Total Safety Management: A Strategy for Improving Organisational Performance in Selected Construction Companies in Nigeria

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Abstract

The paper discusses total safety management (TSM) as a strategy for improving organisational performance (reduced accident/incident rate, improved safety practices, enhanced productivity and increased profitability) in selected construction companies in Nigeria.TSM is a performance-oriented approach that integrates all aspects of construction safety (intention, behavior, culture and process) to achieve a safe work environment that is consistent with peak performance and continuous improvement. The objective of this research is to ascertain the extent of implementation and influence on better organisational performance (reduced accident/ incident rate, improved safety practices, enhanced productivity and increased profitability) of total safety management in the six selected construction companies. Thus, the research question addressed the extent of implementation and influence of total safety management on better organisational performance in the six selected construction companies. This research is based on Ken Wilber's Integral Safety Model which views construction safety from the perspective of the construction worker as an entity consisting of four inter-dependent and complementary dimensions (intention, behavior, culture and process).It assumes that implementation of TS Mintegrates these four dimensions of construction safety into a strategic tool for better organizational performance. The research concludes that implementation of total safety management at the organisational level in construction companies in Nigeria will improve organizational performance. The research therefore recommends among others:team building, attitudinal, behavioral and structural modifications in construction safety management as a means of sustaining the gains of total safety management in the Nigerian construction industry.

Keywords: Total safety management, Safety culture, Construction safety, Organisational performance, Continuous improvement.

1.1 Introduction

The construction industry in Nigeria is growing in complexity and in order to be competitive at the global level; it must not approach construction safety as just another step in avoiding unwanted accidents/costs but as a strategic tool for maximizing competitiveness and profitability. This strategic approach to safety can be accomplished through a total safety management philosophy which finds its roots from the total quality management principles. Total safety management is a performance-oriented approach to construction safety that gives an organization a sustainable competitive advantage in the global marketplace by establishing a safe work environment that is consistent with peak performance and continuous improvement through the integration of all aspects of construction safety (intention, behavior, culture and process).

Although the concept of TSM is relatively new in the Nigerian construction industry, it is gaining popularity due to its ability to embrace all perceptional, psychological, behavioral and managerial factors in construction safety management. It involves all the members of an organization in establishing and maintaining a work environment that is safe and conducive to quality and productivity. The primary purpose of TSM is to provide excellence in safety through continuous improvements of products and processes by the total involvement and dedication of each individual who is in any way a part of that product/process. TSM as a structured approach to improvement involves to two guiding principles: customer satisfaction and continuous improvement. It follows the same sets of standards as TQM and provides a competitive advantage to the companies that implement it, by establishing a safer working place that leads to a continuous and sustainable improvement in organizational performance.

Many construction companies in Nigeria have comprehensive safety plans, but the quality of the plan does not necessarily correlate to a company's safety performance. Written safety plans have the potential to be very effective, but companies must go beyond the safety plan and create a true "safety culture"(Hinze, 1997). Most current safety practices in the construction sector are based on the normative approach .i.e. compliance with prescribed safety rules (Mitropoulos, Cupido, and Namboodiri, 2009). They focus on measures to control hazards, and means to control workers' behaviors so that they comply with prescribed safe practices. This approach emphasizes (1) management commitment and policies to prevent unsafe conditions and (2) workers' training and motivation to prevent unsafe behaviors.

While the traditional or normative approach aims at creating safe work behaviors, it ignores how the characteristics of the individual, production system and team processes influence the work behaviors and affect the possibility of errors and accidents (Mitropoulos, Cupido, and Namboodiri, 2009).Hence, it has proven to be inadequate for the increasingly competitive and dynamic conditions of the construction workplace. The challenge for researchers and practitioners is to develop total safety systems that are simultaneously highly productive and highly reliable and can function effectively in the dynamic, complex, and competitive conditions that construction projects face. This requires a treatment of safety from a total perspective taking into consideration the impact of safety on organizational work culture, production pressures, team processes, individual characteristics and the like. It is against this background that it becomes pertinent to explore and identify the influence of total safety management on organizational performance in construction companies in Nigeria.

