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ORIGINAL ARTICLE

THE IMPACT OF SAFETY AND HEALTH ISSUES ON THE CONSTRUCTION WORKFORCE PRODUCTIVITY IN MALAYSIA

Queenie Wong[1], Noraina Mazuin Sapuan[1*], Muhammad Waris Ali Khan[2]

[1]Faculty of Industrial Management, Universiti Malaysia Pahang, 26600 Pahang, Malaysia.
[2]Faculty of Business and Law, The British University in Dubai, UAE

ABSTRACT – This research aims to study the impact of safety and health of the construction workforce productivity among workers in G3 contractors in Kuantan, Pahang, Malaysia. Previous research found that construction companies face a lack of safety concerns due to insufficient safety compliance and poor attitude towards safety. While poor safety measures in the working environment and material storage cause injuries and accidents that affect work on-site. Lack of health concerns based on physical and mental health issues affected the productivity of the construction workers. In this study, a quantitative research is used to collect and analyze data using the PLS-SEM model. This research has collected 152 responses from workers of G3 contractors in Kuantan, Pahang. Hence, the result of this study could be used as a reference for future studies among the constructions companies in improving the productivity of their workers in order to sustain their business operation.

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Introduction

Safety and health issues are very crucial to the construction industry, especially with the high fatality rate of accidents that frequently happened in this industry. Occupational safety and health (OSH) is concerned with protecting the mental, physical, and emotional well-being of employees, and also keeping the workplace environment largely free of actual or prospective risks that could injure employees. (Nyirenda et al., 2015)

In the year 2022, the Department of Occupational Safety and Health (DOSH), Malaysia investigated and reported a total of 129 cases of accidents from January to September 2022. A total of 77 cases of non-permanent disabilities, 1 permanent disability, and 51 death cases were reported to DOSH Malaysia that year. The large number of accident cases which are increasing would affect the workforce productivity from time to time. The Department of Occupational Safety and Health (DOSH) has issued recommendations on Occupational Safety and Health in the Construction Industry (Management) OSHCIM 2017 for implementation in the construction industry. This guideline serves as a motivator to reduce construction fatality rates by 2020, as well as encourages the adoption of OSHCIM 2017 practices in Malaysia's construction industry.(Mohd et al., 2020).

Even though various initiatives have been taken to overcome the safety and health issues in this sector, several health issues continue to happen especially during the era of the COVID-19 pandemic in 2019. During the pandemic year from 2019-2020, the construction industry was the most affected the industry as the implementation of the lockdown on the national scale has caused all construction activities to stop their operation to control the spread of the viruses among these workers.

In Malaysia, the construction industry has a weak safety record which results from a lack of safety concern among the management and the workers such as inadequate self-preparation, insufficient safety compliance, insufficient safety equipment, unsafe methods or sequencing, unsafe site conditions, failure to use safety equipment, a poor attitude toward safety, and isolated, abrupt deviations from prescribed actions have cause and contribute in the safety records (Sultan et al., 2021). Malaysia's construction industry has a big number of foreign workers from other countries that have different cultures and less knowledge, especially on health and safety issues, so the government faces little pressure from the local community and NGOs to overcome these issues (Chen et al., 2017).

Moreover, the construction industry is a workspace that lacks health concerns they easily ignored the hygiene issues among workers. The hygiene concern during the covid-19 pandemic has affected the worker's physical health, especially their respiratory system and their mental health which was coming from stress and burnout among workers due to no enforcement following the standard of procedures at work such as social distancing, maintaining good airway circulation in the construction site, ensuring personal and working environment hygiene, enhance wearing PPE at work and limitations on number of workers at work (Hollingsworth, 2020). Other than that, inadequate use of PPE, lack of personal hygiene, and social distancing problem also cause infection among workers in the workplace.

Construction work has a relatively high fatality and accident rate among other industries. Understanding the management of health and safety issues could maintain the construction workforce's productivity. Successful methods in the life-cycle of the project could increase workforce productivity (Chen et al., 2020). Fatigue, weather condition, working

*CORRESPONDING AUTHOR | Noraina Mazuin Sapuan | ✉ noraina@usm.my

environment, workers' professions, and management in the project are also factor that influences workforce productivity (Nasirzadeh & Nojedehi, 2013). Moreover, the worker's health and safety issues have brought an impact on productivity (Alsharef et al., 2021).

