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Study on the Factors to Improve Productivity and Efficiency of Construction Workers in Klang Valley

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Abstract

The construction industry is one of the fastest growing industries, with a labor shortage and low productivity and efficiency among construction workers. To discover the elements impacting labor productivity on the progress of construction work, this research has been conducted in order to give approach and exposure to the construction industry. However, worker productivity has a disadvantage in terms of improving building progress. A specific issue is the lack of skilled workers, lack of building experts and lack of communication in the construction industry. Consequently, there are three objectives of the study carried out in this research which is to determine the important element for improvement of productivity and efficiency, to investigate the factors that decrease productivity and efficiency and to suggest the methods to improve construction workers productivity and efficiency in construction industry. This research focused on the construction workers in the Klang Valley's area. Total construction workers in the Klang Valley are 3424 workers, so the sample size is 346. The respondents were given a questionnaire by a link of google form through WhatsApp, Instagram and Email. A total of 184 respondents (53.18%) had given feedback in the questionnaire. Frequency analysis was used to analyses the demographic of respondents while Cronbach alpha, mean and frequency was used to analyses the data for all objectives. This research found that the important element for improvement the productivity and efficiency of construction workers are rewards while the factors that decrease productivity and efficiency of construction workers are low wages. Lastly is the method to improve construction workers productivity and efficiency in construction industry is send to construction training centre that provided by CIDB. In addition, this study has significant to improve the productivity and efficiency of construction workers in construction industry.

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1. Introduction

This section describes the research background, problem statement, research questions, research objectives, research scope, and significance of the research.

1.1 Research Background

The development of the nation's economy depends heavily on the construction industry infrastructure and resources and will make important contributions to the country's economic growth. As it combines all other resources in different construction activities, labor is the most crucial resource in the construction business (Ghate and Minde, 2016). According to Shahab and Audrius (2018), labor expenditures typically account for 30% to 50% of the entire cost of a construction project. To achieve long-term success in the construction industry, firms need to increase labor productivity (Ghate and Minde, 2016). Therefore, labor productivity and efficiency in the construction industry is very important. This is so that it can contribute to raising the efficiency of the industry.

Due to Malaysia's excessive reliance on a sizable foreign labor population, labor is one of the most challenging issues the sector is now confronting (Najib et al., 2019). Most of the on-site labor in Malaysia's construction industry consists of up of skilled workers, including masons, carpenters, painters, electricians, welders, plumbers, factory operators, and others. Their participation significantly influences the quality of the industry's output. According to Hussain et al., (2020), there are several issues that contribute to low-skilled labor engagement in the construction sector, including unfair labor pay, poor site safety, a lack of defined career routes, decreased access to skilled labor training programs, and delays in on-site work schedules.

1.2 Problem Statement

With the virus epidemic affecting the world economy in 2020, Malaysia's labor productivity performance remained in fall. According to the most recent Ministry of Economy Department of Statistics Malaysia (2021), labor productivity per capita has fallen in all sectors of the economy, with the construction industry experiencing the worst decrease, with labor productivity decreasing by 15.7%. After two years of subpar growth, Malaysia's labor productivity decreased 5.4% in 2020. The National Productivity Corporation of Malaysia claims that when compared to other sectors including manufacturing, agriculture, and services, the construction industry has the lowest productivity (Corporation, 2016).

Apart from that, consistent problems in the construction industry often include inadequate safety and health conditions, unsatisfactory working conditions (such as unsuitable and uncomfortable workplaces), and poor quality of work. All of these can negatively affect productivity, overall performance, and company reputation (Jamaludin et al.,2014).

According to Hisyam (2015), unskilled workers make up 93% of foreign workers in the construction sector who have been registered with CIDB. Hamzah et al. (2020) and Mohd Fateh et al. (2020) made a similar observation, stating that most of foreign workers are unskilled and come from countries such as Indonesia, Bangladesh, and Myanmar. Many of them come from their area with only basic building experience. This problem directly contributes to the lack of skilled construction workers in the country, as workers in this small country have limited access to information. Hiring low-paid foreign workers may reduce contractor costs, but neither the quality nor the welfare of Malaysians is guaranteed.

Furthermore, according to the chairman of the Malacca Builders Association in The Star (2023), Datuk Lim Hau Jan, said most of the foreign workers in the construction sector do not have the essential skills to meet local demand. They start from nothing, as he points out, and employees need time to develop their knowledge and expertise. In addition, when companies decide to use advanced and efficient building technology such as IBS. Most workers are unskilled and exposed to this construction method. Due to these problems, some projects can experience delays and loss of productivity.

1.3 Research Question

This study aimed to address the following research questions:

i. What are the important elements for improvement of productivity and efficiency of construction workers?
ii. What are the factors that decrease productivity and efficiency of construction workers in the construction industry?
iii. How to improve construction workers' productivity and efficiency in the construction industry?

1.4 Research Objective

The objectives of this research are:

i. To determine the important element for improvement of productivity and efficiency of construction workers.

ii. To investigate the factors that decrease productivity and efficiency of construction workers in the construction industry.
iii. To suggest methods to improve construction workers productivity and efficiency in construction industry.

