LEAN MANAGEMENT PRACTICES AND ORGANIZATIONAL PRODUCTIVITY

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Abstract

In recent years, many industrial and service organizations have been compelled to focus more on product quality to enhance customer satisfaction. The study therefore examined the influences of Lean Management Practices on organizational productivity of Dangote Cement Plc, Ibese Plant. The research employed a survey design, targeting 950 employees from the production department of Dangote Cement Plc., Ibese Plant. A sample size of 281 was selected using a simple random sampling technique throughTaro Yamane's sample calculator formula was utilized. Primary data was collected via structured, self-administered questionnaires. The data was analyzed using descriptive statistics and linear regression through SPSS version 23. The results indicated that the Andon Support System has a significant positive effect on organizational efficiency. Furthermore, a positive and significant relationship was found between Value Stream Mapping and organizational effectiveness.Based on these findings, the study concluded that lean management practices significantly impact the productivity of Dangote Cement Plc, Ibese Plant. Therefore, the study recommended that Dangote Cement Plc should ensure optimal use of the Andon Support System to allow employees to report issues in real-time, which would help reduce downtime and improve

responsiveness. Additionally, the company should regularly conduct Value Stream Mapping to identify and eliminate non-value-adding steps in the production process, thereby reducing waste, cutting costs, and maximizing profit.

Keywords: *Andon Support System, Efficiency, Effectiveness, Lean Management, Organizational Productivity and Value Stream Mapping*

1.0 Introduction

Organizations across the globe are suffering from the pressure of outperforming customer expectations and remaining competitive. In this environment, they require strategies that could increase product quality, speed up delivery timelines, and reduce operational costs (Elunem et al., 2023; Chena, 2021). The International Labour Organization reported a growth of 2.1% in global labor productivity in 2022, yet organizations struggle to cope with the evolving market demands. To be competitive, firms need to offer high-quality goods and services that will meet the requirements of the global market. Lean Management practices have become vital in achieving such goals by ensuring waste reduction and operational efficiency. Studies have proved that firms which adopted lean principles reported a reduction in inventory cost by 25–40%, while on-time delivery showed improvement by up to 50% (Davis & Heineke, 2020; Fullerton et al., 2019).

Organizational success transcends short-term goal achievement; it includes sustained profitability and market relevance. Metrics such as meeting or exceeding sales targets, maintaining superior quality standards, and achieving production efficiency are critical indicators (Crowell, 1998; Nestle, 2019). Lean Management facilitates these metrics through tools like Value Stream Mapping, which enhances workflow visualization, and the Andon support system, which promotes rapid response to operational issues (Liker, 2020; Modi, 2021). Despite these, however, the systematic application of Lean Management in the manufacturing industry is under-researched.

In highly competitive industries, manufacturing and service organizations hardly have any strategic opportunities to differentiate their services or products. Lean principles address these issues through increased efficiency, high-quality products, and low costs. According to a McKinsey report published in 2021, for instance, lean practices can trim operational waste by up to 30% to drive profitability and customer satisfaction. However, fragmented communication channels and underutilized data analytics are just some of the barriers to fully realizing lean benefits, according to Dana (2021) and Schwagerman & Ulme (2019). It also requires effective leadership and strategic alignment in surmounting these obstacles and embedding Lean Management into corporate strategy. This is what Womack and Jones (2023) propose.

Manufacturing in Nigeria accounts for 12% of the country's GDP and provides jobs for over 6 million workers. Firms like the Ibese Plant of Dangote Cement have been very pivotal in this regard, but also face a number of challenges, ranging from inefficient processes to changing technological requirements. Studies have proved that manufacturing companies that apply lean techniques can realize productivity gains of up to 20% and operational cost reductions of up to 15% (Campbell, 2022). Despite these promising figures, Lean Management adoption in Nigeria is limited, often constrained by inadequate communication systems and insufficient decision-making data (Dana, 2021; Schwagerman & Ulme, 2019).

