

Role of Safety Culture on Safety Management System in Food and Beverages Industries in Lagos State of Nigeria

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Abstract—The role of safety culture (SC) on the safety management system (SMS) within the context of food and beverage (F&B) industries in Nigeria was examined in this study. To the best of the authors' knowledge, no study has empirically showed this influence. Hence, the objective was to investigate the impact of SC on SMS. The data was collected from a survey of F & B industries in Lagos state of Nigeria, whereas structural equation modelling (Smart PLS 2.0) was used for empirical analysis. The results showed that there is a significant positive relationship between safety culture (SC) and safety management system (SMS). Furthermore, the results provided empirical evidence that SMS is linked to the SC of organizations. In addition, the results confirm the importance of safety culture implementation and its effects on promoting the safety initiatives of various firms in the F & B industries in Nigeria. Therefore, it is noteworthy that safety culture plays a key role in the development of the safety management system. Therefore, the findings of this study provide empirical evidence of the positive influence of safety culture on safety management system.

Keywords— Safety Culture; Safety Management System; Food & Beverages; Nigeria.

I. INTRODUCTION

With the recent rise in occupational accidents, the management of organizations worldwide are actively seeking novel approaches to improve safety and reduce accidents. Bearing in mind the financial benefits of improved workplace safety, there have been an increasing interest by researchers to investigate drivers of firm's safety performance within the occupational safety literature [1, 2]. In these regard, many concepts such as safety climate have

been explored to enhance safety performance of organizations around the globe [3], management practices [4-5], safety leadership [6], and safety management system [1]. One concept that has significantly contributed to the enhancement of safety performance is the safety management system (SMS) of organisations. The SMS is management tool for handling the safety programmes within an organization [7]. Typically, SMS comprises the policies, practices, roles, procedures and functions that relate to safety [8]. Likewise, safety management system can be referred to as the mechanisms planned and incorporated into organizations [9] to the curb hazards that could affect the safety and health of workers [10]. The findings of these studies highlight the relevance of the SMS in achieving superior safety performance.

However, there is limited knowledge and empirical undertakings on the factors that can influence the safety management systems (SMS) within organisations. In context Cooper [11], surmised that the SMS is a manifestation of the safety culture of organizations. This position was supported by Guldenmund [12]. Intrinsically, the impact of safety culture on SMS is a likewise important issue that requires further investigation. Hence, the influence of safety culture on safety management systems will be examined and presented in this paper.

II. LITERATURE REVIEW

The notion of culture seeks to examine the intricacies related to various groups of people. Therefore, culture is an important factor for the implementation of effective management systems [13-14]. This implies that, with identifiable adaptable profiles of strong culture, a company's management system can be effectively and efficiently implemented and improved continually. In addition, the process can provide a planned management system that increases the performance of an organization [15-16]. Numerous

research have been conducted to examine the successful implementation of management systems and potential benefits accrued by adopting organizations.

Koh and Low [14] surmised that the relationship between culture and management system is “mutually reinforcing”. In addition, the study noted that good organisation culture can ensure effective application of any management system thereby resulting in the accomplishment of desired organizational outcomes. Furthermore, building up the concept of culture within an organisation impacts on management practices and vice versa (Noronha, 2002). More importantly, it requires that all the practices organisation are in congruence for good practices to function [14]. This implies, that if the management of an organization applies an approach that emphasizes the internalising of values [17]. Hence, the culture of organisation creates a climate within the organisation that supports improvement and growth climate. This disposition impacts the management processes and implementation that achieve results [18]. Hence, organisational behaviourists postulate that an organization’s SMS is the result of a positive safety culture [19-20]. Furthermore, some researchers have noted that organizations with a positive safety culture can implement a sustainable safety management system more often than organizations without one [21].

Kennedy and Kirwan [8], defined a safety management system as the practices, procedures, activities and policies employed or followed by an organization’s management aimed at safety of its employees. Empirically, these practices and procedures can enhance the implementation of an organization’s safety culture [2]. Consequently, Díaz-Cabrera et al. [22], opined that when an organization maintains its safety culture, it gains a holistic and complete vision to bolster its safety management system. On a related note, Gerede [23] stated that a positive safety culture is a prerequisite to the success of a safety management system in any organization.

