

The Safety Policies Practiced in the Construction Industry of Saudi Arabia

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Abstract

Globally construction industry is one of the most hazardous industry and is responsible for the occurrence many fatalities due to accidents. In the Middle East, Saudi Arabia is the leader in the development of construction projects and the Saudi Arabian construction industry is recording a high number of accidents that cause injuries and fatalities. In Saudi Arabia, the implementation of safety policies and achieving an adequate safety culture is one of the key challenges. Construction firms contain well-equipped safety policy but lack of implementation of safety policy is a concern. Safety culture and overall safety performance require proper development and implementation of safety policy. Nonetheless, this subject matter has evoked quite a significant deal of debate in the current phenomenon. Correspondingly, a framework has been developed in this paper, addressing the issue of safety culture in the all-round development within the Saudi Arabian Construction industry.

The study is based on the interpretivism philosophy along with the deductive approach to assess the issues related to safety within the construction industry of Saudi Arabia. It will then focus on framing and implementing policy as well as a framework into the regular proceedings to improvise the safety culture therein. Besides, the use of the mixed research approach and multiple research strategies has contributed immensely in providing a comprehensive and justified discussion on the issue of concern. Data has accordingly been collected from both primary and secondary sources, which were then analyzed qualitatively and interpreted using the thematic analysis tool. The collected data were also analyzed quantitatively using the SPSS software, where they were tested for reliability and significance differences. ANOVA and correlation testing were also conducted on the collected data to assess the position of the Saudi Arabian construction industry in terms of safety and measures to improve in the future.

As a result of the analysis, it was evident that management of the construction organizations in Saudi Arabia needs to focus on its effective framing and implementation of safety policy measures into organizations not only to improve their organizational culture but also to enhance their performance as a whole.

Keywords: Safety policy in construction industry; Saudi Arabian construction industry; Organizational culture in Saudi Arabia; Safety culture in construction

Introduction

Poor safety performance has always been a significant issue of concern for the Saudi Arabian governmental as well as private organizations. Saudi Arabian construction industry is large and expanding with immense structure and manpower but Aldhafeeri [1] reported that between 2003-2013, the construction industry had the biggest share in the number of injuries resulting from accidents. The occurrence of a high number of accidents in the Saudi Arabian construction industry is a major concern. Although various strategic measures have been applied till date to counter the hazards and risks faced by the employee in the industry, critics have been arguing regarding the effectiveness of the policies implemented therein. Mosly [2] emphasized the importance of adequate safety policy in the Saudi Arabian construction and argued that there is an urgent need of improved safety policies. In order to improve the safety performance construction industry is implementing many strategies such as technology inclusion, generating awareness amid the workforce, and taking proper precautionary measures through training. However, the construction industry is still considered as one of the highest-risk industries, depicting low safety improvements until now. As revealed by Mosly, only in 2014, the industry had recorded 69,242 accidents, which was approximately 51% of the total workplace accidents recorded in the year as compared to other industries of Saudi Arabia. Inadequate safety policies have been recognized as one of the key factor impacting safety performance. Haadir, et al. [3] criticized the safety policies implemented in the Saudi Arabian construction sector, assessing those as ineffective

to ensure highest safety standards in working sites. The causes of such ineffectiveness have often been vague to the policy developers, which in turn affect the successful accomplishment of the safety-related objectives. Possible challenges, as identified by Mosly [2] may include the lack of managerial effectiveness to deal with the intensely diverse workforce and their varying beliefs concerning safety. Moreover, the lack of effective leadership practices also might contribute to the risk factors. This paper thus explores the contributors of the safety hazards in the Saudi Arabian construction industry, with critical emphasis on the safety policies implemented therein. Further suggestions will also be framed aimed at enhancing the effectiveness of the safety policies implemented in the industry.

Literature Review

Saudi Arabia is in the development phase and is witnessing the construction of mega projects in different regions of the country. According to Awad and Smith [4,5], the Kingdom of Saudi Arabia

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(KSA), despite its rapid growth in the construction industry of the Middle East region does not pay much heed to safety. Shoult [6] also asserted according to the growing demand of the construction industry in Saudi Arabia, which influences people all around the globe to invest as well as be employed in this sector. It is thus that both Awad and Smith [4,5] had argued that instead of directly focussing on safety policies, the construction industry of Saudi Arabia assesses techniques to manage the increasing accidental expenses and diminishing the delays caused in the completion of construction as a result of accidents [4,5]. Albogamy et al. [7] has also clearly highlighted upon the fact that the construction industry of KSA considers delays in their projects to be a matter of deep concern and hence, lacks proper assessment techniques when determining the safety issues. Hence, to eradicate the issue from its roots, Mosly [2] stated that it is essential to frame effective safety policies and implement them in the regular course of actions by the individuals associated with the Saudi Arabian construction industry. Friedman [8] also affirmed its significance to personal commitment and responsibility of the individuals, as the most significant aspect behind the implementation of safety policies within the workplace.

Overview of Saudi Arabian construction industry safety performance

Saudi Arabian construction industry is large and expanding with significant structure and manpower but it constitutes almost half of the occurrence of accidents as compared to other industries [2]. In Saudi Arabia, Government Organisation of Social Insurance (GOSI) estimates that 122,645 occupational injuries were recorded between 2015 and 2016 (GOSI, 2018). GOSI (2018) statistics show that construction, trade and manufacturing sector were responsible for most of the number of injuries at the workplace. In 2015, the Saudi Arabian construction industry recorded the highest number of work-related injuries which were 26,982 cases (Construction week online, 2016). GOSI states the construction industry was responsible for 24,760 work-related injuries which account for 46.36% of total recorded occupational injuries in 2016. Statistics show that in 2015, 35,552 occupational injuries were recorded by GOSI in the construction industry which account for 51.35% of the total occupational injuries (GOSI, 2018). In 2014, 69,000 accidents were reported at the workplace and 51% pertain to the construction sector of Saudi Arabia [9]. Aldhafeeri [1] reported that between 2003-2013, the Saudi Arabian construction industry had the biggest share in the number of injuries resulting from accidents as shown in Figure 1.

In recent years many construction accidents are reported that caused fatalities and injuries to the workers. In 2015, one of the deadliest construction accident occurred in Makkah when a crane collapsed due to strong wind and heavy rains and resulted in killing more than 100 people while injuring more than 250 people [10]. In 2015 another accident occurred in the city of Qasim, where ten workers lost their lives at a construction project when concrete columns collapsed due to overload while concrete pouring was underway [11]. Aldhafeeri [1] reported that 14 fatalities and 29 injuries occurred in the construction sites situated at cities of Makkah, Najran, Qasim, and Riyadh. In 2010, at the construction project of King Abdullah Financial District in Riyadh, five workers died who were working on a scaffold which collapsed [12].

