

Risk Control Strategies and Occupational Safety: Evidence from Iron and Steel Manufacturing Companies in Lagos State, Nigeria.

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Abstract

The study investigated the nexus between risk control practices and occupational safety among Iron and Steel Manufacturing Companies in Lagos State Nigeria. The study used survey research design. The population of the study comprised of five thousand, two hundred and thirty-four (5,234) staff in thirteen (13) Iron and Steel firms in Lagos State, Nigeria. The sample size of four hundred (400) was derived through the application Taro Yamane formula. Multistage sampling comprising of cluster, quota and convenience techniques was employed in administering research instrument to the respondents. The study employed an adapted questionnaire whose validity was tested through test-retest validity and its reliability through Cronbach Alpha test of reliability. The result of the findings of the study revealed that pre-loss control has significant influence on accident frequency while post-loss control has significant influence on accident severity. The study concluded that workplace accidents can be overhauled when management ensure that risks are properly managed and controlled. Based on the findings, the study recommended that iron and steel manufacturing firms should intensify their efforts in assessing risks frequently in order to effectively control them.

Keywords: Pre-loss control, post-loss control, risk avoidance, accident frequency, accident severity and risk management strategies.

Introduction

Modern economic theories highlight the importance of production, as it stabilizes the economy through foreign exchange earnings, job creation, and national income generation (Roys & Seshadri, 2014). Thus, the sustained operation of the manufacturing sector is crucial to achieving economic objectives. However, a major challenge for manufacturing firms is the risk of industrial accidents, which can lead to significant losses if not well managed (Sakina & Omar, 2018). In recent decades, many companies have intensified efforts to reduce the occurrence and impact of industrial accidents by implementing risk control strategies (Abazid & Harb, 2018; Meiryani, 2018; Al Saadi & Norhayatizakuan, 2021). Despite these efforts, the recurrence of occupational accidents in certain Nigerian industries remains a serious issue (Kalejaiye, 2013). For example, the Iron and Steel industry has seen a disturbing frequency of fire accidents and explosions especially in factories where pressure vessels, steam boilers and other sophisticated machineries are utilised. In 2002, a tragic incident in Ogijo, Ogun State, resulted in numerous factory workers losing their lives in a fire outbreak after being neglected by their Chinese supervisors (Idubor & Oisamoje, 2013). Similarly, in 2019, several workers lost their lives in an Iron and Steel factory in

Ikorodu, Lagos, when molten metal was accidentally spilled on them. Given the ongoing nature of such accidents, it is essential to implement robust risk control strategies (Pons, 2010). Companies should therefore adopt a comprehensive approach, employing a variety of techniques and methods to manage risks holistically (Deloitte, 2015).

Workplace accidents are multifaceted events influenced by various factors that can also predict other outcomes, such as health, job satisfaction, and absenteeism (Drakopoulos & Theodossiou, 2016). These incidents arise from a blend of personal and behavioral elements (Cheung, 2014; Sakina & Omar, 2018), organisational factors (Eskandari et al., 2017; Muchiri *et al.*, 2019; Sawhney & Cigularov, 2018; Thurston & Glendon, 2018), and work or task-related elements (Mullen *et al.*, 2017; Sawhney & Cigularov, 2018; Sheikhalishahi *et al.*, 2017). Studies indicate that workplace accidents are shaped by both internal factors, such as worker characteristics, and external influences, like the work environment and organisational practices. However, it appears that earlier studies have not thoroughly examined how pre-loss and post-loss strategies can help mitigate risks and minimize losses. Consequently, this study aims to explore the impact of these strategies on workplace safety, specifically within iron and steel firms in Lagos State, Nigeria.

The aim of this study is to investigate the impact of risk control practices on risk characteristics of iron and steel manufacturing firms in Lagos State, Nigeria. The specific objectives are as follows:

- To investigate whether pre-loss control has significant effect on accident frequency among iron and steel manufacturing firms in Lagos State, Nigeria.
- To investigate whether post-loss control has significant influence on accident severity among iron and steel manufacturing firms in Lagos State, Nigeria.

