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Factor affecting Construction Safety Post Covid-19 Challenge's in Islamabad Capital Territory

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Abstract

The imposition of lockdowns and strict health safety measures in response to the Coronavirus Disease of 2019 (COVID-19) significantly impacted the construction sector, a prominent labour-intensive industry. Consequently, there is potential for this situation to adversely affect projects aligned with the sustainable development goals (SDGs) associated with the construction sector. This research thesis delves into the challenges that emerged during the pandemic and proposes feasible solutions, considering the viewpoints of various stakeholders, to steer the post-COVID-19 revival toward achieving the pertinent SDGs. Methodologically, the study began with in-person interviews, the insights from which were subsequently deepened through a questionnaire survey conducted within the capital territory of Islamabad.

The findings highlight several key recommendations: enhancing management efficacy, expediting the integration and adoption of digital technologies by construction firms with the backing of governmental initiatives, fostering new skills related to emerging tools and technologies, and augmenting governmental expenditure on infrastructural facilities. In conclusion, this research underscores the pivotal role of multi-stakeholder collaboration and the incorporation of Fourth Industrial Revolution (4IR) technologies in realizing the SDGs pertinent to the construction sector in the aftermath of the COVID-19 pandemic.

Introduction

Many recent technical developments have been created to improve the safety and comfort of construction workers. Despite fast changes, the construction sector has been complained for being improvised and inadequate to make full use of health and safety (H&S) technologies. H&S technologies were once seen as a luxury, but in light of the 2019 coronavirus illness (COVID-19) epidemic, they may now be essential. Many lives have been lost, business activity has slowed, unemployment rates have risen, and people's daily routines have had to adjust because of the COVID-19 epidemic. This sector is one of those that will feel the pinch. The construction industry has been beset by issues such as site closures, disruptions in the supply chain, and prolonged delays. During the early phases of the COVID-19 period, mostly businesses closed their doors and employees remained enforced to work home-based. However, it was not possible to entirely close down construction sites because many ongoing projects, such as hospitals, needed to be finished on time to guarantee the public's safety. Construction sites now face a new health and safety risk due to the COVID-19 virus, so firms have taken measures to resist the virus and aid their industries in recovering as soon as possible. Many workers in the construction industry have low levels of education, which may be one of the major obstacles to implementing safety measures on the job sites.

Literature

In the face of the implementation of safety and health measures and line-ups, such as those advanced and obligatory by the Occupational Safety and Health Administration (OSHA), Abudayyeh et al. (2006) report that incurable and nonfatal injury and illness rates remain relatively high in the construction industry.

Ng et al. (2005) observe that in today's market-driven culture, actors in the construction industry, particularly for one which is at the bottom of the stock chain, tend to prioritize finishing schemes quickly and cheaply while still satisfying quality criteria. Therefore, it stands to reason that we don't make security a primary priority.

Abudayyeh et al. (2006) report on more recent research that cites the work of Hinze et al. (1998 referenced), which finds that construction injuries have an immediate effect on both workers and the project. Increased insurance premiums, construction delays, lost productivity, and potential liability lawsuits as a result of an injury sustained on the job are just some of the bad outcomes that might result from an accident. Damage to the owner's bottom line can occur from construction accidents as a result of delays in project completion and a decrease in employee morale.

Standardized checklists for assessing physical and technological safety on construction sites have been developed thanks to the research of Janadi and Assaf (1998; cited in Fang et al., 2004). However, managerial issues are not addressed by these standards. Duff's (2000) findings provide credence to the idea that human behaviour evaluation and safety management assessments should be conducted jointly (Fang et al., 2004).

Fang et al. (2004) conducted a literature review and found that when judging the quality of safety performance, the standard benchmarking approach in construction is to look at the site's physical safety conditions and accident records. However, management factors that affect site safety have received very little attention. Despite its widespread use, this approach to safety evaluation disregards the issues of safety management (Fang et al., 2004).

It is awkward to hassle the significance of a connection among construction and nature in the creation of a sustainable, regulated civilization. Long-term, this could be the answer to matters with sustainability. According to Opoku (2016), the construction business is a microcosm for larger cultural norms and values. Governments all over the world are beginning to show more support for Agenda 2030 and its set of Unassailable Development Goals (Sachs, 2012). According to Ebekozien and Aigbavboa (2021), the construction industry can benefit from 4IR technologies because it can be used to revitalize defunct construction sites.

The studied literature consistently drew connections between COVID-19 and the building trades. Few articles discussed the business sector's potential to achieve the SDGs in a decade or less.