Injuries suffered by workers due to occupational accidents cost around USD 461 million. Cost of accidents in the construction industry assumed that the cost of accidents in the industry is roughly 40% to 50% of the total cost because the proportion of the construction accidents is based on 40% to 50% of the total accidents in the all industries in Saudi

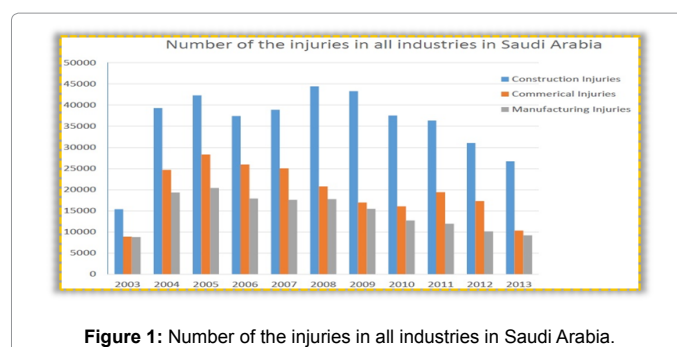


Figure 1: Number of the injuries in all industries in Saudi Arabia.

Arabia [11].

Statistics from GOSI suggests that foreign manpower is mostly involved with the site activities and experiences more injuries by accidents compared to Saudi manpower. In the Saudi Arabian construction industry expatriates are working for most of the jobs ranging from low skill positions to highly trained positions [13]. GOSI shows that in the construction industry between 2015 to 2016, expatriates (59,142) suffered the most work-related injuries in the construction industry as compared to Saudi nationals (790) (Table 1).

Most of the unskilled workers in the Saudi Arabian construction industry are from Asian countries: Pakistan, India, Bangladesh, Nepal, and the Philippines. According to the Nepali embassy in Riyadh, since 2000 around 3,000 workers from Nepal died in Saudi Arabia [14]. Nepali embassy mentions the reasons for the death of so many Nepali workers is working in extreme conditions and difference in the cultural environment [14]. In Khobar, Al-Dawood [15] reported that due to occupational injuries, only 1.5% of the Saudis were admitted in the private hospitals. Meanwhile, expatriates' workers constitute 98.5% of the reported admissions in private hospitals (Al-Dawood [15]. Saad [16] pinned that workers are mostly from Asian countries and they don't speak or understand English or Arabic whereas, the supervisors are mostly Arabic speaking so lack of proper communication and understanding is one of the reasons for worker's involvement in the occurrence of the accidents. In Saudi Arabia, there is no government health and safety regulatory authority [16] so construction companies have the freedom to plan and implement safety policy of their choice and sometimes safety policy is only documented and not implemented especially in the small-sized construction companies due to no accountability by any regulatory authority. Erogul and Alyami pinned that in Saudi Arabia, lack of clear national policies, systems, and programs is a reason behind the lack of safety practices in the construction industry as employers are found ignoring their responsibilities in the provision of the safe working environment.

The report presented by the Government of Alberta and Reese [17] further stressed upon the fact that maintaining health and safety within a workplace is the basic step of managing an organization, as it contributes largely in the promotion of competency and consistent performance of the workforce. Chen et al. [18] highlighted that implementation of adequate safety policy helped in an increase of safety performance and decrease in incidents by the enforcement of an increasingly more comprehensive construction safety act that brought about greater safety awareness. Pérezgonzález [19] mentions that in 1970, Occupational Safety and Health Administration (OSHA) was launched in the USA and in 1974 UK launched Health and Safety at Work Act (HASWA) to provide certain necessary health and safety guidelines for the contractors, workers, managers as well as the sub-

contractors to ensure employee health and safety is being maintained at the workplace. However, certain authorities, such as the supervisors, refused to comply with the safety norms, as they believed it was not their responsibility to be concerned with the possibilities of safety hazards or accidents within the workplace [19].

According to Halwatura [20], the factors of safety, as well as health, are indeed a matter of deep concern for all types of the organization. The construction industry is herewith regarded as most hazardous due to the innumerable hazards and accidents taking place therein. The work-at heights, deep excavations, and lifting operations at complex sites are considered the most common reasons behind the safety-related issues of the construction industry. As inferred from the records of Construction Industry Health and Safety Strategy, from 2004 to 2010, due to the recruitment of unskilled workers in a particular industry the instances of workplace accidents have increased considerably. Researchers have emphasized the importance of the implementation of adequate safety culture to minimize accidents. Safety culture and safety program is vital for the improvement of safety performance and the prevention of accidents [18,21,22]. Hence, it is important that the construction industry develops a safety culture within its organization by framing and implementing the safety policies to the maximum level possible. In agreement to this, Alrashed et al. opined that the construction industry of Saudi Arabia encounters hazards and risks in varied segments of its business activities, which implies that it is of great significance that the stakeholders learn the processes of risk identification and mitigation to make sure that root causes of the risks and hazards are controlled and will improve the safety culture therein.

Methods

This study was prepared with a focus on creating a framework to establish an association between safety and culture, pertaining to safety performance within the construction department of Saudi Arabia. The interpretivism philosophy was implemented in the study as the basic characteristics of the human respondents were to be identified with the determination of their active involvement in the cultural and social life [23]. The selection of this philosophy has thus helped in understanding the variations in the thought-processes of individuals associated with the Saudi Arabian Construction Industry, who were selected as respondents for the research process [24]. Stating precisely, the research process comprises the use of deductive strategy to formulate the framework and improve the safety culture and performance of the construction projects therein. The aptness of selecting this strategy lies in the completion of the research by following a particular pattern as represented in the below illustration (Figures 2.1 and 2.2). This has, in turn, helped in obtaining effective supervision and funding for the completion of the study [12,25].

Moreover, the study consists of multiple research strategies, which go well with the complicated approach of the interpretivism philosophy. The various strategies that have been used in the research process are interview, multiple case studies and a questionnaire survey [25]. The multiple case study approach included three construction companies of Saudi-Arabia, which entailed a government concern and 2 private organizations. The case studies helped in deriving a clear understanding of the complex issue of safety culture practiced within the Saudi-Arabian construction projects from past records, available in the form of official reports and documents provided voluntarily by the participating organizations [26]. The outcomes of the case study analysis were hence justified with primary data collected through interviews and questionnaire surveys conducted on a similar issue

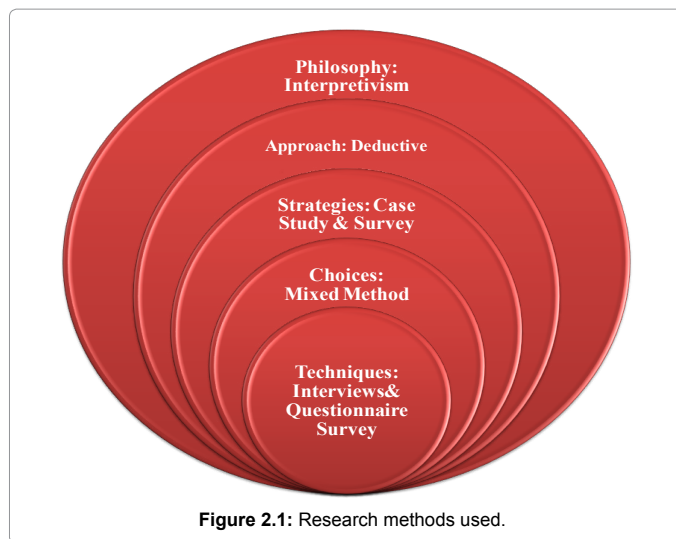


Figure 2.1: Research methods used.

