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Research Article

Significant Critical Success Factors for The Implementation of Safety Programs in The Construction Industries of Developing Countries

Rahaf Ajaj[1], Mohanad Kamil Buniya[2], Omar Sedeeq Yousif[3], M.K.S. Al-Mhdawi[4], Badr T. Alsulami[5]

1 Department of Environmental and Public Health, Abu Dhabi University, Abu Dhabi, UAE
2 Department of Civil Engineering, Al-Maarif University College, Anbar city, Iraq
3 Department of Building Engineering and Projects Management, Al-Noor University, Nineveh, Iraq
4 School of Computing, Engineering and Digital Technologies, Teesside University, Middlesbrough, UK
5 Civil Engineering Department, College of Engineering and Architecture, Makkah 24382, Saudi Arabia. btsulami@uqu.edu.sa
Correspondence: rahaf.ajaj@adu.ac.ae

Abstract

The construction industry is widely recognized as one of the most hazardous sectors, with accident rates on construction sites significantly higher than in other industries. This study aims to identify the critical success factors that influence the effective implementation of safety programs in the construction industry, particularly in developing countries. To achieve this aim, Iraq was selected as a case study of a developing country, where both semi-structured interviews and questionnaire surveys were conducted with construction experts to identify and rank the critical success factors. This paper highlights the importance of these critical success factors in enhancing the implementation of safety programs and provides valuable insights for policymakers, project managers, and industry stakeholders to develop more effective safety strategies, improve regulatory frameworks, and foster a safer working environment across the construction sector in developing regions.

Keywords: **Success factors; safety program implementation; construction industry; developing countries.**

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Highlights

- Critical Success Factors (CSFs) play a key role in improving the execution of safety initiatives.
- CSFs offer valuable guidance to decision-makers, project leaders, and industry participants.
- CSFs contribute to creating efficient safety plans and promoting a safer workplace.

1 Introduction

The construction industry plays a vital role in fulfilling human development needs; however, it is widely perceived as one of the most hazardous industries [1, 2]. Numerous studies have shown that the construction sector experiences a disproportionately high rate of fatal accidents [3, 4]. According to the National Safety Council, individuals working in the construction industry face a 1 in 300 chance of being fatally injured on the job [5]. Similarly, Sawacha, et al. [6] highlighted that the construction industry has one of the highest accident rates globally. Nadhim, et al. [7] reported alarming accident rates in various countries, including 40% in Japan, 50% in Ireland, and 25% in the UK. The situation is often worse in developing countries, where safety standards are significantly lower due to inadequate safety regulations. In such contexts, safety policies either do not exist or are poorly implemented and ineffective [8].

Implementing effective safety programs can significantly enhance workplace safety by establishing safer processes and working environments, ultimately reducing accident rates [9]. Such programs also help foster a strong safety culture within organizations by encouraging collaboration between management and workers in the application of safety measures [10]. Beyond improving on-site safety, effective safety programs can also reduce equipment and tool damage, prevent project delays, and enhance the organization's reputation [11]. Key success factors that contribute to the effectiveness of these programs include worker involvement, management commitment, adequate resource allocation, and teamwork—elements commonly cited in success stories related to improved safety performance [11].

2 Literature Review

2.1 Construction Safety Program

Several researchers have defined the concept of a safety program, with most definitions emphasizing the systematic efforts undertaken to prevent workplace injuries and promote a safe working environment. Anton [12] defined a safety program as "the control of the working environment, equipment, processes, and the workers to reduce accidental injuries and losses in the workplace." Similarly, Rowlinson [13] described a "safety and health program" as "a term that describes what people are doing to control injuries and illnesses at their workplace," highlighting the active role of individuals and management in maintaining workplace safety. Furthermore, [13] emphasized that the primary objectives of implementing a safety program on construction sites are to discourage improper and unsafe behaviors that may result in accidents, ensure that potential hazards are promptly identified and reported, and guarantee that accidents are recorded, investigated, and addressed in an appropriate and timely manner. An effective safety program typically includes a structured set of policies, procedures, and practices designed to identify hazards, assess risks, implement control measures, and continuously monitor and improve safety performance. These programs may involve safety training, regular site inspections, hazard reporting mechanisms, emergency preparedness planning, and the enforcement of personal protective equipment (PPE) usage. Additionally, successful safety programs encourage employee participation and promote a culture of safety where all workers are actively involved in identifying and mitigating risks. Effective safety programs can significantly reduce the occurrence of workplace accidents by addressing unsafe work practices, improving hazard awareness, and fostering a safe and health-conscious working environment [9]. When properly implemented, these programs not only contribute to the physical well-being of workers but also

enhance organizational efficiency by minimizing downtime, reducing costs associated with accidents, and boosting employee morale and productivity. Ultimately, safety programs serve as a critical foundation for achieving sustainable safety performance in construction project.

