



Risk Factors for Construction Workforce Safety towards Sustainability

Muhammad Mujtaba Asad^{1*}, F. Sherwani², Zahid Hussain Khand³

^{1,3}Sukkur IBA University, Airport Road, Sukkur, Sindh, PAKISTAN

²National University of Computer and Emerging Sciences, Karachi, PAKISTAN

*Corresponding Author

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Abstract: This research article is based on the identification of safety risk factors associated with construction projects in Pakistan related with the China-Pakistan economic corridor (CPEC). In this paper, four construction sites have been targeted from Sindh, Punjab, Khyber Pakhtunkhwa, and Baluchistan province of Pakistan. The research was based on quantitative mode where the questionnaire survey was adopted for data collection and analysed statistically. The targeted respondents were 400 CPEC construction workforces from four different targeted sites in Pakistan. The collected data was analysed using descriptive statistical methods of Statistical Package of Social Sciences (SPSS) 23.0 software. According to the findings, it has been specified that the respondents from all four targeted construction sites in Pakistan has considered three major safety risk factors such as administrative, personal protective equipment (PPE) and workforce safety. Risk factors for administrative is between 1.06 and 2.65 (low level to moderate level), for PPE is between 1.06 and 2.65 (low level to moderate level) and for workforce safety is between 2.4 and 3.60 (moderate level to high Level). Meanwhile, the safety experts have been indicated the lack of proper training & PPE equipment's, falling from height and falling object hazards are as the major cause of injuries at Pakistani construction sites related with CPEC projects. The findings of this study will be the catalyst for the CPEC projects in Pakistan to minimize the safety and health concern among construction industry workforce.

Keywords: Sustainable projects, China-Pakistan economic corridor, construction sustainability, workplace risk

1. Introduction

Constructions industry is one of the major industries for building the infrastructure of any country or origin (Gamil et al., 2019). It also plays an important role for providing most suitable, economical, and innovative design in terms of building structure and materials for the infrastructural development (Rehman et al., 2018; Boni, 2019, Butt et al., 2020). Like the rest of the world, construction industry in Pakistan is also on the priority of the stockholders and developers. Unfortunately, it is not as per the safety and management standard like other developed countries. There are numerous issues and risks which has been highlighted by previous studies such as the lack of competency in construction management projects, delay in construction projects, lack of safety management systems and untrained labor and workforce (Sherwani et al., 2020, Adeyemi, Martin & Kasim, 2015). Moreover, after the agreement between the Pakistan and China in terms of China- Pakistan Economic Corridor (CPEC) several new constructions projects have been started in all over Pakistan to full fill the demand and requirements of this collaborative corridor between China and Pakistan (Abid & Ashfaq, 2015; Makhdoom et al., 2018; Ali et al., 2020). Whereas, this collaborative project brings new opportunities for the people and workforces of this county but at the same time it is also one of the major challenges for the builders and construction project industries to implement suitable strategies and framework for the safety of the workforce. Because every year's hundreds of accidents occurred during construction projects in Pakistan in which the workforce suffered with major injuries and sometime lifetime disabilities due to insufficient safety management while

building constructions. Therefore, in this study, the major risk factors and safety hazards has been identified with their mitigating approaches for safe China-Pakistan Economic Corridor (CPEC) related.

2. Literature Review

In the context of construction industry in Pakistan, which is always associated with numerous concerns and challenges for the developers and sometimes they tried to figure out and most of the time it has been ignore due to unprofessional attitudes. Resultantly, the construction labour and workforce must suffer (Wasim & Siddiqi, 2018). Similarly, delay in construction projects and lack of effective management issues can be figured out through the implication and coordination between the stockholders and contractor (Soomro et al., 2019). But the most important issue and challenge is the protection and safety of construction workforce which is always on the low priority. Therefore, several incidents have been investigated after the accidents took place which should be conducted prior to the construction activities and projects. Because, the workers and labour of the construction projects are the most important part for the success of project, therefore the safety and health of workforce should be the priority of the industry (Ishaque, 2016; Sohu et al, 2018).