1.5 Research Scope

The research was focused on the construction worker's productivity and efficiency in the construction industry. According to CIDB Malaysia 2022, it has been reported that the average productivity rate for the construction industry was lower than other industries. Due to this reason, the researcher decided to do research about the factors to improve productivity and efficiency in the construction industry. Besides, the research was conducted in construction industry in Klang Valley area. According to the News, The Star,2022 it stated that a survey conducted by the Akademi Binaan Malaysia (ABM) stated that Selangor and Kuala Lumpur have employ the highest number of foreign construction workers in the country. Due to this reason the researcher suggests doing research in that area. In addition, the target respondents in this research were the construction workers who are at the Klang Valley construction industry. They were distributed with a questionnaire via social media.

1.6 Significance of Study

This study has significant to improve the productivity and efficiency of construction workers in the construction industry. This study has identified the important element for improvement of productivity and efficiency, investigate the factors that decrease the productivity and efficiency, and suggest the methods to improve the productivity and efficiency of construction workers in the construction industry.

2. Literature review

The purpose of this chapter is to improve the productivity and efficiency of foreign workers in the construction industry. This section will go over the importance it is to improve the productivity and effectiveness of foreign workers in the construction sector. In addition, the chapter will address the factors that influence the productivity and effectiveness of foreign workers in the construction industry. The factors that improve the productivity and efficiency of foreign workers in the construction industry are covered in the concluding section of this chapter.

2.1 Definition of productivity

Productivity is the effectiveness with which varied inputs are converted into products and services (Alyew, 2020). Productivity is the capacity to create the same amount of output with fewer inputs or more output with the same inputs. Productivity refers to how much work is completed in a specific length of time. We are all aware of how labour-intensive construction activities are. Consequently, inadequate performance immediately impacts the price of building. Because of this, poor productivity is frequently used to gauge productivity in the construction sector. An effective or good construction project is one that is finished on schedule and under budget, achieves defined quality standards, and carefully complies with safety procedures (Alyew, 2020). When referring to the ratio of output to input, the word "productivity" is frequently employed.

2.1.1 Worker's productivity

Labour is used extensively in the construction sector. Researchers can use inadequate productivity metrics to analyse and assess the overall performance of construction companies (Hwang, 2013). Academic research suggests that to remain competitive over the long run, construction companies should assess staff productivity. Jarkas (2015) claim that when making bids, executives in the construction industry utilize information on inefficient productivity to estimate inefficient project costs. To complete projects on schedule and under budget, it's imperative to meet adverse productivity projections. Low productivity has been defined in many ways by researchers (Moselhi, 2012 and Khan et al., 2011). The link between the number of hours worked and the amount of work completed is how most experts define labour productivity (Moselhi, 2012). By evaluating output in relation to input, low productivity is determined. It doesn't depict total effectiveness (Moselhi, 2012). Low productivity, as defined by Hwang (2013) and Yi and Chan (2014), is the disparity between the outputs generated and the inputs consumed in a manufacturing process. Low productivity is described as the ratio of outputs to inputs in a production process by Moselhi,2012 and Khan et al.,2011 and Nguyen (2013). According to several studies (Jarkas 2015 and Jarkas, Radosavljevic et al., 2014), a variety of factors, including employee skill levels, job satisfaction, leadership, organizational commitment, and worker involvement, affect labour productivity in the construction industry. Construction sector executives may benefit from what works while improving what doesn't by identify and evaluating the causes causing low productivity (Alazzaz, 2015).

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2.2 Definition of efficiency.

According to the Cambridge Dictionary, efficiency can be defined as the ability to use resources efficiently to do the most amount of meaningful work. It may also be described as a condition in which people, businesses, factories, etc. efficiently use resources like time, materials, and labor to the fullest extent possible without wasting any of them. For example, companies make significant investments in updating production, while workers accept flexible work schedules to increase efficiency. Efficiency is a performance quality that uses the least amount of input while achieving maximum output. The number of resources, such as time and personal energy, that are not necessary to generate a particular output must be reduced in order to increase efficiency. In addition, the proportion of usable output to total input can be used to quantify efficiency. While achieving the required result, efficiency improvements reduce resource waste, including that of time, energy, and physical materials (Caroline Banton, 2022).

2.3 Important element for improvement of productivity and efficiency of construction workers

(a) Remuneration

One of the most effective management strategies for inspiring, influencing, and changing employee behaviour is the remuneration structure. In fact, remuneration is seen as a crucial component of employee engagement, which may inspire workers to put in more effort for the benefit of both the firm and them. Due to the system's improved ability to maintain employee engagement, employees are more concerned about it (Sanneh & A.Taj, 2015).

(b) Rewards

Employees are greatly motivated by recognition because it fosters a sense of success and helps them value their efforts and hard work (Sanneh & A.Taj, 2015). The effectiveness of a worker's work can be increased through appreciation in addition to boosting self-confidence in the employee. Employees are reinforced in their conduct and are more inclined to carry it through when they get recognition for their efforts. Aside from that, companies might provide them bonuses or presents as rewards. According to statistics on employee appreciation, 72% of workers stated they would put in more effort if they were appreciated.