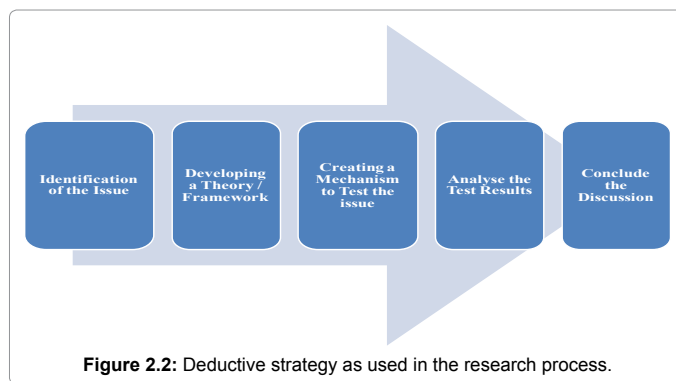


Figure 2.2: Deductive strategy as used in the research process.

of concern. The use of both the strategies had accordingly helped in deriving confirmatory outcomes related to the perceptions of the selected respondents [27]. The questionnaire survey was also conducted among 250 respondents, out of which only 135 were selected for the final research. This survey involved the individuals associated with all the three levels of management, namely the directors, supervisors, and managers as well as the operational foremen and leaders (operational level). The interview process included a total of 15 respondents with experiences in different job roles of the Saudi Arabian construction industry, as stated below in the form of a Table 2.

To maintain a proper balance of the selected strategies, the mixed method has been selected for the research, which implies that the data collected will be analyzed and evaluated using both the qualitative and quantitative approaches [28]. The mixed method had contributed largely to providing a theoretical discussion of the social and cultural factors along with logical and analytical descriptions. Although both the research methods are considerably different from one another, their combination in this research helped in making the study reliable and valid to the utmost level possible [29,30]. The mixed research approach was implemented on the data collected from both primary and secondary sources. Notably, secondary data were collected from credible sources available from beforehand, such as textbooks, a literary journal, magazines and newspapers along with reliable websites. Consecutively, the primary data were collected through the processes of interview and questionnaire survey [31,32].

The collected data were then analyzed using both qualitative

Economic Activity	Saudi		Non-Saudi		Total		Percentage (%)	
	2016	2015	2016	2015	2016	2015	2016	2015
Construction	309	481	24,760	35,071	24,760	35,552	46.36%	51.35%
Trade	368	544	11,471	12,404	11,471	12,948	21.48%	18.70%
Manufacturing	903	1,242	8,589	10,158	8,589	11,400	16.08%	16.46%

Table 1: Work Injuries by Establishment Economic Activity between 2015 and 2016.

Interviewees	Position	Experience
1	Foreman	7 (3 years on-site; 4 as foreman)
2	Foreman	10 (4 years on-site; 6 as foreman)
3	Safety officer	7 years on site as safety officer
4	Safety officer	9 years on site as safety officer
5	Safety Engineer	12 years on site as safety Engineer
6	Safety Engineer	16 (7 as foreman; 9 years on site as safety Engineer)
7	Architectural Engineer	10 years as Architectural Engineer
8	Architectural Engineer	20 years as Architectural Engineer
9	Mechanical Engineer	19 years as Mechanical Engineer
10	Electrical Engineer	24 years as Electrical Engineer
11	Civil Engineer	17 years as Civil Engineer
12	Site supervisor	22 (8 years as Engineer, 14 years as site supervisor)
13	Project Manager	33 (10 as Civil Engineer, 23 as project manager)
14	Project manager	35 (11 as Civil Engineer, 24 as project manager)
15	Project Manager	27 (10 years as Civil Engineer, 20 years as project manager)

Table 2: List of 15 Interviewees.

and quantitative analysis procedures. For the qualitative analysis, the descriptive data collected from the interview transcripts, surveys as well as the secondary sources were evaluated individually and themes were formed, based on the research aim and objectives [33]. Correspondingly, a quantitative analysis was conducted through the analytical data collected from the 135 questionnaires on the SPSS software. The technique of factor analysis was used for the study with the implementation of Varimax Rotation to make the variable sand factors retrieved from data simpler [34,35]. Furthermore, in order to maintain the reliability of the research procedure, a pre-test was conducted among 135 respondents comprising managers, engineers, laborers, and foremen (questionnaire) and 15 managers (interviews) and 3 construction companies (case study). It was conducted 1 month prior to the final test to avoid any kind of confusions. To ensure the validity of the research process, internal as well as external validity method was undertaken. The internal validity method referred to the assessment of changes between the outcomes of the pre-test and the final obtained results, whereas the external validity was ascertained through the use of random sampling method for the selection of respondents [36]. Confidentiality of the respondents' details and data collected from them were kept confidential to the optimum level [37-40]. Besides, the ethical guideline, as per the University of Salford regulations for preparing the study, was complied with strict adherence to enhance its reliability in the academic field.

Results and Discussion

Questionnaire survey

The results of this research have been derived based on the different

approaches used for data analysis. The data of the questionnaire survey was analyzed with respect to the research objectives, wherein the Kaiser-Meyer-Olkin measure of 0.94 (Table 3) depicts the sufficiency of the sample size and its adequacy in the evaluation of the principal component.

From Table 4, it can be inferred that a total of 8 factors possesses an Eigenvalue of more than 1 and showed variances, which were different, both prior to and after the implementation of Varimax rotation.

The rotated component matrix and Eigenvalue based on the factors provided below in the Tables 5-10, with some factors were deleted for its irrelevancy to the research process.

Table 11 provided below depicts the results of Chronbach's alpha (reliability) for the six factors, which were selected based on the outcomes of the Principal Component Analysis. Factor 1 with 29 items was found to be most reliable in nature, whereas factor 4 with 2 elements was the least reliable of all.

The descriptive statistics for factors 1-6 are provided below in Tables 12-18 whereby the rankings have also been made in each factor based on their respective mean values, the histograms for factors provided in Figure 3.1.

The impact of education on the 6 factors can be depicted from f values in Table 19. The highest impact of education is observed on Factor 4, while the least impact was on the second factor. The results can be more clearly inferred from the below-presented Figure 3.2.

Similar results for the impact of job type on the overall factors can

KMO and Bartlett's Test
Kaiser-Meyer-Olkin Measure of Sampling 940
Adequacy.
Bartlett's Test of Approx. Chi-Square 6510183
Sphericity *df 1540
Sig. 0.000
df: It stands for Degrees of Freedom. It involves the sample size and the variables.

Table 3: Sampling adequacy.

