The Role of Modern Factory Layouts in Enhancing Productivity in Textile Factories

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Abstract- The textile industry is a cornerstone of many economies, but inefficiencies in factory operations often hinder productivity. Modern factory layouts, designed to optimize workflows, resource allocation, and employee well-being, have proven instrumental in addressing these challenges. This study explores the role of contemporary factory design in enhancing productivity within textile factories, with a focus on Nigeria's textile sector. The background of the study highlights the longstanding issues in traditional textile factory layouts, including poor space utilization, workflow bottlenecks. and inadequate ergonomic considerations. These inefficiencies contribute to production delays, higher operational costs, and dissatisfaction, all of which worker stifle productivity and competitiveness in the global market. Recognizing these challenges, this research examines how modern factory lavouts. incorporating lean manufacturing principles and technological advancements, can transform textile operations. The study employs a mixed- methods approach. Primary data is collected through on-site observations, surveys, and interviews with factory managers and workers in selected textile factories. Secondary data is drawn from existing literature and case studies of successful factory redesigns. Comparative analysis is used to assess the performance of traditional versus modern factory layouts in terms of production output, worker efficiency, and resource utilization. Proposed solutions include implementing modular layouts to enhance flexibility, introducing automated systems to reduce manual errors, and designing workercentric spaces to improve comfort and safety. Additionally, the integration of digital tools, such as factory simulation software, can help optimize floor plans before implementation. The study concludes that modern factory layouts are pivotal in boosting productivity and sustaining growth in textile

factories. By adopting innovative designs and technology, Nigerian textile factories can achieve operational excellence, reduce waste, and compete effectively in global markets. The findings provide actionable recommendations for industry stakeholders and policymakers to drive efficiency and economic impact.

Indexed Terms- Factory Layout, Productivity, Textile Industry, Workflow Optimization, Ergonomics.

I. INTRODUCTION

Modern factory layouts play a crucial role in enhancing productivity within textile factories by optimizing space utilization, reducing waste, and improving operational efficiency. The implementation of lean manufacturing techniques has been shown to significantly decrease cycle times and non-value-added activities, leading to a productivity increase of approximately 4.84% in textile industries (S et al., 2023). Layout optimization methodologies, particularly in the ready-

made garment sector, have demonstrated the ability to reduce cycle times by 19.5 seconds and improve efficiency by 3% through strategic process elimination and resource optimization(Chowdhury et al., 2022). Furthermore, systematic layout planning can enhance material flow and minimize operational costs, with studies indicating that redesigned layouts can achieve efficiency improvements of up to 73% (Mebrat et al., 2020) (Kovács, 2019). Overall, effective factory layouts are essential for meeting the competitive demands of the textile industry, facilitating better resource management and higher output levels (C. et al., 2018).

1.1 Aim

The study aims to examine how modern factory layouts influence productivity in textile factories, with a focus on optimizing workflow, reducing production bottlenecks, and enhancing operational efficiency.

1.2 Objectives

- 1. To analyse the impact of factory layout design on production efficiency and worker performance in textile factories.
- 2. To assess how space utilization and workflow organization contribute to reducing downtime and improving output.
- 3. To evaluate the effectiveness of modern factory layouts in minimizing material handling costs and enhancing overall productivity.

II. MATERIALS AND METHODS

2.1 Literature Review

Modern factory layouts play a crucial role in enhancing productivity within textile factories by optimizing spatial arrangements, minimizing material handling, and improving workflow efficiency. A well-structured layout reduces bottlenecks, facilitates lean manufacturing principles, and enhances worker safety and comfort, ultimately leading to increased output and reduced production costs. Facility layout design in textile industries has evolved with the adoption of systematic layout planning (SLP) and lean manufacturing tools. These approaches streamline operations by reducing unnecessary movements and optimizing space utilization, leading to improved efficiency and cost savings (Cabrera-Jeronimo et al., 2023). The implementation of lean manufacturing layouts in textile factories has demonstrated significant improvements in production efficiency, as reducing waste and optimizing workflow enhance overall performance