(c) Leadership

The capacity to inspire respect, loyalty, and collaboration in one's followers is referred to as leadership (Mkheimer, 2018). Furthermore, leadership was the practice of influencing subordinates to act in a particular way to forward the objectives of the company (Nanjundeswaras and Swamy, 2014). A leader was someone who holds a leadership or higher position within an organization, could influence others, and exercises a high degree of control. Moreover, leadership and employee engagement have a good and significant association (Ngure & Makokha, 2016 and Sanneh & A.Taj, 2015)

(d) Workplace

Employee performance improves with a good, adaptable, and conducive work environment. A positive work environment is a workplace that fosters employee safety, growth, and purpose achievement. (Dari, Jabeen, & Papastathopoulos, 2018). This is the environment that is most conducive to a successful workforce because it encourages employees to perform at their best. Therefore, the environment has a high impact on employees. This is because, when they carry out their work, they will feel more comfortable, and their work will be smoother. Therefore, productivity will increase.

(e) Training

According to Durdyev S & Ismail S (2016), training should be "application-driven and created to provide skills that are immediately useful in specific situations." Training and development are the process of methodically increasing a person's job-related knowledge and skills in order to improve performance. An individual's self-awareness, talents, skills, and motivation may all be increased via training and development initiatives, enabling them to carry out their duties to the best of their ability. Furthermore, employers frequently see training and development as a deliberate attempt to help workers learn appropriate work-related behaviours. Any information and abilities individuals have gained that are pertinent to organizational goals might be considered work-related behaviours.

(f) Internet of Things

The internet of things (IoT) was cited as one of the nine (9) pillars of the fourth industrial revolution that would help the business sector improve its productivity results (Alaloul et al., 2018; Ibrahim et al., 2019). To successfully develop a construction project, precise information about the project specifics, such as the project design, structure, materials, and other specifications, was also necessary to ensure that the project's outcome was in line with those specific items (Crotty, 2012; Tahir et al., 2018). Therefore, it's crucial to integrate IoT with other elements of the fourth industrial revolution, such as advanced robotics, additive manufacturing, augmented reality, simulation, system integration, cloud computing, cyber-security, and big data analytics, to maximize how the construction industry uses technology for monitoring and controlling projects (Nagy et al., 2018).

(g) Encourage flexible working hour and days off.

More organizations should be receptive to flexible work alternatives now that flexible working models are available. This allows for a more regulated work/life balance that enhances employee wellbeing and provides employees the freedom to choose when, where, and how the organization operates to fit their requirements. Teams are empowered in an agile workplace to take charge of projects, manage their own time, and make the most of their own talents. (Airtasker, 2020) A study by professors at Cardiff and Southampton University found that most people who work from home are equally as more productive than at the workplace.

2.4 Factors that decrease productivity and efficiency of construction workers in the construction industry.

(a) Lack of skills labours

The most important factors of a construction project's carrying on management was the labour. The labour factor was a major reason why many building projects fail repeatedly. The failure of projects because of a lack of trained or experienced workers was highlighted by Windapo (2016). The shortage of skilled labour was caused by a lack of high-quality basic education, economic conditions, mandated worker certification, and a retiring population. Additionally, he discovered a strong link between a shortage of trained workers, the necessity for certification in the workforce, and poor employment results in the absence of certification standards. Laborers were described as unskilled workers who typically work in the construction industry for the purpose of clarity.

(b) Lack of advance technology.

The presence foreign workers had severely affected the productivity of the Malaysian construction industry. When company decided to use advanced and efficient building technology such as IBS. Most workers were unskilled and can't exposed to this construction method. According to a report (Ismail et al., 2018), foreign workers who have never managed large-scale projects find it difficult to adapt to this new work environment. The Malaysian construction industry also faces difficulties when construction sites have started but foreign workers have problem or does not come to work. The construction industry may face delays in project completion and impact on productivity due to worker shortages.

(c) Lack of communication

Most construction disagreements were triggered by violations or poor communication among team members (Olanrewaju et al., 2017). Design difficulties that result in delays and low quality are frequently caused by the presence of design knowledge that has been miscommunicated (Olanrewaju et al., 2017). When discussing, validating, and transferring critical project information, responsible field engineers must pay careful attention. Between two or more individuals, communication was the process of transferring information, news, knowledge, and directions (Radosavljevic & Bennett, 2012)

(d) Labour shortages

Labour shortages were frequently cited as a significant economic issue in several. This may be observed in research by the worldwide accounting company Grant Thornton, which indicates that there is a 39% global average shortage of qualified employees, with greater numbers of over 60% in Singapore and Malaysia (Grant Thornton worldwide Limited, 2012). With 1.2 million workers, or 9% of the total, the construction industry in Malaysia is the fourth largest employer (Perbadanan Produktiviti Malaysia, 2015). Despite having a strong national economy, Malaysia's construction sector was now experiencing a shortage of workers. The possibility of

a labour shortage in the construction industry in Malaysia was evident with the rise in the number of foreign workers on building sites.

