Operational Research in Engineering Sciences: Theory and Applications
Vol. 6, Issue 1, 2023, pp.432-457
ISSN: 2620-1607
eISSN: 2620-1747
DOI: https://doi.org/10.31181/oresta/0601136

PROJECT PERFORMANCE: ROLE OF OPERATIONAL SAFETY, HEALTH PERFORMANCE AND SAFETY PREPARATION

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Received: 17 January 2023
Accepted: 26 June 2023
First Online: 15 August 2023

Research Paper

Abstract:*Contemporary construction companies are placing emphasis on implementing various safety and health strategies in order to attain a favorable safety climate within the industry and enhance operational effectiveness. The purpose of this study is to examine the influence of operational safety (OS), health performance (HP), and safety preparation (SP) on the project performance of construction companies in Saudi Arabia. In order to effectively accomplish the stated objectives and yield optimal outcomes, data was gathered from a sample size of 316 employees employed in construction companies. The findings of the study emphasize that operating systems (OS), human resources practices (HP), and strategic planning (SP) have a significant influence on the project performance of construction companies. The mediation of open-source software (OSS) has demonstrated significant effects on the relationships between operating systems (OS), hardware providers (HP), software providers (SP), and platform providers (PP). This study renders a valuable contribution to the existing body of knowledge on safety by investigating the effects of pertinent factors within the construction industry. The results of this study provide valuable insights for professionals in the construction industry, enabling them to enhance the efficacy of safety management systems within their respective work environments. Furthermore, it serves as a driving force for the development of programs and policies aimed at facilitating the effective implementation of operating systems (OS), scheduling practices (SP), and health and safety protocols (HP) in order to attain optimal performance in construction projects.*

Keywords: *Operational safety, health performance, safety preparation, construction companies, project performance, Organizational support*

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1. Introduction

The Saudi construction sector has encountered a range of obstacles, including schedule delays, disruptions to cashflows, challenges in getting approvals and permits, limitations imposed by immigration restrictions, important safety and health concerns, as well as shortages in equipment and materials(Mosly, 2015). Additionally, the aforementioned observation highlights the successful efforts of the United Arab Emirates governmental institutions and construction industry in safeguarding the sector against the adverse impacts of the pandemic. The aforementioned endeavors encompassed initiatives such as economic assistance programs, the digitization of processes, the waiving of surcharges and fines, the establishment of healthcare facilities, and the implementation of various statutory relaxations(Sami Ur Rehman, Shafiq, & Afzal, 2022a; Sami Ur Rehman et al., 2022b). Construction firms have a substantial impact on the development of the global economy and the engagement of the workforce. Therefore, it is evident that instances of employee damages and accidents persistently occur at a high frequency, resulting in substantial adverse consequences on a global scale, encompassing economic, social, and personal domains(Shafique & Rafiq, 2019). From the period spanning 2009 to 2018, Mainland China witnessed an annual average of 2485 accidents and 2851 fatalities on construction sites. Specifically, the year 2018 witnessed a total of 3952 fatal construction accidents, indicating a notable surge of 30.8% compared to the previous year's incident count in 2017 (Zhongming et al., 2018). Previous studies on construction safety(Gunduz, Birgonul, & Ozdemir, 2018) has indicated that safety performance is considered a practical indicator for assessing the safety status of construction personnel, as opposed to relying solely on statistical data related to casualties and fatalities(Meng & Chan, 2022). Therefore, the examination of enhancing the modeling of Safety performance through integration is imperative and advantageous in the context of establishing occupational safety within the construction industry. It is essential to take into account potential theories pertaining to safety structures(Nyoni et al., 2019). In addition, the implementation of innovative ideas represents a commendable approach to enhancing safety measures at construction sites. The building industry has a substantial influence on the global economy, as evidenced by its $10 trillion contribution to the worldwide Gross Domestic Product(Columbus, 2017). The construction industry in the United States has demonstrated ongoing growth, making a substantial contribution of over $650 billion or 6.2% of the nation's Gross Domestic Product (GDP) during the years 2015 and 2016(Nnaji & Karakhan, 2020). The workforce in the construction sector plays a pivotal role in driving the global and United States economies. Increased productivity and job quality may result in the development of robust structures and other civil works, as a direct outcome of ensuring the safety of the construction workforce(Oesterreich & Teuteberg, 2016). However, the productivity and quality of work among construction employees are adversely impacted by the challenges they encounter. This could potentially have detrimental consequences for both the economy and the well-being of the general public. Hence, it is imperative to prioritize the improvement of worker safety within the construction sector(Ganah & John, 2015).Organisations adopt Operational Safety and Health Management Systems in order to mitigate the occurrence of worker injuries and illnesses, as well as to establish work environments that promote health and safety. The responsibility for identifying work-related risks, implementing safety measures to mitigate or eliminate those hazards, and informing employees about any remaining potential risks lies with the

employer(Dado et al., 2017). The implementation of the ISO 45001 standard is expected to enhance the prioritisation of occupational safety, workplace accidents, and operational diseases(Šolc et al., 2022).There is an immediate need for enhanced implementation and enforcement of workplace health and safety regulations in small-scale domestic construction projects(Erogul & Alyami, 2017).According toAljobaly and Banawi (2020), the Saudi Arabian government has implemented three distinct directives aimed at achieving the objective of establishing a secure work environment. These directives encompass the prioritization of employee well-being and the cultivation of safe workplaces as the first instruction, the enhancement of working conditions as the second instruction, and the establishment of safety groups within the workplace as the third instruction(Khasawneh, 2014).The construction industry in Saudi Arabia contributed 7.8% to the nation's gross domestic product (GDP) in the year 2014(Moshashai, Leber, & Savage, 2020). The achievement of productive performance in the construction industry is not solely reliant on the efforts of individual workers in carrying out sequential activities. Rather, it is crucial for organisations to provide support and demonstrate a vested interest in project performance. It is imperative for the construction industry to prioritise operational safety and the well-being of employees in order to achieve optimal outcomes. The Saudi construction sector demonstrates a strong commitment to prioritising the well-being of its workers(Rhoades & Eisenberger, 2002). The construction industry in Saudi Arabia prioritises the provision of communication, resources, reinforcement, and encouragement to enhance the physical well-being of its employees. The construction industry's provision of organizational support not only enhances employee satisfaction and fosters a sense of affiliation with the company, but also contributes to a decrease in turnover rates and an increase in worker retention. This is particularly evident in the preference of employees to work for companies that prioritize their physical and safety well-being(Bernarto et al., 2020; Qi et al., 2019). This study intends to evaluate the impact of employee safety and perceived organizational support on project performance within the construction industry of Saudi Arabia. Various features associated with these factors will be examined to gain a comprehensive understanding of their influence.