1.2 Statement of the Problem

Traditionally, safety in construction sites has always been measured by the level of implementation of safety rules and procedures, and hazard control mechanisms. This systems approach to safety measurement fails to address the "person", "culture", and "behavior" components associated with total safety management. Recent advancements in construction safety management such as the move towards "safety culture" and "behavior-based safety" have proven to generate better results; however, these approaches also fail to acknowledge safety as an "integral "or "total" process encompassing multiple dimensions, i.e. person, culture, behavior and process, which cumulatively determine the true safety performance of a construction company.

Safety performance on construction sites is usually measured using "lagging" indicators (such as accidents) and not by using "leading" indicators (such as safe work behaviors). The effect of adopting these traditional approaches to safety management has been three-fold: 1. Construction companies invest all/ major safety related efforts on reducing the number of accidents/ injuries by adopting related control mechanisms and incentive/disincentive mechanisms based on accidents/ injuries 2. Construction workers tend to hide their unsafe acts (injuries) to the extent possible because until they do not reveal their unsafe acts/ injuries to top management, they are likely to be considered as safe workers and will not be punished for unsafe behaviors. 3. Construction workers find themselves working in an environment where, although they usually have an incentive to act safely, do not have any obligation, commitment or motivation to see to it that their co-workers are also behaving safely. Considering these factors, it can be inferred that there is a dire need for construction safety to be addressed from the perspective of total safety management or "total measurement and improvement" rather than from the perspective of "controlling the outcome (accidents)" especially in the Nigerian construction industry.

1.3 Objectives of the Research

The objectives of this research are as follows:

1. To ascertain the extent the six selected construction companies implements total safety management in their activities at the organizational level.
2. To ascertain the extent of influence of total safety management on organizational performance in the six selected construction companies.

1.4 Research Questions

From the above research objectives, the following research questions are formulated:

1. To what extent do the six selected construction companies implement total safety management in their activities at the organizational level?

2. To what extent does total safety management influence organizational performance in the six selected construction companies?

1.5 Research Hypothesis

In view of the above research questions, these hypotheses were formulated:

H_O: Better organizational performance (reduced accident/incident rate, improve safety practices, enhanced productivity and increased profitability) is not dependent on the incorporation and implementation of total safety management in the six selected construction companies.

H_1:Better organizational performance (reduced accident/incident rate, improve safety practices, enhanced productivity and increased profitability) is dependent on the incorporation and implementation of total safety management in the six selected construction companies

2.1 Literature Review

Traditionally, safety performance in the construction industry has been measured by such metrics as the Occupational Safety and Health Administration (OSHA,2008) recordable injury rate (RIR); or the experience modification rating (EMR) on workers' compensation. These have served the purpose of providing information by which construction contractors could assess their safety performance in terms of construction industry averages on those metrics or to make comparisons with other firms. These metrics provide historical information about some aspect of the safety performance that has occurred and rely primarily on some form of accident or injury data which are labeled reactive, trailing, downstream, or lagging indicators because they rely on retrospective data.

Focusing on these measures (e.g., accident rates and compensation costs) often means that the success of safety is measured by the levels of system failure (Cohen, 2002). While lagging measurements can provide data about incidents after-the-fact, the question remains regarding the value of these metrics as a means of predicting workplace safety performance.

It is important to note that a growing number of safety professionals question the value of lagging indicators and argue that lagging indicators do not provide sufficient information or insight to effectively avoid future accidents. Glendon and Mckenna (1995) identified a number of reasons why accident data, or similar outcome data, are poor safety indicators: they are insufficiently sensitive, retrospective, and ignore risk exposure. Laitinen, Marjamaki, and Paivarinta (1999) state that it is almost impossible to use accidents as a safety indicator for a single construction site. This is because of random variation, where many sites will have no accidents, and it is not possible to determine whether these sites with zero accidents are safer than sites with four or five accidents. Recognizing such shortcomings, many scholars advocate a shift to using proactive, upstream, or leading indicators (Flin, Mearns, O'Connor and Bryden, 2000; Cooper, 2000; Mohamed, 2002; Choudhry and Fang, 2005; Hinze, 2005).