(e) Lack of labour supervision

The lack of labour supervision in the construction industry can significantly contribute to decreased productivity and efficiency among construction workers. Hence, monitoring and supervising are crucial tasks for every construction project since they can have an impact on the project's quality, schedule, and budget. The incompetence of supervisors was an issue, workers were highly concerned with the supervision personnel and questions of their competency. (Jarkas & Radosavljevic, 2013; Ohueri et al., 2018)

(f) Low wages

According to B. Garcés-Mascareas (2015), skilled construction employees always tend to go to other construction firms where skilled workers' earnings were uniform and well-established. Conversely, when salaries are not fixed but instead vary based on employee performance levels, the shortage of competent personnel in construction firms becomes obvious.

(g) Condition of works

There were several factors that influence worker productivity, and one of them was the height at which people work. Moselhi, 2012 and Khan et al.,2011 discovered that production falls as worker height increases owing to the time necessary to shift people and equipment to higher levels of the building. Some employees despise working at heights, while others were terrified of them (Moselhi, 2012). Employee productivity may be impacted when workers perform at a higher level due to possible mental state changes.

2.5 Methods to improve construction worker's productivity and efficiency in construction industry.

(a) Education

Construction employees need education to increase their productivity on projects. People get the information, understanding, and skills necessary to enhance their growth through education, which was a learning process. Delivery to construction training centres, training for international workers, employer mentorship, and maintaining worker discipline were found to be the four education-related subthemes. In addition, according to the news, The Malaysian Reserve,2022, the Malaysian Productivity Corp (MPC) was planning to increase the county's education achievement to a higher level by 2026. Additionally, the business stressed that, to boost productivity development and the competitiveness of the nation, the primary focus should be on initiatives to raise educational attainment levels. As a result, they would also carry out the Academy in the Factory program using the Triple Helix method with involvement from the public and private sectors as well as higher education institutions.

(b) Send to construction training centre that provided by CIDB

Employees were trained in career development skills at the training facility. Many of the labourers employed in the building sector lack understanding about and expertise with construction. This was because they have never had formal architectural instruction. Since they would only be able to learn certain tasks during working hours, their job efficiency would suffer, which would have an impact on their output and result in a longer turnaround time. For example, companies can send the employees to the construction training centre such as CIDB IBS Training Centre. The centre primarily emphasizes training in Industrialized Building Systems (IBS), which includes modern construction methods aimed at improving efficiency and quality in construction projects. As a result, sending employees for construction training that provided by CIDB could help them be more productive. When construction employees were highly competent and informed, productivity rises. (Arshad MN, Ab Malik Z 2015).

(c) Provide additional training on site

Construction employees from other countries would be able to upgrade their abilities through training. Low productivity, or faulty or low production that necessitates expensive and time- consuming rework, was frequently linked to an inexperienced and inadequately trained staff (Durdyev S, Ismail S 2016). Before they start working, employers might teach international employees. Therefore, they would have more information

and abilities at their disposal when they were working. Their task will therefore go smoothly, leading to a rise in production.

(d) Appoint a leader in charge for the workers

A leader was someone who sets an example for others to follow and helps them reach their objectives. In any organization, leaders then play a crucial role. A good strategy for raising the output of foreign labourers was to assign someone to look after construction tasks. As instructed by their companies, leaders will train and act as role models. Performance among employees was significantly and favourably affected by effective leadership. Leaders may boost performance, direct team members in the proper directions, and ensure that construction projects move along smoothly by employing efficient and effective leadership techniques (Tabassi et al.,2014) If any issues arise at work after that, the other team members can speak with the leader directly. Among the foreign workers, employers may choose a qualified and experienced leader. Due to the possibility that some foreign employees may not be able to speak the local tongue, it was simpler for leaders to instruct or educate them. As a result, leaders may speak the same language as their followers. This stops instructions from being misunderstood and improves efficiency.

(e) Reduce lack of material availability

The quality of the task was improved by using the appropriate supplies and tools, which improves labour productivity. Delays in material delivery could be caused by several things, such as bulk handling of different materials, incorrect storage of those goods, reckless waste, access barriers to storage facilities for those supplies, vast travel distances between those storage areas and work sites, lengthy manufacturing schedules, and shipping delays. Construction projects were less productive when there were active construction sites. With effective material management and a solid optimization strategy, this issue may be resolved. (M M Rahman et al, 2017)

(f) Provide incentive

Incentives were defined as incentives, or any sort of monetary reward offered to employees. Another way to think about motivation was as an objective standard where people only want to set a quantifiable bar for achievement. Incentives were used as a strategic strategy in compensation packages to reward employees for their performance and keep them on board by enhancing their well-being and promoting employee happiness in addition to maximizing productivity. According to Quadri AA, 2019, companies may affect and spark employee motivation by incentives. When managers inspire their staff, their general well-being and abilities increase, and they experience job satisfaction. Most businesses view incentives as a means of achieving their objectives (Prasad TS et al, 2019). According to Waqas Z and Saleem S, 2014, offering incentives has a significant role in ensuring that workers receive health benefits, were satisfied with their jobs, and were loyal to their employers.