2. Literature Review

2.1. Theoretical Background

The theories of Goal-Freedom Alertness and Distractions can provide support for the enhancement of operational safety and health performance. The initial one was established byKerr (1957), while the latter was founded by Hinze in 1997. According to goal theory, the achievement of safe and secure work outcomes or performance is contingent upon the presence of a mentally fulfilling environment in which employees feel secure. This positive atmosphere is particularly pronounced when superiors and managers actively engage in efforts to prevent risks, hazards, illnesses, and accidents within the workplace.Organizations prioritize safety measures as a means of providing a supportive environment for their employees. The impact of perceived organizational support, when combined with a conducive work environment, is found to have a beneficial effect on employees' overall performance and productivity. It fosters enhanced employee performance. In contrast, the second theoretical perspective posits that the concept of distraction is contingent upon various contextual factors, particularly those related to health and safety (H&S).

Moreover, it can be divided into two distinct components. The risks arising from insecure physical conditions are being addressed. On the contrary, the second perspective acknowledges the phenomenon wherein employees experience distractions stemming from factors unrelated to their work-related tasks(Oluoch, 2015). Other authors have also emphasized this point(Namian, Albert, & Feng, 2018).

2.2 Impact of operational safety on project performance

The adoption of safety practices in the construction industry has increased due to a rising number of risks and accidents. Construction tasks and procedures often entail the use of heavy machinery, equipment, and the presence of hazardous conditions, such as working at elevated heights. These factors have the potential to lead to injuries and accidents(Durdyev et al., 2017; Khalid, Sagoo, & Benachir, 2021; Mohammadi, Tavakolan, & Khosravi, 2018).Therefore, the risks mentioned above associated with construction activities can lead to the depletion of significant resources, including time, finances, and quality. The loss of productivity is evident in this context(Alkaissy et al., 2020; Khalid et al., 2021; Muhammad, Abdulateef, & Ladi, 2015).Still, there are various additional indicators that point to the lack of safe and healthy practices within the organization. These include financial repercussions, loss of human life, illness, diminished skills resulting from turnover or mortality, and substantial expenses incurred by the organization as compensation. The previously mentioned costs are classified as direct costs, while there exist additional expenses that are not classified as direct costs and typically exceed the magnitude of direct costs.

Examples of negative consequences include reduced performance outcomes, project completion delays, and increased expenses due to property damage. Therefore, the implementation of safety rules, regulations, procedures, and practices holds significant importance in the realm of safety management(Abas et al., 2020; Khalid et al., 2021).The identification of potential safety hazards is of utmost importance, as failure to identify them can significantly contribute to the occurrence of unsafe incidents and accidents(Guo, Yu, & Skitmore, 2017).

The leaders prioritise the development of safety skills and integrate safety measures into the various processes and activities associated with production. The workers actively participate in the decision-making process pertaining to safety matters, and they are duly apprised of all safety regulations(Casey et al., 2017; Casey, Neal, & Griffin, 2019). When an accident of this nature transpires, it entails significant financial costs and time disruptions. The costs associated with construction escalate, as a consequence of delays that necessitate the utilisation of additional materials, and the imposition of penalties and compensation arising from legal ramifications related to accidents. This leads to the generation of margins and profits(Usukhbayar & Choi, 2020). Several significant variables that contributed to the success of the initiative included the endorsement and backing from senior management, the implementation of a well-structured plan, and the establishment of effective channels of communication and engagement between employees and managers. The International Organisation for Standardisation (ISO) has reached a consensus on this matter, in addition to ensuring the provision of essential resources for the implementation of safety practices(International Organization for Standardization, 2018; Winge, Albrechtsen, & Arnesen, 2019).Many research studies, as previously referenced, have examined the influence of safety on productivity; however, certain studies have yielded inconclusive findings regarding this correlation(Ghodrati, Yiu, & Wilkinson,

2018). In addition to the mentioned factors, scholarly research has also emphasised the objectives of safety programmes, which encompass the prohibition of behaviours that may result in accidents, the promotion of the identification and reporting of such behaviours, and the facilitation of reporting accidents and their corresponding preventive measures. The success of such programmes is contingent upon the demonstration of commitment to safety and responsibility, meticulous employee selection, and thorough safety assessment. By implementing these strategies, organisations can effectively ensure operational safety in construction projects, thereby mitigating potential financial burdens, time constraints, project delays, and reputational risks(Bavafa, Mahdiyar, & Marsono, 2018; Wu et al., 2015).

H1: *Operational safety has a significant and positive impact on project performance.*

2.3 Impact of health performance on project performance

The prioritisation of employee health and safety is integral to the attainment of a company's desired objectives. Research indicates that the presence of health concerns and associated risks, particularly those of a chronic nature, have a significant negative impact on productivity(Street & Lacey, 2019).Within the realm of health concerns, stress has emerged as a prominent factor contributing to significant financial implications. The impact of employees' health and well-being on a company's profits, productivity, and overall performance is significant(Street & Lacey, 2019). Moreover, research has indicated that organisations that actively oversee occupational safety and health measures for the welfare of their employees reap advantages such as increased profitability, reduced occurrence of accidents and injuries, enhanced employee dedication, and greater job satisfaction among employees(Haslam et al., 2016).According toLoan (2020), the presence of job satisfaction and commitment among employees has been observed to have a positive influence on their performance. Consequently, these factors have the potential to enhance the overall performance of an organisation or any project it embarks upon. Numerous studies have provided empirical evidence supporting the notion that the implementation of health and safety management practises within an organisation has a direct and significant influence on its overall performance(Gopang et al., 2017). The implementation of positive attitudes and behaviours, the adoption of effective health and safety policies, the provision of favourable working conditions, and the utilisation of safer equipment and tools have the potential to enhance both the occurrence of occupational accidents and illnesses and overall productivity(Han et al., 2014; Sharvindren, Vajravelu, & Zaini, 2021).In order to enhance the welfare of employees, organisations should adopt a proactive approach that extends beyond mere efforts to prevent illness and injuries. In order to enhance organisational effectiveness, it is imperative to establish improved and collaborative leadership, proactive policies and regulations, a culture of responsibility and accountability, consistent feedback mechanisms, active engagement and participation of both employees and managers, identification of opportunities for implementing corrective actions, and the provision of effective employee training(Schulte et al., 2019). Organisations that proactively prioritise the welfare of their employees and actively engage in initiatives aimed at promoting employee well-being have been found to experience reduced rates of absenteeism, increased levels of productivity, enhanced capabilities, improved health outcomes, and heightened operational efficiency(Gubler, Larkin, & Pierce, 2018). Organisations are required to engage in the process of analysing, evaluating, and assessing various situations in order to mitigate potential risks. Research has