Component	Initial Eigenvalues			Total Variance Explained			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	27.44	48.994	48.994	27.44	48.994	48.994	16.471	29.413	29.413
2	3.224	5.758	54.752	3.224	5.758	54.752	4.672	8.343	37.756
3	1.865	3.33	58.082	1.865	3.33	58.082	4.402	7.861	45.617
4	1.709	3.051	61.133	1.709	3.051	61.133	3.24	5.785	51.403
5	1.311	2.341	63.474	1.311	2.341	63.474	3.081	5.502	56.905
6	1.222	2.182	65.656	1.222	2.182	65.656	2.99	5.34	62.245
7	1.117	1.995	67.651	1.117	1.995	67.651	2.705	4.83	67.075
8	1.028	1.836	69.486	1.028	1.836	69.486	1.351	2.412	69.486
9	0.956	1.707	71.193						
10	0.947	1.692	72.885						
11	0.854	1.526	74.411						
12	0.811	1.448	75.859						
13	0.788	1.408	77.267						
14	0.745	1.331	78.598						
15	0.74	1.322	79.919						
16	0.684	1.221	81.14						
17	0.64	1.142	82.282						
18	0.606	1.082	83.364						
19	0.591	1.055	84.419						
20	0.556	0.993	85.412						
21	0.531	0.948	86.361						
22	0.49	0.875	87.236						
23	0.477	0.851	88.087						
24	0.435	0.777	88.864						
25	0.4	0.714	89.578						
26	0.387	0.692	90.269						
27	0.359	0.642	90.911						
28	0.342	0.61	91.522						
29	0.339	0.605	92.127						
30	0.31	0.553	92.68						
31	0.291	0.52	93.201						
32	0.283	0.505	93.706						
33	0.276	0.494	94.199						
34	0.263	0.47	94.669						
35	0.25	0.446	95.116						
36	0.237	0.422	95.538						
37	0.221	0.395	95.934						
38	0.208	0.371	96.305						
39	0.184	0.328	96.633						
40	0.18	0.321	96.954						
41	0.165	0.294	97.248						
42	0.16	0.285	97.533						
43	0.148	0.264	97.797						
44	0.145	0.258	98.055						

45	0.134	0.239	98.294						
46	0.122	0.218	98.512						
47	0.118	0.211	98.722						
48	0.108	0.193	98.915						
49	0.102	0.182	99.097						
50	0.095	0.17	99.266						
51	0.087	0.156	99.422						
52	0.081	0.144	99.566						
53	0.076	0.136	99.702						
54	0.059	0.105	99.807						
55	0.057	0.102	99.909						
56	0.051	0.091	100						

Extraction Method: Principal Component Analysis.

Table 4: Eigenvalue and total variances (before and after implementing varimax rotation) for individual components.

		Component							
		1	2	3	4	5	6	7	8
B15	The company's safety culture forces us to wear personal protective equipment.	0.83							
B3	The advantages of safety culture is to make people receive the necessary training to avoid accidents and maintain safety.	0.78							
A1	Management commitment is needed for safety Policy implementation.	0.77							
A5	One of the Safety procedures is to use ergonomic and suitable machinery and equipment in the projects.	0.77							
D1	Implementing the right safety policies significantly contribute to the success of a safety performance	0.76							
B14	The company's safety culture is training us how to respect the instructions given by our guide.	0.76							
A12	Stable safety culture gives Managers a full understanding of what they and we should do regarding safety.	0.75							
A2	In management meetings Feedback on safety is very important.	0.74	0.4						
A4	Project leadership considers that Safety has to be constantly implemented every time and everywhere.	0.73							
C1	Strong safety culture gives the company to maintain best practice that cannot fall into safety problems.	0.73							
B8	The company's safety culture has to assign someone that makes us aware of safety issues.	0.72							
B16	The company's safety culture gives penalty to people who not wearing protective gear at the workplace.	0.71							
B13	Effective Safety culture requires the employee to be trained for the safety of co-workers and work equipment.	0.71							
B1	The company trains all employees that the words "SAFETY FIRST" have a significant meaning.	0.69	0.4						
B4	One of the company's safety culture procedures is to train people on first aid and emergency procedures.	0.68							
B7	The company's safety culture makes our manager/supervisor checks that we can do the job safely.	0.67							
B6	The company's safety culture is that all employees get trained in safe work procedures* for their jobs.	0.65	0.42						
A13	A strong safety culture gives management how to get involved in safety issues.	0.65							
A14	Safety culture means that Managers/Supervisors know what to say and to do regarding safety matters.	0.65	0.42						
A11	A positive and strong safety culture has given top management greater ability to initiate effective safety policies.	0.64							
C4	Poor safety culture strategies have led to failure in implementation of safety policies.	0.62							
B2	The company's safety culture is to train people by their Leaders/Supervisors.	0.59							
A9	Management systems and behaviour has priority in Safety culture model.	0.58							
A10	Non-commitment to safety culture procedure has caused a failure in safety policies.	0.57			0.45				
C9	The impact of safety culture gives best practice in competence, attitude, commitment and value for a free accident site.	0.57			0.44				
A15	The company's safety culture procedure that there is notice board has a poster about injury management	0.56	0.42						
D9	A sign of the important of safety within organisation is that If we report a serious problem where someone could get hurt, they take an urgent action.	0.55	0.43						
C10	Poor safety culture implementation makes no one would really care if I didn't follow a safety instruction.	0.5							
B12	Due to the strength of safety culture, we always get feedback (e.g. minutes, tool box talks) on what's happening with our safety issues within seven days.	0.44							

Table 5: Rotated component matrix for those under factor 1.

		1	2	3	4	5	6	7	8
C5	People do understand how safety culture impacts on safety performance.		0.74						
D10	The importance of safety culture makes the company resources/money are mostly focus on safety within projects.		0.63						
A3	During management meetings' agenda, safety discussion comes first.		0.6						

Table 6: Rotated component matrix for those under factor 2.

		1	2	3	4	5	6	7	8
D11	The clashes in management responsibilities have made some managers/supervisors not get involved in safety culture.			0.77					
B11	Due to the poor safety culture procedures, we don't do risk assessments when we start a new process or when a process is changed.			0.6					
D12	Lack of knowledge in the workplace toward safety culture indicated that Managers/supervisors don't mean what they say or do what they say, in safety matters.			0.54	0.43				
C3	Poor safety culture intends to non-commitment to best practices to either cut cost or ensures fast production.	0.41		0.52					

Table 7: Rotated component matrix for those under factor 3.

		1	2	3	4	5	6	7	8
C12	Non-commitment to best practice gives feeling like safety culture does not matter or influence on safety performance.				0.6				
D3	Our poor safety culture makes us not caring to communicate with managers about health and safety.				0.5				

Table 8: Rotated component matrix for those under factor 4.

		1	2	3	4	5	6	7	8
A6	One of the safety cultures within an organization that there is a reward system based on observation of safety.					0.7			
A7	Management encourages by giving a reward based on observation of safety.					0.68			
A8	One of safety culture that there is a system in place for appraisal regarding safety.	0.49				0.53			

Table 9: Rotated component matrix for those under factor 5.

		1	2	3	4	5	6	7	8
D8	No one of Health & Safety department reviews safe work procedures after an incident report to try to find out why an incident happened and how to fix it.						0.76		
C8	The company's safety culture does not give us enough time to learn our safe work procedures.						0.75		
D5	The clashes in Management rules toward safety make us not always report safety incidents.			0.44			0.5		
D4	There is a safety-reporting procedure, but poor implementation of safety culture makes us sometimes use them.				0.41		0.46		
B5	One of the company's safety culture disadvantages isn't everyone getting induction training when they start.						0.44		
C6	Poor safety culture has led company management not to work out all the jobs/tasks in the area that have safety risks.						0.43		

Table 10: Rotated component matrix for those under factor 6.