In contrast, leading indicators are measures which are not necessarily historical in nature but rather can be used as predictors of future safety performance. These are conditions, events, or measures that precede an incident and have a predictive value with regards to an accident/incident/unsafe conditions. Toellner (2001) characterized leading indicators as measurements linked to actions taken to prevent accidents. Thus, leading indicators serve as the building blocks of an organization's safety culture. In view of the above discourse, this study adopts safe work behaviors as a leading indicator to measure organisational safety performance.

2.2 Theoretical Framework of the Study

This study is based on Ken Wilber's (Wikipedia, 2011) Integral Safety Model which states that integration all aspects of construction safety (intention, behavior, culture and process) will create a safe work environment, improve safety and organisational performance. The model views construction safety from the perspective of the construction worker as an entity consisting of four dimensions mapped into four quadrants as shown in Figure 1 below: (1) Behavioral i.e. exterior individual (the upper-right quadrant); (2) Intentional i.e. interior individual (upper-left quadrant) (3) Cultural i.e. interior collective (lower-left quadrant) and (4) Process i.e. exterior collective (lower-right quadrant). All four pursuits: intentional, cultural, behavioral and process, offer complementary, rather than contradictory, perspectives. Each by itself offers only a partial view of reality.

An integral view of construction safety can only be achieved if integration is made of these four areas of knowledge through an acknowledgement of them as the four fundamental dimensions of construction safety necessary for the creation of a safe work environment. The right sides of the quadrants are concerned with empirical observations— what does it do? While the left sides of the quadrants focus on interpretation—what does it mean? This integral approach to safety provides a more complete view of reality. It allows for a study of what drives organisational safety performance (intentional, cultural, behavioral and process), highlights the importance of the human side of safety and provides a mechanism to achieve incident/injury free work environment.

Traditionally, organisations tend to implement change through systems – a process approach to safety or by improving workers' behaviors – a behavior based approach to safety. They focus on measures to control hazards (via systems), and means to control workers' behaviors so that they comply with prescribed safe practices. This approach emphasizes (1) organizational policies, systems and procedures to prevent unsafe conditions and (2) workers' training and motivation to prevent unsafe behaviors. Safety programs – such as subcontractor selection, training, inspections, motivation, enforcement, etc., as well as efforts towards behavior-based safety aim at increasing the workers' compliance with prescribed 'safety rules' and 'safe behaviors.' This approach has resulted in significant improvements, but has still not succeeded in improving organizational performance.

While the traditional application of this "exterior" approach to safety aims at creating safe work behaviors, it ignores how the interior characteristics of the individual and the organizations influence the work behaviors and affect the possibility of errors and accidents. On one hand, it does not account for the personal factors that collectively define a worker's intention for safety such as, level of self-commitment, interpretation of being safe, the perceived value of safety, and the natural tendency for least effort, and the individual response under production and economic pressures for efficiency. On the other hand, the approach does not account for the cultural factors that shape the work environment such as, the team values, beliefs, norms, practices, and collective response under production and economic pressures for efficiency. These factors generate the situations the workers face as well as the crew's ability to cope with these situations (Mitropoulos, Cupido, and Namboodiri, 2009).

From a practical perspective, a key concern is that at the work level, there is a continuous tension between safety and production or costs; in the short term, such conflicts are usually resolved in favor of production, because production efforts have relatively certain outcomes and receive rapid and rewarding feedback (Reason, 1990). A recent study of safety on international projects (Mahalingam and Levitt, 2007) also illustrated that economic pressures were stronger determinants of work behavior than the safety systems. As a result of these "interior" characteristics, efforts to improve safety through objective assessments and advancements (new methods/ improved safety features and controlled behaviors) tend to be ineffective because the behavior change is only temporary and is not usually sustainable (Mitropoulos, Cupido, and Namboodiri, 2009). The current safety strategies in construction, which are largely oriented towards systems advancements and behavior control, have proven to be inadequate in achieving better organizational performance because of this fundamental flaw in their approach.

