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Cultural Factors Impacting Health and Safety (H&S) Practices in a Developing Construction Economy

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Abstract: The study investigated the influence of cultural factors on Health and Safety (H&S) practices in the construction industry of a developing economy using a quantitative approach. Data were collected through a questionnaire survey from industry professionals. The findings reveal varying perceptions of safety culture, communication, and practices, with mean scores ranging from 2.692 to 3.607. Safety training frequency showed high variability (mean = 2.692, CV = 43.13%, Skewness = 0.42, Z-score = −0.69, range = 1.531 to 3.853), while subcontractors' safety compliance exhibited the least variability (mean = 3.589, CV = 26.50%, Skewness = −0.38, Z-score = 0.58, range = 2.638 to 4.540). Practices (mean = 3.327, CV = 25.69%, Skewness = −0.38), behaviors (mean = 3.234, CV = 27.40%, Skewness = −0.25), and norms (mean = 3.028, CV = 31.91%, Skewness = 0.10) also showed significant variations. Additionally, the key challenges with highest values include budget constraints (mean = 3.607, CV = 31.80%) and company rules (mean = 3.523, CV = 30.28%). Furthermore, Kruskal–Wallis's test indicates statistically significant differences across variables, with medium to large effect sizes (η^2). By addressing important cultural factors and challenges, the findings provide actionable insights to enhance worker safety, reduce accidents, and promote a safer working environment, thereby contributing to sustainable development and resilience in Pakistan's construction sector.

Keywords: cultural factors; health and safety (H&S); occupational safety; sustainable development; safety management; workplace resilience; sustainable construction practices

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1. Introduction

The construction industry, a crucial sector in economic development, encounters notable obstacles in ensuring Health and Safety (H&S) on job sites, particularly in developing nations. The industry under study is known for its intricate and high-risk settings, where implementing efficient safety measures is crucial to reduce hazards and safeguard workers. The relationship between cultural factors and H&S practices is especially noticeable in developing countries. Research has shown that cultural attitudes, norms, and values significantly impact safety behaviors, perceptions of risk, and compliance with safety regulations [1]. By examining how cultural elements influence H&S practices in the construction industry, this study seeks to clarify the distinct challenges and potential advantages that emerge in such contexts. The development of targeted strategies that improve working

conditions and enhance safety outcomes in the construction sector is contingent upon the comprehension of these cultural influences.

Moreover, in their research, Cabana and Kaptein [2] delve into the notion of culture as a byproduct of the interplay between the targeted interactions among individuals (psychological aspects), the tasks they perform (behavioral aspects), and the overarching structure of the organization itself (situational aspects). Moreover, van Nunen et al. [3] go on to elaborate on safety culture as the observable level of joint commitment demonstrated by all organizational members toward consistently improving safety measures within the workplace. Similarly, Choudhry et al. [4] developed a comprehensive framework model to assess the complex components of Construction Safety Culture, with a clear distinction between two distinct segments. The initial segment is intricately linked to the internal psychological aspects, encompassing the personal safety climate prevalent among the workforce within the construction industry. Conversely, the latter segment is reliant on the external observable factors, which encompass the overall environment, specific situations, and organizational behavior. This conceptual model meticulously underscores various crucial elements, including the human factor, practical considerations, situational contexts, and organizational dynamics, along with their interconnections and interdependencies. Within the framework, three fundamental concepts take precedence, namely safety climate, behavior-based safety, and safety system. It is worth noting that this model essentially serves as a pivotal foundational structure that can be utilized as a fundamental basis for scrutinizing and evaluating the diverse array of characteristics that define the construction safety culture landscape. Similarly, Tepe and Kaya [5] advocated for fostering a resilient culture of safety in construction, which underscored the significance of fostering a robust safety culture and articulated the necessity of establishing and applying coherent occupational health, safety, and environmental risk recognition, evaluation, and management systems. Attainment of a goal of zero incidents is plausible when the realms of safety management science and safety management art collaborate effectively.

Safety regulations and safety concerns are often influenced by cultural norms, which can affect the workforce's attitudes toward these regulations. In certain contexts, employees may be less likely to voice their concerns or question authority figures. To address this, professionals in the construction industry must understand these cultural nuances and tailor their H&S initiatives accordingly. This can include creating culturally sensitive training materials and promoting open communication. This approach fosters a culture of proactive risk prevention, ultimately benefiting the workforce. Throughout the course of history, the construction industry has seen an excessive increase in occupational deaths and injuries compared to other labor-intensive sectors. In the year 2021, the construction sector accounted for 22.5% of all fatal accidents at work in the European Union (EU). The number of fatal accidents at work in the EU in 2021 was 3347, representing a decrease of 1.5% compared to the previous year, 2020 [6]. Similarly, in the USA, with only 5% of the workforce, the construction sector is responsible for 20% of all incidents [7]. Given the paramount importance of workforce H&S, it is crucial to recognize the contextual aspects that influence the positive execution of safety practices and the effectiveness of interventions. Researchers highlight the significance of contextual factors, which include influences on culture and leadership, in molding the adoption of evidence-based measures in various fields, including healthcare [8].

Rationale for Focusing on Pakistan's Construction Industry

The emphasis on Pakistan's construction industry can be justified given its importance in national development, its role as an indicator of infrastructure advancement and urbanization, and its contribution to employment generation. The construction industry in

Pakistan constitutes a significant portion of the GDP, playing a crucial role in the development of capital stock and providing support to sectors such as real estate, manufacturing, and transportation. However, despite the industry's significance to the national economy, it will continue to face issues like weak regulations, labor shortages, and sluggish adoption of cutting-edge technologies and effective building techniques. The constraints faced in these aspects hinder the sector's potential for sustainable growth and innovation, indicating a need for further research in this area. Additionally, the Pakistani construction industry encompasses both formal and informal structures, presenting numerous opportunities to examine broader issues that may not be regarded as distinctive in other industrialized economies. The integration of family businesses, informal labor, and traditional structures of governance with modern technologies provides a distinctive context for understanding the challenges of emerging economies. The considerations create unique conditions in which industry must evolve in alignment with the progressive and dynamic society while adhering to conservative social and economic frameworks.

This study offers an in-depth examination of the Pakistani construction industry, focusing specifically on cultural factors that affect the adoption of H&S practices. Therefore, the purpose of this study is to analyze the impact of cultural factors on the adoption of H&S practices in the construction industry of Pakistan. The research demonstrates the impact of culture and values on H&S behavior while also identifying the potential and challenges associated with safety management in business. The study further identifies recurring challenges in the sector, such as low productivity, insufficient training, and contractor inefficiencies. These issues hinder the implementation of H&S measures inside firms and impede overall industry and professional advancement.

The objective findings from this study may apply to other developing countries with comparable economic, cultural, and regulatory contexts. The study proposes focused attention on the development of initiatives and political reforms tailored to specific cultural contexts. Consequently, the research findings provide appropriate recommendations and optimal practices in the form of a conceptual framework for the construction industry to mitigate hazards and risks, enhance efficiency, and address complexity like those faced by other emerging nations. This research is quantitative and aims to cultivate an understanding of the impact of culture on H&S in construction. The findings provide an essential guide to policymakers, industry stakeholders, and practitioners in improving safety standards and performance within the construction sectors of emerging economies such as Pakistan.

2. Literature Review

In developed countries, stringent enforcement of workplace safety standards is observed, emphasizing the importance of human life and dedication to optimizing safety in work environments. Conversely, developing countries often lack a focus on safety, leading to insufficient laws and regulations to mitigate risks. Workers in developing nations face a disproportionate exposure to approximately 80% of the total global occupational hazards, resulting in a significant impact on health, injuries, and, in severe cases, fatalities [9]. Furthermore, several factors impact safety and health within the construction sector of developing nations. Initially, a lack of adequate training and education for workers leads to a deficiency in understanding safety protocols and procedures [10]. This deficiency, combined with poor enforcement of regulations by governmental entities, results in a disregard for safety measures at construction sites. Furthermore, substandard working conditions, such as extended work hours, insufficient rest periods, and exposure to dangerous substances, contribute to the high incidence of accidents and injuries in these regions [11]. Additionally, the prevalence of informal employment arrangements worsens safety issues as workers may lack access to essential protective gear or medical assistance

during emergencies [12]. Therefore, addressing these factors through enhanced training initiatives, stricter regulation enforcement, and advocacy for improved working conditions is crucial for enhancing safety and health outcomes within the construction industry of developing countries.

The construction sector in Pakistan contributes approximately 2.53% to the GDP and employs around 7.61% of the labor force [13]. Despite experiencing rapid development in the last decade with nearly 3 million workers, the construction sector accounts for 7.6% of the total workforce and 17.3% of construction accidents [14]. Surprisingly, little effort is made by governmental or private authorities to ensure the well-being of construction personnel. Current safety acts in Pakistan, such as the Factories Act of 1934, the Workmen's Compensation Act of 1923, and the Minimum Wage Ordinance of 1961, are not specific to the construction sector. Instead, they address H&S issues related to industrial workers in a broader context [15].

Pakistan faces challenges in construction projects, including delays, cost overruns, and defects. Remedial actions are needed to address these issues despite financial disputes and tight timeframes. The demand for quality work at competitive rates and within tight timeframes places significant financial and time constraints on projects, compromising their overall quality. In the context of Pakistan, despite being a member of the International Labor Organization, the country has not yet signed Convention 187 on the Promotion of Occupational Safety and Health at the workplace, highlighting a gap in prioritizing occupational H&S (OHS) standards [16].

Safety in Pakistan's construction sector is hindered by inadequate supervision systems and a lack of regulatory environments. This deficit safety culture, marked by challenging situations and varying perceptions, contributes to recurring unsafe working environments [15–18]. The construction industry in Pakistan has been associated with accidents originating from unique circumstances, unrealistic timelines, inadequate safety measures, and unethical workplace practices [19]. Stakeholders are faced with the compelling necessity to improve construction practices and foster a safety culture in Pakistan's construction industry.

