The Seybold Report

ISSN 1533-9211

DOI: 10.5281/zenodo.10012288

OCCUPATIONAL SAFETY AND PERFORMANCE OF PHARMACEUTICAL MANUFACTURING FIRMS IN SOUTH EAST, NIGERIA

IHIONU, MARCELLINUS C [1], ANTHONY ANIAGBAOSO IGWE [2]* and AKPAN EKOM ETIM [3]

[1, 2, 3] Department of Management, Faculty of Business Administration, University of Nigeria, Enugu Campus. *Corresponding Author

Abstract

This study investigated the effect of occupational safety practices on the performance of pharmaceutical manufacturing firms in South East, Nigeria. Using a cross-sectional survey design, data was collected from pharmaceutical manufacturing firms located in the South East region of Nigeria. The study assessed the implementation of occupational safety practices, such as incidents reporting, safety commitment and safety education. Additionally, various dimensions of business performance, such as quality, cost and delivery, were measured. Results showed that occupational safety practices have significant effects on measures of performance. The study concluded that incidents report, safety commitment and safety education enhances the performance of the pharmaceutical firms. The study contributes to the existing literature by providing empirical evidence of the connection between occupational safety and performance in the pharmaceutical manufacturing sector in Nigeria. The findings have implications for policymakers, industry stakeholders, and pharmaceutical firms aiming to enhance their performance and safety practices. Strengthening occupational safety measures can lead to improved employee well-being, better product quality, and increased operational efficiency, thereby contributing to the sustainable growth of pharmaceutical manufacturing firms in South East, Nigeria.

Keywords: Occupational Safety; Performance; Pharmaceutical Manufacturing Firms.

1. INTRODUCTION

Nigeria's South- East region is famous as being the business and manufacturing hub of the country. It is a trading and commercial zone that is home to dozens of small, medium, and large scale industries which are focused on product manufacturing (Emelumadu et al., 2014; Ngwama, 2016). The contributions of these firms to the socio-economic development of the region as well as the nation have been enormous and unquestionable. Nonetheless, the nature and modus operandi of these firms leaves very little to be desired about the safety of their workers; and thus justifies the need to examine the effect of occupational safety on performance of pharmaceutical firms in South-East Nigeria.

The laxity in the regulatory frameworks may have contributed to these firms subjecting their workers to unwholesome working conditions in the bid to cut costs and increase output. Attempts by unions to improve working conditions have been unproductive and miffed employees have no means of voicing out. The intention of this study is that by investigating the influence of occupational safety climate in these organizations, the managers and leaders would be enlightened on the long term benefits of employee safety to the firm's bottom line and make efforts to improve their work environments rather than insist on cutting corners and

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

endangering human lives in order to reap short-term profits. Pharmaceutical manufacturing firms committed to the safety of their employees, frequently implement various safety protocols and procedures that ensure that the risks of harms and hazards are minimized. First, such organizations adhere to the safety regulations obtainable in their environment of operations. The essence is to ensure that they are committed to safety and by so doing attract the most competent employees to their organization. Second, they are committed to the timely investigation of incidents that occur in the firm. Channels of reporting incidents are created and employees are encouraged to suggest ways that safety can be improved. Third, there is also an unstinting commitment to safety training and education of employees on the most relevant safety measures and innovative ways to discharge their duties with minimal exposure to safety hazards.

While these actions are characteristic of firms operating in more developed climes, the situation in Nigeria, and South-East in particular, is an unfortunate one. Because regulations are lax, incidents are rarely investigated even if they are reported. Incidents and accidents have become more frequent than ever before, and attempts to publicize hazardous occurrences and the neglect of the firm are usually met with efforts by management to downplay the incidents. As a result, employees renege from reporting these incidents and this affects the ability of the organization to promptly deliver its products to customers. Due to the fact that these incidents are not reported, it is usually difficult to identify which aspect of the production line or the equipment requires interventions and thus the quality of products finally delivered is negatively affected. These firms are characterized by little or no commitment to safety protocols and this makes them incur more overhead costs in the form of fines, compensations to injured workers or their dependents, idle time, and other control costs. Since they are not committed to safety education and training, employees are unable to explore several safety options that may be available to them in their line of duty; and are bereft of any technical skills that may allow them vary production volumes and product quality so as to maintain output levels.

The continuous exposure of pharmaceutical employees to adverse working conditions may lead to perpetual safety hazards such as loss of body parts or death. If this continues, the firm would have a reputation for ignoring worker safety and would be unable to attract competent people for its manufacturing activities. The quality of products and the ability to respond to varying customer demands would decline and there would be financial losses. The firm would incur more costs that would affect their bottom line in ways that they never imagined. In a contextual environment where the general health of the public is hugely dependent on these pharmaceutical firms, lack of occupational safety may ultimately lead to the provision of sub-standard/harmful drugs or even the complete unavailability of life-saving medications. The above consequences of unwholesome safety practices among pharmaceutical firms informed the need to investigate the effect of occupational safety on performance of pharmaceutical firms in South-East, Nigeria.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

2. LITERATURE REVIEW

Occupational Safety

Occupational safety in the pharmaceutical industry is a critical concern that focuses on creating a safe and healthy work environment for employees involved in the research, development, manufacturing, and distribution of pharmaceutical products (Yang, Lin & Maresova, 2021). Due to the nature of the work involved, which often includes handling hazardous substances, operating complex equipment, and following strict procedures, ensuring occupational safety is essential to prevent accidents, protect workers' health, and maintain the quality of pharmaceutical products.