2.2 Critical Success Factors Affecting Safety Program Implementation

The factors that contribute to the success of projects are commonly referred to as Critical Success Factors (CSFs). These are defined by Rockart [14] as "areas in which results, if they are satisfactory, will ensure success within and of the organization." Moreover, the implementation of an effective safety program depends on certain expected events or activities that are required to occur [15, 16]. According to previous research, 22 key factors have been identified as essential for the successful implementation of safety programs. Table I summarizes these factors as identified in earlier studies and examines them in the context of the Iraqi construction industry to support effective safety program implementation.

Table I. Safety program success factors.

No	Items	References
1	Personal attitude	Attitude is the ability to react positively or negatively to certain persons, objects, or conditions, typically established through experience. If the positive attitudes of employees toward safety are reinforced, a successful safety program can be achieved
2	Personal motivation	In order to ensure commendable safety records, all employees in the workplace should be motivated to perform their responsibilities safely by the possibilities of achievement, recognition, the opportunity for additional responsibilities, rewards, and personal growth.
3	Safety meeting	To enhance safety performance, regular safety meetings must be organized to review the safety records
4	Efficient enforcement system	to ensure workers follow the safety rules and regulations, management should provide an efficient enforcement scheme that leads to faceless cases of breaches by employees
5	Suitable Supervision	The employer should provide appropriate supervision to protect workers from workplace hazards. Successful supervision can make the environment safe by collaborating with workers and listening to them to be sure all workers follow the rules and regulations, therefore finding the solution for the occurring safety problems
6	Training	If the employees receive adequate safety training programs, that will lead to improving the employees' knowledge and skills on safety at the workplace and safety behaviors and attitudes
7	Equipment and maintenance	To ensure the workplace is always in a safe condition, the management should provide appropriate equipment and do regular maintenance
8	Personal competency	The right person is on the right job to have a successful safety program. The result of this action is the ability of the individual to do the right thing at the right time by using experience and skills to identify the hazard and make the right decisions
9	Program evaluation	After implementing a safety program, an evaluation should be conducted periodically to determine its success in meeting the objectives and goals. If the safety program does not meet the goals, the evaluation can identify its deficiencies.
10	Good communication	Communication between all levels of project staff (top management, workforce) and workers can prompt reports of unsafe and hazardous working practices.
11	Allocation of authority and responsibility	To ensure safety and carry adequate and appropriate actions and decisions, the authority and responsibility should be assigned to workers
12	Adequate resources allocation	Adequate resources can make the safety program succeed. The resources for safety programs include time, money, sufficient staff, information, and methods used in safety works
13	Management Support	In an effective safety program, management plays a very important role. Management should allocate sufficient resources, write a comprehensive safety policy, prepare a regular safety meeting, visit the workplace,
14	Teamwork	Safety programs succeed when all levels of staff are engaged and realize that preventing accidents is everyone's responsibility. The goals of safety programs can be achieved by cooperating in the workplace between all levels of staff, such as planning, controlling, and handling problems.
15	Clear and realistic goals	Safety goals should be established; the goals should be clear to provide a clear direction for all staff to reach the desired results. By completing the goals, safety performance can be easily measured

16	Continue participating of employees	Employee involvement is very important for a successful safety program. The worker should have a chance to participate in implementing the safety program.
17	Safety Committee	A committee including supervisors, managers, and workers to address safety and health at workplace activities such as meetings and inspections.
18	Site system inspection	The safety inspection aims to assess the sites to identify uncontrolled hazardous exposure to work and violations of safety regulations and policies
19	Hazard Identification	The aim is to check all construction practices and materials in order to identify the possible hazards which cause accidents or injuries
20	Pre-task planning for safety	Meetings conducted shortly before the work begins, such as mini training for each project to recognize the potential hazards of the tasks
21	Safety Policies	Having high-quality safety policies and regulations leads to improved management and workforce attitudes toward safety performance
22	Technology	Technology can be used to enhance in many different ways