However, specifically, there is a lack of comprehensive understanding of how cultural factors influence H&S practices in the context of the construction sector in Pakistan. Therefore, there is a need for research to examine and explore these cultural influences and their effects on the implementation of H&S practices. The literature reviewed by [13,15,17,20] revealed that there was a lack of research work on the cultural elements that influenced the H&S protocols adopted by Pakistan's construction sector. By investigating the cultural elements that outline the attitudes, behaviors, and practices related to H&S within the construction field of Pakistan, this research aims to fill the existing 'literary hole' knowledge gap and provide valuable insights. Understanding the cultural influences on H&S in construction practices is critical for promoting a safer working environment, reducing accidents, injuries, and fatalities, and ultimately improving the overall well-being of construction workers in Pakistan. Additionally, this research has the potential to inform policy decisions, industry practices, and training programs that are culturally sensitive and effective in promoting a culture of safety within the construction industry. The factors extracted from current studies' literature review have been summarized in Table 1, which highlights their impact on the implementation of H&S practices in the construction industry of Pakistan.

Table 1. Literature summary.

Cultural Category	Summarized Description	Reason for Adoption	Reference
Lack of safety culture	In Pakistan, there is a diverse variety of cultures, and how these cultural attitudes respond to safety cultures in construction processes vary.	The main reasons are the historical perspectives, societal norms, and attitudes toward risk; there is a casual/laid-back attitude observed in the construction sector of Pakistan, and this attitude contributes to a culture where safety is not given a priority, which delays the growth of a strong safety culture.	[1]
Communication barriers	Strong communication is detrimental to the success of any project, in our present case, cultural nuances in communication styles can impact the effectiveness of H&S protocols in the sector of construction.	Pakistan has a very diverse culture; many different languages and dialects are used throughout the country. The laborers usually speak Punjabi, Saraiki, Sindhi, or Balochi, depending on the province where the construction project is being carried out. While the engineers/H&S personnel mainly speak Urdu/English, hence a communication gap can potentially be created in conveying the safety guidelines and information, making it challenging to ensure the H&S protocols for effective communication and implementation.	[21]
Resistance to change	Resistance to change arises from cultural preferences where old traditions are given importance and new trends are generally shunned.	In a country like Pakistan, which values traditions, orthodox methods, etc., the introduction of new safety practices may be faced with serious resistance. Overcoming this resistance requires proper education and consideration of cultural perspectives on change.	[22]
Hierarchical structures and reporting mechanism	Hierarchical Structures within the construction may influence the decision-making processes and construction personnel participation.	In Pakistan, strong hierarchies are observed that can challenge the input of construction personnel and their empowerment in safety decisions; this can ultimately affect the implementation of H&S regulations.	[23]
Limited training and education	The cultural value emphasized on training and education may impact the importance of developing a well-trained workforce.	In Pakistan, there is a lack of adequate training programs; this can potentially hinder the workforce's ability to adhere to safety protocols.	[24,25]
Perceived regulatory compliance	Cultural attitudes towards regulatory compliance can shape the construction industry's approach to adhering to H&S regulations.	A prevailing culture of regulatory noncompliance leads to a laid-back approach to following the H&S protocols, which leads to several inadequacies.	[26]
Governmental oversight and industry collaboration	Cultural and social attitudes towards government oversight and collaboration influence the construction industry's response to regulatory bodies.	In a culture where there is uncertainty or mistrust of government involvement, such as the current economic condition of Pakistan. The collaboration between the regulatory bodies, industrial stakeholders, and professionals may face challenges, which can influence the effective enforcement of H&S regulations.	[27]

The cultural factors identified in this study have been derived from a comprehensive synthesis of existing literature related to organizational culture and safety culture within the construction industry, particularly emphasizing the context of Pakistan shown above. For instance, the concept of Lack of Safety Culture arises from studies demonstrating how regional cultural perceptions influence the recognition and acceptance of safety measures in construction environments. Like the previous concept, Communication Barriers are also examined through the lens of literature on Cross-Cultural Communication, highlighting the challenges encountered when interacting with individuals from varied communication backgrounds in multinational and/or diverse teams. The concept of Resistance to Change is deeply embedded in the theories surrounding cultural attitudes toward change and tradition, often clashing with the contemporary safety standards in industries characterized by their distinct practices. In examining the Hierarchical Structures and Reporting Mechanisms within organizations, the discourse on organizational behavior is explored to assess how authority, decision-making, and hierarchical relationships influence the dissemination of information and the enforcement of safety protocols. Additionally, Limited Training and Education are supported by studies examining the connection between educational values and the significance of skill acquisition, while Perceived Regulatory Compliance is informed by research on the impact of cultural views regarding law and order on safety compliance. The discussion on Government Influence and Industry Cooperation focuses on public policies and the dynamics between the industry and the government, emphasizing the impact of cultural attitudes towards government on compliance with safety standards. The cultural factors incorporated into the research instrument are essential for measuring their impact on H&S practices within the construction industry. The literature review ensures that these measures align with both theoretical and empirical research findings, thereby providing a solid foundation for the study's objectives.

3. Materials and Methods

The current research intends to offer an in-depth knowledge of how cultural factors impact workers' behaviors, attitudes, and perceptions toward H&S practices in the construction industry of Pakistan. Thus, the current research strategy examines the impact of cultural factors on the adoption and implementation of H&S practices in the Pakistani construction industry, followed by the identification of challenges in its implementation. A quantitative research strategy using a questionnaire survey is utilized to accomplish this purpose. Survey respondents' awareness of and compliance with H&S rules, as well as their cultural values, attitudes, and challenges surrounding work safety, were evaluated through the questionnaire, and the collected data were analyzed through statistical methods such as the Cronbach alpha test, mean, SD, RII, and Kruskal Wallis test as described in the subsequent sections.

The study employed both the mean and the RII to analyze the findings from two distinct perspectives. The two measures collectively provide the fundamental trend of responses; however, they serve distinct purposes. The mean employs a simple computational method to provide the average response for each item, facilitating the analysis of overall trends in the results [28]. Conversely, the RII allows for the analysis of the relative importance of each item based on response frequency across many scales, offering insights into participants' prioritization of different criteria [29]. Secondly, about the ranking of questions utilizing the mean: it is important to highlight that while the mean assesses measures of central tendency, it does not provide rankings, which have been done through RII. The findings of the current research can be utilized to guide the development of culturally appropriate strategies intended to improve safety measures in Pakistan's construction industry. A comprehensive research methodology flowchart is presented in Figure 1.

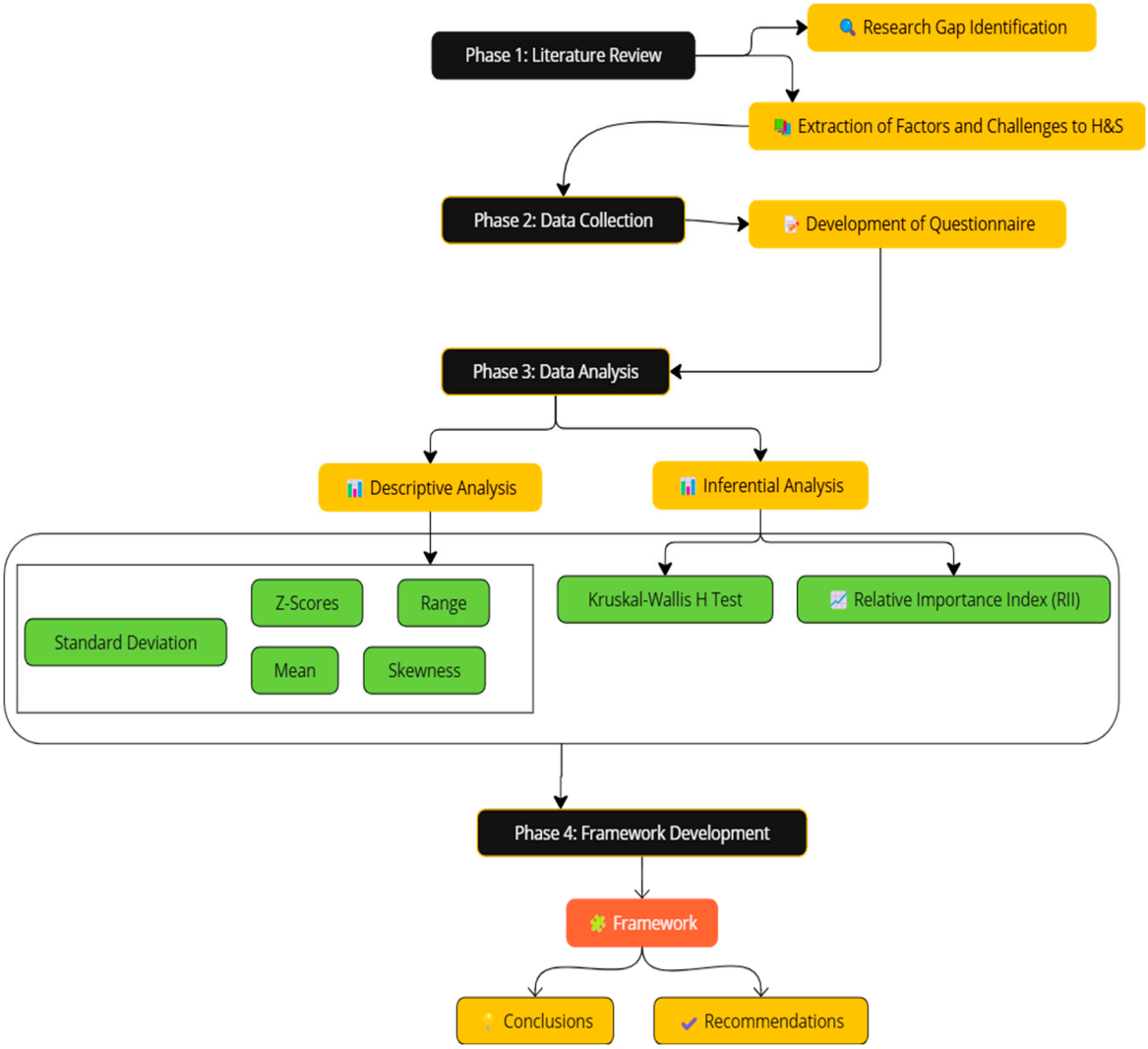


Figure 1. Methodology flowchart.

3.1. Data Collection

Accuracy, consistency, and integrity are the most important factors to consider when implementing a systematic strategy to guarantee the validity and quality of the data that has been obtained [30]. The primary source of data collection used in this study is a questionnaire survey. The questionnaire has been attached as Appendix A. The first section of the survey questionnaire gathers demographic information from respondents, including their job titles, educational backgrounds, affiliations, and experience, all of whom are professionals in the construction industry. This information is valuable for contextualizing the responses and obtaining a diverse array of answers based on the roles of the respondents within the industry. Section II focuses on cultural aspects, and the questions aim to identify how beliefs, values, norms, and behavior impact safety in construction. The inclusion of these factors is essential as they represent critical issues that are likely to influence the effectiveness of safety measures within an organization, often stemming from the organizational culture itself.

