified 19 factors in terms of severity and frequency using the Likert scale. Only a total of 170 questionnaires were received back representing a response rate of 53%. The gathered data through survey were analyzed by using severity index, frequency index and important index.

IV. DATA ANALYSIS

The method of data analysis was adopted from previous research [23]. The gathered data were analyzed and ranked through the following statistical techniques and indexes:

A. Frequency Index

The formula below is used to rank factors affecting labor productivity in Malaysian non-residential projects based on frequency of occurrence as stated by the respondents.

$$\text{Frequency Index (F.I) (\%)} = \sum f (n/N) \times 100/5 \quad (2)$$

Where,

f = The constant expressing weighting given to each response (ranges from 1, for very rarely, to 5 for always)

n = The frequency of the responses

N = Total number of responses

B. Severity Index

The formula below is used to rank the severity of identified factors as indicated by the respondents.

$$\text{Severity Index (S.I)(\%)} = \sum s(n/N) \times 100/5 \quad (3)$$

Where,

s = The constant expressing weighting given to each response (ranges from 1, for very low, to 5 for very high)

n = The frequency of the responses

N = Total number of responses

C. Important Index

The importance index of each factor is calculated by using the values from both frequency and severity index. The formula is shown as below:

$$\text{Importance Index (IMP.I) (\%)} = [(F.I) (\%) \times (S.I) (\%)] / 100 \quad (4)$$

V. FINDINGS

In this study, 19 factors negatively affecting the labor productivity in Malaysian non-residential projects were identified and ranked through the frequency index, severity index and important index based on equation (2)-(4). The identified factors were classified into three main groups: labor, managerial and equipment and material.

A. Labor Group

Table 1 shows the ranking of factors for labor group. A total of seven factors were identified under this group. Based on the results, the top three frequency, severe and important factors were: lack of experience, bad labor relation and overmanning.

B. Managerial Group

Table 2 illustrates the ranking of factors under the managerial group. There were seven factors identified under this group. The table shows that the top three frequency, severe and important factors were poor site management, Misunderstanding among labor and superintendent and problems related to drawing and specification.

C. Equipment and Material Group

Table 3 indicates the ranking of factors under the equipment and material group. There were five factors identified under this group. The top three frequency and important factors were equipment and material shortage, delay in material delivery and old and inefficient equipment while the top three severity factors were equipment and material shortage, delay in material delivery and improper storage material location.

TABLE I. RANKING OF FACTORS FOR LABOR GROUP

Factor	F.I	Rank	S.I	Rank	IMP.I	Rank
Labor personal problem	35.5	6	40.6	7	14.4	6
Overmanning	68	3	65	3	44.2	3
Labor absenteeism	55.6	4	50.3	4	27.9	4
Lack of experience	79.4	1	75.6	1	60	1
Bad labor relation	70.1	2	69.5	2	48.7	2
Lack of competition	43.5	5	44.5	5	19.4	5
Lack of labor	30	7	39.7	6	11.9	7

TABLE II. RANKING OF FACTORS FOR MANAGERIAL GROUP

Factor	F.I	Rank	S.I	Rank	IMP.I	Rank
Poor site management	78.6	1	80.6	1	63.4	1
Improper construction method	69.5	5	44.8	6	31.1	6
Misunderstanding among labor and superintendent	72	2	76.5	2	54.9	2
Problem related to drawing and specification	70.6	3	60.7	3	42.9	3
Lack of training and supervision for labor	68.6	7	43.5	7	29.8	7
Variation Order (VO)	69	6	50.6	5	34.9	5
Inspection delay	70.2	4	56.4	4	39.6	4

TABLE III. RANKING OF FACTORS FOR EQUIPMENT AND MATERIAL GROUP

Factor	F.I	Rank	S.I	Rank	IMP.I	Rank
Equipment and material shortage	81.5	1	79.5	1	64.8	1
Old and inefficient equipment	65.5	3	40.5	4	26.5	3
Delay in material delivery	69.3	2	65.6	2	45.5	2
Low quality of raw material	50.1	4	40.8	5	20.4	5
Improper storage material location	49.6	5	50.1	3	24.8	4

VI. DISCUSSION

The top five factors affecting labor productivity in Malaysian non-residential projects were discussed below:

A. Equipment and Material Shortage

Based on the findings, equipment and material shortage were one of the major factors that affect labor productivity in Malaysian non-residential projects. Some of the construction companies in Klang Valley do not own equipment for the construction work. They rent the equipment when required. This will cause some problems in obtaining the equipment during the seasons when there are many construction works. Besides that, the rented equipment is poorly maintained and leads to failures causing the projects to be delayed. Time spent waiting for the arrival of equipment and material as well reduces the quantity of work expected during a given man-hour time period. Thus, it is affecting the overall productivity of labors in the construction work. These findings can be supported by previous studies that done by few researchers [13] [23].