3 Methodology

Following the identification of 22 success factors via the literature review, the authors conducted semi-structured interviews with nine construction experts in Iraq to validate the identified factors. Interviews were selected due to their ability to provide in-depth insights, allow for clarification of complex issues, and capture expert opinions based on practical experience [10]. Following this, a questionnaire survey was developed and administered to construction experts in Iraq to rank the identified factors. Surveys were selected as a data collection tool due to their ability to reach a wider audience, facilitate quantitative analysis, and enable the systematic comparison and prioritization of the identified success factors. A Likert scale was used in the questionnaire survey to offer respondents a broader range of response options [17, 18]. The scale ranged from 1 (strongly disagree) to 5 (strongly agree)[19]. To this end, a total of 320 questionnaires were distributed to respondents, and 204 completed the survey [20]. Eight responses were identified as invalid, and ultimately, 196 questionnaires were considered valid for this study.

4 Results and Discussion

4.1 Respondents' Features and Demographic Profiles

Table II presents the distribution of respondents across various demographic variables, including gender, experience, position, level of education, organization type and function, familiarity with safety, participation in safety training, perceived importance of safety programs, availability of safety policies, and adherence to safe work practices. The effective implementation of safety programs is influenced by the level of awareness and knowledge among personnel. As shown in Table 2, the majority of respondents (87.8%) had not attended any safety training, indicating a generally low level of safety knowledge. Furthermore, only 28% of respondents reported the existence of a safety policy within their organizations. This lack of safety policy is concerning, as it reflects the limited attention given to safety in the Iraqi construction industry. Given that over 60% of the participants were employed by public sector organizations, these findings suggest that the government is not taking adequate steps to enforce safety regulations in the construction sector.

Table II. Frequency of the demographic characteristics.

Variable	Level	Freq	%
Gender	Male	169	86.2
	Female	27	13.8
Experience	5 years or less	31	15.8

	6 to 10 years	48	24.5
	11 to 15 years	67	34.2
	16 to20 years	31	15.8
	More than 20 years	19	9.7
	5 years or less	39	19.9
	6 to 10 years	52	26.5
Present organization	11 to 15 years	66	33.7
	16 to20 years	19	9.7
	More than 20 years	20	10.2
	Director	11	5.6
	Senior manager	16	8.2
Current position in your organization	Project manager	53	27
	Site engineer	89	45.4
	Manager	27	13.8
	Diploma	12	6.1
Education	Bachelor	111	56.6
	Master	60	30.6
	PhD	13	6.6
Organization type	Public	120	61.2
	Private	76	38.8
	Client/developer	81	41.3
Organization function	Consultant	63	32.1
	Contractor	52	26.5
	Totally familiar	25	12.8
	Familiar	105	53.6
Familiarity with safety	Moderately familiar	46	23.5
	Not familiar	17	8.7
	Totally not familiar	3	1.5
Attended any formal safety training	Yes	24	12.2
	No	172	87.8
	Strongly disagree	8	4.1
	Disagree	7	3.6
Importance of Safety Program	Neither agree nor disagree	37	18.9
	Agree	49	25
	Strongly agree	95	48.5
Policy	Yes	54	27.6
	No	142	72.4
	Strongly disagree	7	3.6
	Disagree	11	5.6
Safety work practices in the projects.	Neither agree nor disagree	46	23.5
	Agree	62	31.6
	Strongly agree	70	35.7

4.2 Ranking of Success Factors

Table III presents the descriptive statistics for the key success factors influencing safety program implementation, categorized into four subscales: Worker Involvement (5 items), Safety Prevention and Control System (9 items), Safety Management (4 items), and Safety Commitment (4 items). Each item was measured using a 5-point Likert scale.

In the Worker Involvement subscale, Personal Attitude (M = 3.71, SD = 0.90) and Motivation (M = 3.71, SD = 1.00) recorded the highest mean scores, indicating that workers' individual drive and willingness to engage in safety practices are perceived as essential. The lowest score was associated with Safety Committee participation (M = 3.57, SD = 0.96), suggesting limited worker engagement in formal safety groups. The overall mean score for this subscale was M = 3.65, indicating a moderate level of worker involvement.

For the Safety Prevention and Control System subscale, Pre-task Planning for Safety had the highest mean (M = 3.97, SD = 0.75), highlighting its perceived importance in minimizing risks before work begins. Conversely, Technology received the lowest score (M = 3.49, SD = 0.95), implying that safety-related technologies are either underutilized or not fully trusted. The overall mean for this subscale was M = 3.60, reflecting a moderate level of implementation.