indicated that when employees operate within a work environment characterised by robust health and safety measures, the resulting financial outcomes demonstrate advantageous effects(Nordlöf et al., 2017).

H2: *Health performance has a significant and positive impact on project performance.*

2.3 Impact of safety preparation on project performance

Safety preparation and management are imperative in the construction industry in order to effectively operate within an environment characterised by inherent risks and potential incidents. The planning and organisation of an entity encompass various elements, including the organisational culture, team composition, equipment and machinery selection, operational processes, and environmental factors. These aspects collectively contribute to enhancing safety preparedness(Ju & Rowlinson, 2014; Moorkamp et al., 2014; Pillay, 2014; Yiu et al., 2019; Yiu, Sze, & Chan, 2018). The effective implementation of project management can be regarded as a crucial factor contributing to the success of a project and its overall management. In order to enhance project efficiency and productivity, it is imperative to incorporate quality standards and safety protocols, particularly in the context of construction projects. In order tooptimise managerial effectiveness, managers prioritise the development of protocols that ensure safety and security within the workplace, as well as the establishment of an improved scheduling system. During this procedure, the individuals also examine and assess the potential hazards associated with carrying out the tasks, subsequently monitoring and evaluating them(Kontogiannis, Leva, & Balfe, 2017; Papke-Shields & Boyer-Wright, 2017; Yiu et al., 2019). In order to achieve optimal safety outcomes and performance, relying solely on rules and policies is insufficient. It is imperative to prioritise comprehensive preparedness measures. The organisation must consider providing training to its employees in order to effectively implement the policies. In order to ensure effective safety management, it is imperative to cultivate a climate that prioritises safety, fosters accountability and responsibility in the execution of safety protocols, and incentivizes adherence to such practises. This approach facilitates the development of a safety-oriented culture, thereby enhancing preparedness for potential safety concerns and ultimately reducing the incidence of accidents and injuries. Numerous studies have underscored the significance of a safety climate in this context, emphasising the necessity of management's commitment, knowledge, and awareness, as well as enhanced perceptions(Chen, McCabe, & Hyatt, 2017; Guo, Yiu, & González, 2016; Kim et al., 2019).The significance of preventing safety accidents and cultivating a safety climate lies in their profound effects on human lives, financial outcomes, and reputation, as highlighted byKim et al. (2019). Companies implement safety programmes to effectively supervise and mitigate injuries and illnesses among labourers. These programmes are designed to oversee various aspects such as locations, surroundings, and processes, with the aim of minimising the occurrence of accidents and fatalities. These programmes aim to equip employees with the necessary skills and knowledge to cultivate safe behaviours, thereby mitigating any actions that may lead to accidents. If properly executed, the implementation of such programmes has the potential to reduce costs associated with injuries and accidents, decrease labour absenteeism, increase productivity, and boost labourers' morale(Buniya et al., 2021; Hatem, 2017).The firm prioritizes key factors in order to achieve desired outcomes during the preparation phase. First and foremost, personal protective tools and equipment are deemed indispensable in this context. Personal protective equipment (PPE) serves the

purpose of safeguarding the various anatomical components of an individual's physique, encompassing their upper and lower extremities, lower limbs, pedal region, facial region, and so forth. In addition, this equipment may encompass garments designed to provide protection for the body, as well as accessories intended to safeguard the head and feet. The second factor pertains to the implementation of governmental regulations and rules, which is subsequently accompanied by the placement of suitable signals, boards, and signs in areas deemed unsafe. Furthermore, it is imperative to acknowledge that the inclusion of training and instruction on safe practises, along with meticulous planning and thorough preparation for unforeseen circumstances, constitutes essential components in this context. These various factors play a crucial role in mitigating the likelihood of hazardous incidents and fatalities among employees who do not align their efforts with the interests of the employing organization or the project at hand(Wong & Soo, 2019; Zekri, 2013). The methods employed by organizations to train and orient new employees and visitors regarding potential hazards, thereby increasing their awareness of workplace risks, emergency escape routes, and protocols, as well as equipping them with the necessary skills to respond effectively to emergencies, is a subject of considerable research interest due to its significant impact on accident prevention and injury reduction. Organizations develop safety protocols to proactively prepare for potential emergencies or crises. Resources and processes are employed for this objective(Abas et al., 2021).

H3: *Safety preparation has a significant and positive impact on project performance.*

2.4 The mediation of organizational support

A study carried out byWang, Zheng, and Zhao (2022) reveals that individuals engaged in project management within the construction industry face significant risks of health injuries and various diseases, such as respiratory ailments, muscular disorders, and cardiovascular conditions. The responsibility of maintaining a secure working environment for employees is incumbent upon all industries, including the manufacturing, services, and construction sectors. The provision of organizational support has been found to positively impact employees' confidence in the company and enhance their sense of belongingness to the organization, leading to a decrease in the rate of employee turnover. The impact of a healthy and safe work environment on the general well-being of employees is significant**.** A culture of organizational support has been found to enhance employee performance, as it fosters a sense of confidence and trust in the comprehensive backing provided by higher-level management within the organizational hierarchy. Perceived organizational support holds significance as it engenders a sense of efficacy among employees by virtue of the appreciation and recognition they receive(Oubibi et al., 2022). The level of organizational support varies depending on the specific characteristics of a business. Certain organizations prioritize providing financial support, while others emphasize non-monetary compensation and support, such as employee appreciation, recognition, and the establishment of favorable working conditions for their workforce. The long-term evaluation of organizational support yields a positive outcome. The study conducted byHameed et al. (2022) suggests that organisational support has a positive impact on employees' job satisfaction. This is because employees who invest their time and effort in an organisation anticipate reciprocation from the company. In this particular scenario, the provision of comprehensive support has been found to enhance employee satisfaction, promote employee retention, and ultimately contribute to increased productivity and performance. This implies that organisations that offer

assistance, establish secure working conditions, and cultivate a healthy environment must also ensure their provision of support in the form of attentiveness and acknowledgement to their employees(Crucke et al., 2022; Lerman, Harney, & Sadin, 2022). By implementing this approach, the level of satisfaction and performance among these workers would be replicated. Based on the preceding discourse, a hypothesis has been formulated as follows:

H4: *Organizational support mediates the relationship between operational safety and project performance*
H5: *Organizational support mediates the connection between health performance and project performance*
H6: *Organizational support mediates the link between safety preparation and project performance*

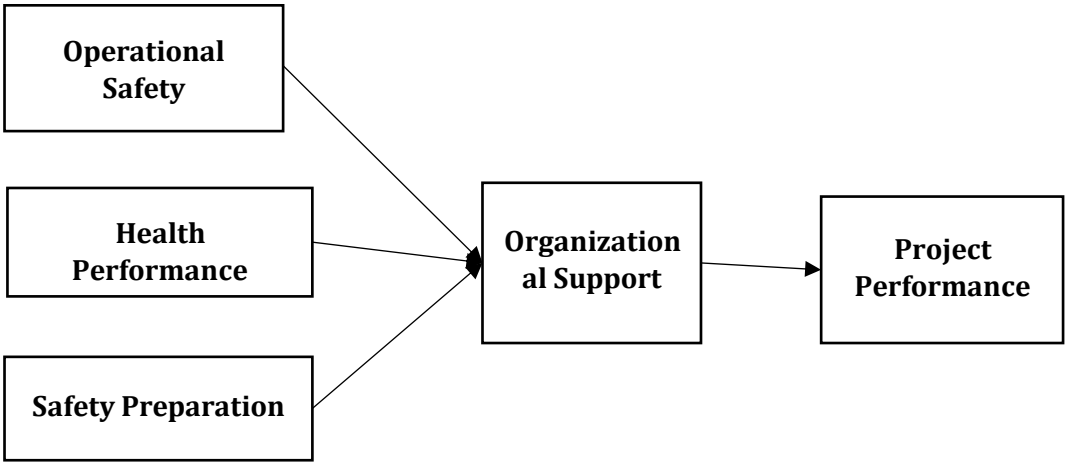


Figure 1. Conceptual Framework

3. Research Methodology

3.1 Methods

The research employs a quantitative methodology to carry out this study. The examination of each issue discovered during the research is conducted using a survey-based questionnaire, which effectively encompasses a significant portion of the population. The present study has devised questionnaires to facilitate the analysis of employees' opinions, ultimately leading to the formulation of research conclusions. The questionnaire consists of two sections, with the initial section focusing on demographic data, encompassing respondent characteristics such as age, gender, and educational background. The second section of the study focuses on research inquiries that have been formulated using measurement scales for each of the research variables, namely operational safety, health performance, project performance, safety preparation, and organizational support. This section is composed of multiple items for each variable. Distinct measurement scales are used to develop questionnaires for each variable. The study incorporates four variables, namely operational safety, health performance, project performance, and safety preparation. The operational safety scale employed in this study is derived from the research conducted byCasey et al. (2019). The measurement scale consists of a set of five items. The measurement scale

developed byKoopman et al. (2002) is employed for the purpose of assessing health performance. This scale comprises four items. The measurement of organisational support was conducted using a scale that incorporated five items(Nguyen Dinh et al., 2020).

The project performance measurement scale utilised in this study is derived from the work ofCha and Kim (2011). It consists of five items that are employed to assess project performance. Finally, the safety preparedness scale utilised in this study was derived from the work ofMalinowska-Lipień et al. (2021). The variables under investigation are assessed using the Likert scale, which ranges from a score of 1 indicating strong disagreement to a score of 4 indicating strong agreement. Each item exhibits varying scores at distinct intervals. For instance, the score for operational safety is situated at point 2, the score for health performance is positioned at 3 points, similarly, the score for project performance is located at point 1, and lastly, the score for safety preparation is designated at point 4 on the relevant component matrix.

The study focuses on the demographic of individuals employed by construction companies in the Kingdom of Saudi Arabia. A total of 350 questionnaires were allocated for distribution among the employees employed in construction firms. A total of 318 questionnaires were received out of the initial sample size of 350. The observed rate of return is determined to be 90.8%. The aforementioned percentage has been used for the purpose of conducting analysis and presenting the findings of the research. The data obtained from the participants' responses is subjected to analysis through the application of a structural equation model and confirmatory factor analysis.

