Global Journal of Researches in Engineering: J General Engineering
Volume 23 Issue 2 Version 1.0 Year 2023
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4596 & Print ISSN: 0975-5861

Promoting Health and Safety Practices in Fast- Track Construction Projects: The Case of Jordan

By Zayed Zeadat

Abstract- In many industries, safety is paramount, and the fast-track construction industry is no exception. Globally, more than 60 000 fatalities are reported each year due to inadequate and incompetent Fast-track construction Site Safety Management (CSSM). In Jordan, construction workers' fatalities and injuries increase year after year, particularly in fast-track construction projects. Implementing fast-track construction site safety management is a significant problem in every project. Therefore, it is critical to investigate the most convenient practices to ensure fast-track construction project safety to reduce death and injury rates. Innovative CSSM is key to solving the current safety challenges in the fast-track Jordanian fast-track construction industry.

This research aims to assist Jordanian construction consultants and contractors in determining the best policy for promoting health and safety in fast-track construction projects. Data was collected using a questionnaire distributed to consultants and contractors; the data was then analyzed using the Relative Importance Index (RRI). The findings and discussions reveal two essential policies to facilitate CSSM in Jordan's fast-track construction projects.

GJRE-J Classification: DDC Code: 338.476900973 LCC Code: HD9715.U52

Strictly as per the compliance and regulations of:

Promoting Health and Safety Practices in Fast-Track Construction Projects: The Case of Jordan

Zayed Zeadat

Abstract- In many industries, safety is paramount, and the fast-track construction industry is no exception. Globally, more than 60 000 fatalities are reported each year due to inadequate and incompetent Fast-track construction Site Safety Management (CSSM). In Jordan, construction workers' fatalities and injuries increase year after year, particularly in fast-track construction projects. Implementing fast-track construction site safety management is a significant problem in every project. Therefore, it is critical to investigate the most convenient practices to ensure fast-track construction project safety to reduce death and injury rates. Innovative CSSM is key to solving the current safety challenges in the fast-track Jordanian fast-track construction industry.

This research aims to assist Jordanian construction consultants and contractors in determining the best policy for promoting health and safety in fast-track construction projects. Data was collected using a questionnaire distributed to consultants and contractors; the data was then analyzed using the Relative Importance Index (RRI). The findings and discussions reveal two essential policies to facilitate CSSM in Jordan's fast-track construction projects. 1) The provision of a first aid box, which is a critical component that is frequently associated with ensuring the construction industry's safety. 2) Communicating health and safety, which enhances safety awareness and reduces the number of accidents and associated costs. The research analysis also affirmed that the two least important policies, according to respondents, were 1) Workers' participation in hazard identification on sites and 2) recruiting outside health and safety consultants. This policy requires employing an organization or individuals with the necessary knowledge, experience, and ability to oversee health and safety on construction projects.

I. Introduction

The fast-track construction sector has long been recognized as one of the most dangerous economic activities in many parts of the world (Chi et al., 2005; Tam et al., 2004; Jaselskis et al., 1996). The fast-track construction industry's abysmal safety record generates widespread concern (Haslam et al., 2004). This is reasonable considering that fast-track construction has the highest death rate of any industry (López et al., 2008; Behm, 2005). According to statistics, construction workers are three to four times more likely than other workers to die in a fast-track construction site (Umar et al., 2017). At least 108,000 people are fatally killed on fast-track construction sites each year, accounting for over 30 percent of all fatal occupational injuries (Gürcanli and Müngen, 2013).

Author: *e-mail: z.zeadat@aum.edu.jo*

The concept of safety culture is gaining traction due to its capacity to encompass all perceptional, psychological, behavioral, and management variables (Rafiq *et al.,* 2007). Numerous scholars have studied factors that improve health and safety in the fast-track construction industry in different cultural contexts (Cheng et al., 2010; Im et al., 2009; Cameron et al., 2008; Macedoand Silva, 2005; Mungen and Gürcanli, 2005; Etiler et al., 2004). According to Tam and colleagues (2004), various factors influence fast-track construction industry safety performance. This includes workers' attitudes (Hinze, 1981); the size of the company, adopted safety policy, project organization, and economic pressure (Hinze and Raboud, 1988); safety management training (Gun, 1993; Jaselskis and Suazo, 1994); and safety culture (Tam and Fung, 1998; Glendon and Stanton, 2000; Tam *et al.,* 2001).

Regardless of these factors, fast-track construction companies that demonstrate and convey their commitment to well-structured and well-funded safety initiatives can significantly reduce incident rates (Hinze, 1997). Fast-track construction safety management has dramatically improved following the Occupational Safety and Health Act enacted in 1970. President Richard Nixon signed the Act, which granted the US Federal Government the power to define and enforce safety and health standards for most of the country's employees. Also, the Act made the employer (i.e., fast-track construction companies) responsible for implementing safety principles in the fast-track construction industry and has resulted in a significant increase in safety planning and management in the fast-track construction industry at large (Hill, 2004)

II. Health and Saftey in Jordan's Fast-Track Fast-Track Construction Projects

Fast-track construction projects play a significant role in the global economy; there is massive pressure to manage project duration while meeting legal requirements, emergency/disaster recovery, and time-to-market constraints. As a result, traditional fast-track construction planning can be compressed using some techniques, such as fast-track projects (Garrido Martins *et al.,* 2017). Fast-track construction is commonly described as the overlapping and compressing of multiple operations in the conceptual design,

procurement, and fast-track construction phases to accomplish a project rapidly and cost-effectively (Cho et al., 2010). Fast-track construction allows for overcoming the sector's current high fast-track construction costs and inflation challenges. In the fast-track construction and engineering sectors, the fast-track technique utilizes the capacity to efficiently overlap and manage activities in the design, procurement, and fast-track construction phases concurrently to shorten the expected project schedule.