Moreover, during the construction projects in Pakistan, construction labour and workforce must face safety issues and suffer with the major injuries which have some time leads to life-threatening disease or death (Batoool et al., 2019). Previously the major accidents occurred due to falling from the buildings while construction work, slip and trip from the site, electric shock during performing welding activities at construction sites and the breathing and lungs diseases due to the radioactive materials (Hassan et al, 2017). Whereas, these days construction industries in Pakistan are boosted due to several new projects has been started for China-Pakistan Economic Corridor and construction is going on all over the country (Epelle & Gerogiorgis 2020). But for the sustainable and safer construction projects the developers and construction projects consultant should give priority to the safety and health culture of the workforce. Because there is an urgent need to identify such strategies and risk factors which cause the accidents at construction sites (Hassan et al., 2017; Tehsin, & Sargana. 2017, Sohu et al., 2017). Also, it is essential to identify the risk controlling approaches to minimize safety issues and concerns in appropriate manners for all CPEC associated construction projects. Therefore, this study has focused to identify most potential risk factors and mitigating appropriate strategies in terms of administrative, personal protective equipment and workforce safety associated with the construction projects in Pakistan with their effective mitigating strategies for CPEC projects.

3. Methodology

In this study adopted quantitative approach which used survey research data and analysed statistically. The questionnaire survey involved four hundred (400) respondents of construction workers who are randomly selected from the construction sites in Pakistan from different CPEC projects as shown in Table 1.

Table 1 - Participant of Study

Construction Sites in Pakistan	No of Respondents
SITE A - Sindh	100
SITE B - Punjab	100
SITE C - Khyber Pakhtunkhwa	100
SITE D - Baluchistan	100
Total	400

Furthermore, for the quantitative data analysis, descriptive statistical (Mean) approach has been employed through SPSS 23.0.

4. Identification of Risk Factors for Construction Industry in Pakistan

For the identification of risk factors and mitigating strategies associated with the construction operation at Pakistan related with CPEC projects, the quantitative data analysis approach has been used to achieve the targeted research objectives of this study. Whereas the descriptive statistical approach was utilized for this study by using Mean. Consequently, a table of mean range is adapted from Hassan et al (2017), which indicate and identify the construction

labour safety factors at constructions sites in Pakistan associated with CPEC projects. Table 2 specified level of severity based on mean score and differentiate them into ‘low’, ‘moderate’, and ‘high’ level of risk factors.

Table 2 - Table of Mean Range and Level of Safety Risk Factors

Mean Range	Level of Safety Risk Factors
1.0 - 2.33	Low
2.34 - 3.49	Moderate
3.50 and Above	High

The descriptive safety findings for the identification of risk factors at the construction industry in Pakistan has been divided in to three major safety risk factors such as administrative risk factors, personal protective equipment (PPE) safety risk factors and workforce safety risk factor. Based on the descriptive statistical findings (Mean Score) for the administrative safety risk factors it has been indicated that at all four targeted sites the administrative safety performance and safety contribution by the contractors at construction site was under the low level of mean range with lack of providing proper equipment’s, safety methods of work, training for workers, safety management systems, and proper supervisor to the labour as shown in Table 3.

Table 3 - Results of Administrative Safety Risk Factors at Construction Industry

Construct	SITE A	SITE B	SITE C	SITE D	Level of Safety Risk Factors
	Mean Range				
Contractor provides proper equipment.	1.34	1.46	1.93	1.43	Low
Contractor provides proper and safe method of work.	1.42	2.43	1.94	1.23	Low & Moderate
Contractor provides competent and appropriately trained staff.	2.43	1.38	2.01	1.34	Low & Moderate
Contractor provides safe system or method of work.	1.76	1.54	1.54	1.88	Low
Contractor provides competent and adequate supervision.	1.87	1.06	1.32	1.76	Low
Contractor provides appropriate training to all staff.	1.44	1.54	1.28	1.87	Low
Contractor did reasonable care for their own safety.	2.54	2.1	2.65	2.54	Low & Moderate
Contractor proper look out for danger.	2.14	1.34	2.55	1.23	Low & Moderate
Contractors provide equipment and ensure it is used for its proper use.	1.66	1.43	1.76	1.42	Low
Contractor provides proper attention to their work.	1.36	1.54	1.32	1.25	Low

