

Conceptual Framework Factors Affecting Construction Labour Productivity

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ABSTRACT

Productivity is one means to measure the efficiency of a construction project. Most of the problems that are always encountered in construction projects are problems related to labour productivity. Labour productivity has become part of the issues that significantly affect the construction project (CP) performance (cost, quality, and time). Labour turn into the most significant productive resource in achieving profitability and successful project. Based on previous investigations, the amount of costs spent on workers is above 30 % of the total cost of the overall project. So it is essential to pay attention to the increase in productivity of construction labour. Labour performance in the construction business remains an indicator of competitiveness and achievement in the construction company. Therefore, by focusing on the productivity of the construction labour, it is very likely that a construction company can achieve a higher level of project completion, more economical construction costs, and control the performance of the ongoing project. One way to increase the productivity of construction labour then requires an understanding of the factors that influence labour productivity. To achieve the increasing construction labour productivity (CLP), it needs a conceptual framework of variables in the form of affecting factors in the CLP. The conceptual framework is obtained by conducting a literature review of related articles from indexed journals and contributions from construction management practitioners in Indonesia. The concept of this framework was built for future research by making a model of CLP.

Keywords: Productivity; construction; project; labour; framework

INTRODUCTION

The construction industry drives economic growth because it has a considerable effect on the economy of a country (Durdyev 2016). Also, the construction industry can provide job vacancies nationally (Khoiry et al. 2017). Absorption of labour through the construction industry reaches 7% of the global labour (Abdulaziz M. Jarkas, Malcolm & Horner 2015; Horta, Camanho, Johnes, and Johnes 2013). In addition, this industry in developing countries mainly contributes around 9% of gross domestic (Horta, Camanho, Johnes and Johnes 2013). Otherwise, in developing countries, the construction industry devotes an average of 10% of gross domestic product from the whole state revenue (Kazaz et al. 2016). Improvements in the construction industry can be made by increasing construction productivity. Nevertheless, low construction

productivity remains a primary issue in the construction business in the world (Ghoddousi et al. 2015). Based on the Construction Industry Institute (CII), productivity is part of the performance indicators frequently used to access the development in CP. Productivity is the vital and flexible resource used in the assessment. Besides, the loss of productivity in a CP will cause delays and increase costs because it is related to time (Hamzah et al. 2011).

In CP, construction productivity is straightly relevant to labour (Muqem et al. 2012). Labour is the primary resource that has an immediate effect on the time and cost of each activity, and labour costs are a function of its productivity. labour as a core and primary input to optimize construction companies' value and efficient output (Bon-Gang Hwang 2013; Jarkas 2012). It measured the labor productivity functions to evaluate and assess the overall performance of construction companies (Bon-Gang Hwang 2013). With a focus on the CLP, Construction companies

can achieve a higher level of project completion and monitor and control the current project's performance. High labour productivity will affect the progress of a CP because most of the budget for a CP is used for labour costs (Hajikazemi, Andersen, and Langlo 2017; Hanna, Taylor, and Sullivan 2005; Sonmez 2007). Therefore, the low labour productivity will impact project completion time, ultimately impacting project costs. Construction labour productivity (CLP) has become the subject of various studies in various countries (Abdul Kadir et al. 2005; Dai, Goodrum, and Maloney 2009; Rivas et al. 2011). Thus, efforts to increase productivity are still underway. By increasing research for CLP, it is recognized that the CLP is entirely unidentified. Therefore, research in this area continues to be carried out in increasing productivity in the construction business.

The first step and a prerequisite for increasing the CLP are by identifying the influencing factors and the impact on CLP to find opportunities in increasing the labour productivity in the construction business (Ghoddousi and Hosseini 2012). Thus, the objective of this study is to propose the conceptual framework of factors affecting CLP. The concept of this framework can be used in the future as a first step to making a projection model of CLP in increasing productivity.

