Examining Respondent Frequency in Construction Site Safety Practices

Dr. Hassan Al-Mukhtar*

Associate Professor, Department of Civil Engineering, Faculty of Engineering, Al Zahra University of Science and Technology, Rabat, Morocco

ABSTRACT

Safety management is being operated in some sectors in India. But it is common to find this system in construction industry. There are many hindrances that make it difficult to apply the system effectively due to the nature of construction and therefore no objective way to measure the effectiveness of this system exists in construction industry. The present research addresses three major concerns. The first is to evaluate the effectiveness of safety management in construction projects. The second is to identify the critical factors affecting the safety management. The third is to propose an implementation framework for safety management in construction projects. Through a survey questionnaire, an attempt has been made to explore the best safety management practices to be followed in construction projects. The main objective of this research work is to evaluate the critical factors that affect the safety management on safety in construction projects. A total of 343 data were collected and analyzed using statistical techniques with the help of SPSSv21 software.

KEYWORDS: analysis; construction projects; factors; management; safety management;

I. INTRODUCTION

Construction Industry is an essential part of infrastructure development which gives incredible boost to our country's economy. The Indian construction industry has registered massive growth for the past 20 years. The technology development is rapid in most of the industries, still labourers are demanding in construction. In India, next to agriculture, the construction sector employs around 36 million. The construction labourers are one of the most vulnerable segments of the unorganized labourers in our country. Labourers being exposed to a wide variety of risks, the rate of deadly mishaps in the construction sector are 5 times that of the other sectors.
As per Ministry of Human Resource Department survey 165 per 1,000 workers get injured during construction activities. The labourers are exposed to a host of hazardous substances, which have a potential to cause serious diseases such as asbestosis, silicosis, lead poisoning etc.

The major construction accidents are 56% falls from height, 21% overturning or collapse, 10% struck by a moving vehicle, 5% contact with electrical discharge or electricity, 4% struck by a falling object during machine lifting of materials, 3% contact with moving machinery or materials being machined and 1% exposure to a hot or harmful substance.

The present study involves identification of those factors which are to be monitored so as to avoid any possible safety hazard in the execution of the project. The factors in the questionnaire was designed based on the construction site safety difficulties faced by the safety officers, site in-charge, project manager, assistant general manager and general manager. Difficulties arise at a particular stage not only due to certain reasons cropping at that particular stage, but also due to certain aspects which are not given due consideration in any of the early stages. The information for the present survey was collected from 343 respondents. The factors were included under five groups of aspects which are to be studied carefully so that no detail is omitted at the project execution stage.

II. LITERATURE REVIEW

Jaselskis and Recarte Suazo (1993) conducted a survey of construction site safety in Honduras. A questionnaire was used to collect safety-related information from construction workers, field management and upper management in the Home Office on residential, commercial and heavy civil construction projects in San Pedro Sula, Honduras. Data were collected using face-to-face interviews - 108 construction workers, 10 field managers and 8 senior managers participated. Data were analysed using correlation, regression and analysis of variance techniques. Results demonstrated a substantial lack of awareness or importance for safety at all levels of the construction organization. Workers rarely wore personal protective equipment, used poorly constructed scaffolds, improperly used tools and ladders and disregarded good housekeeping practices. Almost three quarters of the craftsmen suffered at least one lost-time accident; many of their injuries were in expected locations on their bodies given the nature of their work and the site conditions. Many of the field project managers stated that they did not provide workers with personal protective equipment or safety training and did not use a dedicated safety person on-site. Top level management does not appear convinced that it was in their best interest to improve safety performance since only approximately 25% provided a company-wide safety training programme, maintained accident records and provided safety incentives. Additional results,

recommendations for improving construction safety in Honduras, study limitations and future research areas were also identified.

Sawacha, Naoum and Fong (1999) studied the factors affecting safety performance on construction sites. The impacts of the historical, economical, psychological, technical, procedural, organizational and the environmental issues were considered in terms of how these factors were linked with the level of site safety. The historical factor was assessed by the background and characteristics of the individual, such as age and experience. The economic factor was determined by the monetary values which were associated with safety such as, hazard pay. The psychological factor was assessed by the safety behavior of fellow workers on site including supervisors. The technical and procedural factors were assessed by the provision of training and handling of safety equipment on site. The organizational and environmental factors were assessed by the type of policy that the management adopts to site safety. Information regarding these factors were correlated with accidents' records in a sample of 120 operatives. Results of the factor analysis suggest that variables related to the `organization policy' were the most dominant group of factors influencing safety performance in the United Kingdom Construction Industry. The top five important issues found to be associated with site safety were: (1) management talk on safety; (2) provision of safety booklets; (3) provision of safety equipment; (4) providing safety environment and (5) appointing a trained safety representative at site.