Factor	Items	Cronbach's alpha
Factor 1: Commitment to Safety Procedure, Training & Practices.	29	0.92
Factor 2: Importance of Safety Culture within Organisation.	3	0.79
Factor 3: The influence of poor knowledge about Safety Culture at Workplace	4	0.81
Factor 4: Safety Culture value for employees in the organisation	2	0.65
Factor 5: The reward management system applications and employee performance toward safety culture	3	0.78
Factor 6: Poor implementation of safety culture within an organisation	6	0.81

Table 11: Cronbach's alpha reliability test (6 selected factors).

be understood from the ANOVA calculations (f value) in Table 20 and in Figure 3.3. It can hence be stated that factor 4 is least affected by the type of jobs, whereas factor 5 is the one, which is mostly affected by it.

Finally, Pearson's correlation was calculated to develop an understanding regarding the strength of the relationship between the experience and the 6 factors. Similarly, the significance levels have also been illustrated in Table 21 (Appendix).

Interviews analysis and discussion

Evaluation of the interview data had provided with an understanding that the safety policies of the organization are the list of norms that the associated members must adhere to within the work environment to ascertain safety for all. It was also observed that the respondents, despite being a part of the Saudi Arabian Construction organization, comply with the international safety regulations of the ISO, OHSAS, ILO, and HSE, as the norms of their nation are mostly

	S.D	D.	N	A	SA	M	SD	Rank
The company's safety culture forces us to wear personal protective equipment.	14	15	15	41	50	3.7259	1.34069	4
	10.40%	11.10%	11.10%	30.40%	37.00%			
The advantages of safety culture is to make people receive the necessary training to avoid accidents and maintain safety.	16	8	19	34	58	3.8148	1.36144	1
	11.90%	5.90%	14.10%	25.20%	43.00%			
Management commitment is needed for safety Policy implementation.	21	11	8	38	57	3.7333	1.46705	4
	15.60%	8.10%	5.90%	28.10%	42.20%			
One of the Safety procedures is to use ergonomic and suitable machinery and equipment in the projects.	11	15	18	38	53	3.7926	1.29348	3
	8.10%	11.10%	13.30%	28.10%	39.30%			
Implementing the right safety policies significantly contribute to the success of a safety performance	12	13	16	58	36	3.6889	1.21843	6
	8.90%	9.60%	11.90%	43.00%	26.70%			
The company's safety culture is training us how to respect the instructions given by our guide.	11	13	21	46	44	3.7333	1.24209	4
	8.10%	9.60%	15.60%	34.10%	32.60%			
Stable safety culture gives Managers a full understanding of what they and we should do regarding safety.	18	7	22	51	37	3.6074	1.30496	9
	13.30%	5.20%	16.30%	37.80%	27.40%			
In management meetings Feedback on safety is very important.	14	15	18	47	41	3.637	1.30216	8
	10.40%	11.10%	13.30%	34.80%	30.40%			
Project leadership considers that Safety has to be constantly implemented every time and everywhere.	16	13	19	37	50	3.6815	1.36945	7
	11.90%	9.60%	14.10%	27.40%	37.00%			
Strong safety culture gives the company to maintain best practice that cannot fall into safety problems.	12	10	24	47	42	3.7185	1.23174	5
	8.90%	7.40%	17.80%	34.80%	31.10%			
The company's safety culture has to assign someone that makes us aware of safety issues.	17	9	22	48	39	3.6148	1.31004	9
	12.60%	6.70%	16.30%	35.60%	28.90%			
The company's safety culture gives penalty to people who not wearing protective gear at the workplace.	11	20	30	32	42	3.5481	1.29129	14
	8.10%	14.80%	22.20%	23.70%	31.10%			
Safety culture adjustment is the ability of an employee to be trained for the safety of co-workers and work equipment.	14	11	32	48	30	3.5111	1.22088	18
	10.40%	8.10%	23.70%	35.60%	22.20%			
The company trains all employees that the words "SAFETY FIRST" have a significant meaning.	11	21	14	27	62	3.8	1.3757	2
	8.10%	15.60%	10.40%	20.00%	45.90%			
One of the company's safety culture procedures is to train people on first aid and emergency procedures.	13	11	22	44	45	3.7185	1.27345	5
	9.60%	8.10%	16.30%	32.60%	33.30%			
The company's safety culture makes our manager/supervisor checks that we can do the job safely.	9	17	31	42	36	3.5852	1.19941	10
	6.70%	12.60%	23.00%	31.10%	26.70%			
The company's safety culture is that all employees get trained in safe work procedures* for their jobs.	15	11	29	43	37	3.563	1.27904	13
	11.10%	8.10%	21.50%	31.90%	27.40%			
A strong safety culture gives management how to get involved in safety issues.	12	17	24	51	31	3.5333	1.22657	16
	8.90%	12.60%	17.80%	37.80%	23.00%			
Safety culture means that Managers/ Supervisors know what to say and to do regarding safety matters.	8	19	18	46	44	3.7333	1.22292	4
	5.90%	14.10%	13.30%	34.10%	32.60%			
A positive and strong safety culture has given top management greater ability to initiate effective safety policies.	15	15	22	48	35	3.5407	1.29155	15
	11.10%	11.10%	16.30%	35.60%	25.90%			
Poor safety culture strategies have led to failure in implementation of safety policies.	13	18	22	43	39	3.5704	1.29604	12
	9.60%	13.30%	16.30%	31.90%	28.90%			
The company's safety culture is to train people by their Leaders/Supervisors.	9	20	25	46	35	3.5778	1.21229	11
	6.70%	14.80%	18.50%	34.10%	25.90%			
Management systems and behaviour has priority in Safety culture model.	10	14	31	46	34	3.5926	1.18634	10
	7.40%	10.40%	23.00%	34.10%	25.20%			
Non-commitment to safety culture procedure has caused a failure in safety policies.	11	19	24	43	37	3.5672	1.25924	12
	8.20%	14.20%	17.90%	32.10%	27.60%			

The impact of safety culture gives best practice in competence, attitude, commitment and value for a free accident site.	17	17	15	51	35	3.5185	1.33747	17
	12.60%	12.60%	11.10%	37.80%	25.90%			
The company's safety culture procedure that there is notice board has a poster about injury management	14	16	32	42	31	3.4444	1.25583	20
	10.40%	11.90%	23.70%	31.10%	23.00%			
A sign of the important of safety within organisation is that If we report a serious problem where someone could get hurt, they take an urgent	19	12	23	44	37	3.5037	1.35423	19
	14.10%	8.90%	17.00%	32.60%	27.40%			
Poor safety culture implementation makes no one would really care if I didn't follow a safety instruction.	20	11	26	47	31	3.4296	1.33014	21
	14.80%	8.10%	19.30%	34.80%	23.00%			
Due to the strength of safety culture, we always get feedback (e.g.minutes, tool box talks) on what's happening with our safety issues	17	22	34	39	23	3.2148	1.266	22
	12.60%	16.30%	25.20%	28.90%	17.00%			

Table 12: Descriptive statistics for factor 1.