LITERATURE REVIEW

PRODUCTIVITY, PROFITABILITY AND PERFORMANCE RELATIONS

The American Association of Cost Engineers Productivity stated that a relative standard of labour efficiency is a success or failure compared to establishing bases or norms (Allmon et al. 2000). In previous studies, there are two types of definitions of productivity (Park 2006). Firstly, the output/input is often used in construction. The second is input and output used to estimate. Productivity is related to profitability and performance. The term profitability is related to productivity because it shows profitability through the relationship of output and input (Tangen 2005). In spite of that, profitability is monetary because it influences price factors (Tangen 2005). There is a difference in productivity, profitability, and performance in a project. Profitability takes economic effects into account, and productivity is related to actual processes between pure physical phenomena (Tangen 2005). However, the most prominent productivity link is performance. Performance plays a broader concept that involves the aspects of operational and economical in an industry (Pekuri, A., Haapasalo, H., & Herrala 2011). The relationship between productivity, profitability, and performance is shown in Figure 1.

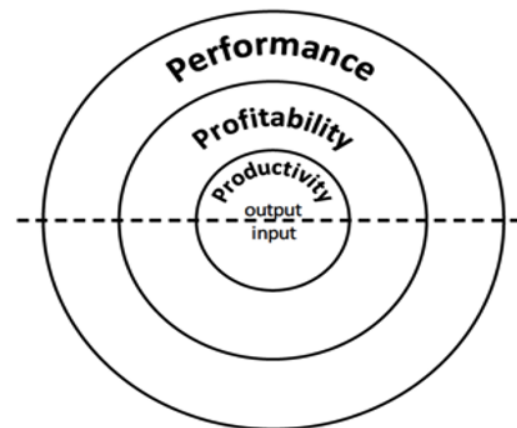


FIGURE 1. The relationship among productivity, profitability, and performance.

Source: (Pekuri, Haapasalo & Herrala 2011)

From Figure 1, it is clearly stated that the relationship between productivity, profitability, and performance is close. Productivity is part of profitability and performance. Therefore, to achieve profit and performance, it is necessary to estimate and to increase productivity, especially for CP activities. Profitability can be achieved if productivity increases, and performance can be achieved if productivity and profitability have been met. This performance is related to the cost, quality, and time that are targeted in the project. Furthermore, the relationship with performance is more significant because it relates to the economy of a country.

PREVIOUS RESEARCH OF FACTORS AFFECTING CLP

Focus on conducting studies in Canada to identify parameters that affect the CLP directly in the site by looking at work results precisely in the field (Moselhi and Khan 2012). A total of nine factors are grouped into three categories of factors, namely the category of weather (temperature, humidity, wind speed, rain), the crew category (gang size, labour percent), and projects (type of work, floor level, method of work). The study results show that the factor's temperature develops into a tremendous influential factor on the CLP in the field, followed by the type of work and floor level (Jarkas & Radosavljevic 2014). They have identified demotivational factors could affect the productivity of CP managers in Qatar. Identification was carried out on 38 demotivational factors, the results showed that the ten most deactivating factors were affecting productivity. Those factors were the lack of financial incentive schemes; slow decision-making process by the owner, remuneration scale, delay in responding to Request for Information (RFI), skilled labour shortage, inadequate materials, technical specifications for clarity and completeness, frequent changing plan or order during

implementation, level of image quality, and rework. Their study (Dai et al. 2009) identified 83-factor items in 2-factor groups; the frequency factor consists of 27-factor items, and the agreement factor consists of 56-factor items. The analysis showed that latent factors affecting construction productivity were construction equipment, materials,

consumable equipment and materials, management drawing techniques, direction and coordination, project management, training, craftsman/craftsman qualifications, superintendent and foreman competencies. A summary of factors affecting the CLP from previous researchers is shown in Table 1.