In Section III, the inquiries pertaining to the frequency and quality of safety training, safety compliance, and overall satisfaction with the current state of H&S. The purpose of this examination is to understand how individuals in the field perceive current or conventional safety and security measures, as well as to identify any significant gaps in education or the implementation of training protocols. Consequently, Section IV offers an analysis

of the challenges faced in H&S practices within the construction industry in Pakistan, highlighting issues such as resistance to change, economic constraints, and inadequate resources. The thoroughness of these challenges fully reflects the realities that complicate the implementation of safety measures. In a nutshell, the items in the questionnaire encompass both categorical and numerical formats to facilitate a comprehensive quantitative analysis of the cultural and organizational factors affecting H&S outcomes in the construction industry. The questions were formulated through a thorough literature review and discussions with field experts to ensure their relevance to the Pakistani construction industry and their sensitivity to the operational context of its organizations. Furthermore, the questions are crafted to facilitate a thorough analysis of the data, aiming to enhance safety practices within the organizations.

Basis for Each Item's Inclusion in the Questionnaire

The content in Section II: Cultural Factors, which entails the assessment of beliefs, values, norms, and behaviors affecting safety, is grounded in research demonstrating that culture plays a significant role in workplace safety behavior. Numerous prior studies indicate that cultural elements, particularly in developing nations such as Pakistan, influence safety standards and risk perceptions [18,31,32]. The comparison of Islam and Pakistani culture to the integrated cultural model reveals a strong alignment, as culture significantly influences perceptions and responses. This relationship is crucial for understanding various aspects of safety phenomena within Pakistan's construction industry.

Similarly, Section III: H&S Practices examines the efficacy of safety training, compliance with established guidelines, and the general contentment with existing practices. The items presented here are based on earlier studies that highlight the significance of consistent and efficient safety training in enhancing safety results. It is well-established in the literature that effective training programs play a vital role in minimizing accidents and fostering a culture of safety within the construction industry [18,33–35]. This section seeks to evaluate the degree of implementation of safety training and guidelines within Pakistan's construction sector, as well as the perceptions held by industry professionals regarding these measures.

Moreover, finally, Section IV: Challenges and Suggestions examines the main challenges to the implementation of H&S practices in Pakistan's construction sector, referencing research that highlights prevalent issues such as financial limitations, reluctance to adapt, and insufficient enforcement. Prior studies indicate that these challenges are especially common in developing nations such as Pakistan, where constraints on resources and institutional obstacles frequently impede the effective execution of safety protocols [34,36,37]. This section aims to pinpoint the challenges encountered within the Pakistani context, offering insights that can guide enhancements in policy and practice.

3.2. Sampling Technique

The sampling criteria have been carefully crafted to guarantee a thorough understanding of the influence of cultural factors on the adoption and implementation of H&S regulations in Pakistan's construction industry. A quantitative strategy is used to accomplish this. Moreover, the targeted population for the study is civil engineers registered with PEC, who are professionally affiliated with either client, contractor, or consultant organizations. This would make it easier to capture a variety of viewpoints regarding cultural influences. Random sampling ensures that every member of the population has an equal probability of being chosen from the population [38]. By using this technique, bias is removed, and it is guaranteed that the sample's findings are representative of the total population. This method's efficacy stems from its capacity to reduce errors and generate dependable data that can be extrapolated to generate precise forecasts or generalizations

about the intended population [39]. The current study confidently draws reasonable conclusions and makes well-founded decisions based on scientific data rather than conjecture or personal bias by using this strategy.

The targeted population for the current study were civil engineers registered with PEC and affiliated with either client, contractor, or consultant organizations. Moreover, for this targeted population, according to the findings of Dillman [40], the minimum acceptable sample size is 96 when the confidence level is set at 95%, with a sampling error of 10% with a 50/50 split of the data. Considering these figures, the sample size for the current study is a minimum of 96 responses to be gathered through a questionnaire. Therefore, the current study utilized 107 responses for data analysis, which is considered satisfactory as per the described sample size threshold of 96 responses.

3.3. Data Analysis

3.3.1. Reliability and Validity Test

The purpose of the reliability and validity test is to check the health of collected data through a questionnaire survey. The consistency and stability of observations or the instruments employed for gathering data are referred to as reliability. When a test yields consistent findings across time or among various raters or observers, it is considered reliable. Test-retest reliability, inter-rater reliability, and internal consistency measures like Cronbach's alpha can all be used to assess this [41]. Considering the ease of utilization and optimum outcomes, the Cronbach alpha test was used in the current study to check the reliability of the data. This test is conducted in SPSS® software (SPSS version 26).

This statistical technique determines how closely scale or questionnaire items measure the same underlying construct. A higher alpha coefficient, which has values between 0 and 1, denotes stronger internal consistency between the items [42]. Studies typically accept an alpha value of greater than 0.7, while more crucial measurements may call for a higher cutoff point (e.g., 0.8 or above) [43]. The current study seeks to evaluate multidimensional constructs, which are composed of multiple connected factors for measuring the impact of cultural factors and challenges in the implementation of H&S practices in Pakistan's construction industry; Cronbach's alpha test is especially useful.

3.3.2. Relative Importance Index (RII)

The current study employed RII for the ranking of factors based on the data collection outcomes. This test has been performed in MS Excel® with proper calculations. This test evaluates each variable in a dataset according to its relative importance. It offers a means of ranking and prioritizing different variables according to how they affect a specific result [44]. Usually, the mean score for each variable is divided by the total mean score for all variables to determine the RII. Higher values in the resulting index denote greater importance, and they range from 0 to 1 [45]. This index is very helpful for decision-making processes since it enables experts and researchers to pinpoint the main causes or variables affecting a result. Comprehending the relative significance of diverse variables enables the current study to optimize resource allocation and devise focused strategies for successfully implementing the H&S practices with enhanced cultural boost. For generating the relative ranking of factors, Equation (1) is used for RII [45], as follows:

$$RII = \frac{\sum W}{A \times N} \quad (1)$$

W = Weighted score for each factor given by individual
A = Highest score
N = Total no. of respondents

4. Results

This section discusses the results of the current study.

4.1. Demographics of Respondents

The questionnaire survey was filled with a wide range of respondents with diverse job titles working on various construction projects in Pakistan. The findings of Figure 2 suggest that the highest percentage of respondents had Project Engineer/Site Engineer designation at 35.51% (38 respondents) followed by Project Manager/Construction Manager with 11.21% (12 respondents) and Planning Engineer with 9.35% (10 respondents) with second and third highest percentages. Moreover, other job titles percentages include Managing Director (5.61%), Project Director (2.80%), General Manager (5.61%), Safety Manager/Safety Supervisor (2.80%), Site Manager, and Architect/Designer (8%), University Professor (4.67%), and MEP Engineer (5.61%). Furthermore, the lowest responses were received from CEO designation, with a response percentage of 1.87%.

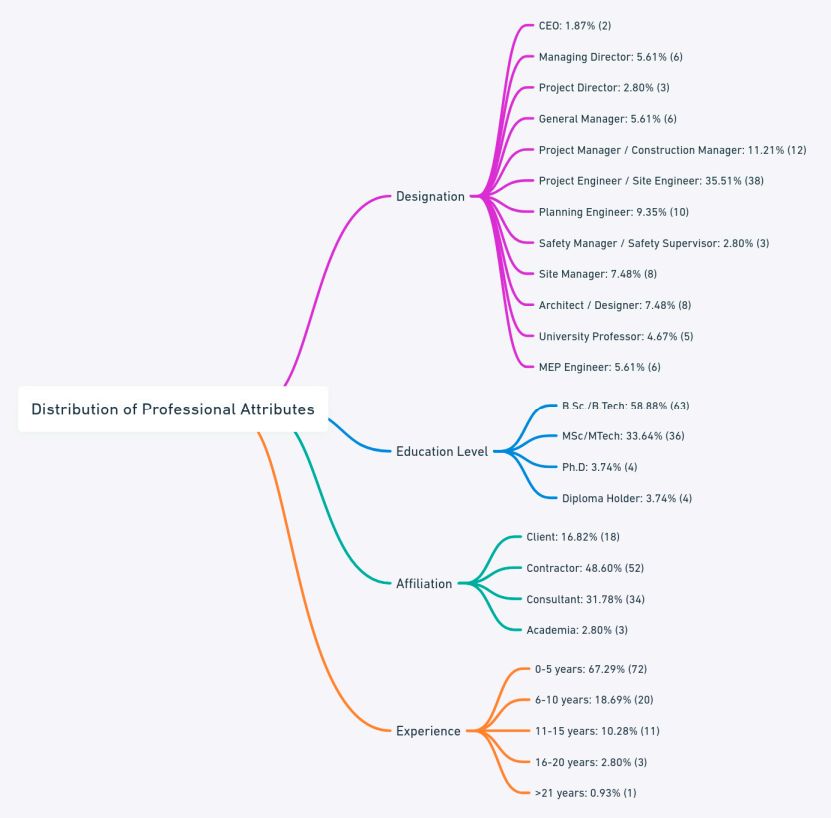


Figure 2. Demographics of respondents.

The highest percentage of respondents had B.Sc./B. Tech degrees, with 58.88% (63 respondents). Moreover, there were 36 respondents with MSc/MTech educational levels. Similarly, the lowest percentage was for respondents with Ph.D. or diploma degrees, with 4 respondents in each category (3.74%). One of the most important ways to obtain thorough insights and guarantee the success of any research project is to involve key stakeholders such as the client, contractor, and consultant in a questionnaire survey. These key stakeholders offer priceless insights and knowledge on a range of considerations regarding the aim and objectives of the research project. Moreover, they can provide firsthand information about their requirements, interests, and concerns by participating in the survey process. Therefore, the current study involved the key stakeholders in completing the questionnaire

survey. The highest percentage of respondents were affiliated with contractor organizations, with 48.60% (52 respondents), followed by consultants (31.78%) and clients (16.82%).