Although the fast-track project delivery approach has several advantages, such as accelerated project completion and lower operating costs (Aleshin, 2001), existing research has identified several challenges that may impede the success of fast-track projects. Harthi (2015) identified client, consultant, and contractor changes, technological changes, safety considerations, a shortage of skills, and a lack of equipment as barriers to fast-tracking a project. Inadequate planning also leads to significant changes in scope and, as a result, project cost overruns. Most importantly, compressing the schedule increases project complexity and introduces new risks, which frequently occur due to overlap between project phases and the risk-management strategies employed by project teams (Aleshin, 2001). The consequences of these risks are perceived in terms of schedule, cost, and technical performance (Harthi, 2015) and can lead to health and safety issues in fast-track projects. This global impact can lead to an increase in the pace of the work sequence, which can exacerbate preconditions and lead to quality and safety failures (Garrett and Teizer, 2009).

Harthi (2015) proposed methods and strategies to control the risk associated with severe compression of project timelines while still guaranteeing project quality meets health and safety standards. He concluded that when dealing with fast-track projects, fast-track construction practitioners should focus on modifying the organizational structure to ensure flexibility, effective communication, and risk management is executed in all concurrent processes. Fast-tracking necessitates that safety risks are clearly defined and constantly monitored throughout the project and that feedback is provided as soon as possible to ensure that health and safety measures are implemented instantly. He also acknowledged the need for managers to receive training, education, and awareness, in which the training/education sessions introduce them to various risk mitigation models and allow them to test and implement the most convenient policy.

Fast-tracking is a more prevalent delivery method in the Middle East (Mehran, 2016) and Jordan. An example of a fast-track construction project in Jordan is The King Hussein Convention Center[1]. This project is Jordan's largest convention center, located next to the seashore of the Dead Sea, and has a total buildup area of 28,000 m^2. The project's fast-track construction started on 01-10-2003 and was finished on 10-05-2004 in preparation for the Annual World Economic Forum to be held in Jordan.; a total of 1,200 people were hired to work for 24 hours a day to complete the project in 6 months (Haddadinco, 2020).

Like many other developing nations, Jordan's culture and economy have incurred human and financial damage due to the poor Fast-track construction Site Safety Management (CSSM) (El-Mashaleh *et al.,* 2010). A study conducted in Jordan by (El-Mashaleh et al., 2010) revealed that annual data issued by the Ministry of Labor (1995-2005) show that the number of work accidents in all industries has continued to rise at alarming rates. Despite accounting for about 7.1 percent of the labor force, the Occupational Safety and Health Institute (OSHI) in Jordan states that accidents in the fast-track construction industry account for approximately 10.5 percent of incidences (OSHI, 2006). However, the actual percentage is approximately 17% (Assbeihat, 2015). According to Hiyasat and Talhuni (2000), the number is much higher for various reasons: several companies avoid reporting injuries on their sites, while others seek to avoid facing the costs of penalties for non-compliance with the terms of the application of public health and safety regulations. Additionally, tens of thousands of workers are employed unofficially in small firms with no social security membership.

The fast-track construction industry is an essential aspect of Jordan's infrastructure development and contributes significantly to the country's economy (Alubaid et al., 2020; Alkilani *et al.,* 2012). Jordanian scholars argued that the country's low economic structure contributes to a lack of health care and professional treatments available to the labor structure (Al-Smadi, Supeni, and Voon, 2021). A study conducted by Alkilani and colleagues (2013) revealed that Jordan's CSSM and measurement are still in their infancy. The failure to implement regulations, policies, and legislation demonstrate a lack of government commitment, limiting the efficiency and productivity of government departments tasked with CSSM and impeding the development of effective CSSM practices.

III. Health and Safety Policies in the Fast-Track Construction Industry

Health and safety policies create broad and general duties on employers, employees, and the self-

[1] It consists of a ballroom for conferences that can accommodate up to 2400 people and ten meeting rooms of various large sizes that can accommodate up to 4,000 people. The structure also includes a 3000 m2 Royal Wing with meeting rooms, lounges, reception wings, and V.I.P. wings (Haddadinco, 2020).

employed (Baxendale and Jones, 2000). It is the employers' foremost duty to ensure all employees' health, safety, and welfare (Hughes and Ferrett, 2008). These policies include commitments from the employer to choose competent personnel, establish emergency protocols, notify employees, and collaborate with other firms that share the same workplace. On the other hand, employees are also responsible for reporting harmful circumstances or flaws in health and safety procedures in fast-track construction sites (Health and Safety Executive, 2013). For instance, each construction worker ought to wear and use protective equipment. Personal Protective Equipment (PPE) keeps construction workers safe and mitigates the seriousness of injuries (Shazwan *et al.,* 2018). On fast-track construction sites, many PPEs are used, including safety equipment, protective clothing, impact-resistant clothing, full-body protective clothing, personal protection shield, and cleanroom suit (Ammad *et al.,* 2021). They also include protective clothing and equipment used as fast-track construction safety norms to reduce accidents. Using safety workwear is vital to promote CSSM, thus preventing—or reducing the impact of accidents. Because fast-track construction sites are typically located outside, seasonal variations have a significant impact, which necessitates the creation of workwear suitable for both summer and winter. In the summer, the employees' faces and heads need to be kept cool, while their hands and faces need to be kept warm in the winter (Eom and Lee, 2020).

Despite accident causation and prevention techniques, motivating and controlling workers to wear PPE needs efforts (Wong *et al.,* 2021). Employers may address the use of PPE in three trajectories (Kelm *et al.,* 2013): (1) education and training, (2) incentives, and (3) enforcement. PPE is generally seen as the most monotonous hardware in a construction worker's daily routine, but it is also regarded as the penultimate line of defense in any situation (Farooqui, 2009). PPE is typically overlooked in underdeveloped nations, although it is often the only line of defense against building site risks in developed countries (Ammad *et al.,* 2021).