For Dangote Cement, achieving sustainable productivity and market dominance requires adopting Lean principles to streamline operations and improve output quality. Although Lean Management has demonstrated significant benefits in waste reduction and customer satisfaction globally, its potential within Nigeria’s manufacturing landscape remains underexplored. Addressing these gaps requires focused study on the influence of Lean Management approaches on organizational productivity. This research focuses on the Ibese Plant, assessing operational issues and suggesting practical solutions to improve efficiency and competitiveness. This study will contribute to a better understanding of the role of Lean Management in generating

organizational performance in Nigeria's industrial industry by studying practical difficulties and including pertinent statistics.

1.2 Objectives of the study

The prime purpose of this study is to analyze the effect of lean management Practices on organizational productivity of Dangote Cement PLC's IbesePlant, Ogun State. Other specific objectives are to:

1. Examine the influence of Andon support system on organizational efficiency of Dangote cement Ibese plant, Ogun state.

2. Investigate the correlation between value stream mapping and organizational effectiveness of Dangote cement Ibese plant, ogun state.

2.0. Literature Review

2.1 Conceptual Review on Lean Management

As expressed by Soriano-Meier and Forrester (2022), Lean true value is how the system can find the flaws early to improve tremendously. Womack, Jones, and Roos (1990) define lean production as a technique for the eradication of waste in manufacturing systems while simultaneously improving productivity. Shingo (1989) holds that Lean systems focus on continuous improvement through waste elimination and aligning all activities to efficiently meet customer demands and satisfaction for organizational productivity.

Lean is a systematic methodology designed to enhance organizational efficiency by eradicating waste throughout the manufacturing process. It is recognized as one of the most effective business improvement strategies, focusing on continuous process enhancement. These techniques are designed to streamline business operations by eliminating defects, reducing cycle times, accelerating delivery, minimizing costs, and speeding up the identification and resolution of issues to achieve excellence in both operational and business management (Antony et al., 2019; George et al., 2020).

The goal of lean management as a corporate strategy is to improve the quality of products, increase customer value, and minimize waste. It emphasizes meeting customer needs with fewer resources, such as labor, equipment, time, and space (Kusumastuti, 2021). This strategy focuses on improving organizational operations (Parkhi, 2019) and is often described as a system and methodology aimed at enhancing efficiency, safety, and quality of services (Khorasani et al., 2020). Respect for people and a dedication to ongoing development are the cornerstones of lean management (Rosin et al., 2020). It systematically uses resources to create customer value while reducing waste (Lenarduzzi et al., 2021), striving for faster processes, higher quality, and greater efficiency (Mousavi Isfahani et al., 2019).

For over four decades, industries have adopted lean management to improve corporate performance (Emiliani, 2019). Researchers like Gupta and Jain (2019), Jasti and Kodali (2019), and Stone (2022) have explored its growth, particularly in manufacturing. Over time, lean practices have evolved, with Shah and Ward (2007) identifying its primary goals as eliminating waste, enhancing quality, and optimizing resources and energy. Lean management employs diverse techniques, including supplier management, quality improvement, and waste reduction. It combines modern manufacturing practices like just-in-time (JIT), total quality management (TQM), and total productive maintenance (TPM) with human resource strategies such as teamwork and empowerment of employees.

Clark et al. (2023) focused on the understanding that the Lean concept of eliminating waste and non-value-added activities is critical for successfully implementing Lean methods. Lean manufacturing principles have been refined and expanded in Japanese industry over time. Shingo (2022) explained that Toyota employees discovered that traditional operations management methods were ineffective when attempting to implement JIT. Defects later emerged from undetected issues early in the manufacturing process, resulting in enormous and inefficient stockpiles. The goal was to improve quality while lowering prices so that Japanese enterprises could compete in foreign markets

for specific manufacturing lines. Lean management strategies assist businesses to gain long-term competitive advantages (Womack & Jones, 2019). The strategic aspects of lean can be quite complex and involve a series of trade-offs. For instance, the time spent in between processes is only wasteful if it means that market opportunities are lost due to delayed production.

2.2 Dimensions of Lean Management Practice

1. Andon Support System

Andon systems focus on real-time communication and instant issue resolution within a production environment. They act as visual control mechanisms that alert workers, supervisors, and managers to emerging problems on the production line (Liker, 2019; Kemmer et al., 2018).