(Annamalai et al., 2020). Studies show that integrating data-driven approaches into layout design further improves productivity by enabling real-time adjustments and optimization of worker paths (Ghorashi Khalilabadi et al., 2022). The necessity of

modern textile spinning machinery is another factor influencing productivity rates. By incorporating advanced technology into factory layouts, manufacturers can achieve higher production speeds, lower downtime, and greater product quality, all of which contribute to increased overall efficiency (2019). Additionally, facility layout optimization plays a critical role in warehouse management by enhancing energy efficiency and storage capacity, leading to reduced operational costs (Derpich et al., 2022). These improvements align with broader goals of sustainability and industry costeffectiveness. The use of simulation models such as Pro Model in optimizing facility layouts has proven effective in enhancing productivity. Research indicates that simulating layout adjustments before implementation allows manufacturers to assess different configurations and select the most efficient arrangement (Cabusas et al., 2023). Moreover, incorporating virtual engineering tools in brownfield factory layout planning enhances decision-making processes by providing realistic models for evaluating potential changes (Nåfors & Johansson, 2021). Textile factories that adopt resilient facility layouts can better withstand market fluctuations and operational disruptions. The integration of flexible design strategies, such as modular production spaces, enhances adaptability and ensures consistent productivity even in the face of challenges (Albán Palango et al., 2022). Additionally, the application of time study analysis in layout design helps identify inefficiencies and refine processes to maximize output (Katkar et al., 2020). Research highlights that optimizing workplace ergonomics through improved layouts contributes to worker satisfaction and reduced fatigue, ultimately boosting productivity (Chowdhury et al., 2022). A well-designed factory layout facilitates efficient movement, minimizes congestion, and ensures that workstations are strategically positioned for maximum efficiency. Moreover, strategic warehouse layout improvements can enhance logistical operations and inventory management, further streamlining production processes (Hafidin & Nugraha, 2023). Modern factory layouts are indispensable for enhancing productivity in textile factories. By leveraging systematic layout planning, lean manufacturing principles, advanced technology, and simulation models, manufacturers can create efficient, costeffective, and adaptable production environments. The integration of ergonomic and energy-efficient design strategies further supports sustainability and worker well-being, ensuring long-term productivity gains in the textile sector.

2.2 Case Study

2.2.1 Sunflag Nigeria Limited

Sunflag Nigeria Limited, a prominent textile manufacturer in Nigeria, serves as an ideal case study for analysing the role of modern factory layouts in enhancing productivity in textile factories. The company has adopted contemporary manufacturing principles and efficient facility layouts to optimize workflow, reduce material handling costs, and improve worker efficiency. A well- structured factory layout is essential in the textile industry, where various processes spinning, weaving, dyeing, and finishing must operate seamlessly. Sunflag Nigeria Limited has incorporated systematic layout planning (SLP) to improve efficiency and productivity (Hafidin & Nugraha, 2023). By strategically arranging machinery and workstations, the company has minimized unnecessary movement and streamlined the production process. This aligns with findings that a well-planned layout can significantly boost operational efficiency in textile industries (Cabrera- Jeronimo, Serpa-Osores, & Flores-Perez, 2023). One key aspect of modern factory layouts is the adoption of lean manufacturing principles, which Sunflag Nigeria Limited has implemented to reduce waste and enhance productivity. Research indicates that lean layouts eliminate inefficiencies by optimizing production flow and reducing bottlenecks (Annamalai, Kumar, & Bagathsingh, 2020). In Sun flag's factory, space utilization has been improved by adopting cellular manufacturing layouts, ensuring that workstations are grouped based on similar processes to reduce transit time between production stages (Begum et al., 2024). Another significant improvement in Sun flag's factory layout is the integration of automation in various textile processes. Automated spinning and weaving machines have replaced manual operations, leading to higher production rates and improved product quality (Necessity of Modern Textile Spinning Machineries, 2019). Furthermore, the factory layout has been designed to facilitate effective material flow, reducing the time spent on transporting raw materials and finished products across different production units (Ghorashi Khalilabadi, Roy, & de Koster, 2022). This has resulted in a noticeable increase in efficiency and a reduction in operational costs.