The safety culture creates cognizance and understanding of the hazards within an organization’s operations, which in turn shapes its attitude towards managing safety (SMS) [24]. Furthermore, Kirwan [25] described an organization’s safety management system as a method in which safety is handled in an organization. In addition, it describes how the procedures and policies that encompass the SMS are implemented in the organization. The authors further stated that the outlined safety management methods are influenced by the safety culture of the organization.

According to Stolzer et al. [26] a resilient safety-focused culture is a basic requisite for the execution of a safety management system. Consequently, developing and sustaining a strong safety culture is a vital pre-condition for organizations bearing in mind the implementation of a safety management system. The view of Kennedy and Kirwan [8] is supported by Choudhry et al. [27] who argues that the effectiveness and success of a safety management system is due to a positive safety culture development. This assertion is based on the notion that when management and

employees become aware of accident prevention their interest in keeping the work environment safe is enhanced.

Hudson [28] argues that for organizations to realize their objectives of achieving safety, it is apparent that it implements a true safety culture that supports the safety management system, which in turn permits the organization to reach its goal. Woo [29] emphasized that the safety culture of any organization is a crucial precondition for implementing SMS. Similarly, Lin [30] found that the safety culture significantly affected the performance of safety management systems among airlines in Taiwan.

Stolzer et al. [26], argue that in developing an SMS, it is critical for an organization to first develop its culture. This disposition is based on the notion that a good SC will shape up the safety management system of the organization. It is believed that the SC of an organisation will improve the safety management system of an organisation. As such, the level of SC relates to a good safety management system of an organisation [31]. In light of the above, it is evident that the SC strongly influences the SMS of an organization. Consequently, the following hypothesis is proposed:

H1: There is a significant positive relationship between safety culture and safety management system.

III. METHODOLOGY

The methodology employed in the study involved a survey of the head safety managers from F&B manufacturing companies in Nigeria as the unit of analysis. This study sampled 126 F&B companies from seven industrial zones in Lagos state of Nigeria. Based on a stratified random sampling, the F&B companies were selected to reflect the total number companies in the sector and their respective strata. Subsequently, the method of random sampling was employed to narrow the sampled population from various industrial zones in the region.

A. Instrumentation and Measurement of Variables

The summary of measures of variables adopted is presented in Table 1.

TABLE 1: Summary of measured variables [11, 32]

Variable	No of items
Safety Culture	7
Safety Management System	
Incentive	4
Policy	3
Training	5
Communication	3
Planning	7
Control	7

B. Analysis Technique

SmartPLS 2.0 was used to run the analyses and for testing the formulated hypothesis of the study. The PLS approach was employed due to its ability to analyse the relationship between the latent variables and their measures. Hence, it was modelled in a reflective or formative way as well as hybrid formative and reflective constructs [33]. The model for this study involves a reflective higher order variable (SMS). Therefore, SmartPLS 2.0 was adopted to compute the path model and estimate the parameters based on the path weighting scheme [34-35]. The measurement models were first evaluated followed by the structural model as discussed sequentially hereafter.

IV. RESULTS

The study used a three-stage approach in the analysis because the constructs of safety management system consisted of first and second-order reflective measures. In the first stage, the measurement model of the first-order constructs was evaluated in the presence of the second and third-order constructs. In the second and third stage, the latent variable scores of all SMS dimensions and the structural relationships were considered using the factor scores of all the variables in the proposed model [34]. Table 2 presents the descriptive statistics of the study variables, whereas Figure 1 presents the measurement model.