Conceptual Clarification

Risk

Risk refers to an unforeseen event or circumstance that, if it occurs, can either positively or negatively affect the goals of a project. It arises from the balance between opportunity and reward, often relating to the likelihood of unfavorable outcomes (Nyce, 2009). In organisational settings, risk is usually defined as any factor that can influence the achievement of a company's objectives (Hopkin, 2017). Since organisations cannot fully eliminate all risks, it is often beneficial for them to adopt risk management practices at corporate, business, and functional levels. Doing so facilitates informed decisions about accepting or addressing risks, helping to prevent catastrophic events or mitigate harmful occurrences (Berg, 2010). Risk management includes the selection of appropriate methods for managing risks (Sakina & Omar, 2018). Nyce (2009) divides risk management objectives into two categories: pre-loss and post-loss. Regardless of the specific objectives, survival is seen as the most important goal for any business (Nyce, 2009), while other goals may include operational consistency, earnings stability, growth preservation, and maintaining a positive public image (Nyce, 2009). Consequently, risk management becomes an essential part of a company's overall financial management. Risk management objectives must align with the company's broader financial goals (Mottet & Santos, 2017). Risk management practices involve integrating the risk management process into an organisation's activities effectively and efficiently (Rejda, 2008). Therefore, risk management should be a continuous process followed from start to finish for every project (Nyce, 2009). Organisations must align their

risk management processes with a chosen risk management framework through risk management practices. Risk management practices can either be pre-loss control or post-loss control (Nyce, 2009; Manuelle, 2010).

Pre-loss control is aimed at minimizing or eliminating risks, it focuses on loss prevention measures (Nyce, 2009). Risk avoidance and loss prevention are central components of pre-loss control, involving programmes such as safety training and equipment maintenance (Williams, Smith & Young, 2005). Risk avoidance seeks to eliminate hazards that could jeopardize a company's assets, though it is rarely possible to avoid all risks entirely (Merna & Al-Thani, 2008). Risk avoidance on the other hand aims to minimize vulnerabilities, and policy, training, and technical measures can reduce and manage risks (Chartered Insurance Institute, 2000). Post-loss control strategies focus on minimizing the impact of risks when they occur (Nyce, 2009). Loss-reduction measures are implemented to lessen the severity of incidents, while loss-prevention measures aim to reduce their frequency. Emergency planning, a key aspect of post-loss control, sets standards for quick action after accidents to prevent further harm (Gallagher, MacKenzie, Blum & Boerman, 2016). According to Manuelle (2010), risk control measures should cover property protection, employee health and safety, product safety, and environmental protection.

Occupational safety through Occupational Risk Management and Well-being (ORMW) is a cutting-edge approach for addressing workplace hazards and their interactions with both external and internal factors (Salmien, 2016). Its purpose is to ensure a holistic approach to wellness while also addressing the fact that work and life are sometimes inextricably linked (Drako, Poulous & Theodossiou, 2016). Its mission is to increase society's social and economic capital while also protecting industries, the environment, and the working and wider communities. ORMW places the individual first, with the understanding that their well-being is a personal, communal, and corporate asset (Oughton & DipOHS, 2013). Occupational safety may be conceptualized into frequency of loss and severity of loss.

The frequency of loss refers to how often a risk event results in loss. Organisations may tolerate certain predictable losses as part of normal operating expenses, while others aim for zero accidents (Chartered Insurance Institute, 2000). Regardless of the approach, mitigating accident frequency is important not only for internal purposes but also for external factors like audits and insurance. Although the chance of a loss can never be totally removed, it is a vital strategy for reducing the risk's consequences (Hopkin, 2017). The minimization of the impact of a risk occurrence is the goal of post-loss control actions (Nyce, 2009). Loss-reduction initiatives aim to lessen the severity of a possible loss, while loss prevention strategies aim to lessen the frequency of possible losses. However, whichever way an organisation defines or evaluates the frequency of accident, it must be borne in mind that accident frequency mitigation and curtailment is vital for certain internal purposes and can also have a huge effect on external factors such as audits and insurances (Umeokafor, Umeadi & Jones, 2014).

Theoretical Framework

This study is anchored on the Heinrich's Domino theory. Heinrich's (1950) idea uses the analogy of dominoes falling over one another and causing a chain of events to explain accidents. Though not the most advanced or complex theory, it is notable for being one of the earliest scientific theories to be used to explain accidents (Koranyi *et al.*, 2018). The theory explains that when

dominos fall over, each one tips the next one over, and so on, until all of the connected dominos have fallen (Hosseinian & Torghabeh, 2012). If only one domino is removed, the entire process comes to a halt. Heinrich discusses the cause of an accident in the same way. That is, if this series is interrupted by the elimination of even one of the several factors that comprise it, the injury will not occur, thereby preserving and ensuring the safety of workers (Muchri et al., 2019).