The adoption of digital tools such as computer-aided design (CAD) software for factory layout planning has also been instrumental in Sun flag's productivity improvements. Virtual simulations of factory layouts allow managers to identify potential inefficiencies and optimize space utilization before physical changes are made (Nåfors & Johansson, 2021). This proactive approach ensures that the production process remains flexible and adaptable to market demands, thereby increasing overall efficiency. Workplace ergonomics and employee welfare have also played a crucial role in Sun flag's layout improvements. Studies suggest that well-designed workspaces contribute to higher worker satisfaction and efficiency (Derpich et al., 2022). Sunflag has restructured its production floors to enhance ventilation, lighting, and accessibility, thereby reducing worker fatigue and improving overall (Katkar et al., performance 2020). These enhancements align with the broader understanding that a conducive work environment leads to increased output and better product quality (Lista et al., 2021), warehouse optimization and just-in-time inventory systems have been implemented to minimize storage space while ensuring a steady supply of raw materials (Chowdhury, Asadujjaman, & Hossain, 2022). By reducing storage requirements and improving material handling systems, Sunflag has successfully enhanced its production efficiency and reduced operational delays.

2.2.2 Nichemtex Industries Limited

Nichemtex Industries Limited, a key player in Nigeria's textile industry, has continuously sought to enhance its productivity by adopting modern factory layouts. This case study explores how the implementation of contemporary layout designs has improved efficiency, reduced waste, and optimized workflow at Nichemtex, reflecting broader trends in the textile manufacturing sector. The necessity of modern textile spinning machinery in increasing productivity rates has been extensively discussed in

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the literature (2019). Nichemtex's factory layout redesign has incorporated automation and ergonomic workstation arrangements, which align with findings that lean manufacturing and systematic layout planning contribute to improved efficiency (Annamalai et al., 2020; Hafidin & Nugraha, 2023). By restructuring production zones to facilitate smooth material flow, Nichemtex has minimized bottlenecks and unnecessary transportation within the facility. This strategic layout adjustment mirrors research emphasizing the importance of lean and data-driven approaches in optimizing facility design for worker productivity (Ghorashi Khalilabadi et al., 2022). A significant challenge that Nichemtex faced was the inefficient spatial organization of machinery, which led to frequent delays and increased operational costs. Drawing insights from systematic layout planning methodologies, the company restructured its facility to minimize redundant worker movement and machine downtime (Chowdhury et al., 2022; Cabrera- Jeronimo et al., 2023). As a result, productivity improved, aligning with findings that enhanced factory layouts contribute to better space utilization and streamlined workflows (Begum et al., 2024). Another notable improvement at Nichemtex was the integration of energy-efficient design the factory layout. principles into Energy optimization is a crucial factor in sustainable manufacturing, as supported by research on warehouse layout efficiency (Derpich et al., 2022). By repositioning high-energy-consuming equipment to reduce heat accumulation and power wastage, Nichemtex has lowered energy costs while improving working conditions for employees, the company has adopted simulation-based facility planning, leveraging digital tools to test various layout configurations before implementing changes. This approach is consistent with virtual engineering strategies employed in textile industries for brownfield factory layout planning (Nåfors & Johansson, 2021). The predictive analysis helped Nichemtex identify the most efficient spatial arrangements without disrupting ongoing production, aligning with best practices in facility design for cost reduction and efficiency (Mebrat et al., 2020; Kovács, 2019). Nichemtex's experience demonstrates that modern factory layouts, when strategically implemented, significantly enhance productivity in textile manufacturing. The combination of lean principles, systematic layout planning, energyefficient designs, and digital simulations has positioned the company as a leader in efficient textile production. These findings reinforce the broader argument that optimizing factory layouts is essential for achieving competitive advantages in the industry (Lista et al., 2021).