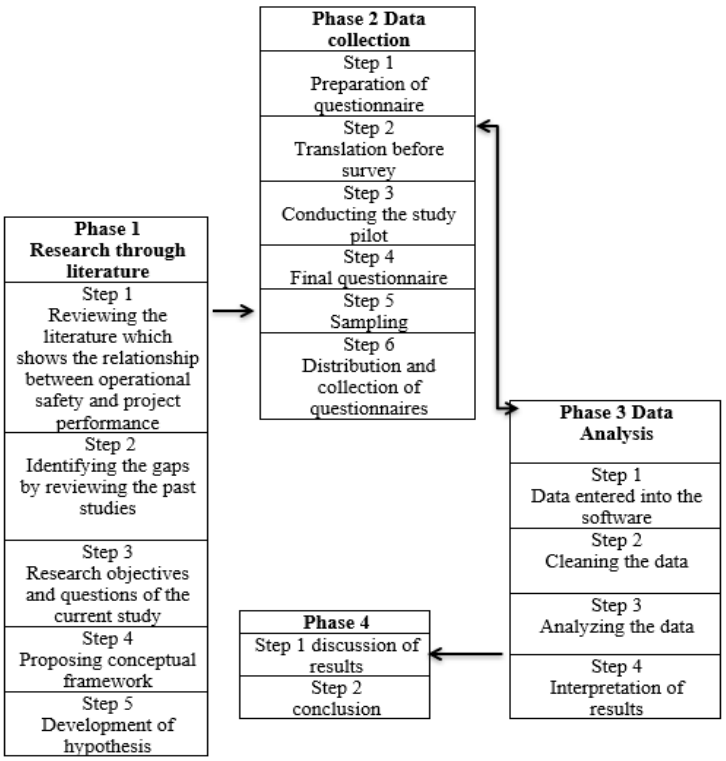


Figure 2: Research Process

3.2 Translation Instrument

Koller et al. (2012) employed a translation methodology in their research study. Considering the cultural and linguistic obstacles present in Saudi Arabia, it is important to acknowledge that not all employees possess a proficient understanding of the English language. The research is grounded in the English language; however, to enhance the quality and efficacy of the study, the method of backward and forward translation is employed. The translation process entailed the involvement of two bilingual translators who worked independently. The two translators serve distinct purposes. The initial translator performed the task of converting the questionnaires from English to Arabic. The outcomes derived from the Arabic version were subsequently analyzed by the second translator, who transformed the Arabic transcript into English. The employing of a translator is motivated by the fundamental objective of conducting impartial research that effectively communicates the perspectives of employees, free from any linguistic or cultural impediments.

4. Results

4.1 Demographic Results

Tables 1, 2, and 3 present a comprehensive overview of the demographic attributes that have been collected and disseminated within the scope of this study. The sample size consisted of 318 participants. Upon analysis, it was observed that out of the total 318 participants, 171 were identified as male, accounting for 53.8% of the sample. Additionally, 147 participants were identified as female, constituting 46.2% of the sample.

Table 1. Gender Distribution of respondents

		Frequency	Percent
Valid	male	171	53.8
	female	147	46.2
	Total	318	100.0

Table 2 presents an overview of the educational characteristics of the participants. Among the total sample size of 318 participants, it was found that 72 individuals, constituting 22.6% of the respondents, had successfully attained an intermediate degree. Furthermore, 153 participants had accomplished a bachelor's degree, while 81 respondents had completed a master's degree, accounting for 25.5% of the sample. Additionally, a minor proportion of 12 participants, equivalent to 3.8%, had obtained degrees other than those previously mentioned.

Table 2. Education of Respondents

		Frequency	Percent
Valid	Intermediate	72	22.6
	Bachelor	153	48.1
	Master	81	25.5
	Other	12	3.8
	Total	318	100.0

The range of ages among the respondents varied. Among the total sample size of

318 participants, it was observed that 99 individuals, constituting 31.1% of the population, were aged below 25 years. Additionally, 131 respondents, accounting for 41.2% of the sample, fell within the age range of 26 to 30 years. A total of 73 individuals fell within the age range of 31 to 35 years, while 15 participants were older than 35 years, representing a proportion of 4.7%.

Table 3. Age distribution

		Frequency	Percent
Valid	Less Than 25 Year	99	31.1
	26 to 30 Years	131	41.2
	31 to 35 Years	73	23.0
	More Than 35 Years	15	4.7
	Total	318	100.0

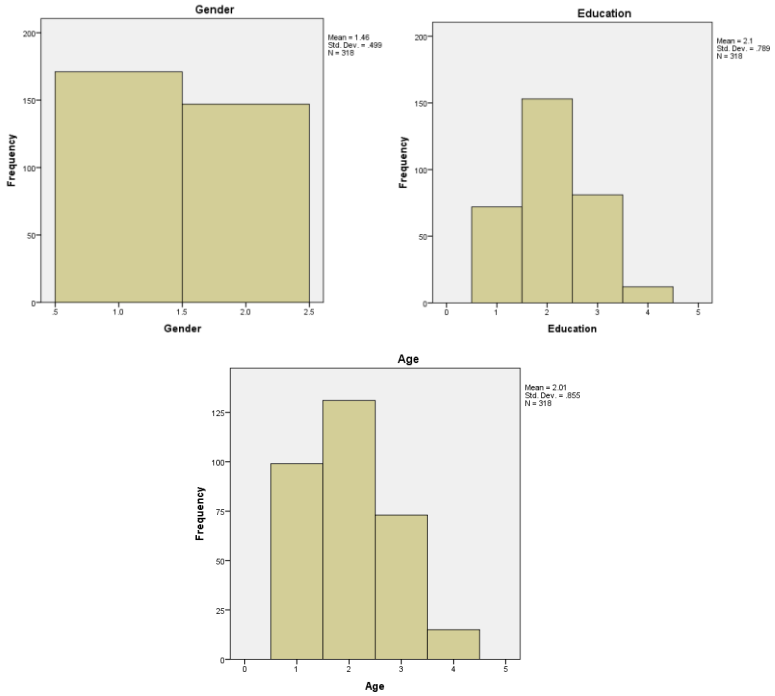


Figure 3. Demographic Characteristics

4.2 Descriptive Statistics

The descriptive tests offer supplementary information regarding the assurance of the absence of outliers in the data and the presence of normality. Summary statistics are employed in the examination to verify the absence of outliers and ensure that the mean values, skewness, and standard deviations of the data adhere to the relevant criteria. The descriptive examination of variables test involves providing explanations for the purpose of describing, outlining, and summarising data related to constructs(Fisher & Marshall, 2009). The objective of this test is to ascertain the emergence of trends that satisfy and fulfill all of the data prerequisites. The provided information can be comprehended through the process of summarization and organization. Hence, the primary objective of descriptive statistics is to analyze research data in order to evaluate the presence of normal distribution as well as

identify any outliers(Kaur, Stoltzfus, & Yellapu, 2018). The table below presents the results of a descriptive summary of the research variables. The mean value of OS is 3.2164, while the mean values of PP, HP, SP, and OSS are 3.2484, 3.2818, 3.2233, and 3.2855, respectively. The standard deviations of the variables OS, PP, HP, SP, and OSS are 1.07274, 1.09500, 1.23047, 1.25027, and 1.22445, respectively. The range of values spans from 1 to 5, encompassing both the minimum and maximum values.