Similarly, for the second major personal protective equipment safety risk factor it has been specified that here is also a sheer need of providing personal protective equipment's at all targeted construction sites in Pakistan for safety systems while working on height, safety gloves, safety shields, safety harness, safety masks, face protection shields, unflamable attires, electric shock proof attires, welding work protection shields with low level of mean range as shown in Table 4.

Table 4 - Results of Personal Protective Equipment (PPE) Safety Risk Factors at Construction Industry

Construct	SITE A	SITE B	SITE C	SITE D	Level of Safety Risk Factors
	Mean Range				
Contractor provides safety systems while working on height	1.42	1.56	1.93	1.41	Low
Contractor provides safety gloves	1.12	1.23	1.34	1.22	Low
Contractor provides safety shields	1.32	1.82	1.11	1.45	Low
Contractor provides safety harness	1.76	1.54	1.54	1.83	Low
Contractor provides safety masks	1.57	1.06	1.32	1.45	Low
Contractor provides face protection shields	1.40	1.54	1.28	1.54	Low
Contractor provide safety shoes	1.45	2.1	2.65	1.62	Low & Moderate
Contractor provide unflamable attires	1.24	1.34	1.62	1.35	Low
Contractor provides electric shock proof attires	1.26	1.34	1.36	1.33	Low
Contractor provides welding work protection shields	1.12	1.43	1.10	1.53	Low

Whereas, it has been specified that the workforce mostly exposed to the height hazards and drop object hazard while working on the construction sites with high level of mean range. However, exposed to the slip hazard, trip hazard, stuck hazard, exposed to addictive dust, electric shock hazard, radioactive dust hazard and pinch hazards are also potential hazards at construction sites in Pakistan with moderate level of mean range as shown in Table 5.

Table 5 - Results of Workforce Safety Risk Factors at Construction Industry

Construct	SITE A	SITE B	SITE C	SITE D	Level of Safety Risk Factors
	Mean Range				
Exposed to Falling from height hazards	3.60	3.57	3.56	3.59	High
Exposed to Slip Hazards	3.12	3.03	2.98	3.23	Moderate & High
Exposed to Trip Hazards	3.34	3.35	3.15	2.40	Moderate & High
Exposed to Drop Object Hazards	3.54	3.55	3.54	3.58	High
Exposed to Stuck Hazard	2.57	3.04	3.38	3.25	Moderate & High
Exposed to Addictive Dust Hazards	3.42	3.33	3.24	3.42	Moderate
Exposed to Electric Shock Hazards	2.56	3.26	3.23	2.90	Moderate
Exposed to Radioactive Dust	3.16	3.4	3.38	3.2	Moderate
Expose to Pinch Hazards	3.18	3.3	3.24	3.31	Moderate

5. Conclusion

The overall findings of this paper specified that, the administrative safety risk factors, personal protective equipment risk factors and workforce safety risk factors are the major cause of accidents and injuries at construction sites in Pakistan associated with the CPEC related projects. It has concluded that construction industry in Pakistan has considered risk factors for administrative and PPE is low level to moderate level and finally for workforce safety factors is moderate level to high level. In addition, the open-ended questions for survey indicated that the lack of proper training & PPE equipment's, falling from height and falling object hazards are the major cause of injuries at CPEC construction sites. The findings of this study will be the catalyst for the CPEC projects in Pakistan to minimize the safety and health concern among construction industry workforce.

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