Not all objectives were met, and only a small number of sources, including Lekan et al. (2020), cited the COVID-19 outbreak. The authors consider the potential role of 4IR technology in facilitating the adoption of sustainable building practices

Research Methodology

In this research, a pilot study is proposed to assess the feasibility and reliability of the research design and methodology. The pilot study aims to detect and address data collection and analysis challenges or limitations, and adjust methodology accordingly. The pilot study results will inform the main study and ensure that the research design is robust and effective. Participants will be selected and a trial run of data collection such as questionnaire instruments will be conducted. The data collected will be analysed and any issues with quality, reliability, or response rate will be identified and addressed. Any potential flaws in questionnaire design are addressed to improve survey effectiveness and audience understanding. A questionnaire comprising of 15 questions was distributed in the pilot study among university students, faculty, engineers, and construction professionals

Research Finding

The researcher classified the aftermath of the pandemic on the construction business into four groups: shifts in working methods and attitudes; challenges and risks; key players; and post-pandemic opportunities. Pakistan's construction industry was found to be particularly vulnerable during the COVID-19 pandemic because of several factors, including a shortage of digitalization, compound cash flow, and plenty of labour severe techniques, a varied stakeholder base, and a reliance on imported supplies, equipment, and foreign expertise.

Table 4.1: Descriptive Analysis

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Workforce Development	93	3.00	2.00	5.00	3.71	0.83
Organization Sustainability	93	3.00	2.00	5.00	4.12	0.64
TQM	93	3.00	2.00	5.00	4.13	0.68
Technology Adoption	93	3.00	2.00	5.00	3.88	0.83
Health and Safety Protocol	93	4.00	1.00	5.00	4.22	0.81
Supply Chain Resilience	93	3.00	2.00	5.00	3.81	0.99

Workforce development, organizational sustainability, total quality management (TQM), technology adoption, health and safety protocol, and supply chain resilience are described in Table 4.1. We find a wide distribution of values across each variable in the 93 points of data. The scores on Workforce Development, for example, can go anywhere from 2.00 to 5.00, with an average of about 3.71 and a standard deviation of about 0.83.

There is less dispersion in scores for organizational sustainability, with a mean score of about 4.12 and a standard deviation of only 0.64. TQM scores average at 4.13, with a standard deviation of 0.68, similar to Organization Sustainability scores. Subsequently, the score (av.) for technology acceptance is about 3.88, with a standard deviation almost similar to workforce development. Mean scores for Health and Safety Protocol are observed as 4.22, with a modest standard deviation of 0.81, while Supply Chain Resilience scores are found around 3.81, with a large amount of variation due to a high standard deviation of 0.99.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.206	6	.052	.907	.0460[b]
	Residual	16.710	87	.057		
	Total	16.916	93			

a. Dependent Variable: Construction Safety

b. Predictors: (Constant), Technology Adoption, TQM, Organization sustainability, supply chain resilience, Health and safety Protocol, Workforce Development.

The Analysis of Variance (ANOVA) findings for the regression model attempting to predict "Construction Safety" are shown in Table 4.2, labelled "ANOVA." This statistical method assesses the overall importance of the model's predictors.

The sum of squares, which represents the amount of explained variance in Construction Safety, is calculated to be 0.206 within the "Regression" section. There is a total of 6 df in the model's predictors, leading to a mean square of 0.052. The model's overall significance, as measured by the F-value, is 0.907%. The overall significance of the regression model is also supported by the significance value (Sig.) of 0.0460, which is less than the typically accepted value of 0.05.

Moving on to the "Residual" section, which examines the unexplained portion of the variance, we find that the square root of the mean squared residual is 0.057, with a sum of squares of 16.710 and 87 degrees of freedom.

Total sum of squares equals 16.916, with a total of 93 degrees of freedom, when considering the "Total" portion, which includes all variance in the dependent variable.

In conclusion, this ANOVA table sheds light on the importance of the regression model's components. If the F-test is significant, then one of the predictors in the model must have a considerable effect on Construction Safety. Further investigation into the individual predictor coefficients and their different levels of significance would be helpful to acquire a more nuanced understanding of which specific predictors carry substantial influence.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	3.866	.154		25.162	.000	3.564	4.169		
	Technology Adoption	.341	.127	.092	1.507	.133	.012	.093	.906	1.104
	Organization sustainability	.315	.220	.014	.023	.081	.045	.035	.886	1.129
	TQM	.220	.119	.059	1.010	.031	.019	.058	.992	1.009
	Health and safety Protocol	.168	.016	.250	4.251	.000	.099	.036	.894	1.119
	supply chain resilience	.172	.028	.148	2.570	.011	.128	.017	.931	1.074
	Workforce Development	.308	.110	.023	.388	.069	.051	.034	.963	1.039