TABLE 1. Literature summary of previous research

Country	Author, year	The total of factors	The top five of the most influencing factors
Thailand	Arun Makulsawatudom, Margaret Emsley and Kuldej Sinthawanarong, 2004	23	Material insufficiency, incomplete drawings, incompetent supervisors, insufficient tools and equipment, absenteeism
Malaysia	M.R. Abdul Kadir, W.P. Lee, M.S. Jaafar, S.M. Sapuan and A.A.A. Ali, 2005	50	Material shortage on-site, termination of material delivery to site because of unfinished payment, change the order by the consultant, late publication by consultants for construction drawings, and the inability of contractor site management to regulate activities on site
Uganda	Henry Mwanaki Alinaitwe, Jackson A. Mwakali, Bengt Hansson, 2007	36	Incompetent supervisors, inadequate skills from the workers, rework, lack of tools/equipment, inferior construction methods
Turkey	Aynur Kazaz , Ekrem Manisali & Serdar Ulubeyli, 2008	37	Site management quality, material management, punctual payment, the systematic flow of work, supervision
Amerika Serikat	Dai et al. 2009	83	Construction Equipment, project management, and craft worker's qualification
Chili	Rivas et al. 2011	11	Materials, tools, rework, equipment, truck availability, and the workers' motivational dynamics
Indonesia	Soekiman, 2011	113	Material shortage, material delay arrival, unclear instruction to labour strike, owner financial difficulties
Qatar	Abdulaziz M. Jarkas, Charles Y. Kadri & Jamal H. Younes, 2012	35	Labour skill, materials shortage, labour supervision, insufficient experienced labour, communication between site management and labour force
Canada	Osama Moselhi and Zafar Khan, 2012	9	Temperature, the work type, and the height of work location
Kuwait	Abdulaziz M. Jarkas and Milan Radosavljevic, 2013	23	Payment delay, rework, short of financial incentive scheme, the extent of change orders during execution, incompetent supervisors
Palestin	Ibrahim Mahamid, 2013	31	Rework, lack of cooperation and communication between construction parties, the financial status of the owner, inadequate labour experience, and materials shortage
Mesir	Khaled, Mahmoud El-Gohary and Remon, Fayek Aziz, 2014	30	Labour experience and skills, Incentive programs, material Availability and ease of handling, Leadership, and competency of construction management, Competency of labour supervision
Oman	Abdulaziz M. JarkasRashid A. Al Balushi and P.K. Raveendranath, 2015	33	Design Drawings Errors and omission orders changing during execution, delay in responding to requests for information, lack of labour supervision, clarity of project specifications
Iran	Parviz Ghoddousi and Omid Poorafshar, 2015	32	Amount of compensation, work satisfaction, timeliness of remuneration, ethical behaviour of manager, promotion opportunities
Kolombia	Serdar Durdyev & Jasper Mbachu, 2017	36	Poor leadership/management, insufficient cash flow, defective workmanship, Shortage of skilled labour, Inadequate contingency provision
Malaysia	Serdar Durdyev, Syuhaida Ismail, and Nurmurat Kandymov, 2019	29	The significant competency level of the management team and labour quality in enhancing labour productivity

CONCEPTUAL FRAMEWORK

This conceptual framework compiled from previous researchers on their critical literature review in several developing countries in international journals with a Scopus minimum reputation and input from construction management practitioners in Indonesia. This study proposes a conceptual framework identifies 51 factors influencing the CLP from 5-factor groups. They are manpower, money, material and machine, method and external. The Detail of the conceptual framework is developed in as follows:

1. The Identification of 51 factors affecting CLP was obtained based on a critical review of eight previous studies in six years. From 2013 to 2018 sourced from reputable journals (Tsehayae and Fayek 2016; Durdyev and Mbachu 2017; El-Gohary 2014; Heravi and Eslamdoost 2015; Jarkas 2015; Mahamid 2013; Durdyev, Syuhaida Ismail 2018; Wael Alaghbari 2017a).
2. Grouping factors were obtained from a critical in-depth review of relevant literature in reputable journals in the past seven years (see table 2). A literature review from previous studies shows the term 5 M is obtained, which is often referred to as the vital resource for a CP's success (Durdyev & Syuhaida Ismail 2018). The resources referred to are manpower (individual), money, material, machine, and method (management). Thus, from the literature, it is assumed that a project might potentially succeed when these five resources must be fulfilled in the appropriate portion. This

resource is used as a theoretical basis for building the conceptual framework in this study. This study also added a group of external factors which very likely to occur beyond the influence of management but are assumed to affect the CP (Durdyev and Mbachu 2017; Durdyev & Syuhaida Ismail 2018). This external factor was added based on an in-depth study of previous research carried out in many countries.