Hinze and Gambatese (2003) analysed the factors that influence safety performance of specialty contractors. The study consisted of separate surveys of three different specialty contractor populations - a contractors belonging to various treades located primarily in southern Nevada, roofing contractors in the state of Florida, and the regional offices of a large, nationwide mechanical contractor. While there appeared to be contradictions between the surveys in some areas, the study concluded that specialty contractor safety performance was consistently influenced, in part, by a number of factors. The factors shown to positively affect safety performance include minimizing worker turnover, implementing employee drug testing with various factors, initiating the testing, and training with the assistance of contractor associations. Safety incentive programs were not necessarily associated with better safety performance. Growth in company size was found to be associated with improved safety performance as well.

Choudhry, Fang and Lingard (2009) conducted a study on measuring safety climate of construction projects in Hong Kong. 71 questionnaires were analyzed using Health and Safety climate survey tool. Seven additional items were included to make the questionnaire suitable for the safety managers in Hong Kong. The questionnaire was examined for content validity, structure validity and offensiveness of the language. The questionnaire was presented in English and Chinese and consisted of 42 states about safety issues. Factor analysis was used to identify the underlying cluster of factors which affected the safety climate. This technique revealed two dimensions: management commitment and employee involvement and inappropriate safety procedure and work practices.

Hallowell, Hinze, Baud and Wehle (2013) studied the proactive construction safety control: measuring, monitoring, and responding to safety leading indicators. When constructing and updating the built environment, ensuring safety of all parties involved is of utmost importance. Traditionally, safety has been measured and managed reactively, where actions were taken in response to adverse trends in injuries. Alternatively, safety-related practices can be measured during the construction phase to trigger positive responses before an injury occurs. Despite the potential benefits of such strategies, few have been identified in the literature and there has yet to be an organized effort to codify and investigate these methods. A mixed-methods research approach was used to (1) clearly identify and define elements of the safety management process that can be measured and monitored during the construction phase, (2) describe resource requirements for measurement, monitoring, and response, and (3) describe specific management actions required when any indicator fails to satisfy a desired value. To produce internally and externally valid and reliable results, data were triangulated from case studies, content analysis of award-winning projects, and focused discussions among construction safety experts. In total, over 50 proactive metrics were identified, 13 of which were selected as top priority by expert professionals. Use of these indicators has been connected to exceptional safety performance in industry-leading organizations. The implication of the findings was that very strong safety outcomes can be expected if contractors build upon a robust safety management foundation with the use of these methods of project safety control.

Terwel and Jansen (2014) investigated the critical factors for structural safety in the design and construction phase. Various investigations concluded that the primary causes of failure were design and construction errors within the building process. However, the exact factors that played a significant role were not clear. Therefore, the primary focus of this study was to improve structural safety by determining the influencing factors for structural safety within the design and construction process. First, a theoretical framework was developed, based

on safety science and management literature. In particular, the concept of critical success factors shows that the factors within projects were essential to reach the stated goals. The factors mentioned by the author played a role within some documented structural failures in the Netherlands. Based on this framework, a questionnaire was established. In this questionnaire, participants from the building industry were asked to indicate the extent to which factors from the theoretical framework were present in successful and less successful projects. In addition, they were asked to select the greatest determining factors for structural safety, in their opinion, from a list of possible factors. The results were statistically analyzed. Factors concerning the interrelations between various project partners had the largest impact on structural safety: communication and collaboration, control mechanisms, allocation of responsibilities, structural risk management and safety culture. These factors were designated as the critical factors for structural safety, which were essential to assure structural safety within projects

III. STUDY AREA

The study area selected was in and around the Southern part of India. Southern division of India is booming with developments in areas of industrial buildings, high rise residential apartments, commercial buildings, educational institutions, healthcare, highway and airport.

IV. DATA COLLECTION

The methodology adopted was descriptive survey. Safety officers, site in-charge, project manager, assistant general manager and general manager who were involved in various construction projects in three different areas (Contractor, Client and Consultant) at present and in the past were personally interviewed. The objective of the interview was to discuss and identify the factors of ground reality and practical nature which are responsible for construction hazards.