Further, in terms of numbers, the questionnaire was filled in by 52 respondents from contractor organizations, 34 from consultant organizations, and 18 from client organizations. Additionally, the lowest number of respondents were affiliated with academia, with only 3 individuals (2.80%), as shown in Figure 2. The reason for the high responses from the contract firms is that the contractor plays a key role in the implementation of H&S practices, given the construction industry is in Pakistan, where there are no robust standards and regulations for H&S implementation. In fact, H&S implementation is completely a voluntary process, which is why the maximum number of respondents are from contractor organizations for obtaining a clearer perspective of the respondents on the current study's subject area.

The respondents who participated in the current study had a wide range of professional experience in the construction industry of Pakistan. The respondents who had 0–5 years of experience were 72 in number, with 67.29%. Since the concept of H&S practices and its challenges are not regularized with no standards to be implemented in construction projects of Pakistan, fresh graduates or respondents with low professional experience are considered the perfect candidates for this survey. Moreover, these graduates possess the latest knowledge about H&S practices and standards; therefore, with proper professional exposure and training, these graduates can become a huge asset to Pakistan's construction industry. Furthermore, the percentage of respondents with 6–10 years of experience was 20 (18.69%), 11–15 years of experience was 11 (10.28%), 16–20 years of experience was 3 (2.80%), and greater than 21 years of experience was 0.93% (1 respondent), as can be seen in Figure 2.

The information about the demographics of the respondents is critical for interpretive and conclusive aspects of the study. Regarding the distribution of professional roles, educational background, affiliation, and experience, these data give an illustration of the respondents' profile, which shapes the study conclusion. For instance, a high percentage of Project Engineers/Site Engineers (35.51%) and Project Managers/Construction Managers (11.21) mean that the results are anchored in practical experiences and real construction projects. The education level of the respondents ensures that the study has technical backing and theoretical soundness, as 92.52% of the respondents hold a bachelor's degree and above. Moreover, the affiliation data revealing contractors as the largest group (48.60%), followed by consultants (31.78%), reflects the findings of the study in terms of perceptions of the field players in project delivery and strategic management. The experience distribution, which indicates that the majority of respondents are within 0–10 years of working experience, is relevant to understanding current and future industry trends. Therefore, the demographic details serve to make the study outcomes valid, reliable, and relevant to real business environments to meet the needs of both practitioners and scholars.

4.2. Cronbach Alpha Test

The Cronbach alpha test is performed in SPSS® software to check the reliability and validity of the data. 31 items in the questionnaire were examined through different descriptive tests such as mean, SD, and inferential tests such as RII and Kruskal–Wallis H test. The alpha value for the items is 0.95, which is above the acceptable range, such as greater than 0.7 [46]. Therefore, the findings suggest that the data are reliable and valid for further analysis.

4.3. Descriptive Statistics and Distributional Characteristics

Results from the survey on H&S standards and company culture provide light on the current state of the Pakistani construction industry. These results presented in Table 2 demonstrate the advancement and stagnation of the industry within the context of Pakistan, particularly regarding safety culture knowledge, skills, and adherence to safety procedures training.

Table 2. Descriptive statistics and distributional characteristics.

Variable	Mean	SD	Skewness	Z-Score	Range (Mean ± SD)
Q7: Safety Culture	3.178	0.96	−0.12	0.18	2.218 to 4.138
Q8: Cultural Factors					
- Beliefs	2.963	1.027	0.18	−0.27	1.936 to 3.990
- Values	2.888	0.945	−0.05	−0.38	1.943 to 3.833
- Norms	3.028	0.966	0.1	−0.06	2.062 to 3.994
- Behaviour	3.234	0.886	−0.25	0.31	2.348 to 4.120
- Practices	3.327	0.855	−0.38	0.47	2.472 to 4.182
Q9: Communication Regarding Safety	3.028	0.985	0.07	−0.06	2.043 to 4.013
Q10: Safety Training Frequency	2.692	1.161	0.42	−0.69	1.531 to 3.853
Q11: Safety Guidelines Effectiveness	3.056	1.017	−0.02	−0.02	2.039 to 4.073
Q12: H&S Practices Satisfaction	3.028	1.023	0.05	−0.06	2.005 to 4.051
Q13: Challenges to H&S Implementation					
- Workplace Injuries	3.467	1.049	−0.32	0.45	2.418 to 4.516
- Economic and Legal Aspects	3.514	1.049	−0.25	0.52	2.465 to 4.563
- Insurance and Project Management	3.327	1.026	−0.18	0.18	2.301 to 4.353
- Environmental and Quality Aspects	3.495	1.004	−0.22	0.46	2.491 to 4.499
- Training and Cultural Factors	3.495	0.994	−0.27	0.46	2.501 to 4.489
- Resistance to Change	3.486	1.111	−0.34	0.45	2.375 to 4.597
- Incident Reporting	3.43	0.992	−0.2	0.37	2.438 to 4.422
- Budget Constraints	3.607	1.147	−0.42	0.65	2.460 to 4.754
- Workplace Conditions & Stress	3.505	1.067	−0.29	0.5	2.438 to 4.572
- Decision-Making and Consultation	3.430	1.001	−0.18	0.37	2.429 to 4.431
- Empowerment and Personal Responsibility	3.421	0.991	−0.15	0.35	2.430 to 4.412
- Attitude and Perception	3.458	1.049	−0.22	0.42	2.409 to 4.507
- Team Dynamics and Support	3.346	1.047	−0.1	0.26	2.299 to 4.393
- Training and Attitude Improvement	3.421	1.01	−0.16	0.35	2.411 to 4.431
- Company Rules and Working Environment	3.523	1.067	−0.24	0.47	2.456 to 4.590
- Responsibility and Safety Procedures	3.421	0.991	−0.15	0.35	2.430 to 4.412
- Company Preferences	3.43	1.047	−0.2	0.37	2.383 to 4.477
- Safety Plan and Criteria	3.402	1.027	−0.22	0.33	2.375 to 4.429
- Safety Monitoring and Reporting	3.430	0.972	−0.18	0.37	2.458 to 4.402
- Communication on Safety	3.495	1.022	−0.25	0.46	2.473 to 4.517
- Subcontractors' Safety Compliance	3.589	0.951	−0.38	0.58	2.638 to 4.540

The overall mean values for most issues, particularly those concerning safety, climate, and organizational health promotion interventions, are predominantly good. For instance, the Safety Culture results imply an average score of 3.1780, which suggests that employees generally characterize a relatively favorable safety climate in the workplaces that were the subject of the study. This may only be applicable to Pakistan and may not hold true throughout all geographical regions or for all construction enterprises. Pakistan has several construction projects, some of which use stringent safety precautions, while others do not, owing to variability among the corporations executing the structures. The disparity in results may explain why certain respondents reported effective safety practices, while some may have experienced adverse working circumstances. The high standard deviations (SD) noted in responses, particularly for Safety Training Frequency (Q10) and Cultural Factors (Q8), underscore a critical concern: the existence of variations in safety practices among various organizations. The construction sector for building and civil works in Pakistan consists of several SMEs that lack the financial capacity to invest in fundamental and periodic safety measures and health training [47]. The frequency of safety training was the highest-ranked item in the survey, with a standard deviation of 1.161, signifying considerable variety in employees' training experience. Some individuals may receive adequate training, while others might operate without established safety protocols, a situation prevalent in numerous locations of the country. This can be ascribed to the inability to enforce national safety standards and the insufficiency of resources, particularly among several construction firms. The disparities may also be attributed to scale, as construction firms in major urban centers like Karachi or Lahore are generally more equipped to offer regular training compared to those situated in smaller towns or rural areas [48].

Moreover, the majority of skewness scores are near zero, indicating that the distribution of responses is symmetric. The minor positive skew for Safety Training Frequency (Q10) (0.42) indicates a prevalent issue in the Pakistani construction industry: insufficient safety training. Concerning this issue, the mean has been calculated as 2.692, suggesting that several workers may perceive safety instruction as infrequent or ineffective. This problem is caused by the general lack of concern in Pakistan about implementing safety in the workplace. This is especially true in the informal economy and small construction companies, where safety is seen as an extra value rather than a core value. Additionally, the Z-scores of the variables are typically close to zero, facilitating the understanding of overarching trends, as the data are generally not significantly skewed or include outliers. Simultaneously, these findings might cover the more sector-specific challenges encountered by individuals in Pakistan's construction industry, notably influenced by their regional location or the organization they are employed by. The experiences of workers in regions with high conformity to construction standards may differ significantly from those in areas with low compliance, particularly in large building projects. The Z-scores for the variables are generally low (close to zero), indicating that the values are close to the mean and not excessive. This suggests that the data are quite symmetric and may follow normal distribution. However, to determine if the data follows a normal distribution, the Shapiro–Wilk test is performed in the subsequent section.

Moreover, the range values calculated as mean $\pm$ SD provide an additional metric for the shift in perceptions. For example, Safety Culture (Q7) ranges from 2.218 to 4.138, indicating the significant variability in safety culture across different companies or regions. The lowest end of this spectrum may be attributed to employers who disregard safety, resulting in employee insecurity and the violation of safety protocols. The lower range may represent the 'typical' organization, characterized by reduced overall safety when employees experience limited adherence to established safety protocols and health protec-

tions. This range illustrates the deficiency of safety culture within the sector, as frequently reported in Pakistan; while large construction firms may occasionally implement updated safety protocols to safeguard their workers, numerous small construction firms, particularly those in rural areas, often neglect safety measures [16].

All in all, these results demonstrate a moderate condition of safety culture and health improvement in Pakistan's construction sector. The findings indicate a generally positive attitude towards safety culture and practices; however, this is accompanied by notable diversities, which may be ascribed to inadequate compliance with safety regulations, geographical variations, and insufficient financial resources required to improve safety practices within construction firms. The considerable potential is indicated by the relatively large standard deviations, positive skew in training frequency, and extensive ranges mentioned above. These disparities will necessitate enhanced regulatory oversight, expanded training programs, and improved safety protocols within the business. One of the main techniques for improving overall safety in Pakistan's construction sector is the establishment of a safety culture that safeguards workers' H&S at all organizational levels within the business.

4.4. Shapiro–Wilk Normality Test

The Shapiro–Wilk results indicate that all variables are not normally distributed, with a $p < 0.05$ for each factor as shown in Table 3. The Shapiro-Wilk statistic, which measures how closely the data follows a normal distribution, ranges from 0.751 (Q8: Practices) to 0.908 (Q13: Team Dynamics and Support), with values significantly below 1. The Shapiro-Wilk statistic in this instance is significantly below 1, suggesting a notable deviation from normal distribution in the data. All the variables exhibit significance values of less than 0.05, indicating that the data do not follow a normal distribution, therefore recommending the adoption of a non-parametric test in further analysis.