Adherence to well-established safety guidelines and regulations is paramount in the pharmaceutical industry (Snyder, 2018). The Occupational Safety and Health Administration (OSHA) provides comprehensive guidelines for pharmaceutical manufacturers to ensure safe working conditions. OSHA's "Guidance on Safe Handling of Hazardous Drugs" is a notable reference document outlining safety practices for working with hazardous pharmaceuticals (OSHA, 2021). Pharmaceutical manufacturing often involves complex chemical processes. The concept of Process Safety Management (PSM) is crucial to prevent chemical accidents. Literature like the book "Guidelines for Process Safety in Bioprocess Manufacturing Facilities" by the Center for Chemical Process Safety offers insights into applying PSM principles in the pharmaceutical context (CCPS, 2010).

Worker health is a vital aspect of occupational safety. The International Pharmaceutical Federation (FIP) emphasizes the importance of protecting workers from exposure to hazardous substances in its "Guidelines on Occupational Safety in the Pharmaceutical Industry." These guidelines offer insights into minimizing risks to workers' health (FIP, 2012). Also, engineering controls and personal protective equipment (PPE) play a crucial role in ensuring occupational safety. The paper "Engineering Controls for Pharmaceutical Manufacturing: Selection Guide" by the American Industrial Hygiene Association discusses the selection and implementation of engineering controls to mitigate hazards in pharmaceutical manufacturing (AIHA, 2015). Likewise, Sittig (2007) asserts that risk assessment is fundamental to identify potential hazards and develop appropriate control measures.

Summarily, occupational safety is a cornerstone of the pharmaceutical industry, safeguarding both workers and product quality (Asumeng, Asamani, Afful & Agyemang, 2015). By adhering to regulatory guidelines, employing process safety management, prioritizing worker health, and implementing engineering controls, pharmaceutical companies can create a safer and more productive work environment (Asumeng, et al., 2015).

Performance

The concept of performance in the pharmaceutical industry refers to the measurable outcomes and achievements of various processes, operations, and activities within the sector (Hussain, Morris & Gurvich, 2021). It encompasses a wide range of aspects, including product quality, regulatory compliance, operational efficiency, research and development advancements, and

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

overall business success (AlAyouty, 2017). Achieving and maintaining high levels of performance is crucial to ensuring the industry's credibility, safety, and effectiveness (Shabaninejad, Mirsalehian & Mehralian, 2014; Akpan, Ibekwe, Worgu & Nwangwu, 2019).

Pharmaceutical companies operate in a complex environment influenced by regulatory requirements, market dynamics, and scientific advancements. Evaluating business performance is essential for assessing the effectiveness of a company's strategies and its ability to meet various goals and objectives. Financial indicators play a crucial role in evaluating business performance. Metrics like revenue growth, profitability, return on investment (ROI), and earnings before interest, taxes, depreciation, and amortization (EBITDA) reflect a company's financial health and its ability to generate value for stakeholders (Shabaninejad, et al., 2014).

There are no generally acceptable measures of performance (Tumba, et al., 2022) but this study adopts those performance measures that relate to the operations of pharmaceutical organizations, as is obtainable in literature. Performance is therefore measured by quality performance, cost performance, and flexibility performance. Quality performance is the extent to which a product works when it is being used by the final consumers (Uzir, Jerin, Al Halbusi, Abdul Hamid & Latiff, 2020). It is the extent of durability and functionality that a product exhibits when it is being used to perform the purposes for which it was developed or produced. Cost performance is the extent that a firm is able to keep its costs of manufacturing and operations within the limits of their budget and not allowing it exceed the budgeted amount; and is measured by determining the unit cost of products when compared to that of competitors and the unit cost of products over its life cycle (Fynes & Voss, 2001). Flexibility performance is the extent that a firm is able to adapt and respond to the changes and vagaries of their environment of operation; and is measured by volume flexibility and variety or product line flexibility (Fynes et al., 2005).

Hypotheses Development

Incidents Reporting and Quality Performance

Incident reporting is crucial for improving the quality performance of manufacturing pharmaceutical organizations. The fact that incidents occur is a pointer to the fact that the quality of the final products may be marred in one way or another (Woloshynowych et al., 2005). But the extent to which these deformities would be discovered and corrected in order to maintain the initially planned quality may depend on how much and how well the damages done during the incident were reported. If the incident was a product of human errors, then the likelihood that employees would withhold certain information which implicates them and portrays them as inefficient would be very high. In the bid to avoid blames and protect their jobs especially in climes where unemployment rates are high, employees involved in the incident may report incomplete information about the incident. Incomplete reportage of incidents may cause certain vital information about the production process which may be crucial for maintaining the quality of the final product to be left out. The outcome is that quality performance is negatively affected. Unfortunately, in reporting incidents, many employees care

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

little about final outputs as long as they receive their wages/salaries. But even the remuneration of employees involved in incidents should be tied to their ability to completely and timely provide information on how, when, where, and the people involved in the occurrence of the incident; such that workers who withhold information for fear of being blamed would receive salary cuts (Kiani et al., 2011). By doing so, workers are compelled to divulge as much information as they can remember about the incident. Moreover, incident reporting may improve quality performance if there are incentives for being forthright with incident information (Vincent et al., 1999). If at all there are punitive measures for involvements with incidents due to carelessness and human inefficiencies, such punishments should be reduced for employees who are sincere about the roles they played or did not play in the incident. By doing so, the lapses in the production process are holistically investigated and improvements to the products would be made where necessary. The proof that the firm's quality performance is high is when there are minimal complaints about the product and when the customer complaint tracking or feedback systems are adequate enough to respond to customers. Therefore, the proof that the incident reporting by employees has yielded quality performance is to the extent that their report provides information that helps the firm minimize customer complaints. It is no use to the firm when employees involved in incidents claim to have completely reported all that happened but lapses in quality and increased customer complaints show that some information was hoarded or even ignored. It is proposed that in organizations where incident reporting is frequent, complete, and timely, quality performance would be high; ceteris paribus.