This theory is applicable to this study as it provides a vivid explanation on how a risk event may bring about the exposure of an entity to new hazards as well as accumulation of losses arising from an uncontrolled exposure. However, the factors responsible for the culmination of the series of events which may lead to accident can be mitigated through some risk control practices such as risk avoidance, risk prevention, risk reduction which altogether form the crux of this study. The limitation of this theory is that it oversimplifies the accident causation process as it assumes that the elimination of one unsafe act will automatically prevent accident from occurring (Kivimaki, 2016). This may not be true in a real-life situation since a number of factors interact to bring about accident.

Methodology

The study adopted a survey research design. The study population included eighteen (18) iron and steel manufacturing companies in Lagos State, Nigeria (Manufacturers Association of Nigeria, 2022), encompassing all employees (both management and non-management) across various departments of these organizations. To ensure reliability, the study selected 70% of the total number of firms using a purposive sampling technique. This resulted in approximately 13 firms being selected. The total employee count across these thirteen firms was estimated to be 5,234. A sample size of 400 was determined using the Taro Yamane formula. Subsequently, the sample size for each company was calculated by estimating the ratio of the number of employees in each firm to the total number of employees across all firms, multiplied by the overall sample size. Given that the study targeted both management and non-management staff, the study established the number of questionnaires to distribute to each category within the companies. This was accomplished using a stratified sampling technique. Finally, a convenience sampling method was employed for questionnaire distribution in each firm. Eighty-two (82) questionnaires were administered to management staff while two hundred and eighty-eight (288) questionnaires were administered to non-management staff with the assistance of a human resource personnels. This implies that only three hundred and fifty (350) questionnaires were returned. The questionnaire was divided into two sections: Section A gathered bio-data such as age, gender, educational qualifications, religion, and managerial level of the respondent, while Section B included questions related to the research variables. The questionnaire utilized a five-point Likert scale, ranging from Strongly Agree (SA) to Strongly Disagree (SD). The hypotheses of the study will be analysed with the application of simple regression analysis.

Statement of Hypotheses

H₀₁: Pre-loss control does not have significant effect on accident frequency among iron and steel manufacturing firms in Lagos State, Nigeria

H₀₂: Post-loss control does not have significant influence on accident severity among iron and steel Manufacturing Firms in Lagos State, Nigeria.

To check the degree of relationship between the variables, the correlation analysis was applied using Statistical Package for Social Sciences (SPSS). Also, the bivariate regression analysis was used to determine to the effect of the independent variables on the dependent variables.

Data Analysis, Interpretation and Discussion of Findings

Descriptive Statistics of Respondents’ Bio-Data

Table 1: Descriptive Statistics of Respondents’ Bio-Data

		Frequency	Percentage
Gender	Male	252	72.0%
	Female	98	28.0%
Age	18-29yrs	85	24.3%
	30-39yrs	38	10.9%
	40-49yrs	193	55.1%
	50-59yrs	24	6.9%
	60yrs and above	10	2.9%
Edu	OND	34	9.7%
	BSc/HND	186	53.1%
	Masters	81	23.1%
	Doctorate	32	9.1%
	Professional Certificate	17	4.9%
Income	Less than 50000	24	6.9%
	50000-99,000	191	54.6%
	100000-299000	64	18.3%
	300000-499000	27	7.7%
	500000-999000	19	5.4%
	1000000 and above	25	7.1%
serviceyear	Less than 5yrs	30	8.6%
	5-9yrs	213	60.9%
	10-14yrs	43	12.3%
	15yrs and above	64	18.3%
mgtNmgt	Management	45	12.9%
	Non-management	305	87.1%

Source: Field Survey (2024)

The above shows that 72% of the respondents are male, while 28% are female. The age distribution shows that most of the respondents were within 40-49 years with 55.1%. relatedly, more than half of the respondents (53.1%) had either BSc. or HND qualifications. This indicates that most the respondents were educated. Level of experience of the respondents revealed that 60.9% had work experience between five to nine years, while about 8.6% had less than five years’ experience. This indicates that most of the respondents can be trained on risk control strategies. The table further revealed that 12.9% of the respondents belonged to the management cadre while the remaining 87.1% of them belonged to the non-management cadre.