It is intriguing to consider how such results were achieved, especially given that data from construction projects in Pakistan tends to be highly disparate and inconsistent, largely due to the prevailing poor safety standards in the industry. For instance, certain variables like beliefs, values, norms, behavior, and practices exhibit notably low Shapiro-Wilk statistics, indicating that the overall perceptions and attitudes regarding safety culture vary significantly across different sectors and regions. This variability may stem from the differences in subsequent organizational culture, resource availability, and the level of formality of the safety training programs offered by the organizations, which can vary significantly between large organizations located in urban areas and smaller organizations situated in rural construction zones. Similarly, the scale of Safety Training Frequency (Q10) has deviated from a normal distribution, possibly due to the inconsistent training frequency across various companies and industrial sectors, highlighting the existence of inequality in safety training. Since the data are not normally distributed, Kruskal–Wallis H test is performed because on a continuous or ordinal dependent variable, the Kruskal–Wallis H test—sometimes known as the "one-way ANOVA on ranks"—is a rank-based nonparametric test used to find if two or more groups of an independent variable show statistically significant variations [49]. It is regarded as a nonparametric alternative to the one-way ANOVA and an extension of the Mann–Whitney U test that allows for the comparison of more than two independent groups.

Table 3. Shapiro–Wilk normality test.

Tests of Normality			
Shapiro–Wilk			
Factors	**Statistic**	**df**	**Sig.**
Q7: Safety Culture	0.887	107	0
Q8: Beliefs	0.829	107	0
Q8: Values	0.856	107	0
Q8: Norms	0.826	107	0
Q8: Behavior	0.783	107	0
Q8: Practices	0.751	107	0
Q9: Communication Regarding Safety	0.821	107	0
Q10: Safety Training Frequency	0.894	107	0
Q11: Safety Guidelines Effectiveness	0.892	107	0
Q12: H&S Practices Satisfaction	0.814	107	0
Challenges			
- Workplace Injuries	0.9	107	0
- Economic and Legal Aspects	0.898	107	0
- Insurance and Project Management	0.904	107	0
- Environmental and Quality Aspects	0.893	107	0
- Training & Cultural Factors	0.9	107	0
- Resistance to Change	0.9	107	0
- Incident Reporting	0.895	107	0
- Budget Constraints	0.888	107	0
- Workplace Conditions and Stress	0.893	107	0
- Decision-Making and Consultation	0.902	107	0
- Empowerment and Personal Responsibility	0.894	107	0
- Attitude and Perception	0.898	107	0
- Team Dynamics and Support	0.908	107	0
- Training and Attitude Improvement	0.904	107	0
- Company Rules and Working Environment	0.896	107	0
- Responsibility and Safety Procedures	0.899	107	0
- Company Preferences	0.896	107	0
- Safety Plan and Criteria	0.884	107	0
- Safety Monitoring and Reporting	0.9	107	0
- Communication on Safety	0.897	107	0
- Subcontractors' Safety Compliance	0.891	107	0

4.5. Kruskal–Wallis H Test and Effect Size

The Kruskal–Wallis H test and Effect Size (η^2) were employed to assess the differences in cultural factors, including beliefs, norms, behaviors, and practices, affecting the frequency of H&S challenges in the construction sector. The Kruskal–Wallis H test was utilized in the present case due to the data failing to satisfy the requisite assumptions

for parametric testing, including normality. To quantify these differences and assess the practical consequences of the results, the Effect Size (η^2) was incorporated into the computations [50]. A significant η^2 indicates that the culture factor significantly influences the safety challenge being examined.

The analysis of the findings derived from the Kruskal–Wallis H test shown in Table 4 indicates that cultural factors significantly influence various H&S challenges in the construction industry but with varying degrees of importance across different dimensions. Workplace injuries had a significant correlation with perceived beliefs and norms, with belief results of H = 35.912, p = 0.000, η^2 = 0.280, and norms of H = 30.908, p = 0.000, η^2 = 0.254. It may be inferred that cultural attitudes amplify perceptions of Workplace Injuries. Workplace Conditions and Stress exhibited a notably high effect size on behaviors (H = 29.889, p = 0.000, η^2 = 0.290), underscoring the significance of cultural views on work pressure in relation to stress. Similarly, there were highly significant outcomes regarding Economic and Legal Aspects in terms of values and practices (values H = 20.345, p = 0.000, η^2 = 0.198; practices H = 17.42, p = 0.002, η^2 = 0.198), which substantiated the research hypothesis that economic decision-making and legal requirements are influenced by culture. A notable disparity in cultivation was identified in Incident Reporting, pertaining just to practices (H = 30.252, p = 0.000, η^2 = 0.289), strongly suggesting that cultural factors exert a substantial impact on reporting behaviors. An analysis of variance revealed moderate to high significance in Resistance to Change regarding Behavior (H = 23.543, p = 0.000, η^2 = 0.204) and VALUES (H = 27.427, p = 0.000, η^2 = 0.271), suggesting that culture significantly hinders the implementation of safety measures.

Table 4. Kruskal–Wallis H test.

Challenges	Beliefs	Values	Norms	Behaviors	Practices
Workplace Injuries	H = 35.912, df = 4, Sig = 0.000, η^2 = 0.280	H = 20.345, df = 4, Sig = 0.000, η^2 = 0.198	H = 30.908, df = 4, Sig = 0.000, η^2 = 0.254	H = 9.385, df = 4, Sig = 0.052, η^2 = 0.067	H = 11.806, df = 4, Sig = 0.019, η^2 = 0.089
Economic and Legal Aspects	H = 20.307, df = 4, Sig = 0.000, η^2 = 0.217	H = 11.674, df = 4, Sig = 0.020, η^2 = 0.158	H = 16.032, df = 4, Sig = 0.003, η^2 = 0.206	H = 17.42, df = 4, Sig = 0.002, η^2 = 0.198	H = 18.789, df = 4, Sig = 0.001, η^2 = 0.225
Insurance and Project Management	H = 15.315, df = 4, Sig = 0.004, η^2 = 0.139	H = 10.934, df = 4, Sig = 0.027, η^2 = 0.097	H = 21.349, df = 4, Sig = 0.000, η^2 = 0.280	H = 18.397, df = 4, Sig = 0.001, η^2 = 0.212	H = 20.973, df = 4, Sig = 0.000, η^2 = 0.228
Environmental and Quality Aspects	H = 11.685, df = 4, Sig = 0.020, η^2 = 0.147	H = 9.832, df = 4, Sig = 0.043, η^2 = 0.137	H = 13.49, df = 4, Sig = 0.009, η^2 = 0.168	H = 18.583, df = 4, Sig = 0.001, η^2 = 0.217	H = 8.97, df = 4, Sig = 0.062, η^2 = 0.099
Training and Cultural Factors	H = 26.18, df = 4, Sig = 0.000, η^2 = 0.267	H = 21.674, df = 4, Sig = 0.000, η^2 = 0.210	H = 29.431, df = 4, Sig = 0.000, η^2 = 0.275	H = 20.441, df = 4, Sig = 0.000, η^2 = 0.200	H = 20.075, df = 4, Sig = 0.000, η^2 = 0.199
Resistance to Change	H = 27.427, df = 4, Sig = 0.000, η^2 = 0.271	H = 16.394, df = 4, Sig = 0.003, η^2 = 0.140	H = 17.948, df = 4, Sig = 0.001, η^2 = 0.146	H = 23.543, df = 4, Sig = 0.000, η^2 = 0.204	H = 28.744, df = 4, Sig = 0.000, η^2 = 0.254

Table 4. *Cont.*

Challenges	Beliefs	Values	Norms	Behaviors	Practices
Incident Reporting	H = 11.431, df = 4, Sig = 0.022, η^2 = 0.142	H = 12.556, df = 4, Sig = 0.014, η^2 = 0.148	H = 17.782, df = 4, Sig = 0.001, η^2 = 0.233	H = 20.239, df = 4, Sig = 0.000, η^2 = 0.242	H = 30.252, df = 4, Sig = 0.000, η^2 = 0.289
Budget Constraints	H = 18.542, df = 4, Sig = 0.001, η^2 = 0.248	H = 9.692, df = 4, Sig = 0.046, η^2 = 0.096	H = 22.074, df = 4, Sig = 0.000, η^2 = 0.263	H = 17.352, df = 4, Sig = 0.002, η^2 = 0.213	H = 17.274, df = 4, Sig = 0.002, η^2 = 0.212
Workplace Conditions and Stress	H = 28.856, df = 4, Sig = 0.000, η^2 = 0.269	H = 16.373, df = 4, Sig = 0.003, η^2 = 0.144	H = 22.666, df = 4, Sig = 0.000, η^2 = 0.249	H = 29.889, df = 4, Sig = 0.000, η^2 = 0.290	H = 19.143, df = 4, Sig = 0.001, η^2 = 0.203
Decision-Making and Consultation	H = 26.354, df = 4, Sig = 0.000, η^2 = 0.264	H = 8.637, df = 4, Sig = 0.071, η^2 = 0.069	H = 19.246, df = 4, Sig = 0.000, η^2 = 0.215	H = 17.824, df = 4, Sig = 0.000, η^2 = 0.203	H = 14.968, df = 4, Sig = 0.005, η^2 = 0.174
Empowerment and Personal Responsibility	H = 24.119, df = 4, Sig = 0.000, η^2 = 0.235	H = 8.365, df = 4, Sig = 0.079, η^2 = 0.069	H = 25.73, df = 4, Sig = 0.000, η^2 = 0.237	H = 17.004, df = 4, Sig = 0.002, η^2 = 0.202	H = 10.549, df = 4, Sig = 0.032, η^2 = 0.118
Attitude and Perception	H = 15.836, df = 4, Sig = 0.003, η^2 = 0.141	H = 12.703, df = 4, Sig = 0.013, η^2 = 0.119	H = 12.7, df = 4, Sig = 0.013, η^2 = 0.119	H = 27.204, df = 4, Sig = 0.000, η^2 = 0.267	H = 16.841, df = 4, Sig = 0.002, η^2 = 0.187
Team Dynamics and Support	H = 28.59, df = 4, Sig = 0.000, η^2 = 0.266	H = 20.29, df = 4, Sig = 0.000, η^2 = 0.215	H = 22.079, df = 4, Sig = 0.000, η^2 = 0.236	H = 20.269, df = 4, Sig = 0.000, η^2 = 0.213	H = 18.442, df = 4, Sig = 0.000, η^2 = 0.185
Training and Attitude Improvement	H = 23.736, df = 4, Sig = 0.000, η^2 = 0.249	H = 16.376, df = 4, Sig = 0.003, η^2 = 0.141	H = 23.112, df = 4, Sig = 0.000, η^2 = 0.245	H = 28.506, df = 4, Sig = 0.000, η^2 = 0.266	H = 34.399, df = 4, Sig = 0.000, η^2 = 0.284
Company Rules and Working Environment	H = 27.468, df = 4, Sig = 0.000, η^2 = 0.263	H = 9.751, df = 4, Sig = 0.045, η^2 = 0.103	H = 23.151, df = 4, Sig = 0.000, η^2 = 0.237	H = 22.806, df = 4, Sig = 0.000, η^2 = 0.229	H = 17.698, df = 4, Sig = 0.001, η^2 = 0.203
Responsibility and Safety Procedures	H = 17.037, df = 4, Sig = 0.002, η^2 = 0.162	H = 15.21, df = 4, Sig = 0.004, η^2 = 0.137	H = 12.253, df = 4, Sig = 0.016, η^2 = 0.138	H = 23.202, df = 4, Sig = 0.000, η^2 = 0.219	H = 12.582, df = 4, Sig = 0.014, η^2 = 0.130
Company Preferences	H = 20.673, df = 4, Sig = 0.000, η^2 = 0.211	H = 22.351, df = 4, Sig = 0.000, η^2 = 0.232	H = 26.373, df = 4, Sig = 0.000, η^2 = 0.257	H = 16.563, df = 4, Sig = 0.002, η^2 = 0.188	H = 11.783, df = 4, Sig = 0.019, η^2 = 0.139
Safety Plan and Criteria	H = 20.631, df = 4, Sig = 0.000, η^2 = 0.210	H = 16.052, df = 4, Sig = 0.003, η^2 = 0.201	H = 26.266, df = 4, Sig = 0.000, η^2 = 0.247	H = 11.584, df = 4, Sig = 0.021, η^2 = 0.148	H = 6.117, df = 4, Sig = 0.191, η^2 = 0.070
Safety Monitoring and Reporting	H = 16.955, df = 4, Sig = 0.002, η^2 = 0.172	H = 14.318, df = 4, Sig = 0.006, η^2 = 0.158	H = 11.182, df = 4, Sig = 0.025, η^2 = 0.124	H = 13.92, df = 4, Sig = 0.008, η^2 = 0.137	H = 13.845, df = 4, Sig = 0.008, η^2 = 0.134