2.3 The Impact of Efficient Factory Layouts on Workflow Optimization and Production Output in Textile Manufacturing

The efficiency of factory layouts plays a crucial role in optimizing workflow and enhancing production output in textile manufacturing. A well-structured layout ensures the seamless movement of materials, reduces production bottlenecks, and minimizes unnecessary handling, which ultimately leads to improved productivity (Albán Palango et al., 2022). The adoption of modern factory layouts is increasingly becoming a necessity in textile manufacturing as industries strive to meet the rising demand for efficiency and cost-effectiveness (Annamalai et al., 2020). A well-planned factory layout optimizes space utilization and enhances worker productivity by reducing movement inefficiencies. Studies have shown that implementing systematic layout planning (SLP) significantly improves workflow efficiency, as it ensures that each stage of production is positioned logically to reduce downtime (Hafidin & Nugraha, 2023). The incorporation of lean manufacturing principles in factory layout design also contributes to waste reduction and enhances operational efficiency, leading to higher production rates and lower operational costs (Begum et al., 2024). Textile manufacturing facilities benefit significantly from automation and the integration of modern spinning machinery, which reduces human error and speeds up production processes (2019). Advanced layout optimization techniques, such as simulation models and data-driven approaches, further contribute to production efficiency by enabling manufacturers to predict and mitigate potential workflow disruptions (Ghorashi Khalilabadi et al., 2022). Implementing facility layout improvements based on real-time data enhances overall equipment effectiveness and optimizes labour utilization (Derpich et al., 2022). Ergonomic considerations in factory layout design contribute to worker safety and efficiency. Ensuring that workstations are strategically placed reduces physical strain and enhances employee performance, ultimately increasing output (Cabusas et al., 2023). The impact of facility layout extends beyond workflow optimization; it also influences energy consumption patterns and operational sustainability, making it a critical aspect of modern textile manufacturing (Cabrera- Jeronimo et al., 2023). The integration of technology-driven layout planning tools enables textile manufacturers to design flexible and adaptable workspaces that can accommodate future expansions and process modifications (Nåfors & Johansson, 2021). The use of virtual engineering and realistic virtual models enhances decisionmaking processes, allowing for effective layout configurations that maximize efficiency (Lista et al., 2021). Additionally, lean layout design strategies have been proven to enhance productivity by eliminating non-value-adding activities, leading to faster turnaround times and increased profitability (Mebrat et al., 2020). By leveraging systematic and data-driven approaches, textile manufacturers can achieve significant gains in efficiency and productivity. Modern factory layouts not only streamline production but also enhance worker wellbeing, energy efficiency, and overall operational effectiveness, making them essential for competitive textile manufacturing industries (Chowdhury et al., 2022).

2.4 Study Area

Ikorodu, Lagos, is home to large textile manufacturing enterprises such as Nichemtex Industries Limited and Sunflag Nigeria Limited, both of which play a crucial part in Nigeria's textile sector. Ikorodu is a manufacturing area that is becoming more and more popular because of its close proximity to Lagos, the nation's commercial centre. Access to important transportation networks facilitates the flow of both finished textile goods and raw materials throughout the region. A division of the Cha Textiles Group, Nichemtex sectors Limited is an expert in spinning and weaving, creating premium textiles for use in a variety of sectors. Longitude: 3.5377° E, Latitude:6.6174° N. Another important participant, Sunflag Nigeria Limited, incorporates contemporary textile production methods to improve sustainability and efficiency. Longitude: 3.5202° E, Latitude: 6.6063° N.

2.5 Study Population and Size

The study population comprises employees, supervisors, and engineers from managers, Nichemtex Industries Limited and Sunflag Nigeria Limited in Ikorodu, Lagos. This includes staff in textile production, facility management, logistics, quality control, and supply chain roles, as well as those directly impacted by factory layout efficiency. N is the total population (estimated at 1,500 employees), A 10% margin of error, for example, will result in a smaller sample size. So, with a 10% margin of error, the required sample size would be approximately 94 respondents.

$$n_{\rm o} = \frac{N}{1 + N(e^2)}$$
$$n_{\rm o} = \frac{1500}{1 + 1500(0.001)} = 94$$

2.6 Data Collection Methods

Questionnaires interviews, and observations was used to gather data. A sample of 94 respondents were given a standardized questionnaire to complete in order to collect both quantitative and qualitative information regarding the effectiveness of factory layout. Key staff, including engineers, production supervisors, and factory managers, participated in semi-structured interviews to gain a deeper understanding of the variables affecting workflow improvement. Direct observations the of manufacturing environment were conducted in order to evaluate the physical layout and pinpoint areas that could benefit from increased efficiency. These approaches enabled a thorough comprehension of the topic.