The key challenge for researchers and practitioners is to develop total safety systems that are simultaneously highly productive and highly reliable and can function effectively in the dynamic, complex, and competitive conditions that construction projects face. This requires a treatment of safety from an integral perspective taking into consideration all four dimensions of safety and their inter-dependence. This treatment will allow a fundamental understanding of the individual and organizational characteristics that govern both the safe behaviors of workers and the effectiveness of safety systems, and will aid in determining the underlying factors that control the true total safety performance of a company.
Interior (Subjective) Exterior (Objective)

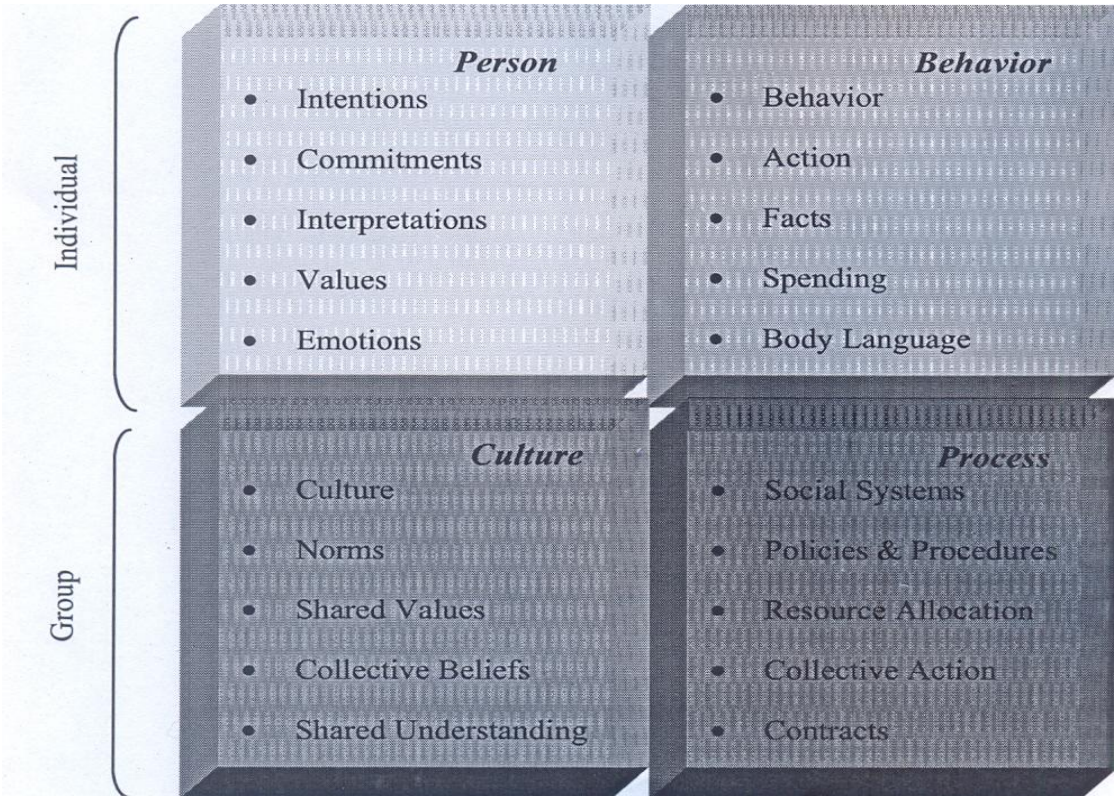

Figure 1: Integral Entity Model of Total Safety Management (TSM) Adapted from the work of Ken Wilber. Wikipedia (2011). http://en.wikipedia.org/wiki/ken_wilber