3. However, many published studies on construction productivity failed to meet an agreement on productivity measurement standards in the construction business. Measuring productivity in CP is challenging, given the complex, unique, different, and non-repetitive project characteristics. Based on a review of previous research conducted by (El-Gohary and Aziz 2014; Ghoddousi et al. 2015; Robles, Stifi & Ponz-Tienda 2014; Thomas et al. 1990), which uses the TFP (Total factor productivity) general equation to define and measure productivity, where construction productivity is a measure of output from a combination of inputs (Eq.1). Input combination in press. Eq.1 is used as a basis for building work concepts in this study.

$$TFP = \frac{\text{Total Output}}{\text{Labour+equipment+material+energy+capital}} \quad (1)$$

4. These five-factor groups are broken down into two: a factor group that has a direct influence on workers (individuals) is the manpower/labour factor group and a Factor group that has an indirect effect on labour, yet will affect labour productivity of the site (money, material, machine, method and external).

TABLE 2. Literature Summary of factor groups from previous researches which influences the CLP

No.	Category Factor	Author and Country										
		Abdulaziz M. Jarkas, Charles Y. Kadri & Jamal H. Younes, 2012 (Qatar)	Osama Moselhi and Zafar Khan, 2012 (Canada)	Abdulaziz M. Jarkas, Ph.D., P.Eng and Camille G. Bitar, P.Eng, 2012 (Kuwait)	Ibrahim Mahamid, 2013 (Palestin)	El-Gohary & Aziz, 2014 (Egypt)	Abdulaziz M. Jarkas, Rashid A. Al Balushi & P.K. Raveendranath, 2015 (Oman)	Aynur Kazaz, Serdar Ulubeyl, Turgut Acikara, Bayram ER, 2016 (Turki)	(Serdar Durdyev dan J. mbachu, 2017 (Kamboja)	Wael Alaghbari, Abubaker A. Al-Sakkaf, Basel Sultan, 2017 (Yamen)	Serdar Durdyev, Syuhaida Ismail, 2018 (Malaysia)	
1	Materials				x							x
2	Equipment				x							x
3	Human/labour	x		x	x	x	x		x	x		x
4	Site Management								x			
5	Resources								x			
6	Project factor		x									x
7	Financial				x							x

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8	Organization						x		
9	External	x	x			x		x	x
10	Management	x	x	x	x	x		x	x
11	Technological	x	x			x		x	
12	Weather		x						

RESULT

Therefore, the framework concept produced in this study can be seen in Figure 2, extracting 51 factors that affect construction workers' productivity and grouping them into five groups of factors; manpower, money, material and tool, management, and external.

MANPOWER

In this study, there are 27 items included in the individual group (manpower) identified for having a compelling influence on the CLP. One of the causalities of productivity loss in CPs comes from the labour absence (Seungjun Ahn ASCE; Sang Hyun Lee 2013). The labour absences at the project site can disrupt project performance, damage the schedule and the workflow. This will cause a decrease in productivity and will eventually make the project suffer a costly loss. According to (Hanna, Taylor, and Sullivan 2005), when the workers' absences at the project site range from 0-5%, this will not interfere with productivity. Productivity will increase by 3.8%. However, if the percentage of workers' absences on site is between 6-10%, then productivity will decrease to 24.4%. In Indonesia, attendance is the third-highest factor that can affect CLP according to (Kaming et al. 1997), and additionally, according to (Soekiman et al. 2011), high absenteeism is among the ten most influential factors on CLP in Indonesia.

Insufficient training offered to labour is one of the identified factors which influence CLP. This factor has led to decreased labour productivity on a project in India (Alinaitwe et al. 2007; S. and Durdyev 2011; Shashank & Hazra 2014)). Training for workers aims to enable workers to work skilfully and proficiently in their work. Furthermore, the workers' level of education is categorized as one factor affecting CLP in Egypt and Yamen (El-Gohary 2014; Wael Alaghbari 2017a).