V. DATA ANALYSIS

The demographic information of the respondents' frequency is given in Table 1

Table 1 Demographic Information of the Respondents Frequency

Description	Frequency	Percent
Age Group		
More than 45 years	31	9.03
41 to 45 years	79	23.03
36 to 40 years	102	29.73
31 to 35 years	92	26.82
Less than 30 years	39	11.37
Working Experience		
More then 21	69	20.11
16 to 20	84	24.49
11 to 15	98	28.57
6 to 10	67	19.534
Les then 5	25	7.28
Respondent Designation		
Safety Officer	73	21.28
Site, In-Charge	75	21.86
Project Manager	78	22.74
Assistant General Manager	65	18.95
General Manager	52	15.16
Existing Project Cost (Rupees)		
More than 400 crore	66	19.24
300 to 400 crore	99	28.86
200 to 300 crore	109	37.77
100 to 200 crore	45	13.11
Less than 100 crore	24	6.99
Experience in Existing Company		
More than 12 years	32	9.32
10 to 12 years	37	10.78
7 to 9 years	82	23.90
3 to 6 years	93	27.11
Less than 3 years	99	28.86

Respondent Side		
Contractor	159	46.36
Client	139	40.52
Consultant	45	13.12

Age Group

The age group was carefully identified through the response of the respondents. Most of the respondents are 31 to 45 years age group. The respondents' age group information was as follows: 9.03% have more than 45 years of age, 23.03% have 41 to 45 years of age, 29.73% have 36 to 40 years of age, 26.82% have 31 to 35 years of age and 11.37% have less than 30 years of age as shown in Fig. 1.

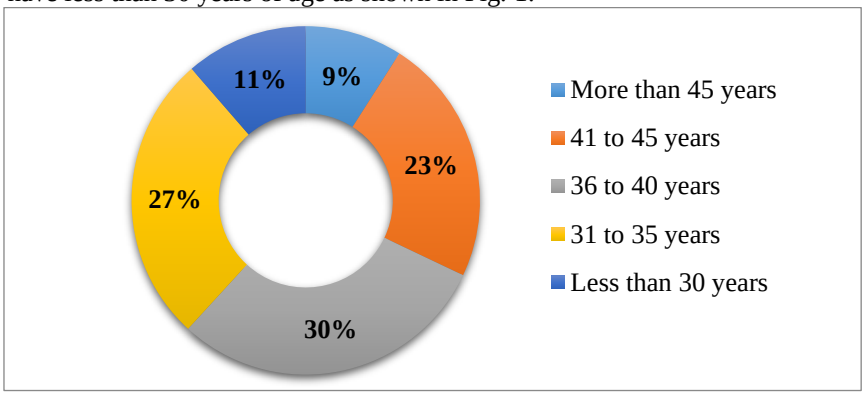

Fig. 1 Age Group

Working Experience

This working experience information helped in confirming that the data were rational, since the majority of the respondents were experienced. The year of working experience distribution was as follows: 20.11% have more than 21 years experience, 24.49% have 16 to 20 years of experience, 19.53% have 11 to 15 years of experience, and 7.28% have less 5 years of experience as shown in Fig.2.

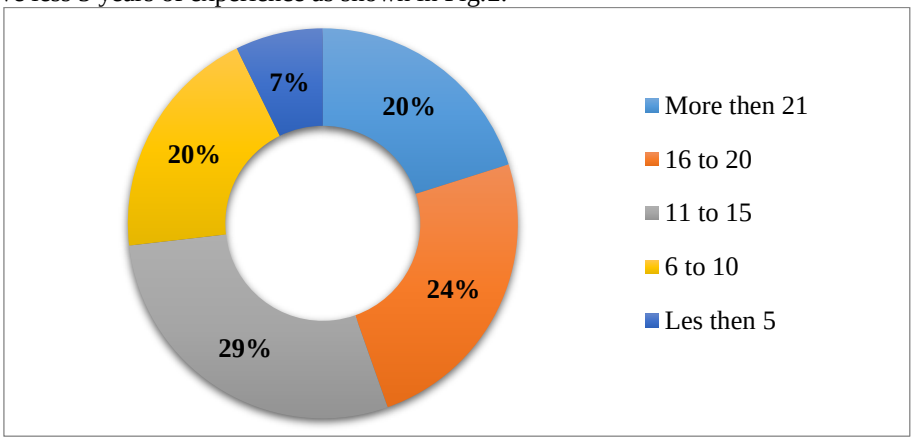

Fig. 2 Working Experience

Respondent Designation

The response from the safety officer, site in-charge and the project manager was more replays for the questionnaire and it's more than 65%. The frequency level of the respondents was as follows: safety officers 21.28%, site in-charges 21.86%, project manager 22.74%, assistant general manager 18.95% and general manager 15.16%. Most of the safety officers were qualified with minimum of Diploma in fire and safety and some of them had completed OSHA (Occupational Safety and Health Administration) and NEBOSH (National Examination Board in Occupational Safety and Health) having 6 to 10 years of experience in construction safety. The site in-charges, project managers, assistant general managers and general managers were qualified with B.E.,(Civil) and Post Graduates having more than 15 years experience as shown in Fig.3.