Employers must ensure continuous accident reporting and follow-up in fast-track construction sites. Construction accident investigation procedures and reporting systems determine what kinds of accidents happen and how they happen (Abdelhamid and Everett, 2000). According to Ale and colleagues (2008), employers must report workplace accidents within 24 hours of their occurrence. Accident reporting enables strict implementation of safety policy on fast-track construction sites. According to Holt (2008), a safety policy is a document that should be available at every construction site. The following should be covered in the policy document:

- A firm commitment to providing a safe and healthy working environment in construction sites;
- An explicit declaration that reposting an accident will have no negative consequences on workers;
- A strict commitment to ensure appropriate funding and facilities are available to ensure the policy's success
- The responsibility of all construction workers to abide by relevant legal regulations;
- Measure to promote staff awareness of safety policy.

The Safety policy document should be reviewed and checked regularly by a senior project manager. Unfortunately, a study conducted in Jordan concluded that 66% of Jordanian fast-track construction firms fall short of international standards, and 43% lack any standard guidelines for safety policy (Alubaid et al., 2020). Moreover, it has been observed by the author that the vast majority of construction sites in Jordan lack adequate safety welfare facilities. According to the International Labor Organization (ILO), there are eight distinct categories of welfare facilities. These are; sanitary facilities, washing facilities, facilities for supplying food and drink, and eating meals. Other scholars added facilities for changing, storing, and drying clothes and rest breaks (Abba *et al.,* 2019). Before any fast-track construction activity (including demolition) begins, the availability of welfare facilities, their placement on-site, and regular checkups must be addressed throughout the planning and preparatory stages of the project. When planning welfare provisions for fast-track construction sites, site engineers ought to consider the nature of the work to be done, as well as the health risks associated with shower provision where the project involves dealing with very dirty work (for example, sewer maintenance, dusty demolition activities, contaminated land work, or concrete pouring (Tabi and Adinyira, 2018).

The demand for safety awareness among fast-track construction organizations has risen considerably during the last decade. Pheng and Shiua (2000) emphasized that quality and safety should be integrated to achieve better coordination and utilization of resources. Koehn and Datta (2003) revealed that adopting safety rules and regulations could help address poor quality work, unsafe working conditions, and a lack of environmental control. The high expense of work-related injuries, workers' compensation, insurance premiums, indirect costs of injuries, and litigation contribute to project failure. A significant amount of time is wasted every year due to work-related health issues and site accidents; therefore, quality and safety are critical in the fast-track construction industry (Shamsuddin *et al.,* 2015). One example of a measure to improve the safety of fast-track construction work is the installation of safety signs (Arphorn *et al.,* 2003). It is imperative that safety signs are well-designed and understood to alert both trained and untrained people

about possible hazards and provide clear instructions on minimizing or eliminating accidents and dangerous conditions (Chan and Chan, 2011). There are many different types of warnings, including vocals, bells, and beep sounds. Warning labels are one of the most popular signs used in the fast-track construction sector. They provide alerts and necessary information informing observers what is permissible and forbidden. Typically, a warning label contains four parts: signal words like "caution," a danger statement, a statement advising observers what will happen if they do not comply, and a statement informing observers how to avoid the hazard. The primary goal is to call attention to the situation and send out immediate warnings about the danger level (Tam *et al.,* 2003).

Safety signs are imperative for identifying and clarifying hazardous activities in fast-track construction sites. The more simultaneous construction activities in fast-track construction projects rise, the more health and safety risks arise. This would become an urgent problem when engaging untrained, unskilled workers to complete the job quickly and feasibly (Ramteke *et al.,* 2021). For instance, workers in hazardous construction activities that include handling hazardous materials (i.e., toxic and chemical wastes) should receive proper training, adequate information on the substances they will be handling, and appropriate protective equipment. Other hazardous items, such as explosives, flammable liquids, and corrosive and acidic compounds, require special training and attention (Teo *et al.,* 2005). It is impossible to keep track of all the potentially dangerous activities on a fast-track construction site. As a result, hazardous operations with higher risks should be recognized and prioritized ahead of time so that senior management can proactively handle them (Song *et al.,* 2007). Therefore, consultants, contractors, and project managers should frequently meet to co-create and develop new safety measures, provide feedback to one another, and address safety-related concerns (Maki, 2015). Periodic site meetings to ensure health and safety are necessary communication tools to share safety information among critical stakeholders in construction (Tam *et al.,* 2004). Jaselisks and colleagues (1996) advocate increasing the number of formal safety meetings with site project managers to enhance project safety performance.

Consequently, fast-track construction sites with superior safety performance had more safety-related meetings than companies with poor safety performance. Both sorts of meetings ("toolbox" safety talks and project-level safety meetings) are clear signs of a company's attention to the significance of safety. Unfortunately, only one percent of construction projects in Jordan have regular safety meetings at the project level (Mashaleh et al., 2010). This indicates poor health and safety awareness among workers and senior management. Construction workers' awareness makes a considerable contribution to project success. To address these present difficulties, project managers should prioritize worker safety and well-being (Ogundipe et al., 2018; Akinwale and Olusanya, 2016).

Many fast-track construction projects require the appointment of a health and safety officer. Safety officers are responsible for carrying out the self-inspection program and ensuring that adequate safety performance is attained through appropriate methods (Langford et al., 2000; Koehn *et al.,* 1995). Principal contractors hire them for large projects to manage all safety issues on the fast-track construction site (Teo (2005; Wilson and Koehn, 2000). Therefore, it is essential for safety officers to understand and determine types and complex construction activities in a fast-track construction. Safety officers must be well-trained and experienced in dealing with the various safety risks during fast-track construction activities. A fundamental prerequisite for a safety officer is to be vigilant, diligent and informed to supervise the daily activities and fast-track construction projects (Hinze and Wilson, 2000). Due to the complexity of fast-track construction projects, some scholars recommend hiring health and safety consultants. According to Oloke and McAleenan (2017), safety consultants are professional firms vested in overseeing fast-track construction sites' health and safety. They can be an organization or individuals with sufficient knowledge, experience, and ability to handle complex, fast-track construction projects. During the pre-construction phase of a project, they plan, manage, monitor, and coordinate health and safety. This involves detecting, removing, or managing potential hazards and ensuring that designers fulfill their responsibilities. They also prepare and provide relevant information to other stakeholders, particularly the contractor (or principal contractor), to help them plan, monitor, and coordinate health and safety in the fast-track construction phase.