Andon, a Japanese name that means "paper lantern," is a visual control system that employs a light board or other signaling device in an industrial environment to allow workers to seek help and stop the production line as needed (Liker, 2019). It acts as a "sign" or "signal" that graphically shows errors as they occur, allowing for prompt corrective action to avert future problems (Kemmer et al., 2018). Andon systems are utilized in Japan to keep all production crew informed about the state of a manufacturing line or process. These systems can take numerous forms, including traffic light-style indications and basic status lights, as well as enormous display boards strategically placed across the manufacturing floor.

Core Characteristics:

Immediate Feedback: The system provides a mechanism for workers to signal issues such as quality defects, equipment malfunctions, or supply shortages, ensuring rapid intervention (Liker, 2020).

Visual Management*:* Andon communicates the status of operations from every corner of the production floor using traffic light indicators, signal lights, or display boards (Liker, 2019).

Empowerment and Engagement*:* Workers are empowered to halt production and call for assistance when necessary, emphasizing a culture of proactive problem-solving (Kemmer et al., 2018).

2.Value Stream Mapping (VSM)

Value Stream Mapping (VSM) provides a holistic view of an organization's processes, focusing on identifying inefficiencies and creating a roadmap for improved workflows. It is a strategic planning tool aimed at long-term improvement (Ukpong, Uwa, & Ekanem, 2022).

Value Stream Mapping (VSM) is a visual and strategic tool based on lean management principles introduced by Toyota Production System (Ukpong, Uwa, & Ekanem, 2022). VSM provides a structured method for organizations to evaluate, understand, and improve their business processes by mapping the movement of data and supplies from the beginning of manufacturing to the last delivery of a good or service. This mapping technique provides a complete picture of the entire value chain, emphasizing each step involved in providing value to the customer.

The key goals of VSM are to recognize and eliminate waste, smooth the workflows, and increase overall efficiency. The VSM communicates each stage with standardized symbols that let cross-functional teams analyze the intricacies of any process visually. This shared visual insight helps different departments to establish one way of looking at value creation and delivery. It thus instills cooperation between departments to resolve problems.

The main distinction in the implementation of VSM lies between a current state map and a future state map. The former works as some form of diagnostic to identify organizational waste, bottlenecks, or points to improve(Uwa,2019). From here comes the so-called future state map design, which is supposed to picture what could be regarded as the enhanced version of that process-a future with no superfluities-and the utmost accomplishment of values and functions through more effective lean principles that drive them.

Core Characteristics

Comprehensive Analysis: VSM maps the flow of materials, information, and activities across the production value stream from raw material to finished goods(Uwa,2019).

Identification of Waste*:* The tool highlights non-value-adding activities, bottlenecks, and redundant processes that hinder operational efficiency (Ukpong et al., 2022).

Collaborative Problem-Solving: Cross-functional teams can use VSM to visualize the current state, share insights, and collectively design a future state (Liker, 2020).

2.3 Organizational Productivity

Organizational productivity refers to how efficiently and effectively an organization uses its resourcessuch as labor, capital, materials, and technologyto achieve its objectives (Womack & Jones, 2019). It is a metric of how well an organization converts inputs into outputs, typically expressed as output per unit of input. An organization's productivity is also measured by its ability to complete projects while balancing competing factors such as quality, timeliness, cost, and stakeholder requirements (Aga et al., 2019). Some indicators for measuring corporate goals include financial success, customer satisfaction, internal procedures, learning, and development.The capacity of a business to accomplish long-term sustainability goals also determines its success (Fleck, 2009). High performance is derived from an organization's ability to effectively meet its goals and objectives (Whitney, 2010). For success, an organization's operations must be aligned with a common vision that all stakeholders share (Dell & Kramer, 2023).