It has been emphasized that incident reports require competent personnel to analyze and interpret. In order to obtain the best from incident reports, no one person should be responsible for investigations so as to ensure an unbiased and comprehensive outlook towards the incident. Also, people responsible for investigating incidents should be vastly experienced in the type of incident being investigated; and they should have the patience and caution needed to meticulously x-ray the situation (Gaidamakin et al., 2020; Woloshynowych et al., 2005). There is the need to have a standard number of investigators without which the outcome of the investigations would not be adopted as an official report for the organization. While the members of this team may be internal to the organization, it may be better to outsource the investigative function in order to ensure objective and panoramic analysis (Woloshynowych et al., 2005). Unfortunately, outsourcing is an expensive function to expedite. Since incidents entail risks, independent investigators may be too costly for the firm to recruit and inviting them to investigate the incident may take a longer time to actuate. Firms in developing climes are usually faced with this dilemma because of cost constraints which make incident investigations to be done haphazardly. As a result, the firm is unable to provide the resources needed to unravel hidden puzzles associated with the incident which may account for the quality needs of the product being developed. Moreover, some pharmaceutical firms may exist in climes where regulatory agencies are responsible for investigating incidents. Such investigations may not require extra fees since it is assumed that the firm should have been complying with any statutory obligations that the regulatory bodies may have stipulated. This means that the degree that reported incidents investigated by government or regulatory

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

institutions would improve the quality performance of pharmaceutical organizations may depend on the extent that the firm's compliance to other statutory obligations should warrant the acceptance and investigation of such reports by the regulatory body. Therefore, it was proposed that:

H_1: Incidents report has a significant influence on quality performance.

Safety Commitment and Cost Performance

The relationship between safety commitment and cost performance is expected to assume a linear relationship (Tadese, Mohamed, & Mengistie, 2015; Michael et al., 2005). Employees are usually the object of safety commitment programmes. The essence of safety commitment is to ensure that employees who work in the manufacturing plants are not exposed to safety risks that are capable of not only increasing production costs for the firm, but causing injuries or deaths of the workers. Safety commitment requires strict adherence to the safety rules and regulations as set by the authorities. Such safety rules usually imply that the firm must meet the minimum requirements for safety within the organization such as the provision of PPEs, adequate factory space, fire exits, fire extinguishers, and other safety measures depending on the nature of the firm (Tadese et al., 2015). On the one hand, continuously keeping these safety rules may impact the cost performance of the organization. One may argue that small and large firms would differ in their investments in safety procedures; and that the cost of safety may reduce as the firm grows large. However, as the firm increases in size its production processes would also increase and this means that more workers would be employed. By implication, the firm is expected to purchase more safety materials and products, leading to increased cost for the organization. On the flip side, industries where employees are highly exposed to risks may find that safety costs may be so high that profits from sale of products may not be sufficient to offset such costs. Moreover, not many pharmaceutical manufacturing firms have adequate resources to ensure their worker safety. Such organizations face the risk of sanctions and fines which have negative impacts on cost performance. In other words, the cost of these sanctions may be factored into the unit cost of goods produced and by so doing; the cost performance of the organization is negatively affected. Therefore, this study hypothesized that:

H_2: Safety commitment has a significant influence on cost performance.

Safety Education and Delivery Performance

The extent that safety education would impact flexibility performance may depend on the degree that safety training is a top priority for pharmaceutical firms (Ashcroft & Parker, 2009). Environmental conditions and other internal dynamics may cause priorities to change from time to time. But in firms where safety is a top priority, it is likely that the transition from one production volume to another may be more seamless than those organizations where safety is not a top priority. Employees who are skilled in varying production volumes are more likely to add value to the firm than those who have no such skill. In addition, firms where safety is regarded as a top priority would be able to train their employees to know how to facilitate product-line flexibility. As highlighted earlier, product line flexibility is the extent of modifications that are made to the quality of a product after production has already commenced

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

(Yayla-Küllü et al., 2021). Safety training programmes are designed to communicate information about the changing tastes and demands of the consumers and how to meet them. In such a setting, the production employees especially are taught how designs and features can be added swiftly to a production line without completely halting the production process. They are equipped with the skills with which to reduce lead times and to determine which aspect of the product can accommodate changes during the production process. The safety education programmes conducted by firms may have a way of communicating to the employees that the firm is concerned about their safety. Such assurance may improve the dexterity and commitment with which flexibility performance is being implemented (Kapur, 2021; Mulvaney et al., 2011). Using an empowerment approach, the safety education of pharmaceutical manufacturing firms can help workers to take responsibility for their safety and not necessarily have to bequeath such responsibility to the management of the organization. Thus, it was proposed that:

H_3: Safety education has a significant influence on flexibility performance

Based on the review above, the research model in figure 1 shows the effect of occupational safety dimensions of incidents reporting, safety commitment and safety education on the measures of performance – quality performance, cost performance and flexibility performance.