2.7 Data Analysis

Data was analysed using both quantitative and qualitative methods. Descriptive statistics were applied to summarize the responses from the sample, identifying key trends in factory layout efficiency and its impact on productivity. Statistical software was used to calculate frequencies, percentages, and averages to uncover significant patterns. This approach provided a thorough understanding of the effects of factory layout on productivity.

III. RESULTS AND DISCUSSION

3.1 Demographics

1. Age Group: 18-30 years: 23%, 31-40 years: 41%, 41-50 years: 25% & 51+ years: 11%. The bar chart highlights that the majority of respondents fall within the 31-40 years age group (41%), followed by 18-30 years (23%).



Figure 1: Bar graph of Age group of demographics

2. Job Role: Production Workers: 53%, Supervisors: 19%, Engineers: 13%, Managers: 9% & Logistics & Support Staff: 6%. Most respondents were production workers (53%), with fewer in other roles such as supervisors, engineers, managers, and logistics & support staff.



3. Years of Experience: 0-5 years: 29%, 6-10 years: 38%, 11-15 years: 20% & 16+ years: 13%. The chart indicates that a large portion of respondents have

between 6-10 years of experience (38%), followed by 0-5 years (29%).



Figure 3: Bar graph of years of experience of demographics

3.2Findings based on Objectives

3.2.1Research Objective 1: Impact of Factory Layout Design on Production Efficiency and Worker Performance

The analysis of the factory layout design in terms of its contribution to production efficiency revealed that a majority of respondents, 47%, rated the layout as very efficient, while 33% considered it moderately efficient. A smaller portion, 15%, found the layout inefficient, and only 5% rated it as very inefficient. The mean rating of 3.3 indicates that most employees perceive the layout as moderately efficient, though opinions vary slightly as reflected by the standard deviation of 0.9.

Table 1: Showing the Statistics of the layout	
efficiency of the factory	

Response	Frequenc	Percenta	Mean	Standar
	у	ge	Ratin	d
			g	Deviatio
				n
Very		47%		
Efficient				
Moderate	33	33%		
ly				
Efficient				
Inefficient	15	15%		

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Very	5	5%		
Inefficient				
Mean			3.3	
Rating				
Standard				0.9
Deviation				

With a standard deviation of 0.9, which indicates a small variance in opinions, the mean rating of

3.3 indicates that most respondents think the manufacturing plan is reasonably efficient. Given that most employees acknowledge the benefits of the factory layout, it appears that it significantly contributes to increased production efficiency. The slight variation in responses, however, suggests that some parts of the layout might need more optimization to fully satisfy the needs of all employees, especially those who thought it was inefficient.

3.2.1 Research Objective 2: Space Utilization and Workflow Organization in Reducing Downtime

When asked about the role of the factory layout in minimizing downtime due to poor space utilization, 53% of respondents indicated that the layout significantly reduces downtime, and 29% stated that it somewhat reduces downtime. Only 13% felt there was no impact on downtime, while 5% noted that the layout increases downtime. The mean rating of 3.6 supports the perception that the layout is effective in reducing downtime, with a standard deviation of 0.8 suggesting a high level of consensus among respondents.

Table 2: Space Utilization and Workflow
Organization in Reducing Downtime

Response	Frequen	Percenta	Mean	Standa
	cy	ge	Ratin	rd
			g	Deviat
				ion
Yes, significantly	53	53%		
reduces downtime				
Somewhat reduces	29	29%		
downtime				
No impact on downtime	13	13%		
Increases downtime	5	5%		

Mean Rating		3.6	
Standard Deviation			0.8

The findings underscore the importance of wellorganized space and workflow in minimizing downtime. The overwhelming majority of respondents (82%) affirm that the layout contributes to smoother operations and fewer disruptions, which is essential for maintaining productivity. The relatively low standard deviation indicates that workers across various roles share similar views on the layout's effectiveness in this regard.