Construction workers' participation in CSSM is widely discussed in the literature. For instance, workers could be engaged in identifying hazardous activities in fast-track construction projects. Identifying safety hazards is a critical step in reducing non-fatal fall injuries and enhancing the safety performance of fast-track construction projects. Current safety hazard identification methods rely on experts' judgment to identify risks and as a result, they are unable to comprehensively detect dangers in the diverse and dynamic character of the fast-track construction environment (Antwi-Afari *et al.,* 2020; Reese and Eidson, 2006). One of the most challenging aspects of CSSM for fast-track construction sites is ensuring that workers can anticipate, detect, and respond to potentially dangerous conditions before being exposed to them.

To sum up, Table 1 below depicts the most common CSSM policies identified in the literature.

Barrier	Description	Reference(s)
Provision of Personal Protective Equipment (PPE)	(PPE) keeps people who work on construction sites safe. It Includes safety equipment, protective clothing, impact-resistant clothing, full-body protective clothing, personal protection shield, and a cleanroom suit	(Shazwan et al., 2018). (Ammad et al., 2021).
Accident Reporting and Maintenance Report	Construction accident investigation procedures and reporting systems determine what kinds of accidents happen and how they happen. Employers are required to report workplace accidents within 24 hours of their occurrence.	(Abdelhamid and Everett, 2000). (Ale et al., 2008).
Provision of Safety Policy	The safety policy is the core document in the management of safety. The general statement of policy should include an expression of the employer's intentions, rather than relying just on employees' safe behavior.	(Holt, 2008).
Provision of Adequate Welfare Facilities on Site	Before any construction activity begins, the availability of welfare facilities must be addressed throughout the planning and preparatory stages of the project. The welfare facilities categories are sanitary facilities, washing facilities, facilities for supplying food and drink, eating meals, and facilities for changing, storing, drying clothes, and rest breaks.	(Tabi and Adinyira, 2018). The International Labor Organization (ILO).
Provision of Health and Safety Clothing and Equipment	Protective clothing and equipment should be used as part of construction safety norms to reduce accidents. The use of safety equipment/clothing is a suitable safety procedure likely to prevent or reduce the impact of accidents.	(Langford et al., 2000).
Provision of a Healthy and Safe Working Environment	The industry seeks high quality while also guaranteeing a safe working environment; therefore, adopting safety rules and regulations could help address poor quality work, unsafe working conditions, and a lack of environmental control.	Pheng and Shiua, 2000). (Koehn and Datta, 2003)
Provision of Health and Safety Signs	safety signs are well designed and understood to alert both trained and untrained people about possible hazards and provide clear instructions on minimizing or eliminating accidents and dangerous conditions.	(Chan and Chan, 2011).
Control of Hazardous Activities on the construction site	It is impossible to keep track of all the potentially dangerous activities on a construction site. As a result, hazardous operations with higher risks should be recognized and prioritized ahead of time so that engineers and management can safely handle them.	(Song et al., 2007).
Site Meetings Especially for Safety Purposes	Consultants, contractors, and project managers should frequently meet to co-create and develop new safety measures, provide feedback to one another, and address safety-related concerns. Regular safety meetings are one type of site meeting; they are necessary for communicating safety information to all parties.	(Maki, 2015). (Tam et al., 2004).

Ensuring Health and Safety Education	Increased awareness of the importance of occupational health and safety and training on identifying and managing risk among contractors and workers will improve site safety.	(Akinwale and Olusanya, 2016).
Designated Health and Safety Person	Safety officers are responsible for carrying out the self-inspection program and ensuring that adequate safety performance is attained through the use of appropriate methods	(Koehn et al., 1995).
Communicating Health and Safety	Safety communications should be integrated with current quality and environmental systems. An integrated system should boost staff morale; promote employee participation in safe behaviors, and lower incident rates.	(Weinstein 1996).
Provision of First Aid Box	First aid box is a critical component that is frequently connected with ensuring the construction industry's safety. The nature and scope of work, the number of employees, and, most all, the types of dangers that may arise should all be considered while providing first aid in the workplace	(Jędrzejas and Sobala, 2018).
Workers' Participation in Hazard Identification on Site	The identification of safety hazards is a critical step in reducing injuries and enhancing the safety performance of construction workers, and it ensures that workers can anticipate, detect, and respond to potentially dangerous conditions before they are exposed.	(Antwi-Afari et al., 2020). (Chen et al., 2013).
Using Outside Health and Safety Consultants	Safety consultants are tasked with overseeing health and safety on construction sites. They can be an organization or individuals with sufficient knowledge, experience, and ability to carry out the role.	(Oloke and McAleenan, 2017).