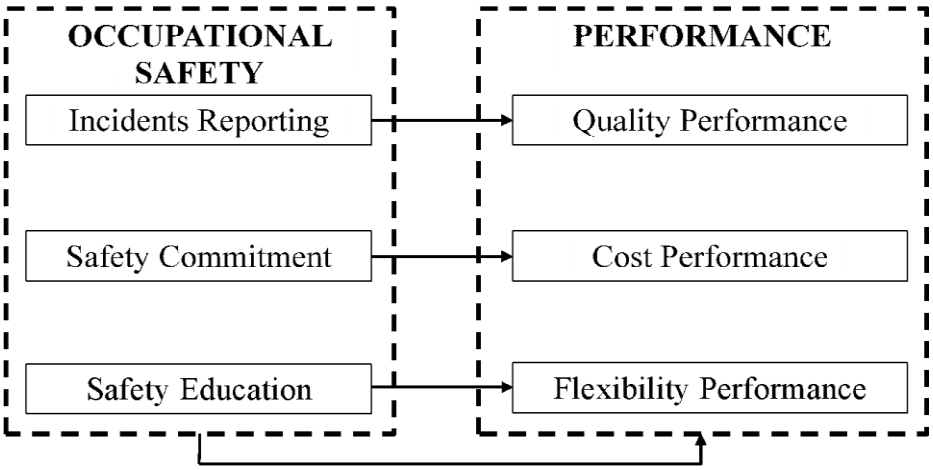

Figure 1: Occupational Safety – Performance Model

Source: Author's Design, 2023.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

3. METHODOLOGY

Research Design

Given that the study is aimed at describing the relationships that exist between the variables under study, a cross sectional survey design was adopted. The cross-sectional survey was appropriate because is it suitable for exploratory research, generating hypotheses, and identifying areas for further investigation. This study covers all pharmaceutical manufacturing firms in South-East region of Nigeria, specifically in parts of Enugu State, Abia State, Imo State and Anambra State. Currently, there is no pharmaceutical manufacturing firm in Ebonyi State. The study population comprised 1,998 respondents from pharmaceutical manufacturing firms in South-East Nigeria. This figure as obtained from Companies' Records 2022 represents all the pharmaceutical manufacturing firms in South-East Nigeria. The sample size of 354 was determined using the formula of Krecjie and Morgan formula.

Questionnaire Design

The questionnaire for this study was designed such that all the variables (dependent and independent) were measured using established and validated constructs. The components of occupational safety and performance of pharmaceutical manufacturing firms were measured using the construct adapted from prior studies. Although adjustments were made on the original constructs to adequately suit the context of the current study, these changes did not in any way affect the content and intent of the original construct, but to account for context variation given that the context of the present study is different from that with which the scale was validated. All the constructs used for this study were designed using a five (5) point Likert scale ranging from 5(strongly agree) to 1 (strongly disagree), with the exception of the control variables.

The independent variable: occupational safety was measured using scales adapted from Ashcroft & Parker (2009). The construct contains 11 question items measuring incidents reporting, safety commitment, and safety education. Specifically, incident reporting was used to measure the extent to which details and attributes of an incident are effectively documented for future references. The question items were on a five point Likert scale ranging from 5 (Strongly Agree) to 1 (Strongly Disagree). Sample from the 6 question item construct is "Incidents and complaints are ''swept under the carpet'' if possible". Safety commitment was used to measure the degree to which the firm owners and employees are committed to sustaining and improving safety within the workplace. The scale contained 3 question items developed on a five point Likert scale ranging from 5 (Strongly agree) to 1 (Strongly disagree). A sample item from the scale is "Patient safety is never sacrificed to get more work done". Lastly, safety education was used to measure the extent to which employees are knowledgeable and adequately equipped with skills that would help them manage emergency situations caused by incidents where they are exposed to high risk of safety hazards. One of the question items from the 3-item construct is "Training in safety has a low priority and is seen as irritating, time consuming and costly". The constructs were on a five point Likert scale ranging from 5 (Strongly Agree) to 1 (Strongly Disagree).

The dependent variables: performance was measured using a construct adopted from previous

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

literature on performance (Kamble & Wankhade, 2018; Fynes et al., 2005a). The construct contains five (5) items measuring performance which are quality performance, cost performance, and flexibility performance. Specifically, quality performance was used to measure the extent to which customers are satisfied with the design, packaging, functionality, and use of a product. The measures were on a five point Likert scale ranging from 5 (Strongly Agree) to 1 (Strongly Disagree). A sample question item from the scale is "We frequently receive complaints from customers". Cost performance was used to measure the extent that a firm is able to efficiently and effectively minimize the costs of manufacturing and operations, by keeping cost within the limits of their budget and not allowing it to exceed the budgeted amount. The construct contained 2 question items on a five point Likert scale ranging from 5 (Strongly agree) to 1 (Strongly disagree). A sample form the scale is "The unit cost of products / services over its life cycle does not exceed the budgeted amount". Lastly, flexibility performance was used to measure the ability of organizations to spot opportunities and threats in their environment and swiftly react to them swiftly, using agile management strategies. The construct was developed on a five point Likert scale ranging from 5 (Strongly Agree) to 1 (Strongly Disagree), with a sample item "Our firm has the capacity to meet increased demands for product varieties in an effective and efficient manner".

Validity and Reliability of the Research Instrument

Validity tests were conducted on the instruments before administering to respondents. To ensure content and construct validity, two (2) lecturers in the department of Management, University of Nigeria Enugu campus, evaluated the instrument for validity. The instrument was presented to measurement and evaluation experts outside of the university to assess its validity. These measures are necessary to ensure that the instrument is able to measure what it is intended to measure. The reliability of the instrument was ascertained using Cronbach alpha values with the aid of Statistical Package for Social Sciences (SPSS). The Cronbach statistics result has generally been proven to be a good measure of the reliability of an instrument. A Cronbach alpha of 0.7 is acceptable, although a score above 0.7 would indicate a more reliable instrument.

4. DATA ANALYSIS AND DISCUSSION

Data collected for this study was analyzed in several ways. First using descriptive statistics, data collected from respondents were screened for any incomplete or invalid responses and presented in tables showing their frequencies and percentages of the response items on the study instrument to be analyzed. Secondly, the study hypotheses were tested using the Simple Regression Analysis with the aid of Statistical Package for Social Sciences (SPSS). The decision rule for the analysis was to accept the alternative hypothesis when the p-value is less than 0.05, otherwise do not accept the alternative hypothesis.