(g) Provide sufficient technical support

Construction workers need to use technology due to the advance technology has a direct impact on labour productivity. Workforce productivity would increase if construction workers had access to modern equipment such as plants, machinery, tools, and software. The construction sector was far less productive than other sectors. On information technology, the construction sector spends less than 1% of its $10 trillion in annual revenue. The construction sector must modernize in order to keep up with its nearest competitors. For example, companies could track their work more quickly than ever before with the help of project management software. Construction documents such as blueprints, change orders, RFIs, and daily reports can be hosted in one centralized area by project management software. Employees no longer must waste time logging things in several areas, or even without logging at all, and then spend hours trying to figure out what they've done before. Project management software may help businesses free up time and make the team more productive by saving time on routine everyday activities. Therefore, construction productivity would rise as technology becomes common place on the job site, and project timelines would be shortened. Communication between the field and the office would improve with the usage of technology. Plan submission and permit approval would be sped up with the use of real-time data (Stevens,2023).

3. Research Methodology

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The research's methodology is explained and described in this chapter. The method employed must ensure that the objective and scope of this study can be satisfied. This chapter will explain data gathering techniques because methodology is important to this research. The factors that can improve the productivity and efficiency of foreign workers in the construction industry will be discussed in this chapter. This chapter will introduce the study design, research process, study population and samples, data collection methods, and data analysis methodologies used to achieve the research objectives provided.

3.1 Research Design

For this research, a quantitative approach will be used. Quantitative research relies on the use and analysis of numerical data together with certain statistical techniques to provide answers to research questions (Apuke, 2017). This study uses a cross-sectional design, which is a type of observational study methodology, and it is often done using a questionnaire. A questionnaire is any text-based tool that asks a series of questions or assertions of survey participants and requests their responses by marking a page, entering a number, or checking a box. The questionnaire is used to gather the data required to address the research issue from a variety of angles. The information obtained from the data is provided statistically after it has been measured, compared numerically, and investigated (Asenahabi, 2019). The survey questionnaire for this study will be created using Google Forms. In order to meet the study's objectives, the gathered findings and data from respondents, as well as the literature research, are analysed and assessed. The research design approach that will be used to achieve the study objective is also shown in Table 1.

Table 1 *Research Design Method*

No	Research Objectives	Method
1	To determine the important element for improvement of productivity and efficiency of construction workers.	• Literature Review
2	To investigate the factors that decrease productivity and efficiency of construction workers in the construction industry.	• Quantitative (Questionnaires)
3	To suggest the methods to improve construction workers productivity and efficiency in construction industry.	

3.2 Procedure of Research

The procedure of research that applies to conducting this research as shown in Appendix A. There are 5 phase that conduct in this research. All the phase generally represents overall process in the research.

3.3 Data Collection

Data collecting, as an important step of research, can obscure the quality of the results acquired by decreasing the number of probable mistakes that might arise throughout research efforts (Taherdoost,2022). According to Kabir (2016), data collection was the process of organizing the gathering and measurement of information about relevant aspects in order to test hypotheses, answer specified research questions, and analysed findings. For this study, both primary and secondary sources of data were gathered. The entire collection of data would be gathered using both primary and secondary sources. As a result, researcher would examine data collection in detail.

3.4 Research Population and Sampling

In this study, Table of Krejci & Morgan (1970) are used in determining the sample size. In addition, the population in this study are the construction workers in Klang Valley as well as population size is estimated at around 3424 construction workers in Klang Valley area based on the list that are given by the PERKESO. Therefore, the sample size is around 346 (Refer to Appendix B)

3.5 Research Method

For this study, questionnaire is a specific instrument or tool for collecting data. The questions in this research questionnaire are divided into four sections, which is Section A: Respondent Background, Section B: The important element for improvement of productivity and efficiency of construction workers, Section C: The factors that decrease productivity and efficiency of construction worker in the construction industry and Section D: The methods to improve construction workers productivity and efficiency in construction industry. Researchers used Likert scales in Section B, Section C and Section D. In this part, a 5-point Likert Scale were used.

3.6 Pilot study

The researcher had conducted a pilot study before performing the full study and distributing the questionnaire to the respondents. In the pilot study, a total of 20 respondents in Klang Valley have answered the questionnaire provided.

(a) Reliability analysis

Cronbach's alpha was used to determine the reliability of the multi-question Likert scale survey. These questions assess hidden or unobservable latent variables, such as a person's conscientiousness, neuroticism, or openness (Glen, 2021). The following rule of thumb: "$\alpha > 0.9$ – excellent, $\alpha > 0.8$ – good, $\alpha > 0.7$ – acceptable, $\alpha > 0.6$ – questionable, $\alpha > 0.5$ – poor, $\alpha < 0.5$ – unacceptable". According to the reliability analysis results of the collected data, Cronbach's Alpha is 0.970 to 0.989, as shown in Table 2, which indicates that the questionnaire has high reliability, and the items have high internal consistency.

Table 2 *The number of Cronbach's Alpha for each objective*

Section in questionnaire	Item	Cronbach's Alpha
Section B	To determine the important element for improvement of productivity and efficiency of construction workers.	0.970
Section C	To investigate the factors that decrease productivity and efficiency of construction workers in the construction industry.	0.989
Section D	To suggest the methods to improve construction workers productivity and efficiency in construction industry.	0.980

3.7 Data Analysis

Data analysis was the process of acquiring, modelling, and assessing data using various scientific and analytical methodologies. Businesses employ analytics methodologies and technologies to gain insights that assist them make strategic and everyday choices. Validity or quality were the two most important factors of an analysis. The validity of an analysis was assessed by whether it measures what it was supposed to measure. Generally, an analysis was deemed valuable if the results it yields allow people to draw valid conclusions about a certain inherent quality, feature, or attribute. The next step was to collect the data that would be evaluated after establishing the objective of the study (Bathia, 2017). After the surveys were completed, the findings were analysed using SPSS. The analysis was carried out to obtain the mean and median score values that would be displayed in the charts, tables, and graphs in the next chapter. As a result, it helps the researcher organize, summarize, and interpret data in a coherent way (Ashirwadam, 2014).

