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STRATEGIES FOR IMPROVING THE SAFETY PERFORMANCE OF CONSTRUCTION CONTRACTORS

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ABSTRACT: This paper aims to determine the most effective strategies for improving the safety performance of construction contractors, and it was conducted in the east part of Libya. The research instruments were fully tested using 254 randomly selected respondents in the construction companies in the eastern part of Libya. Of the 254 distributed questionnaires, only 202 were returned and were included in the analysis, with a response rate of 79.5%. The findings from this paper has proposed some recommendations, one of these recommendations, was that government should introduce a special task force to conduct safety inspections at work sites to ensure that the workplace and work environment is safe and suitable and another interesting recommendation was for construction contractors companies to evaluate safety performance regularly to identify weaknesses and try removing them or at least minimize their effects on the overall performance of projects. This will lead to maintain company's reputation and increase opportunities of firm to get more tenders.

Keywords: Safety Performance, Strategies, Contactors, Construction Industry, Libya

1. INTRODUCTION

The construction industry is a key sector in the economy whose input is required for the economic advancement of any nation. It provides the basic infrastructure needed for both social and economic development and at the same time directly contributes to the growth of the economy as a major player (Drewer, 1980). It is, however, one of the riskiest places to work (Chua and Goh, 2004). The defined function of the construction industry, which is applicable to both advanced and emerging economy, is the building of facilities, accomplished through the combination of various resources that are then transformed into these facilities after undergoing any or some of the following processes of planning, designing, constructions, maintenance, or repairs. The end result is the production of a public or private structure that comes in the form of either residential or non-residential buildings, or heavy-duty infrastructures. It is the presence of these visible structures that provide the bedrock for economic advancement. The notion of safety culture is a useful indicator of how much influence the Libyan government wields on contractors' attitude towards safety in the construction industry. Safety culture is the safety belief and behavior practiced within an organization. Organizations practice safety culture that are primarily motivated by the chief contractors or management staff, who through deeds and utterances raise or restrict the level of safety awareness within the establishment. These employees initiate and maintain, which directly relates to safety performance. In most countries, the construction industry contributes considerably to the GDP; they stimulate the development of other industries which, in turn, contribute more directly to economic growth. One of such contributions is employment creation. Closely aligned with the question of employment creation is that of income generation and re-distribution. A usual concomitant of underdevelopment is low per capita income, a condition generally made even more

serious by the accompanying inequitable income distribution. Through the many direct and indirect means by which construction creates employment it also generates income. The rapid pace of industrialization and over reliance on foreign specialists in Libya places huge burden on the construction industry of the country (Ngab, 2010) although, recently, the quality of safety in Libyan construction industry has been experiencing drastic changes from the norm due to the introduction of the ISO quality policy by the government. Each year, more and more contractors are acquiring the ISO 9000 quality management system certification. But the contractors' know-how is inadequate on ways of implementation of the ISO quality within the Libyan settings, which creates a major challenge to safety performance (Sayah, 2006). Libya is presently experiencing another massive explosion in constructions that will surpass the construction boom of previous decades. More homes would be built, with the war-ravaged airports and seaports rebuilt and new ones erected, and the road network refurbished and additional ones constructed. Not to be left out of this growing frenzy of constructions are the building of hotels, offices and resorts to meet the growing demand of the tourism industry. All these require stringent safety performance measures so as to improve the performance index of construction contractors in Libya as a way of reducing accidents that could lead to wanton loss of lives and properties. The safety standard in Libya's construction industry is poor (Al-Kilani, 2011). He further observed that in recent decade, the injury and fatality rate in Libya's construction sites has escalated. This condition is influenced by the opening up of this sector to foreign investments. A lot of these investments are focused on the east of Libya where most of the civil war in 2011/2012 took place thereby resulting in damages to buildings and other infrastructures. Hence, the numerous infrastructure building projects going on there. While approving the numerous infrastructural projects in Libya, the Libyan government has been unable to keep pace with the huge inflow of construction projects. The safety performance index of building/construction contractors can be said to be quite low due mostly to ignorance on the path of the authority. Added to this, is the fact that the Libyan government is more focused in completing as many structures as possible within the shortest possible time with little regard to the several injuries and deaths maybe because most of the construction workers are foreigners. Due to the growing rate of accidents occurring in construction sites, safety performance is considered as one of the key challenges of construction companies. More importantly, safety performance assessment is an important step in the development of safety regulations and practices of construction companies who are to implement such practices among workers during the execution of construction projects. In Libya, safety is a major obstacle to developing the construction industry. Studies have been conducted that examine factors such as safe behavior like safe scaffolding and also on the factors affecting the safety practices. However, little attention has been centered on other several factors such as the influence of group policies, processes, personnel and incentive, degree to which perform values of the contractors for applying a safe performance at the construction sites. This paper is aimed at determining some effective strategies that would improve the safety standards employed by Libyan's construction companies.