Table 4. *Cont.*

Challenges	Beliefs	Values	Norms	Behaviors	Practices
Communication on Safety	H = 17.696, df = 4, Sig = 0.001, η^2 = 0.196	H = 14.714, df = 4, Sig = 0.005, η^2 = 0.169	H = 18.106, df = 4, Sig = 0.001, η^2 = 0.205	H = 22.743, df = 4, Sig = 0.000, η^2 = 0.243	H = 11.446, df = 4, Sig = 0.022, η^2 = 0.130
Subcontractors' Safety Compliance	H = 16.713, df = 4, Sig = 0.002, η^2 = 0.172	H = 13.408, df = 4, Sig = 0.009, η^2 = 0.146	H = 25.22, df = 4, Sig = 0.000, η^2 = 0.270	H = 19.474, df = 4, Sig = 0.000, η^2 = 0.212	H = 18.877, df = 4, Sig = 0.000, η^2 = 0.203

H-Kruskal–Wallis H Value; η^2 = Effect Size.

Additionally, all dimensions were deemed significant for Training and Cultural Factors; however, norms exhibited the highest significance (H = 29.431, p = 0.000, η^2 = 0.275) regarding safety training, followed by belief (H = 26.18, p = 0.000, η^2 = 0.267), which correlates cultural attitudes with safety training. The results similarly revealed PCR discrepancies between the Safety Plan and Criteria for norms (H = 26.266, p = 0.000, η^2 = 0.247), suggesting that safety planning is significantly affected by culture norms. There was a substantial difference in the findings concerning Subcontractors' Safety Compliance related to norms (H = 25.22, p = 0.000, η^2 = 0.270) and practices (H = 19.474, p = 0.000, η^2 = 0.212), highlighting that subcontractors' safety compliance encompasses additional organizational safety practices and policies. In summary, these findings underscore the significant influence of cultural antecedents on perceptions, expectations, and practices related to H&S in construction, with varying degrees of effect and statistical significance across different problems.

4.5.1. Findings of RII

The RII test is performed to determine the relative ranking of factors mentioned in question 8 and H&S challenges mentioned in question 13. Equation (1) has been solved for one factor only because for all the other factors, the same procedure is adopted. Solved RII for beliefs (cultural factor) is shown below:

$\sum W = 317$

$A = 5$

$N = 107$

$$RII = \frac{317}{5 \times 107}$$

$$RII = 0.593$$

RII for Cultural Factors

The questionnaire comprised five H&S-related cultural factors such as beliefs, values, norms, behaviors, and practices. The highest RII among these factors, as shown in Table 5, is for H&S practices (RII = 0.665). The reason is that practices related to H&S are very important to the construction sector in Pakistan. Given the industry's infamously high accident and fatality rate, worker well-being must be given priority. These procedures guarantee that employees are shielded from bodily harm and lower the possibility of mishaps at work [51]. Companies can reduce the risks associated with construction work by putting in place appropriate safety procedures, such as routine equipment maintenance, offering personal protective equipment (PPE), and holding extensive training sessions. Similarly, the second highest RII is for H&S behaviors (0.647), followed by norms (0.606) and beliefs (0.593).

Table 5. RII for cultural factors.

Rank	Cultural Factors	RII	Category	Contribution (%)	Interpretation	Impact Analysis
1	Practices	0.665	Behavioral	22.3	Strong influence on cultural adoption	Highest impact; reflects implementation effectiveness
2	Behavior	0.647	Behavioral	21.7	Critical for cultural alignment	Key for maintaining internal consistency
3	Norms	0.606	Normative	20.3	Moderate influence; accepted standards	Foundation of behavior patterns; aids predictability
4	Beliefs	0.593	Cognitive	19.9	Forms cultural assumptions	Reflects underlying ideologies; drives perception changes
5	Values	0.578	Cognitive	19	Core principles guiding behavior	Relatively lower impact; aligns decisions with principles

The lowest RII value is for H&S values (0.578). This is because the industry professionals in Pakistan are largely unaware of international standards and best practices in implementing H&S values in construction projects. This lack of education and awareness leads to safety precautions being disregarded, as they are often seen as an extra cost rather than an investment [52]. The widespread idea of a fatalistic mindset, which disregards safety regulations, has led to a belief that accidents are unavoidable in business [53].

The current study has examined the influence of cultural factors on H&S implementation in the construction of Pakistan. Moreover, the study also analyzed the challenges faced by professionals in the implementation of H&S practices. It is reported from the findings of the current study that for the successful implementation of H&S, cultural factors such as beliefs, norms, values, behaviors, and practices play a crucial role. The same findings have been concluded by [33,34]. The current study also revealed that when it comes to the construction sector in Pakistan, attitudes and beliefs around H&S practices are greatly influenced by cultural influences.

One major factor is the deeply embedded Islamic mentality, which holds that Allah's will or fate ultimately decides a person's fate. As a result, some employees feel that injuries or accidents on construction sites are predestined and cannot be avoided by human involvement [54]. Their acceptance of H&S policies and regulations is frequently hampered by this fatalistic viewpoint. Furthermore, Pakistani society's hierarchical structures have a role in the ignorance and lax enforcement of workplace safety regulations [16]. Employees may choose to follow instructions from managers or owners without evaluating if they are sufficient to ensure their well-being. To promote a culture of safety awareness and the

broad adoption of H&S standards in the construction industry in Pakistan, certain cultural elements must be addressed [55].

Furthermore, the published literature also signifies the values and norms as important cultural elements that influence the implementation of H&S practices in construction projects [53]. The values that are ingrained in society have a big impact on how construction workers feel about safety precautions. H&S requirements may be disregarded, for example, if there is a widespread attitude that individualism and personal achievements are more important than group responsibility or following the law [56]. Research conducted in various countries such as Indonesia and Mexico has delved into the examination of the correlation between safety culture and worker behavior in relation to H&S practices [57,58]. The results of these studies indicate that deeply ingrained cultural attitudes, perceptions of risk, and established behavioral norms play a crucial role in influencing the uptake and efficacy of H&S protocols on sites. Analogously, the standards upheld by social groups or organizations influence how much weight is placed on safety precautions. Adoption of efficient H&S practices may be hampered if efficiency and production are valued more highly than the welfare of employees. Thus, encouraging a safety-conscious atmosphere in Pakistan's construction industry requires an understanding of and attention to these cultural concerns. To put worker safety first, efforts should be made to reframe norms and match values with H&S principles [51].

Moreover, the multifaceted cultural environment of Pakistan includes various norms, traditions, and belief systems that influence how people behave when it comes to H&S procedures at work. Comprehending these cultural elements becomes essential when dealing with worker safety-related concerns. Research has shown that the implementation of H&S practices in Pakistan is heavily impacted by elements including collectivism, large power distance, hierarchical organizational structures, and lack of acquaintance with international norms [16]. Professionals in the field must be aware of these cultural differences and adjust their strategies appropriately. To promote a safe work environment that adheres to global best practices and is in line with cultural norms, it is necessary to engage in culturally sensitive training programs, collaborate with local stakeholders, and apply context-specific solutions [53].

RII for H&S-Related Challenges

Subsequently, RII is also performed on the H&S implementation challenges as shown in Table 6. The findings of the test highlight that the topmost significant challenges with the highest RII are budget constraints (RII = 0.721), subcontractors' safety and compliance (RII = 0.718), and company rules and work environment (RII = 0.705). Following safety rules and making sure subcontractors follow safety requirements are crucial in Pakistan's construction sector. Budgetary restrictions, however, may limit these initiatives. For construction enterprises, budgetary restriction is a major obstacle when it comes to allocating resources for the implementation of complete H&S regulations [53]. Due to budgetary constraints, it frequently results in compromises when it comes to guaranteeing subcontractor safety compliance for inspections, equipment updates, and training programs. As a result, subcontractors who are not properly trained or equipped with the required safety equipment may be more vulnerable to mishaps and injuries [33].