Test of Hypothesis One: Incidents report has a significant influence on quality performance.

Implicit model: QP= f (IR)

Where: QP is the Quality performance of manufacturing firms

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

IR is the Incidents Reporting in manufacturing firms

Proposed model: $QP = \beta o + \beta_1 IR + e$

Table 1: Result of Hypothesis One

Coefficients						
		Unstandardized Coefficients		Standardized Coefficients		
Model		β	Std. Error	Beta	t	Sig.
1	(Constant)	.458	.090		5.077	.000
	INCIDENT REPORTING	.859	.030	.859	28.964	.000

a. Dependent Variable: QUALITY PERFORMANCE

Source: SPSS Output, 2023.

Resultant model: QP = 0.458 + 0.859IR

The resultant model above shows that the intercept and incident reporting impact on quality performance are all statistically significant based on the significance level already stated in the previous chapter. This means that the null hypothesis is rejected and the alternate hypothesis is accepted. Thus, there is a statistically significant impact of incidents reporting on the quality performance of manufacturing firms in South-East, Nigeria. Furthermore, the result here shows that an increase in the level of incidents reporting would precipitate a corresponding increase in the quality performance of manufacturing firms to the extent of 85.9%.

Test of Hypothesis Two: Safety commitment has a significant influence on cost performance.

Implicit model: CP= f (SC)

Where: CP is the Cost performance of manufacturing firms

SC is the Safety Commitment in manufacturing firms

Proposed model: $CP = \beta o + \beta_1 SC + e$

Table 2: Result of Hypothesis Two

Coefficients						
		Unstandardized Coefficients		Standardized Coefficients		
Model		β	Std. Error	Beta	t	Sig.
1	(Constant)	.513	.099		5.168	.000
	SAFETY COMMITMENT	.818	.032	.826	25.271	.000

a. Dependent Variable: COST PERFORMANCE

Source: SPSS Output, 2023.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

Resultant model: CP = 0.513 + 0.826SC

The resultant model above shows that the intercept and safety commitment impact on cost performance are all statistically significant based on the significance level already stated in the previous chapter. This means that the null hypothesis is rejected and the alternate hypothesis is accepted. Thus, there is a statistically significant impact of safety commitment on the cost performance of manufacturing firms in South-East, Nigeria. Furthermore, the result here shows that an increase in the level of safety commitment would precipitate a corresponding increase in the cost performance of manufacturing firms to the extent of 82.6%.

Test of Hypothesis Three: Safety education has a significant influence on flexibility performance

Implicit model: FP= f (SE)

Where: FP is the Flexibility performance of manufacturing firms

SE is the Safety Education in manufacturing firms

Proposed model: $FP = \beta o + \beta_1 SE + e$

Table 3: Result of Hypothesis Three

Coefficients

Model		Unstandardized Coefficients β	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.538	.103		5.200	.000
	SAFETY EDUCATION	.801	.033	.812	24.003	.000

a. Dependent Variable: FLEXIBILITY PERFORMANCE

Source: SPSS Output, 2023.

Resultant model: FP = 0.538 + 0.812SE

The resultant model above shows that the intercept and safety education impact on flexibility performance was statistically significant based on the significance level already stated in the previous chapter. This means that the null hypothesis is rejected and the alternate hypothesis is accepted. Thus, there is a statistically significant impact of safety education on the flexibility performance of manufacturing firms in South-East, Nigeria. Furthermore, the result here shows that an increase in the level of safety education would precipitate a corresponding increase in the flexibility performance of manufacturing firms to the extent of 81.2%.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

Discussion of Findings

This study focused on determining the impact of occupational safety and performance of pharmaceutical manufacturing firms in South-East, Nigeria. The first hypothesis tested for the impact of incidents reporting on quality performance. This means that the subjective values of incident reporting were used to predict the subjective values of quality performance. The result shows that there was a statistically significant positive impact of incidents reporting on the quality performance of manufacturing firms in the South-East Nigeria ($\boldsymbol{\beta}$ = 0.859; $p < 0.05$; n = 300). The implication of this result is that the quality of the products delivered to customers would improve if the workers are apt to report any incidents they experience in the course of performing their duties. As expected, incidents have the likelihood to limit the cognitive, psychological, and physical performance of employees. As a result, employees that experience one incident or another may not be able to correctly determine the right measures of the material inputs that are necessary in the production process.

Thus, reporting incidents would draw the attention of management to their health and safety, and improve the quality of care that they would receive for the purpose of performing their tasks. There is also no doubt that safety procedures and protocols would be taken seriously when more incidents are reported as opposed to when such incidents are not reported. This finding is corroborated in previous studies, as Prajogo & Sohal (2003) found that there was a statistically significant effect of total quality management on the product quality performance of organizations in both the manufacturing and the non-manufacturing sectors. Total quality management has been tipped as a critical management practice that ensures that firms attain competitive advantage over their competitors. It also comprises every activity within the firm that aims to ensure the smooth running of the production and operational processes for the purpose of facilitating performance (Abbas, 2020).

Since total quality management assumes a top-bottom approach to identifying and correcting lapses in the production process, it means that when such lapses are corrected, then the quality of products delivered would be high. Curkovic, Vickery, and Dröge (2000) confirmed that quality-related action programmes would improve the quality performance of organizations. Fynes, Voss, & De Búrca, (2005) found that supply chain relationship quality would have a statistically significant effect on quality performance. Employees are crucial players in the supply chain. If they are able to report issues in the production process, then quality concerns would be promptly addressed. But their ability to do so may depend on the extent to which they have honed quality relationships with managers and other members of the organization. If the relationship is cordial, then incident reporting would be easier and would lead to quality interventions. Otherwise, quality performance would not improve.