3.1 Research Methodology

The scope of the research is limited to the six most populous construction companies in Nigeria (Julius Berger Nigeria Plc, Setraco Nigeria Ltd, Fourgerolle Nigeria Ltd, Arab-Contractors Nigeria Ltd, Dantata & Sawoe Nigeria Ltd and Costain Nigeria Ltd). It is assumed that responses obtained from workers in these selected companies would be representative of all construction workers opinion on the effects of total safety management on organisational performance. An exploratory, cross-sectional survey was used in generating the primary data required for the study. The population of study consists of 40,568 workers of three categories (3,560 supervisors, 10,028 foremen and 26,980 workmen) drawn from the six construction companies selected for the study. A sample of 396 workers (35 supervisors, 98 foremen and 263 workmen) determined at 5% level of significance for sample error, using Taro Yamane's (1964) formula, was selected using stratified random sampling method for the purpose of questionnaire administration. The questionnaire was designed to obtain a fair representation of the opinions of the three categories of construction workers in the six selected companies using a three-point Likert type scale. The questionnaire responses of the sample respondents were presented using tables, analyzed and interpreted using simple percentages. A total of 396 copies of the questionnaire were administered, out of which 2 were cancelled while 4 were not returned and 390 (98%) were used for analysis.

4.1 Results and Discussion

Question Number 1: To what extent does your company implement total safety management in the execution of its activities at the organizational level?

Table1, Response pattern on the extent of implementation of total safety management in the six selected construction companies

Category of Respondents/Workers	Responses Provided			
	Large extent	Mild extent	Poor extent	Total
Supervisors	25	8	2	35
Foremen	85	10	3	98
Workmen	221	25	11	257
Total	331	43	16	390

Source: Field Survey, 2012.

Table 1, indicates that a total of 331 i.e. 85% of the workers across the three categories are of the opinion that their company to a large extent implements TSM in their activities, 43i.e. 11% of the workers are of the view that their company to a mild extent implements TSM in their activities while 16 workers i.e. 4% expressed a poor extent view of their company implements TSM. We therefore conclude that there is evidence of a large extent implementation of TSM in the activities of the six selected construction companies as buttressed by the 85% large extent response of the sample respondents.

Question Number2: To what extent does the implementation of total safety management in your company influences better organizational performance?

Table 2 Response pattern on the extent total safety management implementation influences better organizational performance in the six selected construction companies

Category of Respondents/Workers	Responses Provided			
	Very large extent	Mild extent	Poor extent	Total
Supervisors	30	3	2	35
Foremen	90	6	2	98
Workmen	225	25	7	257
Total	345	34	11	390

Source: Field Survey, 2012.

Table2, indicates that a total of 345 i.e. 88% of the workers across the three categories are of the view that their company's implementation of TSM in their activities, to a large extent influences better organizational performance,34 i.e. 9% of the workers are of the view that their company's implementation of TSM in their activities, to a mild extent influences better organizational performance while 11 workers i.e. 3% expressed a poor extent view. We therefore conclude that there is evidence that implementation of total safety management in the activities of the six selected construction companies to a large extent influences better organisational performance as buttressed by the 88% large extent response of the sample respondents.

Question Number 3: To what extent does better organizational performance of your company depend on the implementation of total safety management?

Table 3 Responses on the extent better organizational performance depends on total safety management implementation in the six selected construction companies

Category of Respondents/Workers	Responses Provided			
	Large extent	Mild extent	Poor extent	Total
Supervisors	20	10	5	35
Foremen	75	15	8	98
Workmen	230	20	7	257
Total	325	45	20	390

Source: Field Survey, 2012.

Table 3 shows that a total of 325 i.e.83.33 % of the workers across the three categories were of the view that better organisational performance depends to a large extent on their company's implementation of TSM, 45 i.e.11.54% of the workers expressed a mild extent view while 20 i.e. 5.13% of the workers expressed a poor extent view. We therefore conclude that there is evidence that better organisational performance depends on the implementation of TSM in the activities of the six selected construction companies, as buttressed by the 83.33% large extent response of the sample respondents.