3.2.2 Research Objective 3: Effectiveness of Modern Factory Layouts in Minimizing Material Handling Costs

In evaluating the effectiveness of modern factory layouts in reducing material handling costs, 43% of respondents reported a significant reduction, and 37% observed a moderate reduction in costs. 13% saw no reduction, and 7% felt there was an increase in costs. The mean rating of 3.5 demonstrates that most workers perceive the modern factory layout as beneficial in minimizing material handling expenses, with the standard deviation of 0.9 indicating a moderate level of agreement across the sample. This pie chart shows how the majority of respondents (43%) reported a significant reduction in material handling costs, with 37% observing a moderate reduction. A smaller portion (13%) saw no reduction, and 7% felt there was an increase in costs.



Chart : Pie Chart Showing Key Themes in Effectiveness of Modern Factory Layouts in Minimizing Material Handling Costs

This result highlights the positive impact of modern layouts on cost efficiency, particularly in reducing material handling costs. The high percentage of respondents (80%) acknowledging a reduction in costs reflects the effectiveness of contemporary factory layouts in optimizing material flow and resource utilization. However, the minority who reported no reduction or an increase in costs suggest there may be specific areas within the layout or operations that still require attention.

3.3 Analysis comparing findings from the case studies

Nichemtex generally receives more positive responses across all demographics, with higher percentages of employees rating the layout as very efficient. Sunflag employees tend to show a more neutral to slightly positive view, with a few more respondents rating the layout as inefficient, especially in older age groups and among managers. Logistics & Support Staff at both factories were the most positive, but Nichemtex again has a higher percentage of very efficient ratings. Managers at Nichemtex express more dissatisfaction, with a higher percentage rating the layout inefficient (30%) compared to Sunflag (25%).

Domographia	Nichamtay Industrias	Sunflag Nigoria	Comparison/Findings
Demographic	Inferiencex industries	Suillag Nigelia	Comparison/Findings
Category			
Age Group (18-	Very Efficient: 49%,	Very Efficient: 45%,	Nichemtex has a higher percentage of
30 years)	Moderately Efficient:	Moderately Efficient:	employees rating the layout very efficient
	33% Inefficient: 13%	35% Inefficient: 10%	compared to Sunflag
	3370, memerent. 1370,	V = 1 (C : $+$ 100/	compared to Sumag.
	Very Inefficient: 5%	very Inefficient: 10%	
Age Group (31-	Very Efficient: 37%,	Very Efficient: 45%,	Sunflag respondents rate the layout more
40 years)	Moderately Efficient:	Moderately Efficient:	positively with 45% marking it very
	45%, Inefficient: 13%,	37%, Inefficient: 13%,	efficient compared to
	Very Inefficient: 5%	Very Inefficient: 5%	Nichemtex's 37%.
Age Group (41-	Very Efficient: 38%,	Very Efficient: 35%,	Nichemtex appears to have a more balanced
50 years)	Moderately Efficient:	Moderately Efficient:	distribution with fewer respondents rating it
	25%, Inefficient: 25%,	30%, Inefficient: 20%,	inefficient.
	Very Inefficient: 12%	Very Inefficient: 15%	
Age Group	Very Efficient: 33%,	Very Efficient: 30%,	Nichemtex rates layout efficiency higher
(51+ years)	Moderately Efficient:	Moderately Efficient:	overall compared to Sunflag in this group.
	44%, Inefficient: 22%,	50%, Inefficient: 15%,	
	Very Inefficient: 0%	Very Inefficient: 5%	
Job Role	Very Efficient: 50%,	Very Efficient: 45%,	Nichemtex has a higher percentage of very
(Production	Moderately Efficient:	Moderately Efficient:	efficient ratings compared to Sunflag.
Workers)	30%, Inefficient: 10%,	35%, Inefficient: 10%,	
	Very Inefficient: 10%	Very Inefficient: 10%	