Table 4. Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
OS	318	1.00	5.00	3.2164	1.07274	-.248	.137
PP	318	1.00	5.00	3.2484	1.09500	-.277	.137
HP	318	1.00	5.00	3.2818	1.23047	-.225	.137
SP	318	1.00	5.00	3.2233	1.25027	-.168	.137
OSS	318	1.00	5.00	3.2855	1.22445	-.226	.137
Valid N (listwise)	318						

OS= Operational safety, HP= Health performance, SP= Safety preparation, PP= Project performance, OSS= Organizational support

4.5 KMO and Bartlett's Test

The sustainability of measurement scales has been assessed through factor loading analysis. The researchers conducted the KMO & Bartlett test and factor loading analysis to assess the presence of a latent relationship among the scale items(Hadi, Abdullah, & Sentosa, 2016). Furthermore, the test was employed to ascertain the suitability of the collected data in relation to the research variables and to determine whether the factor analysis would yield statistically significant results. The results of KMO and Bartlett's Test are presented in Table 5. Table 5 presents the results pertaining to the suitability and statistical significance of the sample utilized in this study, along with the identification of a correlation between the parameters under investigation.

Table 5. KMO and Bartlett's Test

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.902
Bartlett's Test of Sphericity	Approx. Chi-Square	12677.323
	Df	171
	Sig.	.000

4.6 Rotated Component Matrix

Making use of the rotation of the component matrix serves as a means to assess the presence of cross-loading or duplication among items. The results for the rotated component matrix can be found in Table 6. Every individual item is placed onto the structure that is being measured. The measurement of the operating system (OS) consisted of five items, while the measurement of the programming proficiency (PP)

also involved five items. Additionally, the measurement of hardware proficiency (HP) was conducted using five items. The measurement of software proficiency (SP) was based on four items, and the measurement of overall system satisfaction (OSS) was assessed through five items. There is an absence of cross-loadings. Furthermore, it is worth noting that each variable possesses a distinct column loading, thereby ensuring that no loadings are duplicated.

Table 6. Rotated Component Matrix

Rotated Component Matrix					
	Component				
	1	2	3	4	5
OS1		.714			
OS2		.756			
OS3		.795			
OS4		.738			
OS5		.676			
PP1	.471				
PP2	.465				
PP3	.860				
PP4	.870				
PP5	.874				
HP1			.870		
HP2			.875		
HP3			.869		
HP4			.872		
HP5			.875		
SP1				.763	
SP2				.813	
SP3				.801	
SP4				.759	
OSS1					.742
OSS2					.772
OSS3					.712
OSS4					.725
OSS5					.707

OS= Operational safety, HP= Health performance, SP= Safety preparation, PP= Project performance, OSS= Organizational support

4.7 Discriminant and convergent validity

The convergent validity of a test is indicative of its degree of association with other tests that assess similar constructs. The assessment of convergent validity holds greater significance in research as it evaluates the extent to which a test accurately captures the intended construct. The assessment of convergent validity involves the utilisation of the average variance extracted and composite reliability measures(Potter & Levine-Donnerstein, 1999). Discriminant validity is an essential element in research, as it pertains to the extent to which tests accurately measure the intended construct and avoid inadvertently assessing unrelated or unintended constructs(Cheung & Wang, 2017). In order for the validity of the average variance extracted to be established, it is necessary for the composite reliability's value to exceed 0.7. The findings and values for each construct are presented in Table 7. The average value (AVE) of the operating system (OS), hardware platform (HP), software platform (SP), programming language (PP), and operating system services (OSS) is

0.675, 0.658, 0.635, 0.545, and 0.549, respectively. The composite reliability values for these constructs are 0.734, 0.721, 0.716, 0.704, and 0.771, respectively.

Table 7. Discriminant and convergent validity

	CR	AVE	MSV	OS	HP	SP	PP	OSS
OS	0.734	0.675	0.374	**0.876**				
HP	0.721	0.658	0.365	0.745	**0.723**			
SP	0.716	0.635	0.341	0.632	0.612	**0.712**		
PP	0.704	0.545	0.321	0.621	0.600	0.601	**0.654**	
OSS	0.771	0.549	0.332	0.611	0.609	0.605	0.612	**0.600**

OS= Operational safety, HP= Health performance, SP= Safety preparation, PP= Project performance, OSS= Organizational support

4.8 Confirmatory factor analysis

The researcher can employ Confirmatory Factor Analysis (CFA) to examine and evaluate the relationship between observed variables and the latent constructs they represent. Various goodness-of-fit methods were employed to examine the adequacy of the measurement model. The present study employed confirmatory factor analysis to ascertain the extent to which the collected data align with the hypothesised measurement model. A range of measurement indices and their corresponding thresholds are employed to assess the adequacy of the measurement model.

Table 8: Confirmatory factor analysis

CFA Indicators	CMIN/DF	GFI	IFI	CFI	RMSEA
Threshold Value	≤ 5	≥ 0.80	≥ 0.90	≥ 0.90	≤ 0.08
Observed Value	3.670	0.848	0.947	0.947	0.08