2.4 Dimensions of Organizational Productivity

1. Effectiveness

Effectiveness is a fundamental element in achieving predetermined goals or targets in any organization (Belwalkar et al., 2018). It refers to the extent to which an organization successfully attains its objectives through optimal performance. For an organization to cultivate and strengthen effective behavior among its workforce, it is essential to provide positive reinforcement. This approach involves recognizing and rewarding employees who demonstrate effectiveness and offer opportunities for personal and professional growth that can enhance their ability to meet organizational goals. These actions promote an environment where effectiveness is encouraged, recognized, and valued, creating a workplace culture focused on achieving results (Belwalkar et al., 2018).Effectiveness, therefore, is considered successful when the set goals or objectives are met. In the workplace, work effectiveness reflects how well an individual or team performs their primary tasks to reach desired outcomes. According to Ibrahim and Daniel (2019), work effectiveness is the extent to which managerial efforts result in the achievement of particular objectives measured through factors like the quantity and quality of work produced and the timeliness of task completion. Thus, a highly effective workforce not only meets but exceeds expectations, driving organizational success through consistent and reliable performance.

2 Efficiency

Efficiency is a critical measure of how effectively a company manages its resources—such as finances, materials, processes, equipment, labor, and costs—to maximize performance (Popovič et al., 2018). In essence, efficiency refers to the optimal use of available resources to produce the highest possible output within the shortest possible timeframe, all while maintaining balance among objective factors, tools, energy, and time. This concept implies achieving desired results with minimal waste and ensuring that every resource contributes effectively toward organizational goals. Efficiency can also be understood as the best possible ratio between the input (effort, resources) and the output (results, performance). Achieving high efficiency means

maximizing productivity and minimizing resource consumption, so the organization operates smoothly and cost-effectively. Thus, efficiency reflects an organization's ability to deliver high-quality outcomes while using fewer resources, which is essential for competitiveness and sustainability.

2.5 Theoretical Review

1. The Theory of the Resource-Based Perspective

This study is supported by the RBV theory proposed by Jay Barney in 1959, wherein a firm's prosperity is based on its unique resources and capabilities. Through the RBV perspective, lean manufacturing can be considered one strategic choice or decision made for the firm when there is an inability to fully provide resources and capabilities, thus optimizing processes and reducing waste. Lean practices, such as Andon Systems and VSM, contribute to reducing production cycles, enhancing operational efficiency, and therefore enhancing the competitive advantage of a firm by increasing the firm's capability to utilize available resources effectively.

Andon Systems and VSM enable a firm to fulfill the RBV theory because they represent valuable, rare, inimitable, and non-substitutable resources that help develop enhanced capabilities regarding operations. Andon Systems provide real-time problem-solving mechanisms, enabling immediate corrective actions and minimizing downtime, while VSM offers a comprehensive tool for identifying inefficiencies and redesigning processes to eliminate waste. Together, these lean tools optimize both tangible and intangible resources, such as raw materials, knowledge, and workflows, fostering a culture of continuous improvement. It is their integration of such practices that gives firms distinctive capabilities, hard to be replicated by competitors, hence strengthening their position in the competitive landscape.