In the Safety Management subscale, Hazard Identification was rated the highest (M = 3.81, SD = 1.04), indicating strong recognition of its role in ensuring a safe working environment. Communication received the lowest mean (M = 3.69, SD = 0.93), pointing to potential issues in effectively sharing safety information across teams. The overall mean of M = 3.73 suggests a relatively high level of safety management practices.

The final subscale, Safety Commitment, showed that Management Support (M = 3.80, SD = 0.93) and Safety Policies (M = 3.80, SD = 0.90) were rated the highest, emphasizing the critical role of leadership and formal guidelines. Teamwork had the lowest mean score (M = 3.66, SD = 0.88), which may indicate a need for stronger collaboration among workers in safety-related matters. The overall mean for this subscale was M = 3.74, suggesting a moderately high level of organizational commitment to safety.

Table III. Descriptive statistics related to the success factors of safety program implementation.

Component	Item	Mean	SD	RII	Ranking	Group Ranking
Worker Involvement	Personal Attitude	3.71	0.99	0.742	6	3
	Motivation	3.71	1.00	0.742	5	
	Safety Meeting	3.60	0.93	0.720	18	
	Safety Committee	3.57	0.96	0.714	19	
	Continuing participation	3.65	0.94	0.730	14	
	Total	3.65	0.84			
Safety prevention and Control system	Enforcement scheme	3.61	0.87	0.722	17	4
	Suitable number of OHS staff	3.62	0.96	0.723	16	
	Training	3.65	1.12	0.730	15	
	Equipment and maintenance	3.55	1.07	0.709	20	
	Personal Competency	3.69	1.15	0.739	9	
	Program Evaluation	3.51	1.07	0.701	21	
	Pre-task planning for safety	3.97	0.75	0.795	1	
	Site system inspection	3.67	1.09	0.734	12	
	Technology	3.49	0.95	0.698	22	
	Total	3.60	0.86			
Safety Management	Communication	3.69	0.93	0.739	10	2
	Allocation of authority and responsibility	3.71	0.86	0.742	7	
	Appropriate Resource Allocation	3.70	0.95	0.741	8	
	Hazard identification	3.81	1.04	0.762	2	
	Total	3.73	0.83			
Safety Commitment	Management support	3.80	0.93	0.760	3	1

Component	Item	Mean	SD	RII	Ranking	Group Ranking
	Teamwork	3.66	0.88	0.732	13	
	Clear and realistic goals	3.69	0.90	0.739	11	
	Safety policies	3.80	0.90	0.760	4	
	Total	3.74	0.79			

5 Conclusions

This study aimed to identify and rank the CSFs influencing the effective implementation of safety programs in the Iraqi construction industry, serving as a representative case of developing countries. A total of 22 success factors were identified, reflecting a comprehensive range of organizational, managerial, and operational elements necessary for improving construction site safety. Among these, the top three factors—pre-task planning for safety, hazard identification, and management support—were found to be the most influential in achieving effective safety program outcomes. These findings underscore the importance of proactive safety measures, such as planning tasks with safety considerations from the outset, systematically identifying and mitigating potential hazards, and ensuring continuous commitment and involvement from top management. The emphasis on pre-task planning and hazard identification highlights the critical need for integrating safety considerations into the early stages of project execution rather than relying solely on reactive measures. Likewise, the prominence of management support reflects the role of leadership in allocating resources, setting safety standards, and fostering a safety-oriented culture across all levels of the organization. Practically, these insights offer a structured framework for construction companies and industry stakeholders to prioritize their safety efforts and develop targeted strategies for improving on-site safety performance. Organizations can use the ranked CSFs as a benchmarking tool to assess their existing safety practices, identify areas for improvement, and guide resource allocation toward the most impactful areas. On a theoretical level, this research contributes to the construction safety management literature by contextualizing CSFs within a developing country environment, where safety regulations, practices, and cultures often differ significantly from those in developed countries. It emphasizes the need for more context-sensitive models of safety program implementation that account for the unique challenges in developing economies, such as regulatory limitations, workforce training gaps, and cultural attitudes toward safety. Despite these contributions, the study has certain limitations, including its focus on data collection from major cities due to funding constraints and the potential for common method bias due to the survey-based approach. Future studies should build on these findings by applying qualitative research methods, such as interviews or case studies, to gain deeper insights into the dynamics of safety program implementation and explore how these CSFs interact within different organizational and project environments.

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Data Availability Statement

The data study supporting this study's findings are available from the corresponding author upon reasonable request. The data are not publicly available due to privacy or ethical restrictions.

Conflicts of Interest

The authors declare no conflict of interest.

References

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