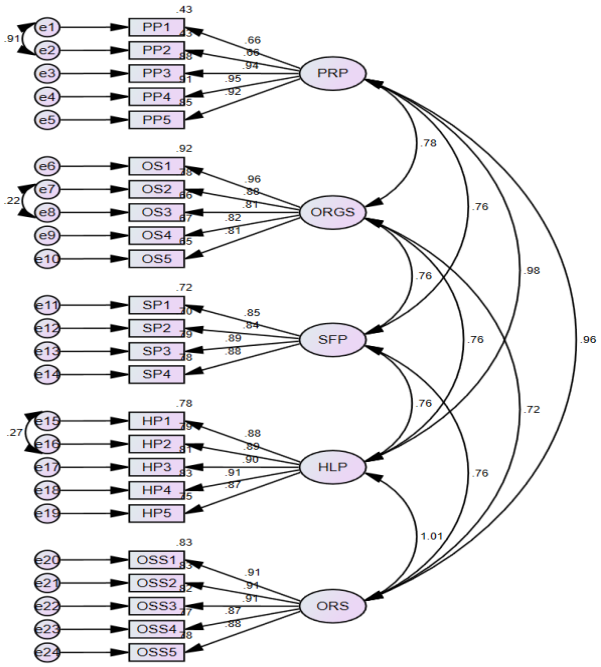


Figure 4. Confirmatory factor analysis

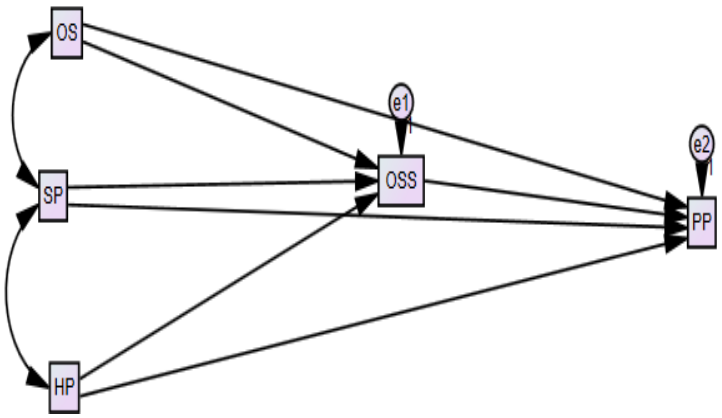
4.9 Structural Equation Modeling

The study uses structural equation modelling to examine the indirect/mediation association between variables, as well as the linear or direct associations. The application of structural equation modelling was employed to evaluate the hypothesis formulated based on the comprehensive literature review conducted in Chapter 2. The following section presents the results obtained from the Structural Equation Modelling (SEM) analysis. According toThakkar (2020), a hypothesis must possess a level of significance below 0.05 in order to be deemed acceptable. The initial hypothesis pertained to the influence of operating systems on programming performance. The results obtained from the structural equation modelling (SEM) analysis indicate that the p-value associated with the tested hypothesis is 0.00, which is below the conventional significance level of 0.05. Consequently, we can conclude that the first hypothesis is supported. The p-value associated with the second hypothesis is 0.02, indicating statistical significance at the 0.05 level. Consequently, the hypothesis is accepted. The statistical analysis reveals that the observed relationship between SP and PP does not reach a level of significance, as indicated by a p-value of 0.10, which exceeds the conventional threshold of 0.05. Consequently, the hypothesis under consideration is rejected. The analysis revealed that there is a significant mediation effect of organisational support on the relationship between OS and PP, as indicated by a p-value of 0.12. The mediation analysis conducted on the relationship between OSS, HP, and PP has yielded a statistically significant result, as indicated by a p-value of 0.02. The most recent mediation analysis conducted on the relationship between the independent variable (IV) and the dependent variable (DV) has yielded a statistically significant result. The p-value obtained from the analysis was 0.00.

Table 9: SEM results

Effects	Hypothesized Path	B	S.E	P value
Hypothesis 1	OS→ PP	.29	.054	0.00
Hypothesis 2	HP→ PP	.70	.056	0.02
Hypothesis 3	SP→ PP	.03	.001	0.10
Hypothesis 4	OS→OSS→PP	.16	.031	0.12
Hypothesis 5	HP→ OSS→PP	.17	.041	0.02
Hypothesis 6	SP→OSS→ PP	.16	.051	0.00

OS= Operational safety, HP= Health performance, SP= Safety preparation, PP= Project performance, OSS= Organizational support



5. Discussion

The dynamic transformations observed in modern construction firms underscore the imperative for swift adaptation and the implementation of effective strategies to navigate the evolving industry landscape. The effective utilisation of available resources is a key priority for construction company management. In order to enhance the performance of construction projects, it is necessary to consider a range of determinants that can effectively analyse the optimal utilisation of resources(Cha & Kim, 2011). This study aimed to examine the influence of operational safety, health performance, and safety preparation on the project performance of construction companies in Saudi Arabia. The findings of the study indicate that the performance of construction projects is significantly influenced by all of these determinants.

Within the realm of operational safety, this study establishes a positive correlation between operational safety and project performance. This finding is supported by a multitude of studies documented in the current body of literature. According toYiu et al. (2019), the implementation of safety management systems (SMS) in construction industries has been found to effectively mitigate the occurrence of casualties and injuries, as well as minimisethe wastage of materials. According toAdeyemo and Smallwood (2017), the establishment of an empowering health and safety (H&S) culture has been found to enhance the performance of construction projects. Therefore, it is imperative for practitioners to effectively monitor and enforce safety management practises. According toWu, Li, and Fang (2017), safety management and safety measures are significant factors that enhance the performance of an organization's projects. The study shed light on the significance of leadership in mitigating workplace injuries and promoting operational safety within projects. According to a study conducted byDuryan et al. (2020), there has been a decrease in workplace injuries within UK construction companies over the past decade. This decline has been attributed to the successful implementation of health and safety management systems. Encouragement of operational safety management is imperative within construction organisations. The results of the aforementioned studies provide validation for the outcomes of this study, demonstrating a notable influence of operational safety on the project performance of construction companies.

The results of this study highlight the beneficial effects of health on the performance of construction projects. The findings of this study are supported by a considerable body of research, asZahoor et al. (2016) emphasize that the implementation of occupational safety and health (OHS) measures has been associated with a comparatively elevated level of performance within the construction sector. The research indicates the need to establish a regulatory body responsible for implementing awareness campaigns and safety incentives. According toZekri (2013), safety and health policies, as well as safety and health inspections, hold significant value for construction companies. The findings of the study underscore the impact on work environments and project costs within construction companies. According toNnaji and Karakhan (2020), the use of technologies and health management in construction industries has been found to positively impact firm performance and safety conditions.Alghaseb and Alshmlani (2022)bring forth the primary determinants of safety and health that pertain to the management of occupational injuries and the enhancement of workforce safety. The aforementioned findings serve as a catalyst for construction companies to enhance their performance by implementing safety and health measures. According toShin, Kim, and Kim (2021),

there is a belief that organisations that demonstrate awareness of health and safety policies exhibit higher levels of productivity and innovation compared to those that do not.