	S.D	D.	N.	A.	S.A.	M	SD.	Rank
People do understand how safety culture impacts on safety performance.	9	33	30	36	27	3.2889	1.22698	2
	6.70%	24.40%	22.20%	26.70%	20.00%			
The importance of safety culture makes the company resources/money are mostly focus on safety within projects.	19	13	42	43	18	3.2074	1.21616	3
	14.10%	9.60%	31.10%	31.90%	13.30%			
During management meetings' agenda, safety discussion comes first.	6	20	39	34	36	3.5481	1.16362	1
	4.40%	14.80%	28.90%	25.20%	26.70%			

Table 13: Descriptive statistics for factor 2.

	S.D	D.	N.	A.	S.A	Mean	SD.	Rank
The clashes in management responsibilities have made some managers/supervisors not get involved in safety culture.	14	34	26	46	15	3.1037	1.20493	4
	10.40%	25.20%	19.30%	34.10%	11.10%			
Due to the poor safety culture procedures, we don't do risk assessments when we start a new process or when a process is	22	20	36	35	22	3.1111	1.30822	3
	16.30%	14.80%	26.70%	25.90%	16.30%			
Lack of knowledge in the workplace toward safety culture indicated that Managers/supervisors don't mean what they say or	13	21	34	43	24	3.3259	1.21452	2
	9.60%	15.60%	25.20%	31.90%	17.80%			
Poor safety culture intends to non-commitment to best practices to either cut cost or ensures fast production.	17	13	37	39	28	3.3582	1.27086	1
	12.70%	9.70%	27.60%	29.10%	20.90%			

Table 14: Descriptive statistics for factor 3.

	S.D	D	N	A	S.A	Mean	SD	Rank
Non-commitment to best practice gives feeling like safety culture does not matter or influence on safety performance.	13	16	36	50	20	3.3556	1.162	1
	9.60%	11.90%	26.70%	37.00%	14.80%			
Our poor safety culture makes us not caring to communicate with managers about health and safety.	19	21	34	35	26	3.2074	1.31067	2
	14.10%	15.60%	25.20%	25.90%	19.30%			

Table 15: Descriptive statistics for factor 4.

	S.D	D.	N.	A.	S.A	Mean	SD	Rank
One of the safety cultures within an organization that there is a reward system based on observation of safety.	10	14	34	36	41	3.6222	1.22698	1
	7.40%	10.40%	25.20%	26.70%	30.40%			
Management encourages by giving a reward based on observation of safety.	10	17	37	40	31	3.4815	1.18983	2
	7.40%	12.60%	27.40%	29.60%	23.00%			
One of safety culture that there is a system in place for appraisal regarding safety.	13	15	33	47	27	3.4444	1.20736	3
	9.60%	11.10%	24.40%	34.80%	20.00%			

Table 16: Descriptive statistics for factor 5.

	S.D	D.	N.	A	S.A	Mean	SD.	Rank
No one of Health & Safety department reviews safe work procedures after an incident report to try to find out why an	37	24	31	23	20	2.7407	1.40873	5
	27.40%	17.80%	23.00%	17.00%	14.80%			
The company's safety culture does not give us enough time to learn our safe work procedures.	26	32	40	26	11	2.7333	1.21065	6
	19.30%	23.70%	29.60%	19.30%	8.10%			
The clashes in Management rules toward safety make us not always report safety incidents.	15	29	33	40	18	3.1259	1.21821	4
	11.10%	21.50%	24.40%	29.60%	13.30%			
There is a safety-reporting procedure, but poor implementation of safety culture makes us sometimes use them.	11	21	43	47	13	3.2222	1.08357	3
	8.10%	15.60%	31.90%	34.80%	9.60%			
One of the company's safety culture disadvantages isn't everyone getting induction training when they start.	22	15	27	39	32	3.3259	1.38127	1
	16.30%	11.10%	20.00%	28.90%	23.70%			
Poor safety culture has led company management not to work out all the jobs/tasks in the area that have safety risks.	20	16	36	37	26	3.2444	1.30708	2
	14.80%	11.90%	26.70%	27.40%	19.30%			

Table 17: Descriptive statistics for factor 6.

Descriptive Statistics										
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Factor 1: Commitment to Safety Procedure, Training and Practices.	135	3.87	1.13	5	3.6012	1.00407	-1.074	0.209	0.144	0.414
Factor 2: Importance of Safety Culture within Organisation	135	4	1	5	3.3481	1.00979	-0.249	0.209	-0.77	0.414
Factor 3: The influence of poor knowledge about Safety Culture at Workplace	135	4	1	5	3.2242	0.99498	-0.372	0.209	-0.696	0.414
Factor 4: Safety Culture value for employees in the organisation	135	4	1	5	3.2815	1.06611	-0.234	0.209	-0.605	0.414
Factor 5: The reward management system applications and employee performance toward safety culture	135	4	1	5	3.516	1.0072	-0.429	0.209	-0.585	0.414
Factor 6: Poor implementation of safety culture within an organisation	135	4	1	5	3.0654	0.91878	-0.017	0.209	-0.489	0.414

Table 18: Accumulated descriptive statistics for the 6 factors.

the similar versions of these developed countries. The respondents also mentioned in the interview session that the assessment of safety in the construction sites of Saudi Arabia is determined based on the pre-specified checklist of the standard practices, which entails the safe usage of hazardous elements. It was further highlighted by the respondents that the determination of safety policies largely depended on the types of sites based on their size (area covered) and a number of workers employed therein. Moreover, they believed that the safety policy of a construction organization must be developed by the company itself as per their discretion, with a condition that it would not hamper the policies of the country.

Moreover, the factors considered to present significant challenges in the path of maintaining safety culture and performance, in the

construction industry of Saudi Arabia are lack of commitment, improper maintenance of safety regulations and non-existence of safety regulations. Some of the respondents also stated that the construction industry can be hazardous also because of the ignorant attitudes of the contractors towards the workers. When asked about the status of safety policies within the country, the majority of the respondents stated that no safety policies existed within the countries, while some of them also stated that international safety policies were adhered to maintaining their safety culture. For the question on the government's role in the development of safety policies, the respondents conferred that there are inadequate H&S regulations properly published, requiring inspections to be conducted by the government at regular intervals.