Thus, this research is intended to study the impact of health and safety concerns on the construction workforce productivity among workers of G3 contractors in Kuantan, Pahang, Malaysia.

LITERATURE REVIEW

Overview of Construction Safety and Health Governance

Several studies stated that accidents and injuries reported in the construction industry have rapidly increased over the last five years (Peñaloza et al., 2020). Safety planning is an important part of proactive monitoring in the construction industry which focuses on risk management and accident analysis to address failures, incidents, and accidents. As a result, the knowledge gathered from these failure-focused events becomes the learning basis for the prevention of future situations (Martinetti et al., 2019).

In Malaysia, the development of Safety Organizations that protect the construction workforce's performance is governed by a combination of various institutions namely the Department of Occupational Safety and Health (DOSH), Department of Environment (DOE), National Institute of Occupational Safety and Health (NIOSH), Social Security Association (Perkeso), and others such as The Construction Industry Development Board Malaysia (CIDB), Ministry of Health, and Universities that are in charge mostly in matters related to the safety and health issues in the construction industry. The CIDB is known as the Lembaga Pembangunan Industri Pembinaan Malaysia, which stimulates development, and improvement undertakes research, and assists in the export service, regulating the construction industry in conformance of standards in construction workmanship and materials, promotes and encourages quality assurance, toward achieving global competitiveness, facilitating professionalism function in delivering quality, productive and build sustainability of the environment (CIDB – Plus PM Consultant, 2021.).

The safety action that CIDB has taken is to enforce a green card system that certified the workers have attended the safety training before work. They must attend the program and issues with the card verified to work on the construction site. CIDB has also executed their responsibility to protocol all the construction sites by checking and reminding all the construction sites to ensure they follow the SOP at work such as assuring the safety of the worksite, social distancing, checking worker's green card, housekeeping of site, sanitization and body temperature record (EdgeProp.My, 2020.). Due to the chaos in society and the seriousness happens with the coronavirus pandemic, the Malaysian government implement the movement control order (MCO) to isolate people in-house to reduce the infection of coronavirus before the vaccination was invented. Other than that, all the economic activities were forced to stop as well to coordinate the government policy. Unfortunately, there are still many construction sites that failed to comply with the SOP and are forced to stop and ordered to close immediately (EdgeProp.My, 2021) whenever they were being checked if they followed the SOP. The approval of permission to operate does not bring corporate from the workers causes increasing in covid-19 infection cases. At last, the projects were still forced to stop and cause project delays.

Poor safety measure like congestion in the construction worksite is also unsafe condition for the workers. The management of building materials such as the coordination of material removal, purchase, delivery, receiving of materials on site, warehousing or storage, and installation are an important part of the project. (Misron et al., 2018) The underlying aspects of the site also take into several issues such as lack of adequate storage space, less room for effective handling of materials, accidents due to poor management, and less adequate space for remaining building materials (Spillane et al., 2011).

Lack of Safety Concern

Safety is a multidisciplinary topic that involves different fields, such as economics, psychology, industrial technology, law, and occupational hygiene among others. Many safety issues in construction projects have been overlooked due to the authorities' primary concern of completing as many activities as possible (Sultan et al., 2021). The construction industry is considered a highly dangerous risk activity in Malaysia. All construction companies must implement safety management by establishing Occupational Health and Safety (OSH) department on the construction site (Alaloul, 2021). Worker's health and safety is always a focus topic in the industry especially in the construction industry (Dennerlein et al., 2020).

Most injuries happen in three types of accident, which is fall, striking against an object, and unclassified accident such as exposure to a harmful substance at the worksite. The majority of these accidents are caused by the working environment such as transport and lifting equipment and machinery. While the factors that affect health and safety performance in the construction industry are due to lack of awareness in the management team, lack of training, and poor hazard awareness among workers.