The second hypothesis tested for the impact of safety commitment on cost performance. This means that the subjective values of safety commitment were used to predict the subjective values of cost performance. The result shows that there was a statistically significant positive impact of safety commitment on the cost performance of manufacturing firms in South-East Nigeria ($\boldsymbol{\beta}$ = 0.826; $p < 0.05$; n = 300).

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

The implication of this result is that when employees and organizations are committed to the safety of workers, then they would incur less costs in losses pertaining to incidents. Costs such as treatment of workers involved in incidents and litigations against the firm by aggrieved and injured workers would be less or non-existent if the firm pays attention to the safety procedures and injunctions provided by regulatory bodies. There is no doubt that sometimes, the cost of reparations for incidents may be higher than the cost of safety commitment.

Firms who are committed to providing all the safety equipment such as gloves, helmets, adequate lighting, boots, and other personal protective equipment required to ensure safety in production factories, would record higher levels of cost performance than those firms that do not perform these important functions. Baloi & Price (2003) found that there are global risk factors that affect the cost performance of construction firms. One of such risk factors is the cost growth in the process of implementation. Cost growth is the percentage difference between the amount awarded for a contract and the amount finally used for the contract. Firms that do not incorporate the costs of safety for their employees in the manufacturing process are likely to spend more funds addressing safety concerns both during and after production. Thus, they would experience cost growth.

But firms that incorporate safety concerns early would experience less cost growths. Esfahbodi, Zhang, & Watson (2016) found that organizations in emerging contexts have to consider their bottom-line in the implementation of their sustainable supply chain management initiatives so that they would not have to face the tradeoffs between cost performance and environmental performance. This is because normally, firms that seek to perform highly in terms of environmental performance may end up not performing well in terms of cost; and those that seek to improve cost performance may end up not improving their environmental performance. It therefore behooves firms to plan the whole supply chain process such that the right amount of funds are invested promptly and initially in the production process and any extra expenses that may affect the bottom-line as a result of lack of commitment to safety rules and regulations would be avoided.

The third hypothesis tested for the impact of safety education on flexibility performance. This means that the subjective values of safety education were used to predict the subjective values of flexibility performance. The result shows that there was a statistically significant positive impact of safety education on the flexibility performance of manufacturing firms in the South-East Nigeria ($\boldsymbol{\beta}$ = 0.812; $p < 0.05$; n = 300). This result implies that when employees are properly educated and informed on how to handle safety equipment and tools, then they would be more flexible with their jobs and would be able to protect themselves irrespective of the tasks they are assigned by the organization.

While it is necessary to provide the protective and safety equipment that employees need to work safely and preserve their health, such equipment would definitely be of no use unless employees are educated in how to use them. Proper safety education empowers employees to not just be reactive towards safety issues in the organization, but to be proactive. It enables them to be able to identify the root causes of any incidents that occur, or that are likely to occur in the course of their duty as well as before any new task that they may be required to perform.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

Beltrán-Martin & Roca-Puig (2013) found that human resource practices such as internal fit and job enrichment had a significant impact on flexibility performance. A primal aspect of achieving job enrichment is the effective communication of the nature of the job as well as the processes by which employees can ensure their safety during task performance. Educating employees would enhance their fit with their jobs and ensure that they are more specialized in the functions that they perform.

Chen (2017) emphasized the importance of organizational training as a facilitator and enhancer of the innovative capabilities of employees. Employees would be more innovative in their use of safety equipment especially when such equipment may have undergone wear and tear and there is a tardiness in management's efforts to replace them. Employees who are trained and educated on how to protect themselves would always improvise when their health and safety is highly compromised. Yousuf, Lorestani, Oláh, and Felföldi (2021) found that both demand and supply uncertainty would moderate the effect of strategic flexibility and the performance of firms. It is known that uncertainties are products of environmental vagaries and fickleness.

But sometimes, the uncertainties that employees of manufacturing firms face may be related to the ignorance of how to facilitate the production activities and how to protect themselves from any dangers that they may face during work. It means that employees who are uncertain about safety rules and even the abrupt changes that may be made to such rules especially in developing climes like Nigeria where instability is the norm, would be less likely to improve their flexibility performance than those who are certain of what to do to protect themselves.

5. CONCLUSION AND RECOMMENDATIONS

Conclusion

The purpose of this study was to investigate the impact of occupational safety and performance of pharmaceutical manufacturing firms in South-East, Nigeria. The findings of the study show that all the hypothesized relationships were positive and statistically significant. The implication is that any organization that pays attention to incident reporting, safety commitment, and safety education would ultimately improve their quality performance, cost performance, and flexibility performance respectively. It is important to note that of all the hypothesized relationships, hypothesis one, which investigated the impact of incident reporting on quality performance showed the highest impact. Therefore, it is not enough to identify or even report incidents as they occur, rather efforts should be made to investigate those incidents and take both corrective and preventive actions to mitigate their repetitive occurrence in the future. Employees should not have to wait for too long and risk their health and lives for the sake of the firm before safety concerns would be addressed.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

Recommendations

Based on the findings of the study, the following recommendations are given:

1. Employees should be prompt in the reporting of any incidents that occur in the course of their work so that any corrective actions that would enhance the final quality of their outputs would be impacted.
2. Manufacturing firms should show tangible commitment to the safety of their employees by providing personal protective equipment to every member of the firm so that the
3. Employees of manufacturing firms should be properly educated on how to use the safety equipment purchased by the firm so that they can be flexible enough to perform multiple roles in the firm.