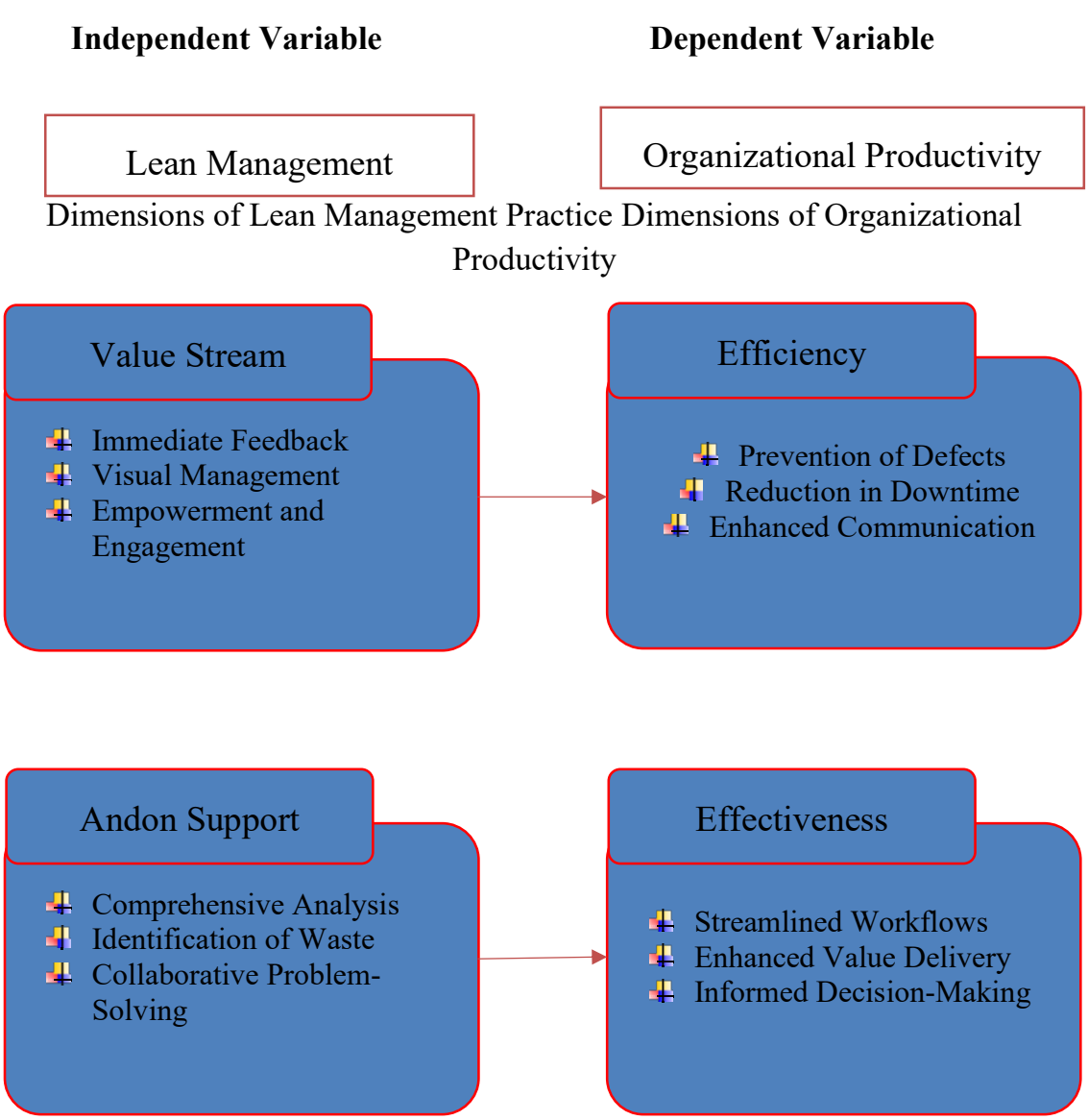
2.6 Empirical Review

Samuel Okurebia, Kingsley Lazarus Uwa, and Idorenyin Charles Willian (2023) investigated how lean management affected the organizational performance of a few industrial companies in Akwa Ibom State. Two research

questions and hypotheses were put out in the study. In this investigation, a survey research design was employed. Using the Census Technique to encompass the complete population, data was collected from 59 employees at the top, medium, and lower levels of management of the chosen companies. Ordinal Logistic Regression was utilized to examine the data. The outcome shows that lean management methods' components, particularly waste removal and value stream mapping, significantly impact organizational performance (3.024, PV = 0.003). Conclusion: These dimensions of lean management are relevant to enhancing the performance of manufacturing firms in Akwa Ibom State.