Based on several researchers' results, the work experience and skill factor items are two of the most critical factors affecting CLP. According to (Durdyev & Syuhaida Ismail 2018), the quality of labour has a significant influence in increasing CLP. The quality of this labour means an experienced, skilled, and proficient worker in carrying out their work. Labour is an essential asset of a company, the shortage of skilled and talented labour can

be caused by many factors, including global economic problems (Farhan and Azry 2019). So that in CPs, skilled and talented labour is part of the influencing factors of construction productivity.

Furthermore, labour turnover is one of the most common factors in India (Thomas and Sudhakumar 2013). Many things affect this factor, including unskilled, skilled labours, labour high absence. This causes the project manager to change labours to improve the project performance (Seungjun Ahn, S.M.ASCE; Sang Hyun Lee 2013). Labour fatigue will also significantly affect CLP; labour fatigue can be caused by excessive overtime work and schedule pressures that require work completed soon.

The labour control system (daily wages or lump sum), labour age, workers availability effect, rest periods during working days, 4-hour overtime, and more are identified factors affecting CLP based on the study by (El-Gohary and Aziz 2014). The disloyalty of labours towards the company and preliminary competition between workers are factors that must be considered in increasing CLP (Mahamid 2013). The workplace condition will also significantly affect the work in the field, including the height. Working in confined spaces will make workers work unproductive and slow. Moreover, many researchers define the traffic congestion on-site will have an impact on CLP in the field. This will cause the work to decline due to field conditions. Congestion in the workplace is caused by improper site layout arrangements, which cause too much build-up materials, tools, and labour arrangements on one type of work, and this will cause limited movement in working. According to (Nurul Fathira Micron & Muhamad Azry Khoiry 2019), congestion at the project site is caused by limited material storage, and if this happens, it will disrupt construction productivity. The systematic storage of materials can make the construction workflow carried out on schedule.

The level of motivation also was identified as a factor influencing CLP. Other researchers also agree that labour motivation levels affect productivity, such as; (Abdulaziz M. Jarkas 2015; Tsehayae and Fayek 2016; Heravi and Eslamdoost 2015; Kazaz and Ulubeyli 2007; Mbachu 2017; Durdyev & Syuhaida Ismail 2018). Motivation is closely related to human psychology. In psychology, motivation comes from the word "MOVERE" which means impulse and motives in the defined power within living things that encourage doing something—one of the primary

motivations for labours in CPs about financial. A bonus offer in the form of money for quicker completion of the project makes them enthusiastic about doing their job. Insufficient financial intensive program scheme affects the workers' motivation in carrying out their work in Qatar, Kuwait and India based on research results from (Jarkas, Radosavljevic, and Wuyi 2014; M 2013; Thomas and Sudhakumar 2013). The communication factor between labours is the next factor identified in this study. Previous researchers have analyzed that communication is a factor that has an influence on labour productivity. Stewart L. Tubbs & Sylvia believes that communication is the transfer of information carried out by two or more people. Communication is very necessary in a CP. In a construction project to provide information about the work implementation, changes, and all matters related to the project implementation. Communication is essentially needed between labour, labour to the foreman, foreman with the management. Furthermore, another factor that can cause a decrease in labour productivity is the late payment of labours' salaries.

MATERIAL AND MACHINE

In CPs, the costs of procurement of materials are more than 50% of the project costs (Ervianto 2004). Thus, good material management consists of procurement, ordering, receiving materials, utilizing materials, and calculating construction materials is decisive for the success of a CP. The material categories factor in this study consisted of items like; defective materials at the project site, late supply of building materials, unsuitability of storage location. In Indonesia, research on the influencing factors on CLP has been carried out by researchers (Kaming et al. 1997; Soekiman et al. 2011). The material factor is ranked second as a very influencing factor on CLP in Indonesia after the supervision factor, and materials shortage at the project site is the most influential factor on construction labour productivity in Indonesia (Soekiman et al. 2011). Previously, the former researcher (Kaming et al. 1997) concluded that the project site's productive time loss turned into the most significant cause for materials shortage at the project site. In addition, investigations were carried out in Malaysia, Gaza, and Thailand by (Abdul Kadir et al. 2005; Enshassi et al. 2007; Makulsawatudom, Emsley and Sinthawanarong 2004) using relative importance index analysis, and the results were similar, that material shortage was the most influential factor on increasing CLP.