The respondents closely associated with the construction industry

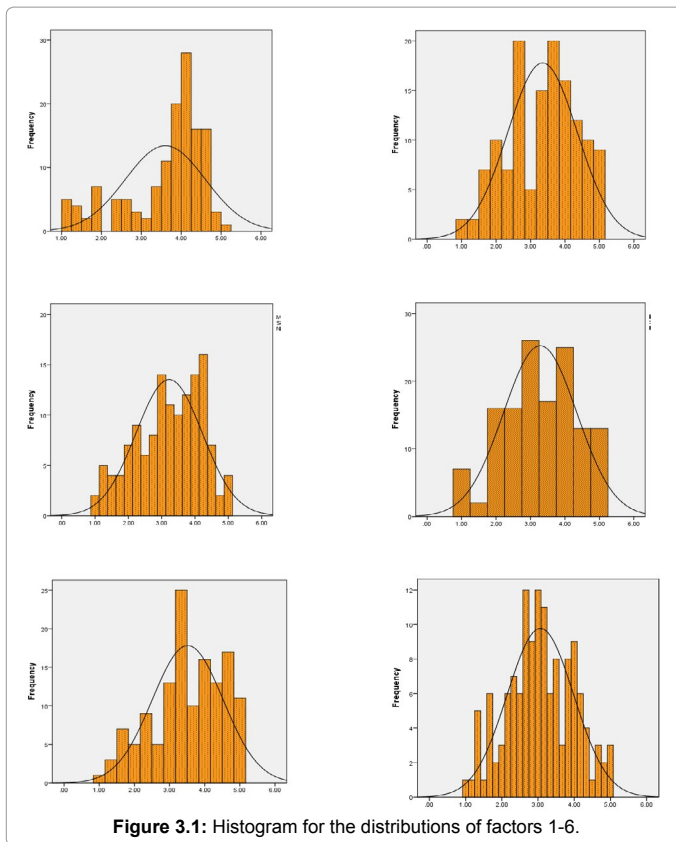


Figure 3.1: Histogram for the distributions of factors 1-6.

of Saudi Arabia also stated that there is a positive relationship existing between safety policy and safety culture, further arguing that these safety policies act as the framework for a particular organization in sustainable decision making. The commitment of an organization towards its safety policy is thus reflected from its culture. Similar outcomes were also received while considering the need for a framework to maintain the safety culture within the Saudi Arabian construction industry. Moreover, it can be understood from the views of the respondents as well as from the secondary data analysis that there were certainly major factors that hampered the improvements of the safety and health practices, such as absence of continuous monitoring, concern for end products, organizational commitment and safety rules infringement (Figure 4).

Case study

The case studies for the three companies have been referred to as Case Study A, B & C, the results for which have been interpreted using the thematic analysis method. The participants of case study A had opined that they did not have any distinct safety culture and hence, had designed them according to the situations' demand. They believed that organizational culture relied largely upon its safety whereby ensuring the introduction and implementation of the safety policy was the discretionary power of the top-level management, who believed it to be expensive and less important pertaining to its end results. Therefore, it is important that the organizational culture can work upon implementing the required safety policies, thereby leading to the improvisation of its safety performance.

Similarly, case study B's participants asserted that they consider safety culture to be a significant element for their organization and hence the management regularly reviews their safety policy. These

ANOVA						
		Sum of Squares	df	Mean Square	*F	*Sig.
F1	Between Groups	11.722	2	5.861	6.271	0.003
	Within Groups	123.372	132	0.935		
	Total	135.093	134			
F2	Between Groups	3.636	2	1.818	1.804	0.169
	Within Groups	133.001	132	1.008		
	Total	136.637	134			
F3	Between Groups	12.625	2	6.313	6.942	0.001
	Within Groups	120.034	132	0.909		
	Total	132.659	134			
F4	Between Groups	18.443	2	9.222	9.093	0
	Within Groups	133.86	132	1.014		
	Total	152.304	134			
F5	Between Groups	7.978	2	3.989	4.115	0.018
	Within Groups	127.959	132	0.969		
	Total	135.937	134			
F6	Between Groups	7.424	2	3.712	4.636	0.011
	Within Groups	105.692	132	0.801		
	Total	113.116	134			

*F: F value for factor one.
 *Sig: If smaller than 0.05 then education has a significant effect on how participants rate F1.
 *df: These are the values in brackets (2,132).

Table 19: ANOVAs stating the impact of education on the 6 factors.

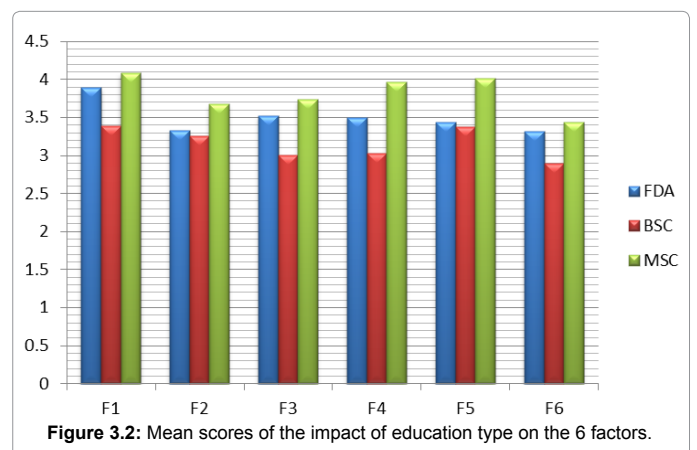


Figure 3.2: Mean scores of the impact of education type on the 6 factors.

participants believed culture to reflect the organization's attitude, which is the sole responsibility of the top level management to ensure their assigned the duties and responsibilities towards the employees. Lack of competency and training amid the managers and the employees hamper their safety culture. The participant finally stated that the safety culture must be a positive one, to prevent the organization and those associated with it from suffering hazards due to poor safety standards.

Correspondingly, the participants of the case study C affirmed that they followed the safety cultures from among three categories ("International Safety Regulation, OSHA, HSE, ISO, ILO", "Local

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
F1	Between Groups	4.302	4	1.075	1.069	0.375
	Within Groups	130.792	130	1.006		
	Total	135.093	134			
F2	Between Groups	4.677	4	1.169	1.152	0.335
	Within Groups	131.96	130	1.015		
	Total	136.637	134			
F3	Between Groups	1.893	4	0.473	0.471	0.757
	Within Groups	130.766	130	1.006		
	Total	132.659	134			
F4	Between Groups	2.013	4	0.503	0.435	0.783
	Within Groups	150.29	130	1.156		
	Total	152.304	134			
F5	Between Groups	11.683	4	2.921	3.056	0.019
	Within Groups	124.254	130	0.956		
	Total	135.937	134			
F6	Between Groups	2.811	4	0.703	0.828	0.51
	Within Groups	110.306	130	0.849		
	Total	113.116	134			

Table 20: ANOVA stating the impact of job type on the 6 factors.

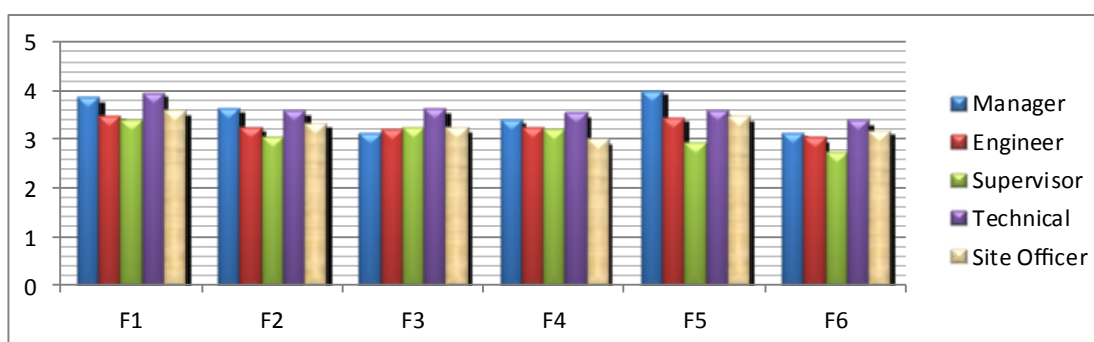


Figure 3.3: Mean scores of the impact of education type on the 6 factors.