In order to improve performance and provide insights for other businesses of a similar kind, Mohammad Ahsan Habib, Ratul Rizvan, and Shamsuddin Ahmad (2023) used lean management techniques, particularly value stream mapping, on a labeling and packaging firm in Bangladesh. Identification of the current issues, assessment of the lean system's and VSM's applicability, distinction of value-added and non-value-added activities, testing of novel parameters, and data analysis for enhancements were all part of the research. Units produced per labor hour (UPLH), lead time reduction, customer complaint rate (CCR), and equipment efficacy were among the key performance indicators (KPIs) utilized to gauge the achieved productivity increases. The adoption of VSM in conjunction with Kanban, setup time reduction, and single-minute exchange of die (SMED) procedures resulted in a significant increase in KPIs, according to the research. For instance, redesigning the Kanban die rack reduced waiting time; optimizing the finishing line setup minimized motion waste, while introducing the new color sticker technique decreased production defects. As a result, lead time was reduced by 7.1%, CCR by 83%, and ICR—likely intended to mean improvements in defect rates—increased by 55% for the production process, indicating increased production efficiency and quality with less waste.

Conceptual Framework



Researchers' Conceptual Framework (2024)

The conceptual framework delineates the relationship between the dimensions of lean management and organizational productivity. The lean practices, through dimensions measured by Value Stream Mapping via immediate feedback, visual management, empowerment,

engagement, and Andon Support System, are directly measured through comprehensive analysis, waste identification, and collaborative problem solving. Productivity is conceptualized to comprise two dimensions: efficiency, which is measured by defect prevention, reduction in downtime, and improvement in communication; and effectiveness, which is measured by streamlined workflows, enhanced value delivery, and informed decision-making for organizational productivity.

3.0 Methodology

A standardized, self-administered questionnaire was used to collect data for the study, which used a survey research methodology. The study targeted a population comprising 950 permanent and contract staff of the Production Department of Dangote Cement PLC, Ibese Plant;it is the department that is directly responsible for production activities within the organization. The data was obtained from the human resources department of the organization as at November, 2024. Using Taro Yamane's method, a sample size of 281 respondents was determined. Data was gathered from primary sources using a standardized and verified questionnaire. With the use of SPSS, multiple regression analysis was performed to examine the influence of independent factors on dependent variables, interpret the data, and test the study's hypothesis formulated.

4.0 Data Analysis

Table 1: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.624[a]	.390	.387	.23625

a. Predictors: (Constant), Andon Support System, Value Stream Mapping.

The coefficient of determination value of 0.624, as presented in the model summary table above shows how much the variables under study explain organizational productivity. This finding implies that Lean Management has a

strong positive influence on organizational productivity at Dangote Cement Plc., Ibese. Moreover, it suggests the strength of the models used in the study, which essentially means that the independent variables chosen—through the inclusion of the predictors—are adequate in explaining organizational productivity variations. The R-squared value of 0.390 indicates that 39.0% of the systematic variation in organizational productivity is accounted for by the predictors.

Table 2: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	95.611	3	31.870	60.702	.000[b]
	Residual	140.182	267	.525		
	Total	235.793	270			

a. Dependent Variable: Organizational Productivity

b. Predictors: (Constant), Andon Support System, Value Stream Mapping.

The model's overall significance is shown in the F-statistics table. Since the 0.000 probability value is below the significance level, we reject the null hypothesis and come to the conclusion that lean management improves organizational performance.

Table 3: Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		

1	(Constant)	.468	.109		4.312	.000
	Andon Support System	.129	.041	.156	3.132	.002
	Value Stream Mapping	.119	.046	.145	2.592	.000
a. Dependent Variable: Organizational Productivity						

4.2 Test of Hypotheses

Accepting the null hypothesis (H0) rather than rejecting it if the p-value is higher than 0.05. Reject the null hypothesis (H0) and accept the alternative hypothesis (H1) if the p-value is less than 0.05.

Hypothesis One

H_0: Andon Support System does not have significant effect on the organizational efficiency of Dangote cement PLC, ibese plant, Ogun state.

H_1: Andon Support System has a significant effect on organizational efficiency in Dangote cement PLC, Ogun state.

The result from the coefficient table indicates that the Andon Support System is 0.002, which is below the threshold level of 0.05. Hence, this system is statistically significant with regard to organizational efficiency. From such a finding, it can be understood that the null hypothesis is hereby rejected in favor of an alternative hypothesis. The implications of this would mean that, indeed, Andon Support Systems have an important effect on the organizational efficiency of Dangote Cement PLC in Ogun State.