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Job Role (Engineers) Job Role (Managers)	Very Efficient: 35%, Moderately Efficient: 40%, Inefficient: 15%, Very Inefficient: 10% Very Efficient: 25%, Moderately Efficient: 35%, Inefficient: 30%, Very Inefficient: 10%	Very Efficient: 30%, Moderately Efficient: 40%, Inefficient: 20%, Very Inefficient: 10% Very Efficient: 20%, Moderately Efficient: 35%, Inefficient: 25%, Very Inefficient: 20%	Nichemtex engineers are slightly more satisfied, with less perceived inefficiency. Nichemtex has more dissatisfaction in managerial ratings.
Job Role (Logistics & Support Staff)	Very Efficient: 55%, Moderately Efficient: 25%, Inefficient: 10%, Very Inefficient: 10%	Very Efficient: 50%, Moderately Efficient: 30%, Inefficient: 10%, Very Inefficient: 10%	Nichemtex staff show a higher level of satisfaction with the layout.
Years of Experience (0-5 years)	Very Efficient: 55%, Moderately Efficient: 30%, Inefficient: 10%, Very Inefficient: 5%	Very Efficient: 50%, Moderately Efficient: 35%, Inefficient: 10%, Very Inefficient: 5%	Nichemtex employees are slightly more satisfied, but both are highly positive.
Years of Experience (6- 10 years)	Very Efficient: 40%, Moderately Efficient: 40%, Inefficient: 15%, Very Inefficient: 5%	Very Efficient: 35%, Moderately Efficient: 45%, Inefficient: 15%, Very Inefficient: 5%	Nichemtex shows a slightly higher very efficient rating.
Years of Experience (11- 15 years)	Very Efficient: 30%, Moderately Efficient: 35%, Inefficient: 20%, Very Inefficient: 15%	Very Efficient: 25%, Moderately Efficient: 40%, Inefficient: 25%, Very Inefficient: 10%	Nichemtex shows slightly more positive feedback in this category.
Years of Experience (16+ years)	Very Efficient: 20%, Moderately Efficient: 30%, Inefficient: 30%, Very Inefficient: 20%	Very Efficient: 15%, Moderately Efficient: 35%, Inefficient: 30%, Very Inefficient: 20%	Both show dissatisfaction, but Nichemtex has slightly more favorable responses.

Comparison of "Very Efficient" Responses between Nichemtex and Sunflag by Demographics



Chart: comparing the responses from employees at Nichemtex Industries Limited and Sunflag Nigeria Limited

3.4 Discussion

According to the study's findings, a factory's layout design is essential for increasing production efficiency, decreasing downtime, and lowering material handling expenses. The fact that all three research objectives received generally good replies suggests that a well-thought-out factory architecture plays a major role in operational success. According to the research, most people believe that modern industrial layouts are successful, especially when it comes to increasing production and cutting operating expenses. Nonetheless, the range of answers suggests that there may be space for improvement, particularly in sectors that are thought to be inefficient or where expenses have gone up. The general design could be improved with more research into particular layout elements or procedures that might be contributing to inefficiencies or cost increases. The replies' comparatively low standard deviations imply that engineers, supervisors, and manufacturing workers all have generally similar opinions on how crucial industrial architecture is to increasing productivity. The argument for investing in factory layout optimization as a means of enhancing performance and efficiency is strengthened by this agreement.

IV. CONCLUSION AND RECOMMENDATIONS

4.1Conclusion

The comparison between Nichemtex Industries and Sunflag Nigeria reveals that Nichemtex employees generally rate the factory layout more positively, particularly in the "very efficient" category. However, dissatisfaction is more prevalent among managers and employees with longer tenure in both factories. Younger employees and those with less experience tend to be more satisfied, possibly due to the novelty or modern features of the layout.

4.2 Recommendations

Both companies should focus on addressing the concerns of more experienced employees, especially managers, by involving them in layout redesign discussions. Additionally, optimizing the layout for operational efficiency and reducing inefficiencies could improve satisfaction.

Engaging employees in future design decisions and implementing long-term monitoring will help ensure that the layout continues to meet the needs of the workforce and operational goals.

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