New staff orientation is specifically important which is to give training and professional briefing and to identify hazards in construction sites. Workers should know the company safety procedure rule, and recognize the function and movement of the machinery on the worksite. Personal protective equipment should be provided by the company at zero cost to the employee, and workers should not work in an unsanitary or hazardous environment. (Sultan et al., 2021) Regular inspection of job site material and equipment and identified the equipment by tagging or locking the controls to render them inoperable. Besides that, communication barriers are broken down and transparency between managers and

employees is encouraged by a good safety culture. An environment of learning would improve safety culture and team performance (Ediale Young et al., 2018).

Poor Safety Measurement

According to Issa et al., (2021), the construction industry has the highest rate of accidents in contributing to economic activity. It is a waste of performance if safety at work is not taken seriously in construction worksites such as injured of skilled workers and accident happens. Workers are expected to be provided a safe working environment such as a workplace where equipment is frequently sanitized, social distancing is enhanced at the workplace, and conducting safety measures on every worker on body temperature and covid tests (Stiles et al., 2021).

Congested site issues were often raised in urban area construction projects. The issues such as inadequate storage space for building materials, less effective space for handling materials, and the accident that happened due to poor management of building materials (Misron et al., 2018) are the facts that cause poor safety measurement issues which impact the workforce productivity. Determining storage location and categorizing the material could ensure the safety of workers, the quality of material assured, and stock records completed (Brutus & Chiyem, 2015).

Based on Berhanu et al., (2019) research we found that high construction injuries are due to improper handling of material such as lifting, pushing, pulling, unloading, and moving the material around. Another possibility is when the workers consume alcohol during work has cause blurry vision and not able to focus at work. To prevent the injuries in construction industry, Tang et al., (2019) suggested improving workers' hazard awareness, and creating a safer workplace for employees at a fair cost, construction safety information and activity in field operations might be automatically processed and visualized in real-time.

Lack of Health Concerns

Health problems and occupational accidents are always overlooked issues among construction workers as they are mostly male workers in construction worksites. So, it also highly affects the labor shortage problem due to the lack of health concerns and causes absenteeism among workers. Lack of back safety concerns and a proper working environment has brought effect on ergonomic health problems such as neck, back, and shoulder pain (Ekpanyaskul & Padungtod, 2021b). Manual handling operations transfer a load, including the lifting, pushing, pulling, carrying, or moving of a load by the hands or through the application of bodily force. Several risk factors make manual handling of loads hazardous and increase the risk of injury. Particularly, back pain, discomfort, or injury are affected by the musculoskeletal system. (OSH Wiki, 2020)

Other than that, workers may experience difficulties in breathing when they are working in limited space, dirty and slippery floors, or dusty and without a good airway environment. The risk of getting asthma is caused by being exposed to Ethylene oxide, antineoplastic drugs, and disinfectant agents (Rai et al., 2020). Especially in older aged workers, where their lung is not expended well and have a slight hunchback. Based on Peng & Chan, (2020) research we found that most older construction workers are encouraged to extend working longer and they were experiencing poor physical and mental health. Hence, the increasing age has brought the elderly with health problems in which they have low capabilities at work.

The mental health and well-being of workers is also an issue in the construction industry. It is an illness that controls our emotional, psychological, and well-being in our daily life. It is mostly affected by how we think and feel such as problem-solving and handling stress that may occur (MentalHealth.Gov, 2022.). Construction workers who sacrifice more time to work and to meet the expected outcome of every project happens a lack of sleep and fatigue that cause them stress and burnout (Powell & Copping, 2016). Sleep problems could cause mental health illnesses such as anxiety and depression, which may cause workplace injuries and accidents. Based on (Ross et al., 2021) article, workplace bullying among young workers may cause suicide cases that resulted from mental health issues. Some older workers have job insecurity due to their age and their financial condition to cope with the high cost of living. Most older workers who live alone or have conflict with their family would experience poor mental health such as depression with their life. The language barrier has made difficulties among certain construction workers because they did not understand the safety procedure and training at work (Chan et al., 2017). Some foreign workers that are being neglected are confused and scared to work in an unsafe environment. Improper safety training may increase the risk of injuries and accidents happening on the work site. Weak team building and teamwork among workers would also cause mental health problems.