Hypothesis Two

H_0: Value Stream Mapping has no significant relationship with Organizational effectiveness of Dangote cement PLC, Ogun state.

H_1: Value Stream Mapping has significant relationship with Organizational effectiveness of Dangote cement PLC, Ogun state.

From the coefficients table, it is clear that Value Stream Mapping has a P-value of 0.000, below the significance level of 0.05. This implies that Value Stream Mapping is statistically related to organizational effectiveness. It is, therefore, possible to accept the alternative hypothesis. It is thereby possible to express that Value Stream Mapping has a relation with the organizational effectiveness of Dangote Cement PLC, Ibese Plant, Ogun State.

4.1 Discussion of Findings

The study reveals that Value Stream Mapping, the Andon Support System, and practices of Lean Management have weak but positive and significant effects on organizational productivity at Dangote Cement Plc., Ibese Plant, Ogun State.

The Andon Support System, by providing real-time alerts that allow for immediate problem-solving, shows an increase in efficiency of 12.9% for each unit increase in this system, with a coefficient of 0.129; thus, the Andon Support System really helps to reduce downtime and streamline operations.

Value Stream mapping—although with a relatively weaker effect—contributes to the elimination of inefficiencies and increases effectiveness by 11.9% for each unit change, where the coefficient value is 0.119. With this tool, the organization now focuses on value addition activities and starts to reduce wastes.

Lean Management, as an overarching practice, has the most substantial impact, improving productivity by 46.8% per unit increase with a coefficient of 0.468.

With its emphasis on continuous improvement, value creation, and cost reduction, Adoption of Lean Management helps Dangote Cement Plc. sustain its competitiveness in the cement industry in Nigeria

5.0 Conclusion

The first hypothesis to be tested in this research was whether the Andon Support System enhances the organizational efficiency of Dangote Cement Plc., Ibese Plant. The hypothesis is accepted since the statistical evidence showed that .002< 0.05 and a beta coefficient (β) of 0.129. This shows that the Andon Support System improves operational efficiency since problems are fixed on the spot, reducing downtime and ensuring quality in production processes. Hence, the study concludes that Lean Management practices, such as the Andon Support System, are crucial in bringing efficiency to the organization of Dangote Cement Plc., Ibese Plant through continuous improvement and delivery of quality products for customer satisfaction and Organizational profitability.

The second hypothesis tested Value Stream Mapping's connection with organizational effectiveness in the same plant. The result showed a positive and significant relationship since.000<0.05 and =0.119. It means that VSM application allows the organization to map and optimize its production process, eliminate waste, and use only high-quality material that adds value to the products. From the above results, the conclusion drawn is that VSM considerably increases the effectiveness of an organization by streamlining the workflows and proper utilization of resources.

Generally, the study established the effect of Lean Management practices on organizational productivity at Dangote Cement Plc's Ibese Plant in Ogun State. The findings reveal that indeed Lean Management enhances productivity, which supports prior studies by Fullerton, Kennedy, and Widener (2022); Shah and Ward (2021); and Womack, Jones, and Roos (2019). These various studies have identified Lean Management as instrumental in promoting the effectiveness, efficiency, and profitability of organizations.

5.1 Recommendations

Based on the findings and conclusions of this study, the following recommendations are therefore made to the management of Dangote Cement Plc., Ibese Plant, and other manufacturing organizations that may find them useful:

• Dangote Cement Plc-Ibese should ensure high utilization of the Andon Support System with accuracy so that employees on the ground can report in real time to reduce downtime while improving responsiveness in the face of impending problems to allow quicker problem resolution, better production flow, and higher general productivity.

• Dangote Cement Plc., Ibese Plant should regularly conduct Value Stream Mapping to identify the non-value-added step involved in a process. This will help in pointing out the ineffectiveness for optimization and will make sure resources are utilized in adding value.

• Dangote Cement Plc., Ibese Plant, should create a culture of continuous improvement by empowering employees at all levels to suggest improvements. Regular training on lean principles and rewards for innovative ideas can motivate employees to seek ways to eliminate waste and improve productivity.

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