Furthermore, tools and equipment include other expensive project components besides materials (Jang et al. 2011). Market prices primarily influence tool and equipment, so the project's tool and equipment category is

an entirely uncontrolled factor. In Indonesia, tools and equipment are requirements for a company to be permitted to participate in the auction process. The minimum tool and equipment needed during the CP will be detailed by the owner in the tender document. Thus, the contractor must have the minimum tool and equipment requirements to win the tender. Such tools and equipment may be obtained by purchasing or renting.

The machine factor category in this study consists of lack of tools and equipment in the project site, the condition of the old and inefficient equipment may affect construction labour productivity (Abdulaziz M. Jarkas 2015; Tsehayae and Fayek 2016; Heravi and Eslamdoost 2015; Mahamid 2013; Mbachu 2017; Durdyev & Syuhaida Ismail 2018; Wael Alaghbari 2017b). In Indonesia, based on the study results (Kaming et al. 1997), lack of appropriate equipment and equipment damage contributed 12.2% of productive time loss in conducting the construction work. In the United States (Dai, Goodrum, and Maloney 2009), the investigation results show that construction equipment is the factor that has the most significant impact on the productivity of construction labour. In line with the other Researchers from other countries such as Chile, Iran, Uganda, Thailand, and the Gaza Strip, also claimed that tools and equipment is one of the main factor items that can affect CLP (Alinaitwe et al. 2007; Enshassi et al. 2007; Ghoddousi and Hosseini 2012; Makulsawatudom, Emsley, and Sinthawanarong 2004; Rivas et al. 2011).

MANAGEMENT

In this study, management has the second most significant factor items after individual (manpower) compared to other factor categories. The management category is entirely under the control of Company Management which fully manages and controls the implementation process of a CP. With good management and control, the employment of human resources and technical resources are possibly conducted optimally (Gundecha 2012). Many studies claim that a management category factor is a group of factors that influence construction labour productivity. Researchers who raised this management group are in this study. Items of factors included in the management category are supervision, performance monitoring, and labour control by competent labour supervision. Insufficient supervision, performance monitoring is also a very influential factor item in construction labour productivity based on research (Alinaitwe et al. 2007; Dai and Goodrum 2012; Hickson and Ellis 2014; Hiyassat, Hiyari and Sweis 2016; Kazaz A 2008; Naoum 2016; Shan et al. 2016; Shashank & Hazra 2014). Furthermore, changes in orders for productivity loss that frequently occur are also identified as a factor item

that impacts the performance of workers on the site. According to (Kassem 2019), Changes during the construction process are the most influential risk factors for CPs in oil and gas processing.

Inappropriate construction methods, facilities offered to labours such as social insurance, health, clarity of instructions and exchange of information on the job site, poor site management by the contractor, construction technology used, appropriate site layout, general facilities provided to labourers such as lodging, transportation, are the items of factors that affect labour productivity based on earlier researches. Furthermore, rework is a factor item that must be considered. In Indonesia (Kaming et al. 1997) argues through their research that as much as 20.1% of rework can eliminate productive time in a CP. This certainly has a significant effect on productivity. Likewise (Mahamid

2013) in Palestine, from the analysis results that rework is the most influential factor on CLP. Several other researchers from several countries agree that reworking has a considerable influence on CLP (Alinaitwe et al. 2007; Jarkas & Radosavljevic 2014; Jarkas and Bitar 2012; Moselhi and Khan 2012; Nasirzadeh and Nojedehi 2013; Rivas et al. 2011; Durdyev & Syuhaida Ismail 2018; Thomas and Sudhakumar 2013). The next factor item is correct planning and unrealistic schedule pressure by management analyzed in this study, identified as a factor item that affects the CLP which based on independent researches by (Abdulaziz M. Jarkas 2015; Heravi and Eslamdoost 2015; Mbachu 2017; Durdyev & Syuhaida Ismail 2018; Shoar and Banaitis 2018; Venkatesh and Saravana Natarajan 2019).