Correlations								
		Experience	F1	F2	F3	F4	F5	F6
Experience	Pearson Correlation	1	0.191*	0.202*	0.205*	0.172*	0.222**	0.245**
	Sig. (*2- tailed)		0.027	0.019	0.017	0.046	0.01	0.004
	N	135	135	135	135	135	135	135
F1	Pearson Correlation	0.191*	1	0.727**	0.635**	0.638**	0.690**	0.584**
	Sig. (*2- tailed)	0.027		0	0	0	0	0
	N	135	135	135	135	135	135	135
F2	Pearson Correlation	0.202*	0.727**	1	0.584**	0.509**	0.538**	0.467**
	Sig. (*2- tailed)	0.019	0		0	0	0	0
	N	135	135	135	135	135	135	135
F3	Pearson Correlation	0.205*	0.635**	0.584**	1	0.635**	0.484**	0.725**
	Sig. (*2- tailed)	0.017	0	0		0	0	0
	N	135	135	135	135	135	135	135
F4	Pearson Correlation	0.172*	0.638**	0.509**	0.635**	1	0.486**	0.665**
	Sig. (*2- tailed)							

	Sig.(*2- tailed)	0.046	0	0	0	0	0	0
	N	135	135	135	135	135	135	135
F5	Pearson Correlation	0.222**	0.690**	0.538**	0.484**	0.486**	1	0.493**
	Sig.(*2- tailed)	0.01	0	0	0	0	0	0
	N	135	135	135	135	135	135	135
F6	Pearson Correlation	0.245**	0.584**	0.467**	0.725**	0.665**	0.493**	1
	Sig.(*2- tailed)	0.004	0	0	0	0	0	0
	N	135	135	135	135	135	135	135

*. 2-tailed means that you are not assuming direction of relationship. It could be positive or negative. You are not predicting one or the other, you are just saying that there is a relationship/correlation

*. Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 21: Pearson's correlation coefficient and significance levels.

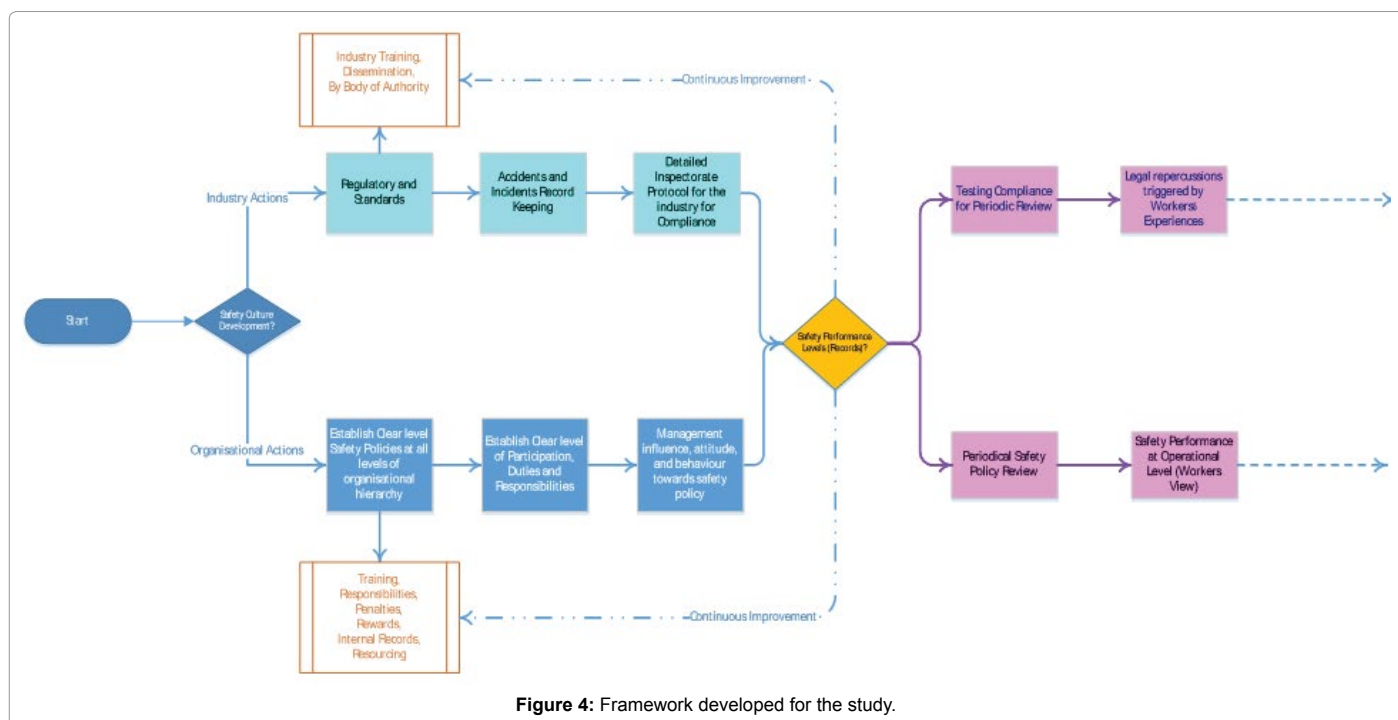


Figure 4: Framework developed for the study.

Country Safety Regulations” and “Client Safety Requirements”) as per their convenience. The determination of the organizational culture and safety policy is the responsibility of the top level managers and it is their commitment to ascertain safety in the working environment. This commitment also influenced the employees to work towards maintaining the organizational culture. However, the ineffective flow of communication and inadequate collaboration among the employees and managers is the reason behind the poor safety culture within the organization, who stated that only framing a safety policy is of no use and hence, implementing them effectively is the most significant matter of concern.

Conclusion

Based on the study findings, it can be argued that maintaining a safety culture in the Saudi Arabian construction industry is undoubtedly a challenging task, as it is subjected to many weaknesses,

as a result of which it faces high risks from accidents on a regular basis. Although the organizations and the associated members selected as respondents have stated that safety culture is followed therein but can hardly be considered the ultimate fact as the statistics and surveys referred indicated a mixed view of the safety policy maintained therein. Implementation of an adequate safety culture requires management commitment, proper safety policy and safe system of work which is a time-consuming process. Although efforts are being taken to practice designing and monitoring safety policy by the construction organization of KSA to some extent, implementation of the policies lack efficiency by a large extent. KSA construction industry needs to significantly improve its safety regulations and policies including its implementation of these policies. Laws have to be laid out for the construction industry to follow and comply with and strict compliance has to be imposed. A government agency has to be set up in order to oversee safety not just in the construction industry but in the workplace as well. Any issues or

gaps in the implementation of safety policies would be detected by this agency and penalties have to be imposed on violators in order to ensure compliance. Therefore, the individuals, as well as the government, need to take measured steps for the proper implementation of the framed safety policy besides inspecting them at regular intervals.

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