In addition to achieving high levels of productivity, the company's level of experience is positively correlated with the implementation of effective safety policies. According to the findings ofSetiani and Abd Majid (2019), the importance of safety and productivity has significantly increased in contemporary construction industries. The findings indicate that the implementation of safeguarding devices and the utilisation of personal protective equipment are crucial safety measures that significantly contribute to the productivity of labourers. According toLi et al. (2018), numerous construction companies haveemphasised the implementation of safety measures in order to safeguard their workforce and optimise the overall performance of construction projects. The results of previous studies support the findings of this study and demonstrate a notable influence of safety preparedness on the project performance of construction firms in Saudi Arabia.

The acceptance of the mediation of organisational safety between the organisational structure, safety practises, human performance, and physical environment has been substantial. In the research conducted byGigliotti et al. (2019), it was found that when employees perceive that their organisation places importance on their contributions to work, prioritises their health, and safeguards the well-being of its workforce, it leads to enhanced organisational performance. This phenomenon can be attributed to employees' desire to reciprocate the organisational initiatives by replicating their own efforts in order to enhance performance and productivity. The significance of organisational support is heightened as it fosters employee appreciation and cultivates an attitude of concern towards their work, ultimately leading to enhanced performance and increased effort in achieving the organization's aims and objectives(Cheng & Yi, 2018). The probability of an employee's proactive response towards achieving the company's mission and values increases in proportion to the level of organizational support they receive, such as praise and recognition for their performance or well-being. The provision of organizational support has been found to positively impact employee retention rates. Providing employees with the necessary resources is considered a key indicator for modern organizations in order to align their performance with the achievement of predetermined objectives(Berberoglu, 2018; Eliyana & Ma'arif, 2019; Yongxing et al., 2017). The theory of organizational support posits that employees form a collective perception regarding the extent to which their organization values their work, contributions, and concerns for their well-being.

6. Conclusion

This study targeted to investigate the influence of operational safety, health performance, and safety preparation on project performance while considering the mediating role of organizational support in Saudi construction companies. The data was gathered and systematically arranged by means of surveys administered to employees within construction companies. A total of 316 responses were recorded, all of which were deemed successful. The results of the study demonstrate that operating systems (OS), human resources practices (HP), and strategic planning (SP) have a significant influence on project performance within construction firms. The mediation of open source software (OSS) is found to have a significant impact on the relationship between operating systems (OS), hardware performance (HP), software performance

(SP), and productivity performance (PP) in a respective manner. The findings of the study indicate that health and safety measures, as well as perceived organisational support, are both significant factors that contribute to the enhanced performance of construction companies. It is recommended that construction companies improve their safety management and policies in order to secure organisational backing and achieve optimal performance in their projects.

6.1 Theoretical and practical implications

This study seeks to enhance the understanding of critical factors that have the potential to enhance the project performance of construction companies. Previous research has not extensively examined the various safety factors within construction firms in Saudi Arabia from a theoretical standpoint. The present study identified operating systems (OS), hardware performance (HP), and software performance (SP) as influential factors in determining overall performance. The analysis has also examined the significance of open-source software (OSS) in facilitating enhanced project performance and employee satisfaction. The present study provides a comprehensive analysis of the correlation between project safety and project performance, thereby making a significant contribution to the existing body of literature on this subject matter. The findings of this study have significant implications for construction practitioners, as they provide valuable insights into enhancing safety management and optimizing the performance of construction projects. Additionally, the study highlights the crucial role of organizational support in achieving these objectives. Consequently, it offers substantial evidence to support the enhancement of health and workplace safety in construction projects, facilitated by organizational backing, in order to achieve improved performance and work outcomes.

6.2 Limitations and future research indications

Notwithstanding the valuable findings elucidated by this study, it is imperative to acknowledge the presence of several limitations. This study aims to examine the primary factors that contribute to safety within the regulated industry sector, specifically in the context of construction. Further research could be conducted to explore the effects of these variables on the oil and gas industries, in order to enhance the generalizability of these findings. Furthermore, the duration of this study was constrained. Subsequent investigations may employ prolonged durations to obtain more comprehensive and reliable findings. Furthermore, the assessment of safety management in this study was limited to worker safety behavior. This presents an opportunity for future research to enhance the measurement of safety management by incorporating indicators such as occupational injuries and fatalities. Additionally, the current study has examined the role of organizational support as a mediator. In future research, it would be beneficial for researchers to also explore the impact of "organisational culture" as a moderating variable. Finally, the data was exclusively gathered from construction firms based in Saudi Arabia, thereby indicating a contextual constraint within the scope of this study. Subsequent investigations have the potential to gather data from various nations, while alternatively, a cross-sectional study may be undertaken as well.

Acknowledgement

This work was supported through the Ambitious Funding track by the Deanship of

Scientific Research, Vice Presidency for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia [Grant 3947]

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Appendix:

	Variables and Items	References
Health Performance		
Item 1	When I have any health issue, my job suffers	(Koopman et al., 2002; Wang & Hu, 2020)
Item 2	Despite having my health issue, I managed to finish hard tasks	
Item 3	My health problem distracted me from performing work effectively.	
Item 4	Despite of my health problem, I was able to focus on achieving my goals	
Item 5	Due to my health problem, I find it difficult to complete my work	
	Operational Safety	
Item 1	Our supervisor set safety performance goals	(Casey et al., 2019)
Item 2	People in our team are recognized when they attain what is expected regarding safety and health	
Item 3	Our company managers takes safety issues seriously	
Item 4	Our manager/supervisor inspires us to think about health and safety benefits	
Item 5	Our supervisor tries to change the way our job is done to make it safer	
	Organizational Support	
Item 1	Our company values my contributions	(Nguyen Dinh et al., 2020)
Item 2	My company would not replace my position even if they recruit someone at a less salary	
Item 3	I always get help from my company when I face problem	
Item 4	My company cares about my needs and desires	
Item 5	My company considers my rights and best benefits when they make any decision related to me	
	Project performance	
Item 1	Cost efficiency dictates the project performance	(Malinowska-Lipień et al., 2021)
Item 2	The cost construction predictability illustrates the project performance	
Item 3	Rework frequency and accident rates determine project performance	
Item 4	The safety education matters in project performance	
Item 5	Safety cost ration is related to project performance	
Item 1	**Safety Preparation**	
Item 2	I feel safe being treated here as an employee	(Cha & Kim, 2011)
Item 3	I am encouraged to communicate safety concerns which I have	
Item 4	Our company takes safety measures seriously	
	Health related errors are handled appropriately in our company	