Construction Workforce Productivity

Productivity in the construction industry is measured by workforce productivity, which can be defined as units of work produced or done per working hour. (Tan & Abdul-Samad, 2022). Based on Kazaz et al., (2008), we found that the construction workforce involves the biggest percentage of the total project cost and it is the key that affects the success of the project. The productivity risk factor has a strong impact on the project duration, which also means that poor construction workforce productivity would cause delay in projects.

Construction work has a relatively high fatality and accident rate among other industries. Understanding the management of health and safety issues could maintain the construction workforce's productivity. Successful methods in the life-cycle of the project could increase workforce productivity (Chen et al., 2020). Fatigue, weather condition, working environment, workers' professions, and management in the project are also factor that influences workforce productivity (Nasirzadeh & Nojedehi, 2013).

Furthermore, the worker's health and safety issue has brought an impact on productivity, especially when they are faced with the larger risk of getting infected by the coronavirus (Alsharef et al., 2021). So construction workforce productivity could be managed by the project manager in doing planning and scheduling of work. Deviations from the regular flow of work have an impact on the efficiency of the construction workforce. Every batch of workers could work and the project manager will minimize the risk of getting exposed so that productivity is assured.

Proposed Research Framework

In this study, the proposed research framework is shown in Figure 1. The health and safety issues that are mentioned in this research are lack of safety concerns, poor safety measures, and lack of health concerns in the construction industry. So, when it occurs about any health and safety issues as mentioned among construction workers, it will affect the workforce productivity in construction sites. The significant effect is when the lack of safety concerns happens on the construction work site, workers will experience fear and unsafe condition in the workplace affecting their productivity of work. Secondly, when poor safety measures in construction work sites such as the SOP and safety training brings affect virus transmission will affect workforce productivity significantly. Last but not least, a lack of health concern may cause back safety which causes back injuries and affect workforce productivity.

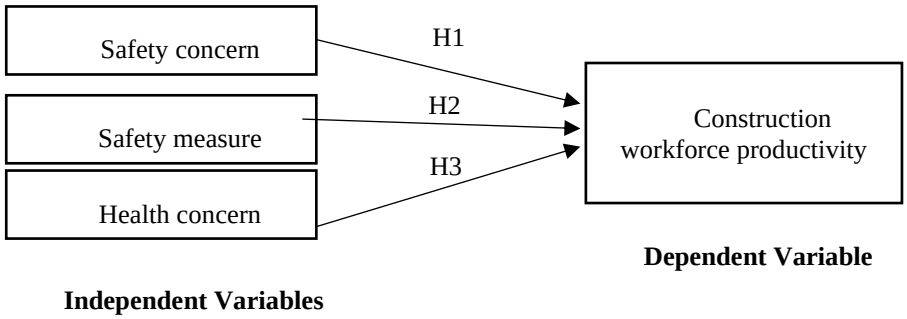

Figure 1: Proposed Research Framework

The Hypothesis Development:
H1: The impact that safety concern has a significant impact on construction workforce productivity.
H2: The impact that safety measurement has a significant impact on construction workforce productivity.
H3: The impact that health concern has a significant impact on construction workforce productivity

RESEARCH METHODOLOGY

Research Design

Research design is the component of the study method selected by the researcher and identifies which research method is the most suitable to carry out for the whole study. The research design is selected based on the purpose of the research. The purpose of this research is to examine the impact of health and safety on construction workforce productivity. Hence, the research design that is suitable for this study is a quantitative analysis based on a cross-sectional survey design.

This research uses quantitative design because the model testing of this study is to test a proposed research model. Past studies are using quantitative design to do research based on health and safety issues in the construction industry. While the cross-sectional survey design collects data from the population that relate to the research which is construction industry workers that are affected by the pandemic but different from the demographic aspect. The researcher uses an online survey form to collect the data by implementing structured interviews.

Measurement Development

To achieve the objective of the measurement in this study, a closed-ended questionnaire with multiple choice questions will be used for the data collection purpose. There are five sections consist in the questionnaire which are the demographic information, health and safety issues that consist of three parts; the lack of safety concern, poor safety measures, lack of health concerns in the construction work site, and the dependent variable which is the construction workforce productivity.