IV. Materials and Methods

This research aims to help consultants and contractors in the Jordanian construction sector decide on the best policy for promoting health and safety in fast-track construction projects. To achieve meaningful and trustworthy research outcomes, this study uses quantitative and qualitative research and data-gathering methodologies. The authors undertook a thorough study of academic publications, textbooks, and peer-reviewed journals to identify the most frequent health and safety policies in the construction sector. However, policies and their efficacy vary depending on the context, and some of them may not apply in fast-track construction projects due to differences in operational and managerial characteristics. The fifteen policies extracted from the literature review were tabulated in a questionnaire style, and their applicability to the fast-track construction environment was assessed based on study participants' opinions and judgments. Purposive sampling was used to choose research respondents officially registered in the Jordan Engineering Association and the Contractor's Association. The respondents were asked to rate the acceptability of each policy on a scale of one to five according to the Likert scale. The questionnaire survey was disseminated by hard copy, email, Google forms, and in-person interviews. The following were the inclusion criteria employed in this study: Each research respondent should hold a bachelor's degree in a field related to construction, such as civil engineering, mechanical engineering, architectural engineering, or construction project management. This criterion guaranteed that the respondents were knowledgeable about construction management's technical components. The second requirement is that research participants have at least five years of experience working on fast-track construction projects. The third criterion is that research participants should be involved in inspecting and investigating on-site safety activities.

a) Relative Importance Index

After collecting survey data, responses from research participants were evaluated using the Relative Importance Index (RRI). RII is a non-parametric trustworthy approach used to analyze structured questionnaires with ordinal attitude assessment. The value and significance of RII reside in its capacity to determine how much a given variable contributes to the prediction of a criterion variable when used alone or in conjunction with other predictor variables. The RII for each incentive strategy was calculated using the following equation

$$RII = \frac{5(n5)+4(n4)+3(n3)+2(n2)+n1}{5(n1+n2+n3+n4+n5)} \quad (1)$$

Equation (1) is the Relative Importance Index Equation, where n1; n2; n3; n4; and n5 are the number of respondents who selected: 1, not effective; 2, for slightly effective; 3, for effective; 4, for very effective; and 5, for highly effective, respectively. Moreover, this study adopted the classification guide in [48, p.239] to determine the level of impact of RII for each driver. See Table III below:

Table 1: Classification Guide to Determine Importance Level of RII

RII score	Evaluation criteria
.200-.358	Very low level
.359-.518	Low level
.519-.678	Medium level
.679-.838	High level
.839-1.00	Very high level

b) Research validity and reliability

Cronbach's Alpha and Pearson's correlation coefficient test quantitative research reliability and validity, respectively. Cronbach's Alpha was used to determine the internal consistency of the returning sets. The alpha coefficient typically runs from 0 to 1, the higher the value, the more dependable the study [49]. To confirm the consistency and dependability of the data collected, a minimum value of 0.5 is used [49]. Cronbach's alpha (a) is calculated by (2) below, where *n* is the number of questions; *Vi* is the variance of scores on each question; and V_{test} is the total variance of the overall scores (Howitt & Cramer (2008) cited in [51, p.337]):

$$a = \frac{n}{n-1}\left(1 - \frac{\sum v_i}{v_{test}}\right)$$

Pearson's correlation (also called Pearson's R) is a correlation coefficient commonly used in linear regression. The correlation coefficient formulas are used to determine the strength of a relationship between two data sets. The formulas generate a number between -1 and 1, with (1) denoting a strong positive relationship, (-1) denoting a strong negative relationship, and zero denoting no relationship.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.942	.943	15

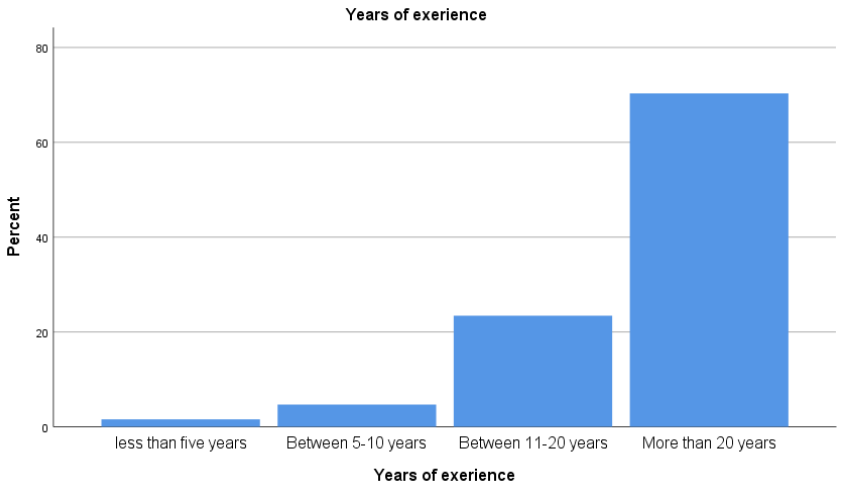
The Cronbach Alpha coefficient was reported as 0.779. Accordingly, the current study reported an excellent Cronbach Alpha coefficient, thus ensuring the scale's internal consistency.

Correlations (N=194)		
		Total
VAR1	Pearson Correlation	.841
	Sig. (2-tailed)	.000
VAR2	Pearson Correlation	.784
	Sig. (2-tailed)	.000
VAR3	Pearson Correlation	.828
	Sig. (2-tailed)	.000
VAR4	Pearson Correlation	.823
	Sig. (2-tailed)	.000
VAR5	Pearson Correlation	.819
	Sig. (2-tailed)	.000
VAR6	Pearson Correlation	.786
	Sig. (2-tailed)	.000
VAR7	Pearson Correlation	.858
	Sig. (2-tailed)	.000
VAR8	Pearson Correlation	.746
	Sig. (2-tailed)	.000
VAR9	Pearson Correlation	.841
	Sig. (2-tailed)	.000

VAR10	Pearson Correlation	.807
	Sig. (2-tailed)	.000
VAR11	Pearson Correlation	.644
	Sig. (2-tailed)	.000
	N	194
VAR12	Pearson Correlation	.622
	Sig. (2-tailed)	.000
	N	194
VAR13	Pearson Correlation	.623
	Sig. (2-tailed)	.000
	N	194
VAR14	Pearson Correlation	.499
	Sig. (2-tailed)	.000
	N	194
VAR15	Pearson Correlation	.678
	Sig. (2-tailed)	.000
	N	194
	N	194