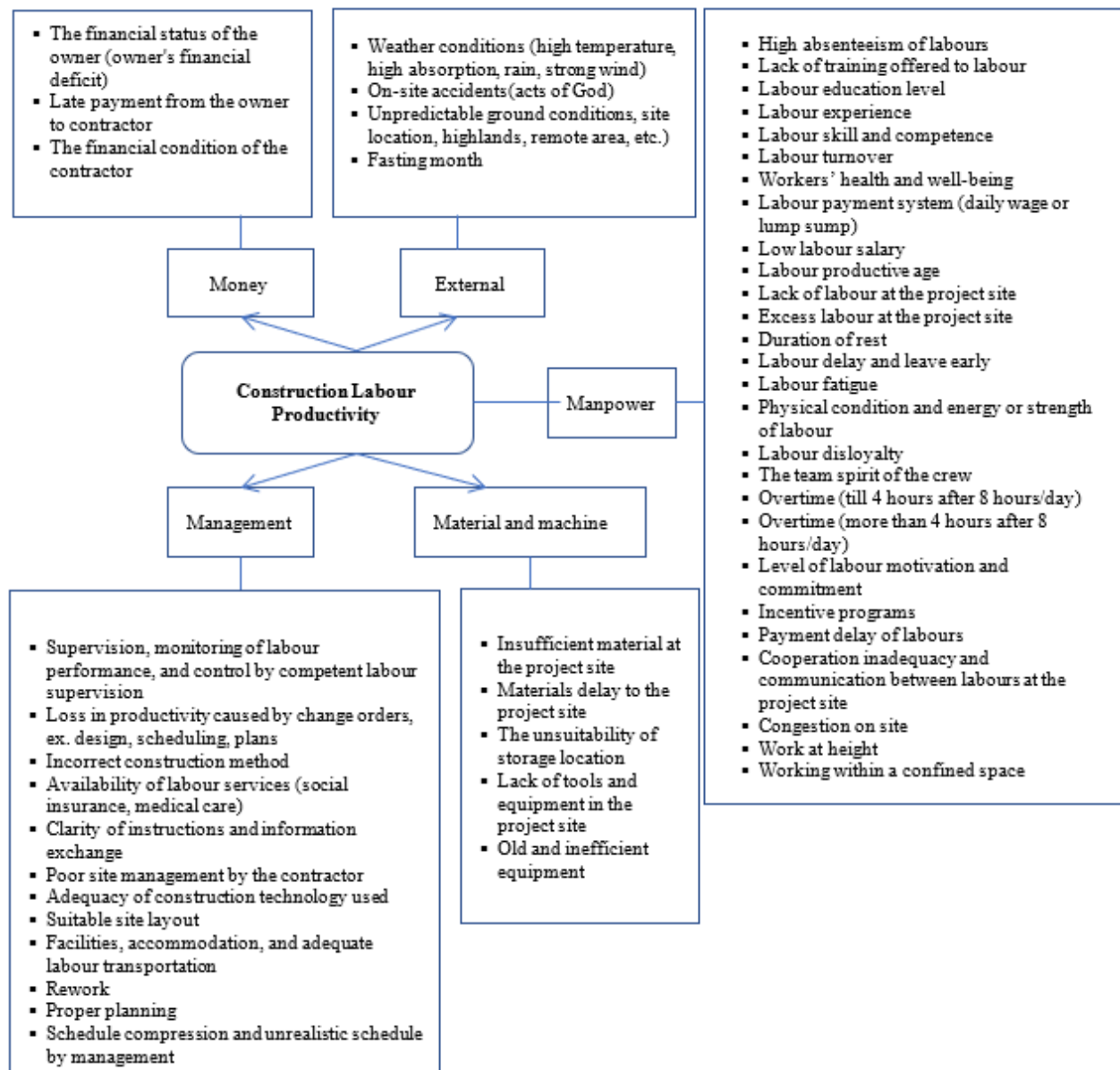


FIGURE 2. Conceptual framework factors affecting CLP

MONEY

The CP requires high costs, and many factors support the company's finance in executing construction work to maintain its stability. Problems with finance often occur, especially in Indonesia. The problems are included the budget deficit from government projects. This often happens, and of course, this is detrimental to the contractor. The contractor will have difficulty in requesting payment for the progress of work that has been achieved. Late payment from the owner or the government will disrupt the implementation of the project on the site, and of course, there will be many effects on the cost and implementation schedule. Assessing price and financial status are the most critical factors when giving jobs to construction companies in Chile (Rivas et al. 2011). Delay in CP is closely related to construction productivity. In Libya, problems related to finance have a significant effect on delays, difficulty in cost available for the project, and delay payment progress by the owner (Aboubaker. Y. Y. Alfakhri, Amiruddin Ismail, Muhamad Azry Khoiry & Ishak Arhad 2017). The author is interested in adding financial factors due to the financial deficits that frequently occur in Indonesia.

In this study, the financial category includes late payment from the owner to the contractor, the owner's budget deficit, and the contractor's financial condition. The determination of these factor items is based on prior research conducted by (Abdulaziz M. Jarkas 2015; Choudhry 2017; Dixit et al. 2019; Mahamid 2013, Mbachu 2017; Durdyev & Syuhaida Ismail 2018). High resource costs will affect the company's finances in completing the project, and of course, will affect the profit margins for the contracting company. Late payments received by contractors frequently happen in Indonesia; this has also been discussed by researchers in Indonesia (Soekiman et al. 2011) that owner's financial difficulties are a factor affecting construction labour productivity, especially for government projects. The contractor needs to make a project funding plan and rearrange project expenses due to the late payments (Adimata 2016).

EXTERNAL

In this study, external factors consist of weather conditions, which earlier researchers have widely discussed. Those factors will have a direct impact on the outcome of the project, especially the scheduling. The labour construction productivity will be affected by the weather both physiologically and psychologically. A labourer working on a CP physiologically will be stressed or even stroke if the weather at the project site is too hot and will experience cold, exclusion, tissue damage, or loss of feeling due to freezing weather (Ibbs and Sun 2017).