In order to ensure the validity and reliability of the measurement quality, a neutral point should seldom be the respondent's answers. It may affect the quality of measurement if every respondent is answering a neutral answer in which they agree and disagree with both sides. There will be a five-point interval Likert scale to choose for the measurement, which is from 1 (strongly disagree) to 5 (strongly agree).

Population and sample

The targeted population of this research is the G3 construction industry company in Malaysia. Based on the CIMS system from CIDB official website, the number of contractors in grade G3 found in Malaysia is 16,382 companies. Therefore, the total number of populations in this study will be 16382 companies. Due to the researcher being based in Kuantan, Pahang, the researcher will approach the G3 contractor mainly in peninsular Malaysia which is in Pahang state only. The population size of G3 contractors shown in the CIMS system in Pahang state is only 548 companies.

After collecting detailed information about the G3 construction company in Pahang from the CIDB website, this study will use simple random sampling techniques as the sampling technique throughout the research. Simple random sampling is a technique where random respondents will be chosen to answer the questionnaire and represent the population of the defined sample group. The respondent shall be a construction worker which defines the population of the research.

To determine the number of the minimum sample size, G-power statistical analysis software is used as a tool to calculate the minimum sample size of the research. The reason this study uses G-power software to determine the minimal sample size is that the number of construction companies applying flexibility is unknown. Therefore, the G-power statistic has shown the minimum sample size in this research requires 119 samples.

Data Collection Technique

The data will be collected by using an online questionnaire survey form and it will be created by using an online Google form. The respondent will receive an email attached with a Google form link as an invitation to answer the research questionnaire. Hence, an email will be sent out to the construction company's email provided based on the CIMS system from the CIDB website.

In this study, the online questionnaire was designed with close-ended questions. There will be five sections consist in the online questionnaire which are section (1): demographic information of the respondent, section (2) the safety concern among construction workers, section (3) the poor safety measure on the construction site, section (4) lack of health concern among workers and section (5) is the construction workers' productivity level.

Data Analysis Method

After collecting the data process, the Smart Partial Least with Structural Equation Modelling (Smart PLS 4.0) software will be chosen as the tool to analyze the collected data. PLS-SEM has become a common method to analyze the complex interrelationship between observed variables. There was much research applied to PLS-SEM such as management studies. This research chose PLS-SEM to better understand and increase the complexity by exploring theoretical extensions of established theories (Hair et al., 2019).

Based on Buniya et al., (2021) research on barriers to safety programs in the construction industry, PLS-SEM has been implemented in this research to analyze the relationship between the independent variable and dependent variable by estimating the coefficient. PLS-SEM could analyze and evaluate the contribution of variables and the implementation of a strategy to the research. Where it could decrease the error and handling the strategy implies. While Yap et al., (2018) explained the benefit that PLS-SEM is the nonparametric method with no distributional assumptions. PLS-SEM as a statistical modeling approach is evolving to allow academics to pursue research opportunities in new and varied ways. Based on this research, the researcher was exploring the health and safety issues in the construction industry amid the Covid-19 pandemic where there is a lack of research and information about this topic and needs to determine whether the research hypothesis is supported.

RESULTS

This questionnaire collected the respondent's demographic profile information which include their gender, age, ethnicity, education level, monthly income, job position, working experience, and does the respondent work on project sites. Table 1 shows the demographic profile total collected. The total number of respondents collected is 152. (n=152) According to the G-Power software provided, the total sample size required for this study is 119 respondents.

Table 1 shows that the majority of respondents are Malay (61.18%) Male (73.68%) workers. Most respondents' age is between 20-29 years old (54.61%) and with an SPM (38.16%) and a Degree education level (34.87%). Most construction workers have RM3500-RM4500 (15.13%) income per month and hold a job position as a project supervisor (28.29%) and site engineer or worker (21.71%). Most respondents work in project sites (88.82%) and with 1-5 years (61.18%) of working experience.