Test of Hypotheses

Table 2: Model summary for Hypothesis One.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.041 ^a	.002	-.001	.57597

a. Predictors: (Constant), PC

ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.192	1	.192	.579	.447 ^b
	Residual	115.445	348	.332		
	Total	115.637	349			

a. Dependent Variable: AF

b. Predictors: (Constant), PC

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.652	.201		18.175	.000
	PC	.040	.053	.041	.761	.447

a. Dependent Variable: AF

The model summary table above indicates a moderate positive correlation between pre-loss control and accident frequency in iron and steel manufacturing firms in Lagos State, Nigeria ($R = 0.041$). The model reveals how much pre-loss control accounts for variations in accident severity among these firms. The coefficient of determination ($R^2 = 0.002$) suggests that pre-loss control explains 0.2% of the variability in accident frequency. This finding is statistically significant, as the p-value (0.000) is below the 0.05 significance level established for the study. Thus, the null hypothesis is rejected.

Table 3: Model summary for hypothesis two

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.038 ^a	.001	-.001	.66105

a. Predictors: (Constant), PC

ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.215	1	.215	.492	.483 ^b
	Residual	152.071	348	.437		
	Total	152.286	349			

a. Dependent Variable: AS

b. Predictors: (Constant), PC

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.854	.231		16.711	.000
	PC	-.042	.060	-.038	-.702	.483

a. Dependent Variable: AS

The model summary table 3 indicates a weak positive relationship between post-loss control and accident severity in iron and steel manufacturing companies in Lagos State ($R = 0.038$). It further illustrates how post-loss control accounts for variations in accident severity among these companies. The coefficient of determination ($R^2 = 0.001$) reveals that post-loss control explains only 0.1% of the changes in accident severity. This finding is statistically significant, as the p-value (0.000) is below the 0.05 significance level set for the study.

Discussion of Findings

The findings revealed that various strategies, policies, techniques, and tools were strong enough to ensure that the likelihood of accidents among these firms were significantly reduced. This presupposes that, Pre-loss control strategies emerge as a critical factor that has helped the firms in mitigating accidents. This could also mean that the favourable outcome achieved have continued to influence the firms to intensify their efforts further in the adoption of pre-loss control strategies since it has proved to be essential for ensuring a safer workplace. This finding aligns with the research conducted by Lauver (2007), which explored the relationship between human resource safety practices and employee injuries. The study found that there is a significant impact of safety practices on employee injuries when regressing injuries against individual and group compensation alongside control variables.

The study also revealed that post-loss control has a significant effect on accident severity among iron and steel manufacturing firms in Lagos State. This finding reveals that efforts of the firm to implement strategies that help to combat the aftermath of losses were highly potent and beneficial

to the organization in achieving the objective of achieving continuity and ensuring survival. This implies that firms in question were able to return to their operations immediately after the occurrence of a loss due to the implementation of certain post-loss strategies. It indicates that the efforts made by these firms to implement post-loss control strategies are crucial for preventing workplace accidents from escalating beyond manageable levels. This conclusion is consistent with the study by Taufek, Zulkifle, and Kadir (2015), which examined the relationship between safety and health practices and injury management in manufacturing industries in Pahag, Malaysia. Their findings revealed a significant positive relationship between safety and health practice indicators and effective injury management.

Conclusion

The empirical results of this study indicate that risk control strategies are crucial for occupational health and safety. Therefore, incorporating effective risk management is essential when discussing the implementation of occupational health and safety regulations. Regular assessment of risks by management before operations can significantly reduce workplace accidents. Pre-loss and post-loss control strategies are effective methods for frequently mitigating these accidents. However, the study reveals that the risk management practices within these companies are inadequate. This suggests that the existing risk mitigation measures are insufficient to address the extent of exposure to occupational accidents. Additionally, the findings indicate that both management and staff possess a similar level of understanding regarding risk management practices in this industrial sector.

Recommendations

Based on the findings of the study, the following recommendations were made:

- i. Iron and steel manufacturing firms should enhance their efforts to conduct more frequent risk assessments. Increased frequency in risk evaluation will aid in identifying and addressing hidden or residual risks that may lead to significant issues after initial risks have been managed.
- ii. Iron and Steel manufacturing firms should improve communication regarding risk-related information. Top management should foster both upward and downward communication channels to ensure timely dissemination of risk information, allowing for proactive handling of potential issues before they escalate into actual losses. Management should also create an effective communication system that enables workers to report any perceived risks associated with their colleagues' operations or activities.
- iii. The management of the firms should provide and implement safety equipment, tools, and gadgets to reduce both the frequency and severity of workplace accidents.
- iv. Finally, it is essential that management ensures all factories, machinery, plants, and equipment are in proper working order after any accident before they are utilized in the organisation's daily operations.

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