Table 4 Observed and Expected Frequencies of table 3

Category of Respondents/Workers	Responses Provided			
	Large extent	Mild extent	Poor extent	Total
Supervisors	20 (29.17)	10 (4.04)	5(1.79)	35
Foremen	75(81.67)	15 (11.31)	8(5.03)	98
Workmen	230(214.17)	20 (29.65)	7 (13.18)	257
Total	325	45	20	390

Source: Field Survey, 2012.

4.2 Test of Hypothesis

(i) **H_o**: Better organisational performance (reduced accident/ incident rate, improved safety practices, enhanced productivity and increased profitability) is not dependent on the implementation of total safety management in the six selected construction companies.
H_1:Better organisational performance (reduced accident/ incident rate, improved safety practices, enhanced productivity and increased profitability) is dependent on the implementation of total safety management in the six selected construction companies.

(ii) **α = 0.05**
(iii) **Degree of Freedom (df) = (r – 1)(c-1= (3-1)(3-1)=4**
(iv)**Chi- square critical value $\chi^2_{0.05}$ = 9.49**
(v)) **Chi- square computed value from table 4 = $\chi^2_c=\sum(F_0 - Fe)^2/Fe$**

Table 5 Computation of Chi-square Test Statistic from table 3

Fo	Fe	(Fo-Fe)	$(Fo-Fe)^2$	$(Fo-Fe)^2/Fe$
20	29.17	9.17	84.0889	2.8827
75	81.67	6.67	44.4889	0.5447
230	214.17	-15.83	250.5889	1.1700
10	4.04	5.96	35.5216	8.7925
15	11.31	3.69	13.6161	1.2039
20	29.65	-9.65	93.1225	3.1407
5	1.79	3.21	10.3041	5.7565
8	5.03	2.97	8.8209	1.7537
7	13.18	-6.18	38.1924	2.8978
				χ^2_c=28.1425

(vi) **Decision Rule:**

Reject H_o: if $\chi^2_c > \chi^2_t$ or Accept H_o: if $\chi^2_c < \chi^2_t$
Since $\chi^2_c > \chi^2_t$ i.e. 28.1425 > 9.49, we reject the null hypothesis and accept the alternative hypothesis that better organizational performance (reduced accident/ incident rate, improved safety practices, enhanced productivity and increased profitability) is dependent on the implementation of total safety management in the activities of the six selected construction companies.

5.1 Conclusion

This paper has tried to address the implications of implementing total safety management on corporate performance in the execution of construction activities in Nigeria, from total quality management/accident preventive perspective.

From the foregoing results and discussion of respondents' responses we can conclude that better organisational performance (reduced accident/ incident rate, improved safety practices, enhanced productivity and increased profitability) is dependent on total safety management implementation in the six selected construction companies.

5.2 Recommendations

Arising from the findings of this paper, it is suggested that the management of all construction companies in Nigeria should take the following measures:

- Establishment of departmental team building sessions as a means of achievingattitudinal and behavioral change of the workforce in safety matters.
- Structural modifications of construction safety managementwith more emphasis on leading indicators as a means of sustaining the gains of total safety management in the Nigerian construction industry.
- Formation of safety circles at the operational level to identify and address workplace hazards.
- Aggressive safety campaigns/workshops on workplace hazards/controls awareness
- Regular training/re-training of safety personnel and the entire workforce on safe work procedures.
- Continuous improvement on employees' motivation and work place supervision.
- Total commitment of top management/the entire workforce to the improvement of safe work practices.
- Continuous safety audit of equipment and work site to identify and eliminate work place hazards.
- Continuous review of corporate safety policies to accommodate changes in the construction environment.
- Continuous use of competitive intelligence, high-level knowledge flow management and co-operative resourcing as a means of obtaining information for improving and sustaining total safety management.
- Focusing of toolbox/safety meetings on continuous improvement of safe work practices.
- Government enactment of safety legislations with stiffer penalties on companies that are not safety conscious in their operations.

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