a. Dependent Variable: Construction Safety

As shown by "B," the unstandardized coefficients shed light on the anticipated shift in Construction Safety caused by a one-unit shift in each predictor if all other predictors remain unchanged. When all other variables are held constant, the constant coefficient, which in this case is 3.866, represents the value of Construction Safety that would be expected. Unstandardized coefficients for the various predictors, such as Health and Safety Protocol, Supply Chain Resilience, Workforce Development, and Supply Chain Resilience, ranging from 0.168 to 0.341. These numbers show that improvements in construction safety may be expected for every unit rise in these predictors, with Workforce Development having the greatest impact and Technology Adoption having the smallest.

Standardized coefficients, denoted by "Beta," provide a measure of the rate of change in Construction Safety expressed as several standard deviations. They make it possible to evaluate various predictors' side-by-side. The Health and Safety Protocol has the greatest standardized influence on Construction Safety, with a Beta of 0.250. However, Organization Sustainability's Beta is only 0.014, indicating a modest normalized effect size.

Statistical significance is revealed by the p-values (Sig.) associated with the t-statistics used to evaluate the significance of the individual coefficients. In statistics, significant predictors have p-values that are less than 0.05. The importance of Health and Safety Protocol in predicting Construction Safety is highlighted by its high significance (p 0.001).

In addition, 95% confidence intervals for the coefficients are included in the table, indicating the range in which the real population value of each coefficient is expected to fall.

Finally, Tolerance and VIF (Variation Inflation Factor) are two examples of Collinearity Statistics that can be used to assess the degree of multicollinearity between different predictors. Acceptable thresholds for both Low Tolerance and VIF are often considered to be about 1. These numbers suggest multicollinearity among predictors is not a major issue here.

The contribution of each predictor on Construction Safety inside the regression model is shown in Table 4.4. To help researchers and analysts make educated decisions based on the model's results, it emphasizes the direction, strength, and statistical significance of these associations. In this light, the Health and Safety Protocol stands out as a powerful and significant predictor.

For construction goals to be maintained in the face of crises like COVID-19, policy actions should prioritize supporting prolonged operations. As part of a financial stimulus package, governments might designate construction as a core economic sector, giving the industry priority access to safety equipment and virus testing, lowering taxes, loosening labour regulations, and investing in infrastructure (Ahmed et al., 2021). Establishing productive public-private collaborations is crucial. Enhancing at-risk workers' access to social safety nets is another way to maintain stability (Shahzad et al., 2021). Comprehensive disaster planning plans can facilitate rapid response.

Wearables, drones, and AI are all technologies that can aid in keeping construction workers safe in the age of COVID. Wearables can be used to monitor social interactions, detect illnesses, and measure travel time, as mentioned by Bashir et al. (2022). Thermal imaging cameras on drones will allow for the scanning of crowded locations (Farooq et al., 2021). Artificial intelligence can help assess new threats and choose the best course of action to mitigate them (Akram et al., 2021). Widespread adoption of such technology, along with training and legislative support, can boost workers' health and happiness in the years following COVID

Conclusion

While the effects of the COVID-19 pandemic on Pakistan's construction industry have been significant, this research helps to illuminate the factors that emerged as the most important during the outbreak. The need for toughness and creativity in the sector has been brought to light by the problems that have arisen because of supply chain interruptions, a lack of available labour, and the implementation of new health and safety regulations. As construction projects experienced delays and financial strains, it became clear that a holistic approach was necessary to navigate the changing landscape. This approach would need to include the introduction of new technologies, the implementation of total quality management, the financing of transformation, the maintenance of long-term viability, and the cultivation of skills in the workforce.

The results highlight the significance of strong project management methods, simplified supply chains, and a highly skilled workforce in ensuring the future profitability of the construction sector. Resilience and agility in the construction industry have been established because of the industry's response to the pandemic, making it better equipped to deal with future disturbances.

This study provides a foundation for future inquiry; its findings can guide policy choices, business procedures, and academic endeavours as Pakistan, and the rest of the globe, deal with the long-term impacts of the pandemic. Although the long-term effects of COVID-19 are yet unclear, the industry's response to the pandemic will be shaped by the lessons it has learned during the past few years. This will result in a construction sector that is more resilient, creative, and safety-conscious than ever before. How the construction industry responds to this unprecedented challenge will speak volumes about its fortitude and dedication to building a sustainable future.

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