Table 1: Demographic Profile

	Count	Percentage (%)
Gender		
Female	40	26.32%
Male	112	73.68%
Ethnicity		
Chinese	51	33.55%
Indian	8	5.26%
Malay	93	61.18%
Age Group		
20 - 29	83	54.61%
30 - 39	29	19.08%
40 - 49	36	23.68%
50 and above	4	2.63%
Education Level		
Degree	53	34.87%
Diploma	28	18.42%
Master's	7	4.61%
SPM	58	38.16%
STPM	6	3.95%
Monthly income range		
< RM1500	6	3.95%
> RM 5500	25	16.45%
RM 1501 - RM 2500	23	15.13%
RM 2501 - RM 3500	22	14.47%
RM 3501 - RM 4500	53	34.87%
RM 4501 - RM 5500	23	15.13%
Job Position		
Associated Engineer	15	9.87%
General Labour	5	3.29%
Management Officer	13	8.55%
Project Architect	13	8.55%
Project Management Officer	30	19.74%
Project Supervisor	43	28.29%
Site Engineer or Workers	33	21.71%
Grand Total	152	100.00%
Do you work on project sites?		
No	17	11.18%
Yes	135	88.82%
Grand Total	**152**	**100.00%**

Descriptive Analysis

The most common measure of variability is the standard deviation. The standard deviation is a measure of the amount of variation or dispersion of a set of values. It is defined as the numeric index that describes how far the mean score in the distribution is located. Table 2 shows the results of min, max, mean, and standard deviation. Based on the result, the range of the mean value variable is between 4.609 and 4.627. The highest mean is Lack of Safety concern with 4.627, while the lowest mean value is 4.609 on construction workforce productivity. At the same time, the highest value of

standard deviation is 0.595 with construction workforce productivity level, while the lowest standard deviation value is 0.577 with safety concerns.

Table 2: Descriptive Statistic

	Descriptive Statistic			
Construct	Min	Max	Mean	Standard Deviation
Safety Concern	3	5	4.627	0.577
Safety Measurement	3	5	4.624	0.585
Health Concern	3	5	4.625	0.580
Construction workforce productivity	3	5	4.609	0.595

Convergent Validity and Reliability

The measurement for convergent validity and reliability includes the Average Variance Estimate (AVE), Composite Reliability (CR), and Loadings. The average variance extracted (AVE) should be more significant with a value > 0.50. Composite Reliability (CR) measures reliability and the value significance with Cronbach's Alpha more than > 0.70 value. Based on this study, table 4.3 shows the AVE value is higher than 0.5, Composite Reliability value is higher than 0.7 thus it has fulfilled the need for convergent validity.

Table 3: Convergent Validity and Reliability

Constructs	Items	Loadings	Mean	Cronbach alpha α	Composite reliability	Average Variance Extracted (AVE)
Construction workforce productivity (CWP)	CWP2	0.822	4.631	0.887	0.917	0.689
	CWP3	0.886	4.617			
	CWP4	0.82	4.617			
	CWP5	0.827	4.610			
	CWP6	0.792	4.567			
Health Concern (HC)	LH1	0.809	4.674	0.956	0.961	0.675
	LH10	0.812	4.617			
	LH12	0.814	4.624			
	LH13	0.846	4.617			
	LH15	0.848	4.617			
	LH17	0.832	4.617			
	LH18	0.838	4.631			
	LH19	0.809	4.617			
	LH4	0.813	4.624			
	LH5	0.834	4.617			
	LH8	0.815	4.624			
	LH9	0.788	4.624			
Safety Concern (SC)	LS1	0.84	4.624	0.88	0.912	0.676
	LS3	0.807	4.610			
	LS4	0.846	4.638			
	LS5	0.853	4.631			
	LS6	0.763	4.631			
Safety Measurement (SM)	PS1	0.841	4.596	0.9	0.926	0.715
	PS2	0.885	4.638			
	PS4	0.831	4.652			
	PS5	0.847	4.617			
	PS6	0.824	4.617			

Discriminant Validity

Based on Benitez et al., (2020) studies, discriminant validity requires two talent variables to measure and compare the correlation between the construct and the square root of the average variance extracted for the construct, two criteria could be assessed under discriminant validity. The first criterion is the Heterotrait-Monotrait ratio of correlation (HTMT rho-c) and the second criterion is Fornell-Lacker. Table 4 shows the average value of Fornell-Lacker is from 0.822 to 0.913. While HTMT in Table 5 shows the value from 0.968 to 1.045. The HTMT value should be strictly <0.89 or 0.90, or the

ratio must be significantly below 0.90. The data in Table 4.5 shows that the data analyzed did not meet the value requirement, the Fornell Lacker criterion must be used. For this study, the Fornell-Lacker value for the items meets the requirement as the confidence interval are are below 0.9.