V. Results

Code	Variables (safety measures)	RII	Rank	Level of importance
VAR1	Provision of personal protective equipment	.8281	3	High level
VAR2	Accident reporting and maintenance report	.7645	7	High level
VAR3	Provision of safety policy	.7968	5	High level
VAR4	Provision of adequate welfare facilities on site	.7500	9	High level
VAR5	Provision of health and safety clothing and equipment	.7791	6	High level
VAR6	Provision of healthy and safe working environment	.7562	8	High level
VAR7	Provision of health and safety signs	.7135	11	High level
VAR8	Control of hazardous activities on site	.7458	10	High level
VAR9	Site meetings, especially for safety purposes	.7072	12	High level
VAR10	Ensuring health and safety education	.6687	13	Medium level
VAR11	Designated health and safety person	.8010	4	High level
VAR12	Communicating health and safety	.8645	2	Very high level
VAR13	Provision of first aid box	.8979	1	Very high level
VAR14	Workers' participation in hazard identification on sites	.5604	14	Low level
VAR15	Using outside health and safety consultants	.4937	15	Low level



The graph demonstrates the percentage of participants in terms of years of experience. As shown, under 10% of participants have less than five years of experience, under 20% have 5-10 years of experience, under 40% have 11-20 years of experience, and more than 60% of the participants have more than 20 years of experience.

VI. Discussions

This research investigated the policies used to promote CSSM in the Jordanian context. For brevity, only the gist of the results is provided hereinafter.

As the pace of construction activities increases in fast-track projects, the probability of occupational injuries and fatalities increases (Jędrzejas and Sobala, 2018). Research result reveals two essential and critical policies to promote CSSM in fast-track construction projects in Jordan. Firstly, research respondents insisted on training construction workers to provide first aid in construction. A first-aid kit should be available and accessible. A first aid kit is a container used to hold goods and resources for an emergency. An occupational accident in fast-track construction projects is a sudden occurrence due to complex and hazardous activity resulting in serious injuries or death. It is a critical component that is frequently connected with ensuring the fast-track construction industry's safety. Research respondents believe that the greater the risk, the more trained individuals in first aid are required in the construction site. Getting first aid training and skills might be one of the most beneficial skills employees need to be acquainted with in fast-track construction projects. Construction workers ought to receive emergency response training to assist them to handle the worst-case scenario professionally and responding appropriately. The result of construction work-related injuries is determined by the severity of the injury and the quality of first-aid care provided (Fiske, 1999). The difference between life and death, fast vs slow recovery, and temporary versus permanent disabilities can be determined by how well-trained construction workers deal with injuries on construction sites.

Moreover, construction workers who have received first-aid training are eager to take personal responsibility for their safety and engage in safe conduct. Therefore, it may be more beneficial to provide first aid training to all employees at a business rather than just a few trained "first aiders." Therefore, the employer's responsibility is to offer first aid points and first aid supplies and train construction workers to provide first aid appropriately. Fairly standard practice is to have signs indicating the location of the first-aid kit and photographs of staff that provide first-aid treatment. In addition, it ought to be part of any induction course that the location of equipment and first-aiders is covered (Walsh, 1982.). Depending on the level of workplace occupational health and safety risk, the recommended ratio of "first aiders" to those not trained in first aid ranges from 1:25 to 1:50 (Vaaraanen et al., 1979).

Research participants' second most crucial safety policy is communicating health and safety measures. Improved communication tactics should promote safety awareness to minimize accident numbers and related costs. Contractors may benefit from increased safety communication by decreasing accidents, saving costs, and increasing productivity, thus enhancing added value. Communication is made efficient when mutual understanding is achieved at minimum resource expenditure (Schermerhorn *et al.,* 1994). For safety communication to be effective, it has to be understood, which is governed by the safety information to be communicated, the target audience, and the environment where information transmission occurs. There are two main communication media in fast-track construction projects: written and verbal, which can be used separately, depending on the message content (Preece *et al*., 1998). Safety communications should be integrated with current quality and environmental systems to avoid duplication and contradiction of standards. An integrated system

should boost staff morale; promote employee participation in safe behaviors, and lower incident rates.

Furthermore, communicating health and safety measures can strengthen the safety climate. Lingard (2019) defines safety climate as "perceptions that employees have about their work environment that function as a reference point for leading suitable and responsive task behaviors." Workers perceive signs in their workplace and form opinions about the behaviors emphasized and appreciated in their work context, enhancing safety behavior. Effective health and safety communication occurs vertically (between workers and managers) and horizontally (between workers). Effective and open communication about health and safety is essential in fast-track construction because it notifies workers about health & safety dangers, threats, and safe working practices. It also evokes vital information about workers' experiences and considerations and incites recommendations for ways to improve health and safety, enabling joint decision-making.

VII. Conclusion

This research argued that providing first aid training to construction workers is critical to promote health and safety in fast-track construction projects in Jordan and communicating health and safety measures. It also deduced that most consultants and contractors do not rely on outside health and safety consultants, and participation in hazard identification is infrequent because current safety hazard identification methods rely on expert judgment to identify risks. Thus, they cannot detect dangers in the diverse and dynamic nature of the construction environment continuously.