Furthermore, Table 6 also indicates that insurance and project management have obtained the lowest RII value (0.665). Construction companies in Pakistan should use insurance as a safeguard against unforeseen accidents, injuries, or property damage while working on a project. Businesses may reduce hazards and improve worker safety on construction sites by putting in place efficient H&S procedures and effective project management practices [59]. All in all, fostering a culture of safety in Pakistan's construction

sector while protecting companies from the financial and reputational risks associated with subpar H&S standards requires realizing the significance of insurance and combining it with effective project management approaches.

Table 6. RII for H&S challenges.

Rank	Challenges	RII	Category	Contribution (%)	Interpretation	Impact Analysis
1	Workplace Injuries	0.721	Safety	23.2	Major safety issue, critical for compliance	Highest impact; requires immediate mitigation strategies
2	Subcontractors' Safety Compliance	0.718	Safety	23.1	Compliance gap among subcontractors	Regular safety audits are needed; and collaboration with subcontractors
3	Economic and Legal Aspects	0.703	Regulatory	22.6	Legal and financial constraints	Key for risk management and sustainability
4	Team Dynamics and Support	0.701	Teamwork	22.5	Impacts collaboration and morale	Promote cohesion; necessary for high-performance teams
5	Budget Constraints	0.697	Resource Management	22.4	Impacts project scope and quality	Budget optimization is essential; impacts project success
6	Communication on Safety	0.699	Communication	22.4	Essential for safety culture development	Regular safety briefings and feedback loops are necessary
7	Decision-Making and Consultation	0.692	Leadership	22.2	Affects efficiency and responsiveness	Transparent decision-making processes required
8	Safety Monitoring and Reporting	0.686	Safety	22	Ongoing monitoring improves safety outcomes	Enhances accountability; requires robust reporting systems
9	Company Rules and Working Environment	0.684	Organizational	21.9	Aligns behavior with company goals	Critical for maintaining a structured environment
10	Training and Attitude Improvement	0.705	Training	21.8	Boosts skills and safety adherence	Regular training programs are required for continuous improvement
11	Safety Plan and Criteria	0.68	Safety	21.7	Sets clear safety standards	Establishes guidelines; requires adherence for effectiveness
12	Resistance to Change	0.699	Change Management	21.7	Barriers to implementing new processes	Change management strategies required for smoother adoption
13	Responsibility and Safety Procedures	0.684	Safety	21.6	Improves individual accountability	Safety training and protocols necessary for compliance

Table 6. *Cont.*

Rank	Challenges	RII	Category	Contribution (%)	Interpretation	Impact Analysis
14	Environmental and Quality Aspects	0.665	Environmental	21.4	Focuses on sustainability and quality	Regular environmental audits are needed for compliance
15	Attitude and Perception	0.669	Culture	21.3	Influences safety behavior	Positive reinforcement and culture-building initiatives
16	Empowerment and Personal Responsibility	0.684	Culture	21.2	Increasing individual accountability	Empowerment programs can boost responsibility
17	Workplace Conditions and Stress	0.686	Health	21.2	Affects mental and physical well-being	Stress management programs needed
18	Incident Reporting	0.686	Safety	21	Critical for learning and improvement	Requires robust reporting systems for accurate documentation
19	Training and Cultural Factors	0.699	Training/Culture	20.9	Enhance skills and cultural integration	Comprehensive training programs needed
20	Company Preferences	0.684	Organizational	20.8	Reflects organizational priorities	Consistent alignment with strategic objectives

The construction industry in Pakistan is grappling with challenges in implementing safeguards for employees' well-being, with legal frameworks insufficient and illiteracy among workers hindering effective communication and compliance, thereby compromising the safety of all workers [52]. The dominant cultural norms also matter, since following customs takes precedence over implementing updated safety regulations. Furthermore, research conducted in various developing nations such as Brazil and Turkey has emphasized the critical significance of establishing a strong and comprehensive regulatory framework alongside efficient enforcement mechanisms to ensure compliance with H&S standards [60,61]. Nevertheless, these studies have also brought to light a number of obstacles, including the presence of outdated regulatory measures, insufficient allocation of resources for enforcement agencies, as well as challenges related to corruption and non-adherence to regulations. The construction industry in Pakistan will not be able to achieve ideal H&S standards until extensive reforms, including improved monitoring systems, stronger rules, and education campaigns, are implemented to solve these difficulties [62]. Additionally, studies conducted in various countries such as Tanzania and Nigeria have pinpointed insufficient training and a noticeable deficit in competence levels among both workers and supervisors as significant obstacles [63,64]. These research outcomes underscore the critical necessity for the development and implementation of all-encompassing training initiatives that are tailored to suit the specific cultural contexts, thereby aiming to bolster awareness and proficiency in H&S practices within the construction labor force.

Apart from these challenges, the results of the current study also indicated that subcontractors' non-compliance, budget constraints, and company rules and work environment considerably impede the H&S implementation practices. Similar findings have been achieved by [51,52,65], thus validating the findings of the current study. Safety is a major concern in Pakistan's construction industry, with subcontractors disregarding safety procedures, endangering employees' health and project success, despite strict laws

controlling safety requirements [54]. This non-compliance is caused by several causes, such as inadequate knowledge and comprehension of H&S regulations, weak regulatory enforcement tools, financial difficulties subcontractors confront, and a dearth of training opportunities. Moreover, the study highlighted the importance of implementing proactive and reactive safety protocols at different levels of management, organization, and personnel to improve safety and prevent accidents on construction sites. The findings of Szer et al. (2021) [66] and Jamroz et al. (2021) [67] also suggested the same that developing personalized safety procedures that consider diverse factors can effectively reduce construction H&S hazards. Apart from these studies, studies conducted in various other nations such as Bangladesh and Zimbabwe have brought to light the significant repercussions of resource limitations on occupational H&S measures [68,69]. These constraints encompass challenges such as insufficient availability of personal protective equipment (PPE), inadequacy in safety gear provisions, and financial barriers that impede investments in H&S protocols. The aforementioned factors possess the potential to act as barriers to the effective execution of comprehensive and resilient H&S practices, especially within the context of small and medium-sized enterprises operating in the construction industry.

4.5.2. Conceptual Framework

The RII and the Kruskal Wallis results strongly validate the proposed framework's structure presented in Figure 3 and demonstrate that the data are devoid of any major deficiencies. The RII test establishes a hierarchical ranking of cultural factors and associated challenges, while the KW test assesses the true significance of these factors and their implications for H&S in the workplace. The collective findings highlight the influence of cultural factors on H&S outcomes, thereby validating the foundational theoretical framework.

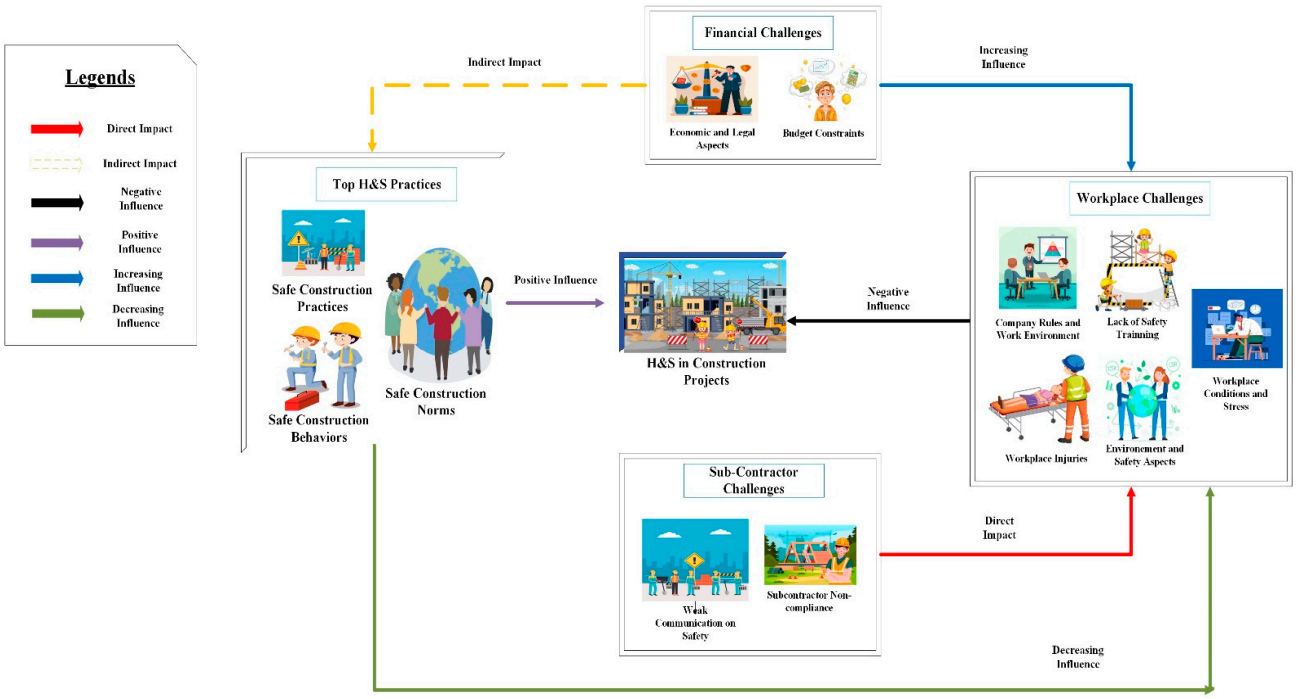


Figure 3. Conceptual framework.

The RII test identified Practices (RII = 0.665) as the primary cultural factor influencing businesses, succeeded by behavior (RII = 0.647) and Norms (RII = 0.606). Consequently, the study also recognized behavior and secure construction as the key factors in cultivating a robust safety culture. The substantial contributions are corroborated by the Kruskal-Wallis test regarding the influence of beliefs and norms, which also impacted Workplace

Injuries and other problems (H = 35.912, p = 0.000, η^2 = 0.280). Norms and behaviors are critical factors influencing workplace injury rates, as they significantly affect workplace injuries in Kruskal-Wallis tests. The elevated ratings of Safe Construction Practices and safe construction behaviors within the cultural model affirm the significant impact of established practices and behaviors on construction safety performance. The elevated H-values and effects seen in Kruskal–Wallis's test indicate that cultural attitudes and norms significantly influence the incidence of accidental accidents and the implementation of safe working practices.