Table 2: Descriptive statistics of the study variables

Construct	N	Minimum	Maximum	Mean	Std. Deviation
Safety Culture	126	1.00	5.00	3.6947	.51573
Policy	126	1.00	5.00	3.9492	.85279
Incentives	126	1.00	5.00	3.7978	.73467
Training	126	1.00	5.00	3.9825	.70324
Communication	126	1.00	5.00	3.9203	.74535
P. planning	126	1.00	5.00	3.8466	.71057
E. response	126	1.00	5.00	3.8828	.77709
Int. control	126	1.00	5.00	3.8903	.74476
Bench Marking	126	1.00	5.00	3.8860	.93651

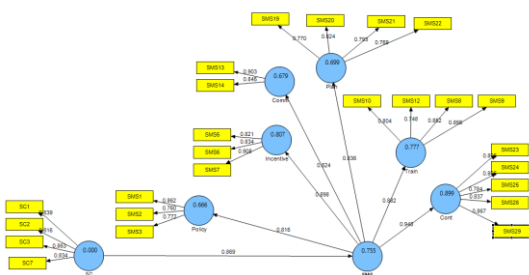


Figure 1: Measurement model of the study

A. Measurement Model

In evaluating the measurement model the outer model was examined based on the relationship between the constructs and the indicators [33]. Table 3 presents the various statistical variables extracted for the first-order constructs. As shown in Table 3, for the internal consistency reliability, the composite reliability ranged from .85 to .91 for the first-order constructs, exceeding the minimum requirement of .70. The average variance extracted (AVE) for the measurement model is above .60 for all constructs, exceeding the cut off of .50 [33], hence meeting the convergent validity for all constructs. Table 4 presents the AVEs shown on the diagonal whereas the squared interconstruct correlations are off the diagonal. Following Fornell-Larcker [36], Table 4 presents the results of assessing the discriminant validity. The results demonstrated that all AVEs are higher than the squared interconstruct correlations, which also satisfies the requirement for discriminant validity. To further assess the discriminant validity, the indicators' cross loadings and all indicator loadings were examined and found to be higher than the respective cross loadings. This further confirms discriminant validity [33]. The study hence, confirmed the reliability and validity of our constructs.

Table 3: Statistical variables extracted for the first-order constructs.

	Items	Loadings	Composite reliability	AVE		
Safety Culture	SC1	0.8395	0.9045	0.7031		
	SC2	0.8165				
	SC3	0.8630				
	SC7	0.8344				
Safety Management System	SMS1	0.8624	0.8412	0.6392		
	SMS2	0.7605				
	SMS3	0.7718				
	SMS5	0.8213			0.8909	0.7318
	SMS6	0.8342				
	SMS7	0.9083				
	SMS8	0.8517			0.8883	0.6660
	SMS9	0.8560				
	SMS10	0.8036			0.7484	0.7650
	SMS12	0.7484				
	SMS13	0.9034				
	SMS14	0.8450			0.8668	0.6231
SMS19	0.7700					
SMS20	0.8239					
SMS21	0.7930	0.9112	0.6725			
SMS22	0.7694					
SMS23	0.8054					
SMS24	0.8048	0.8667				
SMS25	0.7840					
SMS26	0.8368					
SMS29	0.8667					

Table 4: Square Root of AVE and correlations of latent variables for the first-order constructs

	Comm	Cont	Incentive	Plan	Policy	SC	Train
Comm	0.875						
Cont	0.764	0.820					
Incentive	0.772	0.806	0.855				
Plan	0.690	0.764	0.714	0.789			
Policy	0.509	0.737	0.704	0.563	0.800		
SC	0.685	0.800	0.783	0.700	0.764	0.839	
Train	0.658	0.798	0.723	0.620	0.762	0.749	0.816

SMS 24	0.724	0.553	0.616	0.706	0.601	0.662	0.805
SMS 25	0.577	0.544	0.626	0.617	0.581	0.555	0.784
SMS 26	0.663	0.604	0.641	0.650	0.609	0.608	0.837
SMS 29	0.776	0.705	0.766	0.688	0.736	0.698	0.867