(Moselhi and Khan 2012) in Canada investigated the most influencing factor and significantly impacted CLP is the factors related to weather or temperature. Furthermore (A. V. Thomas and Sudhakumar 2013), in Kerala, India, conducted a study about the most significant factors on labour productivity in India. The results show that harsh weather conditions are critical factors that affect labour productivity in India. In addition, according to (Dai, Goodrum, and Maloney 2009), extreme weather factors are challenging to eliminate from the factors that can affect CLP. Various methods were done to minimize this impact because the weather is an external factor that the construction party impossibly controls. Furthermore, the authors added the fasting month factor based on research conducted by (Wael Alaghbari 2017a) as a hypothesized factor that would affect construction labour productivity. Because Indonesia is a country with more than 80% Muslim population, this fasting month factor is interesting to discuss. In addition, there are two other factors identified based on casual research that will affect construction labour productivity, namely workplace accidents and unexpected field conditions such as highlands, remote areas, etc.

CONCLUSION

The conceptual framework in this study was built from a critical literature review from previous researchers in several developing countries and input from construction management practitioners in Indonesia. By using the results of previous studies on CLP, the theoretical framework for this research is established. The concept of this framework was created to support future research to make CLP modeling. This framework is formed by collected literature review from previous international research in journals with Scopus minimum reputation in developing countries and input from construction management practitioners in Indonesia.

In order to obtain the conceptual framework to enrich research in the CLP field, it is produced and will be used in Indonesia. Based on eight previous studies in reputable journals, fifty-one factors affect the CLP over six years from 2013 to 2018. Furthermore, these factors are grouped into 5-factor groups known as 5 M (Manpower, Money, Material, Machine, and Management) and additional external factors, which often occur and affect the CLP. The concept of the grouping framework was built from a literature review from previous research in the last seven years in several developing countries so that the term 5 M was obtained to accomplish a construction project as the primary resource.

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DECLARATION OF COMPETING INTEREST

None.

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