Furthermore, the RII rankings also reveal that Workplace Injuries and Subcontractors' Safety Compliance are the most hazardous safety areas, as measured by the RII values of 0.721 and 0.718, respectively. These results conform with the Kruskal–Wallis results, which presented that Subcontractors' Safety Compliance and Workplace Injuries are highly affected by cultural factors. For instance, the analysis of variance by ranks test using the Kruskal–Wallis H statistic for Workplace Injuries (H = 35.912, p = 0.000, η^2 = 0.280) demonstrates the culturally constructed disparity in causing an injury act. Subsequently, greater RII values suggest that compliance deficiencies within subcontractors are strongly associated with cultural solutions, including safe construction work attitudes and procedures. In view of this, it can be implied that enhancing compliance among subcontractors calls for changing organizational culture concerning safety.

In addition, Training and Cultural Factors were highly rated on the RII test (RII = 0.699), indicating the need for substantive training programs that involve cultural factors. This is further supported by Kruskal-Wallis's test in which cultural training factors were significantly correlated with Resistance to Change (H = 27.427, p = 0.000, η^2 = 0.271) and Incident Reporting (H = 30.252, p = 0.000, η^2 = 0.289). The relationship between cultural training and incident reporting has demonstrated how further training programs enhance the reporting process and safety culture and, therefore, the construction sites' safety.

The same was also applied to the Kruskal–Wallis test on the Importance Rank, where significant differences were observed in Budget Constraints (H = 18.542, p = 0.001, η^2 = 0.248), Safety Monitoring and Reporting (H = 16.955, p = 0.002, η^2 = 0.172), and Safety Plan and Criteria (H = 20.631, p = The results of this study imply that cultural factors could help enhance the best practices of financial control and safety regulation in construction organizations. For instance, budgeting and safety resource disposition have major cultural implications on the imperative of surmounting the financial barriers to safety intervention as encapsulated by the Budget Constraints determinant of safety implementation.

The study of the RII and Kruskal–Wallis's test results provide evidence-based explanations of the impact of cultural influences on H&S issues in construction companies. The survey data corresponds effectively with transitional knowledge that underpins the conceptual framework, indicating that inadvertent beliefs, norms, and practices influence critical safety factors such as workplace injuries, subcontractor compliance, and safety training. This is not merely a theoretical model; it is based on actual data, which underscores the necessity of considering cultural factors to improve safety and health on construction sites.

Potential Use of Conceptual Framework Within Industry

The proposed conceptual framework can be used as a useful tool to improve the practical application of H&S practices in the construction industry. Therefore, by systematically identifying the financial, workplace, and subcontractor challenges that can affect H&S outcomes, the framework is useful for systematically categorizing issues that need to be tackled proactively. The applications include developing policies to effectively address workplace injuries and employee stress, improving subcontractor management and communication to enhance compliance, and managing finances to balance the set budget

with legal and safety requirements. In addition, the framework focuses on promoting safe construction norms and behaviors that can be introduced into training initiatives and corporate environments. This model can also assist industry leaders in identifying which factors are most crucial to address to have a substantial impact on H&S results, such as the absence of safety training or work conditions. Finally, the data-bound framework functions as a guide that coordinates the improvement and optimization of safety and risk levels while shifting the construction industry toward greater sustainability and compliance.

5. Conclusions

The primary objective of the present investigation was to thoroughly examine the impact of various cultural factors within the context of the implementation of H&S practices in the construction industry of Pakistan. Based on the comprehensive analysis and assessment of the findings obtained from the current study, it can be asserted that cultural factors do exert a notable and substantial influence on H&S implementation within the construction industry of Pakistan.

The research revealed that the cultural practice factor yielded the highest RII value, underscoring its significance in a developing country such as Pakistan. Kruskal–Wallis's test results indicated statistically significant differences in challenges, beliefs, values, norms, and behaviors, demonstrating variety in perception and practice with a moderate to medium effect size η^2. The frequency of safety training, communication, and employee adherence to corporate regulations demonstrated cultural heterogeneity in safety protocols. The inability of subcontractors to comply with safety requirements was an additional problem, reflected in the highest RII score resulting from their unfamiliarity and disregard for safety norms. Addressing this issue is essential through sustainable capacity-building initiatives and focused training to enhance compliance with safety regulations and foster a secure work environment. Since construction companies are becoming more dedicated to adopting health and safety solutions, it is necessary to create a strong, all-encompassing framework that will not only improve safety but also make practices more environmentally friendly. It would align with extensive sustainability goals for resource efficiency, environmental preservation, and human health and well-being. Moreover, it is essential to get the backing of all stakeholders and implement effective legislation by the government and relevant agencies, prioritizing sustainability to ensure that sector expansion aligns with broader societal and environmental objectives.

Even though this study focuses mainly on the context of Pakistan, the outcomes might be useful in any other region that can be characterized by similar cultural, economic, and developmental conditions. Some of the issues and prospects that characterize Pakistan's construction industry are not uncommon in many developing countries, especially in South Asian and some Middle Eastern countries. Concerns like regulation, labor, and technology that act as barriers in construction do not only pertain to Pakistan but also to industries of countries like India, Bangladesh, and some African nations that can be seen to be influenced by similar socio-economic setups. Through examining common characteristics in these areas, the findings presented in this study can be generalized to other similar regions, thereby increasing the study's applicability while also contributing to the long-term resilience and sustainable development of construction industries in these regions.

5.1. Theoretical and Practical Significance

The construction industry in Pakistan faces significant H&S issues due to outdated machinery, inadequate training, and lack of regulatory monitoring. This study aims to address these issues and create tailored solutions for Pakistani workers, enhancing

their well-being and reducing workplace accidents. The findings can help establish a knowledge base for stakeholders and policymakers, highlighting the financial consequences of disobeying H&S laws. By enhancing H&S procedures, worker happiness, and well-being can improve productivity and retention rates in the Pakistani construction sector.

5.2. Study Limitations

The study limitations in Pakistan's construction industry reveal a lack of a comprehensive data-gathering system, hindering accurate hazard identification and compliance levels. The industry's fragmentation and lack of centralized reporting procedures further complicate the evaluation of safety practices. Additionally, disparities in data collection methods and potential response bias make comparisons challenging. These limitations hinder the development of evidence-based initiatives for workplace safety improvements.

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Appendix A

QUESTIONNAIRE SURVEY
(FOR CONSTRUCTION INDUSTRY PROFESSIONALS)

School of Engineering & Built Environment,
Birmingham City University,
UK.

Dear Sir/Madam,

QUESTIONNAIRE ON: Cultural Factors Impacting H&S (H&S) Practices in a Developing Construction Economy

The purpose of the enclosed questionnaire is to gather data on the aforementioned topic. This exercise is being done towards the achievement of an Individual Master's Project in the School of Engineering & Built Environment. Your contribution will be kept private and used exclusively for scholarly purposes.

We appreciate your anticipated cooperation and patience.

Yours Sincerely,
Kashan Fayyaz

SECTION I: DEMOGRAPHIC INFORMATION

The eligibility for filling out this questionnaire includes the registration of an individual with the Pakistan Engineering Council (PEC) with a "registered engineer" or "professional engineer" tag working anywhere in Pakistan's construction industry.
Kindly fill in or tick the below questions as appropriate.

(1) Job Title (tick that may apply)

Designation	Tick
CEO	
Managing Director	
Project Director	
General Manager	
Project Manager/Construction Manager	
Project Engineer/Site Engineer	
Planning Engineer	
Safety Manager/Safety Supervisor	
Site Manager	
Architect/Designer	
University Professor	
MEP Engineer	
Other	

(2) Academic Qualification

(a) B.Sc./B.Tech (c) MSc/MTech (d) Ph.D.
(e) Others (specify). . .. .

(3) Professional Affiliation

(a) Contractor (b) Consultant (c) Client
(f) Others (specify). . .. .

(4) Years of Experience of respondent

(a) 1–5 (b) 6–10 (c) 11–15 (d) 16–20 (e) 21 and above

(5) Understanding about H&S Practices on construction sites

1. No understanding
2. Moderate Understanding
3. Exceptional Understanding

SECTION II: CULTURAL ELEMENTS

(6) How would you describe the overall safety culture in your workplace?

(a) Very Poor
(b) Poor
(c) Neutral
(d) Good
(e) Exceptional

(7) To what extent do you think the following cultural factors (e.g., beliefs, values, norms) influence safety practices in the construction sector?

Factors	No Influence	Minor Influence	Moderate Influence	High Influence	Very High Influence
Beliefs					
Values					
Norms					
Behavior					
Practices					

(8) How would you rate the level of communication regarding safety practices in your workplace?
   (a) Ineffective
   (b) Somewhat Effective
   (c) Neutral
   (d) Effective
   (e) Very Effective

SECTION III: H&S PRACTICES

(9) How frequently do you encounter safety training programs in your workplace?
   (a) Rarely
   (b) Occasionally
   (c) Neutral
   (d) Frequently
   (e) Always

(10) To what extent do you think safety guidelines and protocols followed in your workplace are effective?
   (a) Ineffective
   (b) Somewhat Effective
   (c) Neutral
   (d) Effective
   (e) Very Effective

(11) How satisfied are you with the current H&S practices in your workplace?
   (a) Very Dissatisfied
   (b) Dissatisfied
   (c) Neutral
   (d) Satisfied
   (e) Very Satisfied

SECTION IV: CHALLENGES AND SUGGESTIONS

This section will assess the key challenges in the implementation of H&S practices in the construction industry of Pakistan.

(12) Kindly mark the effect of the following main challenges in implementing H&S practices in the construction sector of Pakistan?

Challenges	No Effect	Minor Effect	Moderate Effect	High Effect	Very High Effect
Workplace Injuries					
Economic and Legal Aspects					
Insurance and Project Management					
Environmental and Quality Aspects					
Training and Cultural Factors					
Resistance to Change					
Incident Reporting					
Budget Constraints					
Workplace Conditions and Stress					
Decision-Making and Consultation					
Empowerment and Personal Responsibility					
Attitude and Perception					
Team Dynamics and Support					
Training and Attitude Improvement					
Company Rules and Working Environment					
Responsibility and Safety Procedures					
Company Preferences					
Safety Plan and Criteria					
Safety Monitoring and Reporting					
Communication on Safety					
Subcontractors' Safety Compliance					

Thank you very much for your valuable response.

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