TABLE IV. TOP FIVE FREQUENCY INDEX AND THEIR RELATED GROUPS

Factor	F.I	Rank	Related Group
Equipment and material shortage	81.5	1	Equipment and material
Lack of experience	79.4	2	Labor
Poor site management	78.6	3	Managerial
Problem related to drawing and specification	70.6	4	Managerial
Inspection delay	70.2	5	Managerial

TABLE V. TOP FIVE SEVERITY INDEX AND THEIR RELATED GROUPS

Factor	S.I	Rank	Related Group
Poor site management	80.6	1	Managerial
Equipment and material shortage	79.5	2	Equipment and material
Misunderstanding among labor and superintendent	76.5	3	Managerial
Lack of experience	75.6	4	Labor
Bad labor relation	69.5	5	Labor

TABLE VI. TOP FIVE IMPORTANT INDEX AND THEIR RELATED GROUPS

Factor	IMP.I	Rank	Related Group
Equipment and material shortage	64.8	1	Equipment and material
Poor site management	63.4	2	Managerial
Lack of experience	60	3	Labor
Misunderstanding among labor and superintendent	54.9	4	Managerial
Bad labor relation	48.7	5	Labor

B. Poor Site Management

Poor site management can result from a series of factors such as poor labor management, poor communications between labors and managers, poor communications between construction parties, poor material management, lack of site managers' experience and lack of labor experience [22]. When related to the non-residential construction projects in Klang Valley, poor site management leads to bad labor mood, interrupt the movement of labors and machinery in the construction site. Lack of knowledge and inexperience of the

site management team in the arrangement, scheduling and procurement affecting the work progress and resulting in poor labor productivity. These findings can be supported by previous studies that done by few researchers [12] [23].

C. Lack of Experience

In general, the level of experience among labor will determine the quality of output in the construction projects. In other words, the level of experience improves both the intellectual and physical abilities of labor that consequently improves productivity [23]. One of the major problems in Malaysian non-residential project is lack of experience among the labors. Most of the general workers are foreigners who came to Malaysia due to lack of job opportunities in their countries. Some of them are very new to the construction industry and fully depends on the guides from superiors. Besides that, the experienced engineers and managers are moving abroad especially to Middle East countries which offer them a high paid job. Therefore, the absence of skilled workers in non-residential projects around Klang Valley is among the reasons that affecting labor productivity. These findings can be supported by previous studies that done by few researchers [23] [24].

D. Misunderstanding Among Labor and Superintendent

As mentioned earlier, most of the construction labors around Klang Valley are foreigners from various parts of globe and speak different languages. Our superiors are mostly Malaysian who converse primarily in the Malay and English languages. Not all of the labors can understand well English language. Thus, it creates language barriers between labors and superintendents which lead to misunderstanding in terms of command given by superiors. The labors productivity is affected when the given orders cannot be fully comprehended by them. Moreover, this social barrier between labors and superintendents creates an unhealthy relationship between them. Such situation has profound negative effects on the labors state of mind and consequently decreases productivity levels. These findings were similar to [25].

E. Problems Related to Drawing and Specification

Alteration of drawing and specification under the managerial group is among the factors that affect labor productivity in the Klang valley non-residential projects. Alteration in drawing and specification cause the efficiency of labors reduced by 30% [26]. The adjustment of resources and manpower required additional time that might affect the productivity of labor. For example, the hacking of hardened concrete might be time-consuming and affects the workers' motivation [12]. The sequence of works is also disrupted due to rework resulting from alteration of drawing and specification. This problem was ranked fourth most important productivity problem in Indonesia construction projects [15].

VII. CONCLUSION

In conclusion, the objectives of this study are to identify the factors impacting labor productivity of Malaysian non-residential construction projects in Klang Valley and to rank the factors in top five according to indexes. To do so, 320 sets

of questionnaires were sent out to the contractors. 19 factors that affecting labor productivity was identified through detailed literature review. The surveyed contractors were asked to rank the factors according to the level of frequency and severity. The identified factors were grouped into three main groups: labor, managerial and equipment and material. From the findings, it can be concluded that equipment and material shortage, poor site management, lack of experience, misunderstanding among labor and superintendent and problems related to drawing and specification were the overall top five factors negatively affecting labor productivity in Klang Valley non-residential projects. Specifically, equipment and material shortage, lack of experience, poor site management, problem related to drawing and specification and bad labor relation were the main identified frequent factors while poor site management, equipment and material shortage, misunderstanding among labor and superintendent, lack of experience and bad labor relation were the top identified sever factors in the construction projects. In terms of important factors, equipment and material shortage, poor site management, lack of experience, misunderstanding among labor and superintendent and bad labor relation were identified.

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