4. Result and Discussion

The results and discussion section presents data and analysis of the study. In total, 184 sets (53.18%) of questionnaires were returned with responses and answers from the respondents. All the returned questionnaires were used for data analysis purposes.

(a) Section A: Demographic respondents

Table 3 *Summary of Data Analysis in Section A: Demographic respondents*

No.	Respondent Background	Frequency	Percentage (%)
1	Gender		

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	Male	96	52.2
	Female	88	47.8
2	Age		
	20-30 years old	55	29.9
	31-40 years old	67	36.4
	41-50 years old	41	22.3
	51-60 years old	21	11.4
	61 years old and above	0	0
3	Level of education		
	SPM	91	49.5
	STPM	5	2.7
	Diploma	42	22.8
	Degree	44	23.9
	Masters	0	0
	PhD	2	1.1
4	Experienced working in the construction industry	59	32.1
	Less than 5 years	74	40.2
	5 to 10 years	31	16.8
	11 to 15 years	20	10.9
	More than 15 years		

Table 3 shows a summary of the data analysis for Section A. As can be seen from Table 2, the proportion of male respondents is higher than that of female respondents, with a total of 96 respondents (52.2%). Respondents aged 31 to 40 have the highest proportion, accounting for 36.4%, equivalent to 67 respondents. In addition, the highest proportion of respondents with the highest educational level is Sijil Pelajaran Malaysia (SPM), at 49.5%, with 91 respondents. Finally, the highest experienced working in the construction industry is between 5 to 10 years, accounting for 40.2% with a total of 74 respondents.

(b) Section B: The important element for improvement of productivity and efficiency of construction workers. (Objective 1)

Table 4 *The important element for improvement of productivity and efficiency of construction workers*

No	Item	Mean	Standard deviation	N	Ranking
1	Remuneration Most effective management strategies for inspiring, influencing, and changing employee behavior is the remuneration structure	4.55	0.752	184	5
2	Rewards Employees are reinforced in their conduct and are more inclined to carry it through when they get recognition for their efforts.	4.66	0.715	184	1
3	Leadership Leadership is the practice of influencing subordinates to act in a particular way to forward the objectives of the company.	4.65	0.686	184	2
4	Workplace A positive work environment is a workplace that fosters employee safety, growth and purpose achievement	4.49	0.823	184	7
5	Training The process of methodically increasing a person's job-related knowledge and skills in order to improve performance.	4.60	0.762	184	3
6	Internet of Things Help the business sector improve its productivity results by maximize how the construction industry uses technology for monitoring and controlling projects.	4.55	0.730	184	6
7	Encourage flexible working hours and days off. Allows for a more regulated work/life balance that enhances employee wellbeing and provides employees the freedom to	4.59	0.734	184	4

	choose when, where, and how the organization operates to fit their requirements.

Based on Table 4 above, it found that the important element for improvement of productivity and efficiency of construction workers is the rewards (Rank 1, means:4.66). Followed by leadership (Rank 2, means 4.65) and training (Rank 3, means 4.60). The encourage flexible working hours and days off comes in (Rank 4, mean 4.59) and remuneration (Rank 5, mean 4.55). The internet of Things comes in (Rank 6, mean 4.55) and last rank is workplace (Rank 7, mean 4.49).

From the analysis done through questionnaire survey, most of the respondents were agreed that rewards are the most important element that can improve the productivity and efficiency of construction workers due to employee are reinforced in their conduct and are more inclined to carry it through when they get recognition for their efforts. Besides, the respondents also agree that leadership can be considered as the important element for improvement of productivity and efficiency of construction workers. This is due to leadership, the practice of influencing subordinates to act in a particular way to forward the objectives of the company while leadership and employee engagement have a good and significant association.

(c) Section C: The factors that decrease productivity and efficiency of construction workers in the construction industry. (Objective 2)

Table 5 *Factors that decrease productivity and efficiency of construction workers in the construction industry*