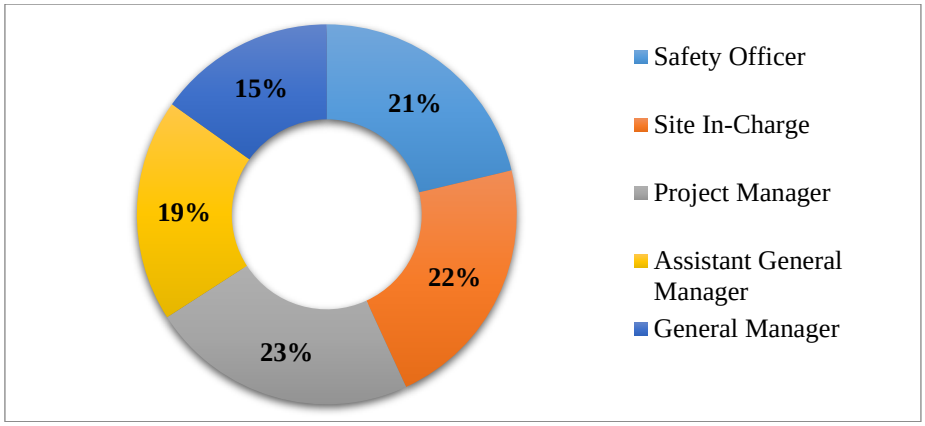

Fig. 3 Respondent Designation

Existing Project Cost (Rupees)

The project cost is influencing the required level of safety in construction. At the estimating time, the project manager must allot sum percentage of fund for safety. The percentage of funds depends upon the project cost. The respondent existing project costs were as follows: 19.24% having rupees more than 400 crores, 28.86% having rupees 300 to 400 crores, 37.77% having rupees 200 to 300 crores, 13.11% having rupees 100 to 200 crores and 6.99% having rupees less than 100 crores as shown in Fig. 4.

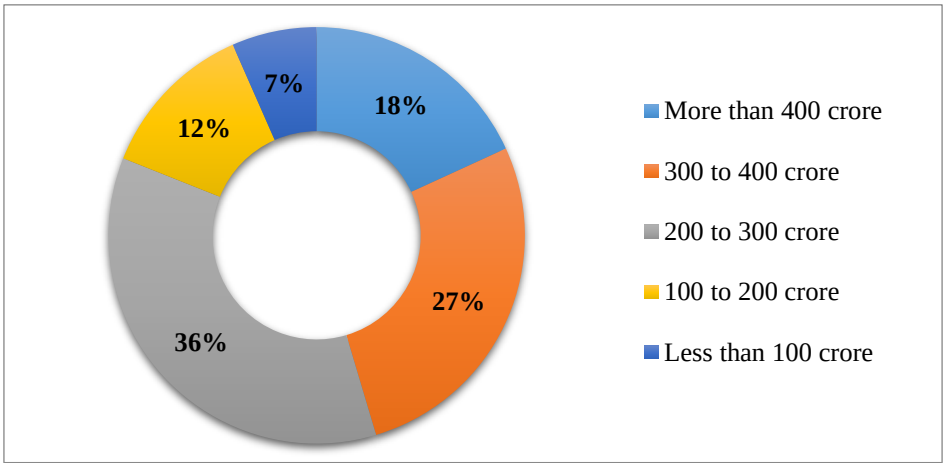

Fig. 4 Existing Project Cost (Rupees)

Experience in Existing Company

The demographic information was collected to identify and understand the consistency of the respondents. The experience in existing company frequency level were as follows: 9.32% have more than 12 years experience, 10.78% have 10 to 12 years experience, 23.90% have 7 to 9 years experience, 27.11% have 3 to 6 years experience and 28.86% have less than 3 years experience as shown in Fig. 4.6. Most of the response level is less than 9 years experience in existing companies.