Contributions to Knowledge

Figure 5.1 shows this study's contribution to knowledge. The diagram shows that the link between occupational safety and the performance of manufacturing firms were positive and statistically significant (this is shown in the thick weight of the lines linking the independent and dependent variables). The main contribution of this study to extant literature is the fact that no study (to the best of the author's knowledge) has investigated this particular model the way it is presented in this study. This study examined the safety climate of manufacturing firms in Nigeria; a context that is continually bedeviled by safety problems such as tardiness in providing safety protocols and procedures as stipulated by the regulatory authorities. This study has validated the need for more safety measures to be put in place to ensure the safety of employees in the manufacturing sector.

Limitations and Suggestion for Further Studies

This study was done using most firms in the private sector. First, further studies in this area can examine the relationships between the variables of this study in manufacturing organizations that are operated by governments and its institutions. This is necessary in order to determine how the government approaches the safety and health of its workers and whether they actually lead by example in fulfilling the health and safety regulations that they expect private firms to adhere to. Second, this study was carried out in the South-East region of Nigeria – a zone particularly popular for manufacturing activities. Hence, this study can be replicated in other states or regions of the country to determine the extent of adherence to safety rules and how it affects the performance of pharmaceutical manufacturing firms in those areas. Efforts can be made to establish if there are any cultural or contextual factors that could affect the implementation of safety guidelines by leaders of firms or its acceptance and adherence by employees. Third, further studies can also investigate this study from the leaders' perspective to understand if there are other extraneous factors that limit the firm's adherence to safety which the employees may be aloof to. This would give a balanced perspective on the demands of safety and how such demands can be adequately met within the limits of the firm's capabilities, resources, and competencies.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

References

1. Abbas, J. (2020). Impact of total quality management on corporate green performance through the mediating role of corporate social responsibility. *Journal of Cleaner Production*, 242, 1–12. https://doi.org/10.1016/j.jclepro.2019.118458
2. AIHA. (2015). *Engineering controls for pharmaceutical manufacturing: Selection guide*. Retrieved from https://www.aiha.org/docs/default-source/default-document-library/engineering-controls-for-pharmaceutical-manufacturing-selection-guide.pdf
3. Akpan, E.E., Ibekwe, U., Worgu, S.C., & Nwangwu, C. E. (2019). Social media usage and firm performance: Reflections from the Nigerian telecommunication sector. *International Journal of Management Science and Business Administration,* 4(6), 7-16.
4. AlAyouty, I. (2017). R&D performance in the pharmaceutical industry: A case study of Egypt. *European Journal of Sustainable Development*, 6(2), 121-134. Doi: 10.14207/ejsd.2017.v6n2p121
5. Ashcroft, D. M., & Parker, D. (2009). Development of the pharmacy safety climate questionnaire: A principal components analysis. *Quality and Safety in Health Care*, 18(1), 28–31. https://doi.org/10.1136/qshc.2006.022129
6. Asumeng, M., Asamani, L., Afful, J., & Agyemang, C.B. (2015). Occupational safety and health issues in Ghana: strategies for improving employee safety and health at workplace. *International Journal of Business and Management Review,* 3(9), 60-79.
7. Baloi, D., & Price, A. D. F. (2003). Modelling global risk factors affecting construction cost performance. *International Journal of Project Management*, 21(4), 261–269. https://doi.org/10.1016/S0263-7863(02)00017-0
8. Beltrán-Martin, I., & Roca-Puig, V. (2013). Promoting employee flexibility through HR practices. *Human Resource Management*, 52(5), 645–674. https://doi.org/10.1002/hrm
9. CCPS. (2010). Guidelines for Process Safety in Bioprocess Manufacturing Facilities. Wiley.
10. Chen, B. T. (2017). Service innovation performance in the hospitality industry: The role of organizational training, personal-job fit and work schedule flexibility. *Journal of Hospitality Marketing and Management*, 26(5), 474–488. https://doi.org/10.1080/19368623.2017.1264344.
11. Curkovic, S., Vickery, S., & Dröge, C. (2000). Quality-related action programs: Their impact on quality performance and firm performance. *Decision Sciences*, 31(4), 885–902. https://doi.org/10.1111/j.1540-5915.2000.tb00947.x
12. Emelumadu, O. F., Ukegbu, A. U., Ezeama, N. N., Kanu, O. O., Ifeadike, C. O., & Onyeonoro, U. U. (2014). Socio-demographic determinants of maternal health-care service utilization among rural women in Anambra State, South East Nigeria. *Annals of Medical and Health Sciences Research*, *4*(3), 374. https://doi.org/10.4103/2141-9248.133463
13. Esfahbodi, A., Zhang, Y., & Watson, G. (2016). Sustainable supply chain management in emerging economies: Trade-offs between environmental and cost performance. *International Journal of Production Economics*, 181, 350–366. https://doi.org/10.1016/j.ijpe.2016.02.013
14. FIP. (2012). *Guidelines on occupational safety in the pharmaceutical industry*. Retrieved from https://www.fip.org/file/1697
15. Fynes, B., & Voss, C. (2001). A path analytic model of quality practices, quality performance, and business performance. *Production and Operations Management*, *10*(4), 494–513. https://doi.org/10.1111/j.1937-5956.2001.tb00089.x
16. Fynes, B., Voss, C., & De Búrca, S. (2005). The impact of supply chain relationship quality on quality

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

performance. *International Journal of Production Economics*, 96(3), 339–354. https://doi.org/10.1016/j.ijpe.2004.05.008.