No	Item	Mean	Standard deviation	N	Ranking
1	Lack of skill labours. The cost, timing, and performance of construction are all significantly impacted negatively by skill labour shortages.	4.59	0.763	184	6
2	Lack of advance technology When company decided to use advanced and efficient building technology most workers are not knowledgeable and not enough exposure to the advance technology.	4.64	0.762	184	5
3	-Lack of communication Design difficulties that result in delays and low quality are frequently caused by the presence of design knowledge that has been miscommunicated. -When discussing, validating, and transferring critical project information, responsible field engineers must pay careful attention. Between two or more individuals, communication is the process of transferring information, news, knowledge, and directions.	4.68	0.662	184	2
4	Labour shortages Malaysia's construction sector is now experiencing a shortage of labour. The possibility of a labour shortage in the construction industry in Malaysia is evident with the rise in the number of foreign workers on building sites.	4.66	0.715	184	3
5	Lack of labor supervision -Construction project, monitoring, and supervising are important task because it may affect the quality, time, and cost of the project. -The incompetence of supervisors is an issue; workers are highly concerned with the supervision personnel and questions of their competency.	4.59	0.777	184	7
6	Low wages When salaries are not fixed but instead vary based on employee performance levels, the shortage of competent personnel in construction firms becomes obvious.	4.71	0.610	184	1
7	Condition of works -Several factors that influence worker productivity, and one of them is the height at which people work. -Production falls as worker height increases owing to the time necessary to shift people and equipment to higher levels of the	4.65	0.694	184	4

	building.

Table 5 shows the item that complies with the second objective of this study which is to investigate the factors that decrease productivity and efficiency of construction workers in the construction industry. From the table above, it shows that low wages (Rank 1, mean 4.71) followed by the lack of communication (Rank 2, mean 4.68) and labour shortages (Rank 3, mean 4.66). The condition of works was (Rank 4, mean 4.65) and lack of advance technology was (Rank 5, mean 4.64). As lack of skills labour was (Rank 6, mean 4.59) and lack of labor supervision comes in (Rank 7, mean 4.59).

From the analysis done through questionnaire survey, most of the respondents agreed that low wages are the factors that decrease the productivity and efficiency of construction workers. This is because when salaries are not fixed but instead vary based on employee performance levels, the shortage of competent personnel in construction firms becomes obvious. In addition, most of the respondents agree that the factors that decrease productivity and efficiency of construction workers in the construction industry are lack of communication. This is due to the design difficulties that result in delays and low quality are frequently caused by the presence of design knowledge that has been miscommunicated. When discussing, validating, and transferring critical project information, responsible field engineers must pay careful attention and between two or more individuals, communication was the process of transferring information, news, knowledge, and directions.

Section D: The methods to improve construction workers' productivity and efficiency in the construction industry. (Objective 3)

Table 6 *The methods to improve construction workers' productivity and efficiency in the construction industry*

No	Item	Mean	Standard deviation	N	Ranking
1	Education -Construction employees need education to increase their productivity on projects. -People get the information, understanding, and skills necessary to enhance their growth through education, which is a learning process.	4.63	0.743	184	7
2	Send to construction training center that provided by CIDB. -Employees are trained in career development skills at the training facility. -Many of the laborers employed in the building sector lack understanding about and expertise with construction and they have never had formal architectural instruction. -For example: CIDB IBS Training Centre. This center primarily emphasized training on modern construction methods and aimed to improving efficiency and quality in construction projects.	4.71	0.662	184	1
3	Provide additional training on site. -Construction employees from other countries will be able to upgrade their abilities through training. -As a result, they will have more information and abilities at their disposal when they are working.	4.67	0.687	184	3
4	Appoint a leader in charge of the workers. -Performance among employees is significantly and favorably affected by effective leadership -Leaders may boost performance, direct team members in the proper directions, and ensure that construction projects move along smoothly by employing efficient and effective leadership techniques.	4.67	0.687	184	4
5	Reduce lack of material availability With effective material management and a solid optimization strategy, the issue of lack of material availability may be resolved.	4.65	0.701	184	5
6	Provide incentive. -Incentives are defined as incentives or any sort of monetary reward offered to employees.	4.68	0.738	184	2

	-Incentives are used as a strategic strategy in compensation packages to reward employees for their performance and keep them on board by enhancing their well-being and promoting employee happiness in addition to maximizing productivity.				
7	Provide sufficient technical support. -Construction workers need to use technology to increase productivity. Workforce productivity will increase if construction workers have access to modern equipment and software. -To provide sufficient technical support in terms of plants, machinery, and tools to construction site workers, companies need to ensure that the equipment is well-maintained, readily available, and suitable for the tasks at hand. -Absolutely, ensuring that the equipment used in construction is well-maintained, readily available, and suitable for the tasks at hand is crucial for the productivity and safety of construction site workers.	4.65	0.731	184	6

Table 6 shows the item that complies with the last objective of this study which is to suggest methods to improve construction workers productivity and efficiency in the construction industry. From the table above, it shows that send to construction training center (Rank 1, mean 4.71) followed by the provide incentive (Rank 2, mean 4.68) and provide additional training on site (Rank 3, mean 4.67). Appoint a leader in charge for the workers was (Rank 4, mean 4.67) and reduce lack of material availability was (Rank 5, mean 4.65). As provide sufficient technical support was (Rank 6, mean 4.65) and education comes in (Rank 7, mean 4.63).

From the analysis done through questionnaire survey, most of the respondents were agreed that send to construction training center provided by CIDB are the methods that can improve construction workers productivity and efficiency in construction industry due to employees are trained in career development skills at the training facility. Sending employees to construction training facilities may greatly increase the productivity and efficiency of the construction sector. By allocating resources towards training and development via construction training centers, businesses may equip their workers with the requisite skills and expertise, resulting in higher output, enhanced efficacy, and superior project results. In addition, one practical strategy to increase productivity is to provide incentives to construction workers. Employees are motivated to perform better and make valuable contributions to the project when they are provided incentives.