Table 4: Fornell-Lacker

	CWP	HC	SC	SM
CWP	0.83			
HC	0.895	0.822		
SC	0.856	0.903	0.822	
SM	0.853	0.913	0.863	0.846

Table 5: Discriminant Validity Result (HTMT Ratio)

	CWP	HC	SC	SM
CWP				
HC	0.967			
SC	0.965	0.985		
SM	0.95	0.984	0.969	

Notes: CWP = Construction Workforce Productivity, HC = Health Concern, SC = Safety Concern & SM = Safety Measure.

Summary Hypothesis Testing

The hypothesis results are summarized in Table 4.6. Three hypotheses in this study will predict and analyze the link between variables. The hypothesis is tested using PLS-SEM which uses bootstrapping to evaluate the significance of all path coefficients in PLS path modeling. The result of hypothesis testing is using bootstrapping with a sample size of 5000 and the test type used is one-tailed. As a result, the significance level of the hypothesis, the p-value must be less than 0.5 and the t-value must be more than 1.645.

Table 6 shows the result of hypothesis testing. Based on the finding, sufficient evidence exists to support the hypothesis based on the positive and significant link from all hypotheses. As proposed in hypothesis 1, there is a significant impact between health concerns towards construction workers' productivity level, it is supported by (β=0.542, p-value=0, t-value= 4.999). The second hypothesis is about safety concern has a significant impact on construction workers' productivity level (β=0.225, p-value=0.008, t-value= 2.417). Last but not least, the third hypothesis is about safety measurement having a significant impact on construction workers' productivity level supported by (β=0.164, p-value=0.033, t-value= 1.842).

Table 6: Significance of hypothesis relationships (direct)

						Confidence interval bias corrected		
Hypothesis	Relationship	β	SD	t-value	p-value	5.00%	95.00%	Decision
H1	HC -> CWP	0.542	0.108	4.999	0	0.385	0.738	Supported
H2	SC -> CWP	0.225	0.093	2.417	0.008	0.069	0.375	Supported
H3	SM -> CWP	0.164	0.089	1.842	0.033	0.009	0.303	Supported

*One-tailed test

DISCUSSION

In this study, three objectives are set to investigate the hypothesis. The first research objective is to aim by identifying the relationship between safety concerns and construction workforce productivity. We proposed that safety concern has a significant impact on the construction workforce productivity. Slips, trips, and falls have the most contribution to construction injuries and accidents. It has led to the domino effect from an unsafe act to affect the construction workforce productivity, and last but not least the deliverables of the project. The safety training program is compulsory to assure the workers' safety and it could enhance the workforce productivity in projects. While the second objective is to identify the relationship between poor safety measures and construction workforce productivity. Congested site issues are an unsafe working environment, where accidents could happen due to poor housekeeping with the building material and resources not organized in the workplace. It has a significant impact on the workforce productivity due to an unsafe working environment. Lastly, the relationship between health concerns based on respiratory illness and stress and burnout issues has a significant impact on construction workforce productivity. The health hazard may include inhalation, ingestion, absorption, awkward body posture, and stress and burnout issues. Respiratory illness such as asthma or asbestosis due to inhalations of microscopic fibers of asbestos is a health issue for workers. So, PPE at work is compulsory to protect