Table 5: Items loading and cross loadings

	SC	Policy	Incentive	Train	Comm	Plan	Cont
SC1	0.839	0.669	0.713	0.619	0.565	0.613	0.722
SC2	0.816	0.665	0.583	0.649	0.498	0.570	0.715
SC3	0.863	0.640	0.660	0.608	0.617	0.604	0.687
SC7	0.834	0.590	0.666	0.639	0.616	0.561	0.678
SMS 1	0.679	0.862	0.640	0.746	0.469	0.530	0.642
SMS 2	0.560	0.760	0.493	0.481	0.290	0.303	0.514
SMS 3	0.585	0.772	0.542	0.569	0.439	0.488	0.600
SMS 5	0.608	0.544	0.821	0.625	0.685	0.616	0.660
SMS 6	0.634	0.581	0.834	0.515	0.600	0.585	0.665
SMS 7	0.759	0.677	0.908	0.705	0.694	0.631	0.740
SMS 8	0.609	0.633	0.592	0.852	0.515	0.512	0.685
SMS 9	0.603	0.612	0.579	0.856	0.514	0.476	0.626
SMS 10	0.594	0.600	0.612	0.804	0.654	0.546	0.699
SMS 12	0.643	0.645	0.575	0.748	0.453	0.486	0.586
SMS 13	0.672	0.564	0.762	0.682	0.903	0.629	0.696
SMS 14	0.513	0.300	0.573	0.446	0.845	0.576	0.637
SMS 19	0.569	0.511	0.595	0.507	0.435	0.770	0.566
SMS 20	0.561	0.431	0.563	0.472	0.588	0.824	0.637
SMS 21	0.568	0.484	0.564	0.556	0.489	0.793	0.600
SMS 22	0.512	0.349	0.532	0.420	0.671	0.769	0.610
SMS 23	0.675	0.605	0.646	0.607	0.593	0.601	0.805

B. Structural Model

The structural relationship of the model was examined using the latent variable scores of the first order constructs. Table 6 and Figure 2 shows the results of the model in this study.

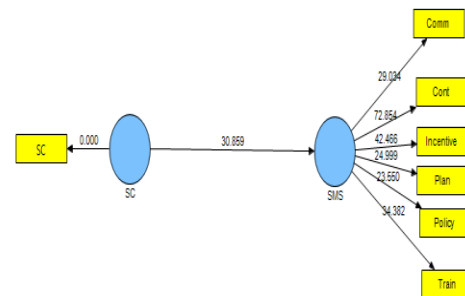


Figure 2: Structural model of the study

The analysis was aimed at reducing the complexity of the model and to acquire a single measurement of safety management system. Next, the path coefficients and their significance were considered along with the R2 value [33].

Table 6: Path analysis and hypothesis testing

Relationship	Beta Value	Standard Deviation (STDEV)	Standard Error	T/Statistics	Decision
SC -> SMS	0.864	0.0281	0.0281	30.8590	Supported

The significance of the path coefficients was determined through the bootstrapping feature and 500 sub-samples in PLS [33]. Table 6 shows the results of the hypothesis test, their coefficients, t values and the p values. Our analysis shows that the hypothesis of the study was accepted.

V. DISCUSSION

The findings of this study show that the proposed positive relationship between safety culture (SC) and safety management system (SMS) was supported. The SC reflects how an organization thinks and

behaves as well as the norms that govern safety [37]. Thus, it becomes plausible to state that the implementation of an SMS is borne out of the strongly instituted safety culture of the organization. Furthermore, Copper [38] indicated that an organizations' SMS is a manifestation of a firm's SC. In other words, firms with strong SC often see the need to develop an SMS. Stolzer et al. [26], stressed that the effective achievement of SMS requires commitment and involvement by managers and employees in organizations both share a common goal towards safety. This finding also gives credence to studies from other management field such as Bowen and Ostroff [39] who emphasized that the embedded values and assumptions have the tendency to shape human resources, management practices, and performance of organisations. The present line of results are in line with Mcneely [40] and Woo [29].

VI. CONCLUSIONS

The influence of safety culture on the safety management system within the context of F&B industries in Nigeria was examined in this study. The results showed that there is a significant positive relationship between safety culture (SC) and safety management system (SMS). To the best of the authors' knowledge, no study has empirically showed this influence. Therefore, it is noteworthy that the given the key role safety culture has on safety management system development. Therefore, the findings of this study provides empirical evidence of the positive influence of safety culture on safety management, energy and agricultural systems [41-42].

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