2. RESEARCH METHODOLOGY

2.1 The Study Area

Libya is African country that spans over 1,759,540 square kilometers (679,182 Sq Miles), making it the 16th largest nation in the world by size. It is linked to the North by the Mediterranean Sea, and bordered



Figure 1. Map of Libya with the Selected Cities of the Study in Green Colour

in the west Tunisia and Algeria, in the Southwest by Niger, in south by Chad and Sudan, and in the East by Egypt. Libya has the longest coast, which stretches by 1,770 kilometers (1,100 Miles) among all African countries bordering the Mediterranean. The portion of the Mediterranean Sea in the North of Libya is often referred to as the Libyan Sea. The construction industry in Libya is a consequence of the interaction among geographical, historical, social, organization, economic, and environmental factors. The Libyan industry operates in difficult geographical, social and economic circumstances. The cities marked with Green Circle in Figure (1) namely Ajdabiya, Ra's Lanuf, Brega, Benghazi, Al-Bayda, Tuburak, Darnah, Al-Marj, and Al-Abyar are the selected ones for the conducted study.

2.2 Data Collection Procedures

Questionnaire was used to collect the data where a sample of 254 respondents was randomly selected from over 300 contractors companies. In this study the targeted population was the contractors in the construction companies in the biggest eastern cities of Libya. In the end, 202 completed questionnaires were returned (Table 1).

The used questionnaire consisted of 3 parts. The first part presented the personal data of respondents such as age, job title, and working experience. In the second part, the respondents were asked to indicate degree of importance of strategies that would improve the safety performance of construction contractors in eastern Libya. In order to make it clearer and easier for respondents in indicating the degree of importance of each

strategy, a five-point Likert scale was used which varies from (1 = Not Very Important) to (5 = Very Important). Each response is associated with a point value as shown in Table (3.4) below. In the third part, the respondents were encouraged to write down comments, requests, or suggestions regarding improving the safety performance of construction contractors in eastern Libya.

2.3 Data Processing and Analysis

The data collected was processed by using Statistical Package for Social Science (SPSS) program for Windows (Version 19.0). Relative Importance Index (RII) will also be used to rank the most effective strategies for safety performance by the contractors in the Libyan construction industry. The five-point scale 1-5 mentioned earlier was transformed to relative importance indices for each of the leadership concepts. The indices were then used to determine the rank of each item. These rankings made it possible to cross compare the relative importance of the items as perceived by the three groups of respondents. The weighted average for each item for the respondents was determined and ranks (R) were assigned to each item representing the perception of the respondents. The relative importance index (RII) was calculated for each item as follows (Lim and Alum, 1995):

$$RII = \frac{4n_1 + 3n_2 + 2n_3 + 1n_4 + 0n_5}{4N}$$

where: n_1 = number of respondents for 'very important; n_2 = number of respondents for 'important; n_3 = number of respondents for 'neutral; n_4 = number of respondents for 'less important; n_5 = number of respondents for 'not important', N = Total number of respondents.

3. DATA ANALYSIS AND FINDINGS

3.1 Background of the Respondents

202 usable questionnaires were used in the analysis. Table 2 illustrates the distribution of the respondents according to their background information. Overall, the respondents were from civil engineering companies (43.6%), housing and residential companies (37.1%), commercial companies (5.4%) and industrial companies (13.9%).

Most of the companies were the large companies with more than 45 workers (32.7%). Respondents of this study were aged 20 to 30 years old (42.1%), 31 to 40 years (38.6%), 41 to 50 years old (18.8%) and more than 51 years old (0.5%). They have been in the construction companies for 1 to 5 years (21.3%), 6 to 10 years (24.3%), 11 to 15 years (27.7%) and more than 15 years (26.7%). Majority of their companies had implemented 11 to 20 projects (43.1%) in last 5 years. Most of the projects cost more than 300,000 LYD.

Table 1. Distribution of the Libyan Construction Companies

Cities	Distributed	Returned	Percentage
Benghazi	50	43	86%
Al-Bayda	50	39	78%
Ajdabiya	30	24	80.0%
Darnah	26	21	80.7%
Tubruk	25	16	64%
Al-Marj	25	22	88%
Al-Abyar	23	19	82.6%
Ra's Lanuf	13	11	84.6%
Brega	12	7	58.3%
Total	254	202	79.5%