References Références Referencias

1. {https://www.hse.gov.uk/violence/toolkit/legislation.htm}
2. Abba, N., Hamid, A.R.A. and Hatem, Z.M., 2019. Provision and Awareness of Welfare Facilities on Fast-track construction Sites. *Proceeding of Civil Engineering UTM*, *4*, pp.133-140.
3. Ale, B.J., Bellamy, L.J., Baksteen, H., Damen, M., Goossens, L.H., Hale, A.R., Mud, M., Oh, J., Papazoglou, I.A. and Whiston, J.Y., 2008. Accidents in the fast-track construction industry in the Netherlands: an analysis of accident reports using Storybuilder. *Reliability Engineering & System Safety*, *93*(10), pp.1523-1533.
4. Aleshin, A., 2001. Risk management of international projects in Russia. *International Journal of Project Management*, *19*(4), pp.207-222.
5. AL-Smadi, S.A.D.W., Supeni, E.E. and Voon, W.S., 2021. A Study on Safety and Health Good Practices at Fast-track construction Sector in Jordan. *East African Journal of Engineering*, *3*(1), pp.57-71.
6. Alubaid, F.A.R., Alhadeethi, R.H. and Mohamed, A.J., 2020. Assessment: The safety policy management for building fast-track construction companies in Jordan. *Journal of Applied Engineering Science*, *18*(1), pp.120-131.
7. Ammad, S., Alaloul, W.S., Saad, S. and Qureshi, A.H., 2021. Personal protective equipment (PPE) usage in fast-track construction projects: A scientometric approach. *Journal of Building Engineering*, *35*, p.102086.
8. Antwi-Afari, M.F., Li, H., Anwer, S., Yevu, S.K., Wu, Z., Antwi-Afari, P. and Kim, I., 2020. Quantifying workers' workers' gait patterns to identify safety hazards in fast-track construction using a wearable insole pressure system. *Safety science*, *129*, p.104855.
9. Arphorn, S., Augsornpeug, N., Srisorrachatr, S. and Pruktharathikul, V., 2003. Comprehension of safety signs for construction workers: comparison of existing and newly designed signs. *Journal of human ergology*, *32*(2), pp.87-94.
10. Assbeihat, J.M., 2015. Fast-track construction Safety in Jordan–Conditions and Obstacles. *International Journal of Operations and Logistics Management*, *4*(3), pp.193-203.
11. Baxendale, T. and Jones, O., 2000. Fast-track construction design and management safety regulations in practice—progress on implementation. *International Journal of Project Management*, *18*(1), pp.33-40.
12. Behm, M., 2005. Linking fast-track construction fatalities to the design for fast-track construction safety concept. *Safety science*, *43*(8), pp.589-611.
13. Chan, K.L. and Chan, A.H., 2011. Understanding industrial safety signs: implications for occupational safety management. *Industrial Management & Data Systems*.
14. Chen, A., Golparvar-Fard, M. and Kleiner, B., 2013, October. SAVES: A safety training augmented virtuality environment for fast-track construction hazard recognition and severity identification. In *Proceedings of the 13th International Conference on Fast-track construction Applications of Virtual Reality, London, UK* (pp. 373-84).
15. Chi, C.F., Chang, T.C. and Ting, H.I., 2005. Accident patterns and prevention measures for fatal occupational falls in the fast-track construction industry. *Applied ergonomics*, *36*(4), pp.391-400.
16. Cho, K., Hyun, C., Koo, K. and Hong, T., 2010. Partnering process model for public-sector fast-track design-build projects in Korea. *Journal of management in engineering*, *26*(1), pp.19-29.
17. Egbelakin, T., Ogunmakinde, O.E., Teshich, B. and Omotayo, T., 2021. Managing Fast-Track Fast-track construction Project in Qatar: Challenges and Opportunities. *Buildings*, *11*(12), p.640.