17. Gaidamakin, N., Gibilinda, R., & Sinadskiy, N. (2020). File operations information collecting software package used in the information security incidents investigation. *Proceedings - 2020 Ural Symposium on Biomedical Engineering, Radioelectronics and Information Technology, USBEREIT 2020*, 559–562. Yekaterinburg,: IEEE. https://doi.org/10.1109/USBEREIT48449.2020.9117671.
18. Hussain, A. S., Morris, K., & Gurvich, V. J. (2021). Pharmaceutical quality, team science, and education themes: Observations and commentary on a remarkable AAPS PharmSciTech theme issue. *AAPS PharmSciTech,* 22(3), 88. https://doi.org/10.1208/s12249-021-01970-7
19. Kamble, R. S., & Wankhade, L. N. (2018). The questionnaire on productivity attributes (QPA): Designing and developing a measuring tool to estimate productivity in manufacturing industries. *International Journal of Productivity and Performance Management*, 67(5), 845–872. https://doi.org/10.1108/IJPPM-01-2017-0012.
20. Kapur, R. (2021). Recognizing the significance of education in rural communities. *The Journal of Social Sciences Studies and Research*, *01*(02), 33–44.
21. Kiani, F., Samavatyan, H., Pourabdian, S., & Jafari, E. (2011). Predictive power of incidents reporting rate and its dimensions by job stress among workers' Isfahan Steel Company. *Iranian Journal of Public Health*, *40*(3), 105–112.
22. Michael, J. H., Evans, D. D., Jansen, K. J., & Haight, J. M. (2005). Management commitment to safety as organizational support: Relationships with non-safety outcomes in wood manufacturing employees. *Journal of Safety Research*, *36*(2), 171–179. https://doi.org/10.1016/j.jsr.2005.03.002.
23. Mulvaney, C. A., Watson, M. C., & Errington, G. (2011). Safety education impact and good practice: A review. *Health Education*, *112*(1), 15–30. https://doi.org/10.1108/09654281211190236.
24. Ngwama, J. C. (2016). Framework for occupational health and safety in Nigeria: The implication for the trade union movement. *Journal of Economics and Sustainable Development*, *7*(11), 98–109.
25. OSHA. (2021). *Guidance on safe handling of hazardous drugs*. Retrieved from https://www.osha.gov/sites/default/files/publications/OSHA3990.pdf
26. PhRMA. (2021). *Biopharmaceutical research & development: The process behind new medicines*. Retrieved from https://www.phrma.org/industry-today/research-development.
27. Prajogo, D. I., & Sohal, A. S. (2003). The relationship between TQM practices, quality performance, and innovation performance: An empirical examination. *International Journal of Quality and Reliability Management*, 20(8), 901–918. https://doi.org/10.1108/02656710310493625.
28. Shabaninejad, H., Mirsalehian, M. H., & Mehralian, G. (2014). Development of an integrated performance measurement (PM) model for pharmaceutical industry. *Iranian Journal of Pharmaceutical Research*, 13, 207–215.
29. Sittig, M. (2007). *Pharmaceutical manufacturing encyclopedia* (3rd ed.). William Andrew Publishing.
30. Snyder, D. J. (2018). *Philosophia soteria: How occupational safety and health professionals influence decision makers*. Graduate Theses and Dissertations Retrieved from https://scholarworks.uark.edu/etd/3140.
31. Tadese, T., Mohamed, A., & Mengistie, A. (2015). Assessment of factors influencing job satisfaction among health care providers, federal police referral hospital, Addis Ababa, Ethiopia. *Ethiopian Journal of Health Development*, *29*(2), 119–126.
32. Tumba, N.J., Onodugo, V.A., Akpan, E.E., & Babarinde, G.F. (2022). Financial literacy and business performance among female micro-entrepreneurs. *Investment Management and Financial Innovations*, 19(1),

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.10012288

156-167. doi:10.21511/imfi.19(1).2022.12.

33. Uzir, U.H., Jerin, I., Al Halbusi, H., Abdul Hamid, A.B., & Latiff, A.S.A (2020). Does quality stimulate customer satisfaction where perceived value mediates and the usage of social media moderates? *Heliyon*, 6(12), e05710.
34. Vachon, S., & Klassen, R. D. (2002). An exploratory investigation of the effects of supply chain complexity on delivery performance. *IEEE Transactions on Engineering Management*, 49(3), 218–230. https://doi.org/10.1109/TEM.2002.803387.
35. Vincent, C., Stanhope, N., & Rn, M. C. R. M. (1999). Reasons for not reporting adverse incidents: An empirical study. *Journal of Evaluation in Clinical Practice*, *5*(1), 13–21.
36. Woloshynowych, M., Rogers, S., Taylor-Adams, S., & Vincent, C. (2005). The investigation and analysis of critical incidents and adverse events in healthcare. *Health Technology Assessment*, *9*(19). https://doi.org/10.3310/hta9190
37. Yang, M., Lin, Q., & Maresova, P. (2021). Does Employee Care Trigger Innovation Under a Healthy and Safe Working Environment? Evidence from the Pharmaceutical Industry in China. *Healthcare (Basel, Switzerland)*, 9(2), 194. https://doi.org/10.3390/healthcare9020194.
38. Yayla-Küllü, H. M., Ryan, J. K., & Swaminathan, J. M. (2021). Product line flexibility for agile and adaptable operations. *Production and Operations Management*, *30*(3), 725–737. https://doi.org/10.1111/poms.13313.
39. Yousuf, A., Lorestani, V. Z., Oláh, J., & Felföldi, J. (2021). Does uncertainty moderate the relationship between strategic flexibility and companies' performance? Evidence from small and medium pharmaceutical companies in Iran. *Sustainability*, 13(16). https://doi.org/10.3390/su13169157.