Table 2. Background of the Respondents

Items	Frequency	Percentage
Civil Engineering	88	43.6%
Housing	75	37.1%
Commercial	11	5.4%
Industrial	28	13.9%
Company Size		
1-15 workers	26	12.9%
16-30 workers	52	25.7%
31-45 workers	58	28.7%
More than 45 workers	66	32.7%
Age		
20-30 years	85	42.1%
31-40 years	78	38.6%
41-50 years	38	18.8%
51 and above	1	0.5%
Working Experience		
1-5 years	43	21.3%
6-10 years	49	24.3%
15-11 years	56	27.7%
More than 15 years	54	26.7%
Number of Projects in 5 years		
1-5 projects	38	18.8%
11 - 20 projects	87	43.1%
More than 20 projects	77	38.1%
Cost of Project		
50000-99000 LYD	1	0.5%
100000-199000 LYD	26	12.9%
200000-299000 LYD	60	29.7%
More than 300000 LYD	115	56.9%

3.2 Strategies for Improving the Safety Performance of Construction Contractors

Based on the ranking (R) of the weighted average of the relative importance indices (RII) for the strategies for improving the safety performance of construction contractors (Table 3), Government should play a more critical role in stricter legal enforcement and organizing safety training programs was ranked 1 (RII=0.818), followed by Safety regulations and procedures on construction site must be strictly enforced (RII=0.816) and Current safety regulations should be improved to permit strict implementation of safety procedures at construction sites (RII=0.811). Relative importance index had also revealed that incorporating safety cost margin for the contractors in the tenders (RII= 0.808) was the most important strategy needed by the contractors for having safety performance program at construction sites.

Table 3: Relative Importance Indices (RII) and Ranks (R) for the Strategies to Improve Safety in the Construction Site

Strategy	RII	Ranking
All parties involved in construction industry should be more active in organizing training programs for educating people about safety practices.	0.758	9
Greater attention should be given to safety in design and selection of tools, equipment and materials.	0.806	5
Safety regulations and procedures on construction site must be strictly enforced.	0.816	2
Provide a well-designed safety recording system that will enable owners and authorities to track the past safety experiences of the contractors.	0.779	7
Government should play a more critical role in stricter legal enforcement and organizing safety training programs.	0.818	1
Safety performance of construction companies should be included in tender evaluation system as one of evaluation criteria.	0.767	8
Safety planning should be practiced from the early stages of project scheduling and planning.	0.793	6
Current safety regulations should be improved to permit strict implementation of safety procedures at construction sites.	0.811	3
Incorporate safety cost margin for the contractors in the tenders.	0.808	4

4. DISCUSSION ON THE FINDINGS

Relative Importance Indices (RII) was used to show the most important strategies for improving the safety performance of construction contractors. Based on the results, the researcher found that "Government should play a more critical role in stricter legal enforcement and organizing safety training programs". This was ranked in the first position as a significant strategy for improving

safety performance by the contactors. The result indicates that, it is necessary to use strict implementation of safety instructions in the construction sites by the contactors. Documents of tender contain the laws of safety, but it is not implemented in construction stage. These results do not conform to Tam et al. (2004) who found this factor as the most effective factor in their study. The reason for such deviation could be due to the laborers' and contractors' culture towards self-motivation and monitoring. Ng et al. (2005) indicated in their study that “the most important SPE factor at an organizational level to be “implementation of safety management system in accordance with legislation” and “compliance with occupational safety and health legislation, codes and standards”. This finding is in line with what Kartam et al. (2000) found in the study conducted on construction safety in Kuwait that; lack of safety regulations and legislation is one of the reasons for lacking safety performance in the construction industry. Liska et al. (1993) in their study on identification of zero accident techniques stated that safety training and orientation are required. Needless to say, Safety regulations and procedures on construction sites being strictly enforced were found to be the second effective strategy by the respondents. Such an agreement is in line with a research by Liska et al. (1993) where they insisted in their study on providing safety policies and procedures.

5. CONCLUSION AND RECOMMENDATIONS

Safety performance in construction industry is affected by many factors related to workers, contractors, government, owners, and safety officer/department. This study was aimed to recommend some ways of improving safety performance of construction contractors in Libya. Nine strategies were proposed to the respondents and among these strategies, all the participants showed consensus agreement on “Government should be more active in the role of implementing safety performance by applications of more strident legal sanctions and conducting more safety training exercises”. The first important strategy to lead for safety performance by the contractors (RII = 0.818), followed by “Safety regulations and procedures on construction site must be strictly enforced” as the second effective strategy for safety performance of the contractors in the Libyan construction industry (RII = 0.816). This paper has proposed few useful recommendations that would improve the safety standards employed by Libyan’s construction companies. The recommendations are as follow:

- » The Libyan government should develop effective strategies and techniques to overcome the problem of excessive competition between contractors which often times lead to the implementation of the project without taking the required safety checks into consideration.
- » Construction contractors companies are recommended to evaluate safety performance regularly to identify weaknesses and try removing them or at least minimizing their effects on the overall performance of projects. This helps to maintain company’s reputation and increase opportunities for firms to get more tenders.

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