5. Conclusion

The construction industry is one of the fastest growing industries, with a labor shortage and low productivity and efficiency among construction workers. In order to discover the elements impacting labor productivity on the progress of construction work, this research has been conducted in order to give approach and exposure to the construction industry. In order to guarantee that work is proceeding smoothly, prevent interruptions, and ensure that the task can be completed correctly and on schedule, labor productivity is today a crucial finding. In order to comply with the problem, study is being done, and three objectives have been achieved.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design:*** *Hoo Boon Xyan, Zailawati Binti Khalid;* ***data collection:*** *Hoo Boon Xyan,;* ***analysis and interpretation of results:*** *Hoo Boon Xyan,;* ***draft manuscript preparation:*** *Hoo Boon Xyan, Zailawati Binti Khalid, Puteri Sidrotul Nabihah Saarani, Norliana Binti Sarpin, Roshartini Omar. All authors reviewed the results and approved the final version of the manuscript.*

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Appendix A: Research Process Flow Chart

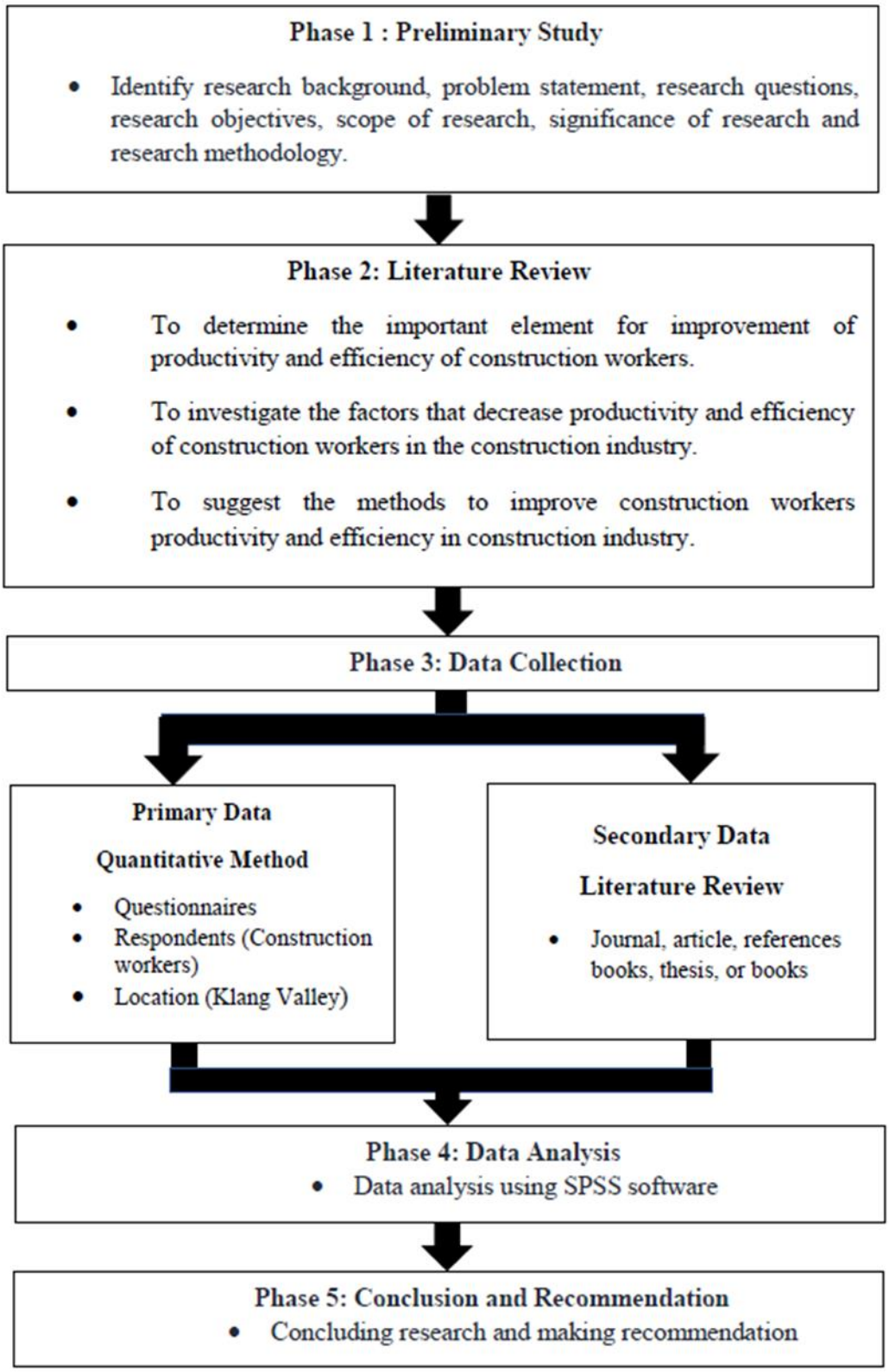

Figure 3.1 Research Process Flow Chart

Appendix B: Table Population (N) and sample (S) Krejcie and Morgan

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Table Population (N) and sample (S) Krejcie and Morgan

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