workers and ensure workforce productivity. These three objectives investigate the impact of safety and health on construction workers' productivity using the average mean score. The findings show the positive effect of all three hypotheses. The highest mean of variable construction workforce productivity is CWP2 (4.631) (Maslow's Theory stated that a worker's motivation is based on the worker's wages, and salary payment, high motivation brings high workforce productivity), lack of health concern is LH1 (4.674) (Manual handling operations transferring a load, including the lifting, pushing, pulling, carrying or moving of a load by the hands increase the risk of back injuries.). The safety concern is LS4 (4.638) (Job site material and equipment have a regular inspection to ensure the equipment is well functioning) and the safety measure is PS4 (4.652) (Wet surface and tools are not in proper storage causing slip, trips, and falls happens there is lack of housekeeping in the construction site.). Based on previous research, safety, and health issues do impact construction workforce productivity, especially during the covid-19 pandemic. (Sami Ur Rehman et al., 2022)

CONCLUSION AND RECOMMENDATION

Research about safety and health in the construction industry has never been stop, it always has become more interesting and more to find out day by day. This conclusion determined the safety and health variable significantly affect the construction workforce productivity. The relationship between independent and dependent variables is linked based on the findings and data analysis. However, this part will explain more about the result of the findings, some limitation that needs to be faced, and suggest some recommendations for future research.

There are three objectives concluded in this research. First is to identify the relationship between safety concerns and construction workforce productivity, second is to identify the relationship between safety measures and construction workforce productivity and third is to identify the relationship between health concerns based on hygiene issues and construction workforce productivity. Most construction companies will build up their understanding by developing workplace safety and health management practice in the construction industry. This will help Malaysia's construction industry to understand more about OSHA which is also one of the factors that affect workforce productivity besides time and cost. Thus, safety training and precaution need to be taken care of to improve workforce productivity in the construction industry.

This research has some limitations that need to be considered for future research. The first limitation is the population and sample size for the research. This research was only focused on construction workers in G3 construction company and it is only focused in Kuantan, Pahang. The respondents in this research are 152 from various companies in the targeted area and involved all management employees. The second limitation is that some respondents are not willing or did not how to answer the questionnaire by using an online platform as the data collected by Google form. The researcher is recommended to prepare the questionnaire in a hard copy form with multi-language for them to able to answer the questionnaire.

For future studies, the researcher can conduct more investigation based on safety and health issue in the construction industry from time to time, as there is no limitation on the safety topic. For example, in a previous study, we know about the health issues among workers due to SARS and Covid-19 pandemic. So, safety and health issues still happen from time to time which is one of the most factors that affect the construction workers' productivity level. Secondly, the research can be conducted wider, besides the construction industry to achieve a more detailed study about safety and health issues towards workforce and productivity.

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CONFLICT OF INTEREST

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Authors' biography

Author's Full Name: Queenie Wong
Author's Email: missqueenieee@gmail.com
Author Professional Bio:
Queenie Wong is a student of Bachelor of Project Management at the University Malaysia Pahang with a minor elective in IT.

Author's Full Name: Noraina Mazuin Sapuan
Author's Email: noraina@ump.edu.my
Author Professional Bio:
Dr. Noraina Mazuin Sapuan is currently the Head of Technical and a Senior Lecturer in the Faculty of Industrial Management, at the University Malaysia Pahang, Malaysia. She graduated with a Doctor of Philosophy (Economics) from Universiti Malaysia Terengganu (UMT). She completed her undergraduate and Master's degrees at Universiti Kebangsaan Malaysia (UKM) majoring in Applied Economics and Public Policy and Islamic Economics, respectively. Her area of interest covers three (3) main research areas namely Growth, Inclusion, and Sustainability. Her specific research areas are in Applied Macro econometrics, Sustainable Development Goals (Micro / Macro), Environmental Economics, Islamic Banking and Finance, and Personal Financial Planning.

Author's Full Name: Muhammad Waris Ali Khan
Author's Email: waris.khan@buid.ac.ae
Author Professional Bio:
Dr. Muhammad Waris Ali Khan is a professional engineer, certified Project Management Professional (PMP) and Associate Professor in the Faculty of Business and Law, The British University in Dubai, UAE. He completed his MSc (2011) and Ph.D. (2015) studies in civil engineering with a specialization in project management from Universiti Teknologi PETRONAS. His research interests include project management & governance, sustainability and renewable energy projects.