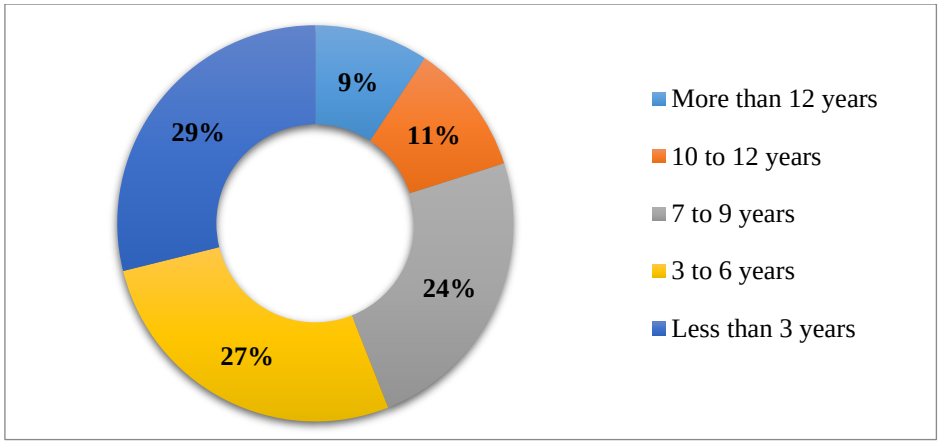

Fig. 5 Experience in Existing Company

Respondent Area

The respondent area is grouped under three categories for descriptive statistics analysis. The respondent area frequency levels were as follows: 46.36% have contractor, 40.52% have Client and 13.12% have consultant as shown in Fig.6. Contractor and Client sides were more than 85% of respondents; Consultant side was less than 15% only.

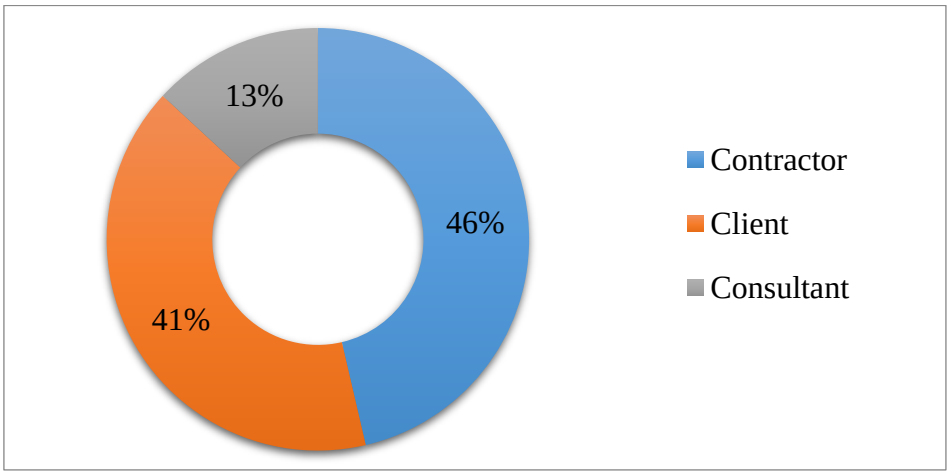

Fig.6 Respondent Area

VI. CONCLUSIONS

The demographics of respondents were discussed in detail. The survey response score percentage of each respondent group was discussed in detail in this study. The respondents are classified in Age group, working experience, Respondent Designation, Existing Project Cost (Rupees), Experience in Existing Company and Respondent Area. This study of survey helps to identify the ground reality if the respondents level of response. The response percentage is very vastly different from one to another, it indicates the level of social responsibilities respondents. The respondents shod increase the enrollment of social responsibilities it helps to reduce the mane and material loss and increase the completion of the projects.

VII. REFERENCES

[1] Jaselskis, E. J., & Recarte Suazo, G. A. (1994), A Survey of Construction Site Safety in Honduras, Construction Management and Economics, 12(3), 245-255.
[2] Sawacha, E., Naoum, S., & Fong, D. (1999). Factors affecting safety performance on construction sites. International journal of project management,17(5), 309-315.
[3] Hinze, J., & Gambatese, J. (2003), Factors that Influence Safety Performance of Specialty Contractors, Journal of Construction Engineering and Management,129(2), 159-164.
[4] Choudhry, R. M., Fang, D., & Lingard, H. (2009), Measuring Safety Climate of a Construction Company, Journal of Construction Engineering and Management, 135(9), 890-899.

[5] Hallowell, M. R., Hinze, J. W., Baud, K. C., & Wehle, A. (2013), Proactive Construction Safety Control: Measuring, Monitoring and Responding to Safety Leading Indicators, Journal of Construction Engineering and Management, 139(10), 223-239.
[6] Terwel, K. C., & Jansen, S. J. (2014). Critical Factors for Structural Safety in the Design and Construction Phase, Journal of Performance of Constructed Facilities, 29(3), 94-103.