18. Eom, RI and Lee, Y., 2020. Working environments and clothing conditions in the fast-track construction industry. *Fashion and Textiles*, 7(1), pp.1-14.
19. Farooqui, R.U., 2009. Addressing the issue of compliance with personal protective equipment on fast-track construction worksites: a workers' perspective.
20. Fiske, S. (1999). Why employees need first aid training. Occupational Hazards, 61, 55 – 57.
21. Garrett, J.W. and Teizer, J., 2009. Human factors analysis classification system relating to human error awareness taxonomy in fast-track construction safety. *Journal of fast-track construction engineering and management*, *135*(8), pp. 754-763.
22. Garrido Martins, C., Valentin, V. and Bogus, S.M., 2017. Risk Assessment in Fast-Track Fast-track construction Projects: A Conceptual Model. In *CSCE/CRC Fast-track construction Specialty Conference*.
23. Gürcanli, G.E. and Müngen, U., 2013. Analysis of fast-track construction accidents in Turkey and responsible parties. *Industrial Health*, pp.2012-0139.
24. Harthi, B.A.A., 2015. *Risk management in fast-track projects: A study of UAE fast-track construction projects* (Doctoral dissertation, University of Wolverhampton).
25. Hinze, J. and Wilson, G., 2000. Moving toward a zero injury objective. *Journal of Fast-track construction Engineering and Management*, *126*(5), pp. 399-403.
26. Hiyasat, M. and Talhuni, B., Fast-track construction Safety Management Developing Countries: A Case Study of Jordan.
27. Holt, A.S.J., 2008. *Principles of fast-track construction safety*. John Wiley & Sons.
28. Hughes, P. and Ferrett, E.D., 2008. *Introduction to health and safety in fast-track construction*. Routledge.
29. Idoro, G.I., 2008. Health and safety management efforts as correlates of performance in the Nigerian fast-track construction industry. *Journal of Civil Engineering and Management*, *14*(4), pp. 277-285.
30. Jaselskis, E.J., Anderson, S.D. and Russell, J.S., 1996. Strategies for achieving excellence in fast-track construction safety performance. *Journal of fast-track construction engineering and management*, *122*(1), pp.61-70.
31. Jędrzejas, N. and Sobala, K., 2018. First aid in the workplace and employee awareness about it. *World Scientific News*, *104*, pp.209-221.
32. Kelm, A., Laußat, L., Meins-Becker, A., Platz, D., Khazaee, M.J., Costin, A.M., Helmus, M. and Teizer, J., 2013. Mobile passive Radio Frequency Identification (RFID) portal for automated and rapid control of Personal Protective Equipment (PPE) on fast-track construction sites. *Automation in fast-track construction*, *36*, pp. 38-52.
33. Koehn, E.E. and Datta, N.K., 2003. Quality, environmental, and health and safety management systems for fast-track construction engineering. *Journal of Fast-track construction Engineering and Management*, *129*(5), pp. 562-569.
34. Koehn, E.E., Kothari, R.K. and Pan, C.S., 1995. Safety in developing countries: professional and bureaucratic problems. *Journal of Fast-track construction Engineering and Management*, *121*(3), pp. 261-265.
35. Langford, D., Rowlinson, S. and Sawacha, E., 2000. Safety behaviour and safety management: its influence on the attitudes of workers in the UK fast-track construction industry. *Engineering, Fast-track construction and Architectural Management*.
36. Lingard, H., Pirzadeh, P. and Oswald, D., 2019. Talking safety: Health and safety communication and safety climate in subcontracted construction workgroups. *Journal of construction engineering and management*, *145*(5), p.04019029.
37. Mäki, T., 2015. Multi-disciplinary discourse on design-related issues in fast-track construction site meetings. *Procedia Economics and Finance*, *21*, pp. 231-238.
38. Mehran, D., 2016. Exploring the Adoption of BIM in the UAE Fast-track construction Industry for AEC Firms. *Procedia Engineering*, *145*, pp.1110-1118.
39. Mohammad, S., Al-Smadi, B.M., Hyari, K.H. and Rababeh, S.M., 2010. Safety management in the Jordanian fast-track construction industry. *Jordan Journal of Civil Engineering*, *4*(1), pp. 47-54.
40. Mohd Amir Shazwan, H. and Ee, J.M., 2018. Effectiveness of personal protective equipment (PPE) at fast-track construction site. *INTI Journal*, *1*(12), pp.1-12.
41. Ogundipe, K.E., Ogunde, A., Olaniran, H.F., Ajao, A.M., Ogunbayo, B.F. and Ogundipe, J.A., 2018. Missing gaps in safety education and practices: academia perspectives. *International Journal of Civil Engineering and Technology (IJCIET)*, *9*(1), pp. 273-289.
42. Oloke, D. and McAleenan, P., 2017. Developing health and safety competence for people in fast-track construction. In *Valuing People in Fast-track construction* (pp. 193-208). Routledge.
43. Pheng, L.S. and Shiua, S.C., 2000. The maintenance of fast-track construction safety: riding on ISO 9000 quality management systems. *Journal of Quality in Maintenance Engineering*.
44. Preece, C. and Stocking, S., 1999, September. Safety communications management in fast-track construction contracting. In *Hughes, W, 15th Annual ARCOM Conference, Liverpool John Moores University*.
45. Preece, C.N., Moodley, K. and Smith, A.M., 1998. *Corporate communications in fast-track construction: public relations strategies for*

successful business and projects. Blackwell Science (UK).
46. Ramteke, D., Rao, T.R. and Mishra, M.K., 2021. Hazard Identification and Risk Assessment in Road Fast-track construction Projects in Chhattisgarh.
47. Reese, C.D. and Eidson, J.V., 2006. *Handbook of OSHA fast-track construction safety and Health*. crc press.
48. Schermerhorn, J.R., Hunt, J., Osborn, R. and Passmore, J., 2006. *Organisational Organisational behaviour*. Langara College.
49. Shamsuddin, KA, Ani, M.N.C., Ismail, A.K. and Ibrahim, M.R., 2015. Investigation the Safety, Health and Environment (SHE) protection in fast-track construction area. *International Research Journal of Engineering and Technology*, *2*(6), pp. 624-636.
50. Song, J.W., Yu, J.H. and Kim, C.D., 2007, September. Fast-track construction safety management using FMEA technique: Focusing on the cases of steel frame work. In *23rd Annual ARCOM Conference* (pp. 3-5).
51. Tabi, N. and Adinyira, E., 2018. Assessing the Adequacy of Welfare Facilities on Fast-track construction Sites in Ghana.
52. Tam, C.M., Fung, I.W., Yeung, T.C. and Tung, K.C., 2003. Relationship between fast-track construction safety signs and symbols recognition and characteristics of fast-track construction personnel. *Fast-track construction Management and Economics*, *21*(7), pp.745-753.
53. Tam, C.M., Zeng, S.X. and Deng, Z.M., 2004. Identifying elements of poor fast-track construction safety management in China. *Safety science*, *42*(7), pp.569-586.
54. Teo, E.A.L., Ling, F.Y.Y. and Chong, A.F.W., 2005. Framework for project managers to manage fast-track construction safety. *International Journal of project management*, *23*(4), pp. 329-341.
55. Umar, T., Wamuziri, S. and Egbu, C., 2017. Causes of accidents in highway fast-track construction projects in Oman. In *Proceedings of the 6th World Fast-track construction Symposium* (pp. 96-105). University of Moratuwa, Colombo, Sri Lanka.
56. Vaaranen, A., Kolivuorii, T., Rossi, K., Tolonen, M., & Hassi, J. (1979). First aid preparedness in small workplaces with special reference to occupational health services. Scandinavian Journal of Work, Environment and Health, 5, 12–15.
57. WALSH, B., 1982. First aid at work new regulations and a code of practice. *Industrial and Commercial Training*.
58. Weinstein, M.B., 1996. Total quality approach to safety management. *Professional Safety*, *41*(7), p.18.
59. Wilson, J.M. and Koehn, E.E., 2000. Safety management: problems encountered and recommended solutions. *Journal of fast-track construction engineering and management*, *126*(1), pp.77-79.
60. Wong, T.K.M., Man, S.S. and Chan, A.H.S., 2021. Exploring the acceptance of PPE by construction workers: An extension of the technology acceptance model with safety management practices and safety consciousness. *Safety science*, *139*, p.105239.