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Standard Work Manufacturing Technique and Performance of Manufacturing Firms in Kaduna State, Nigeria

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Abstract

While standard work manufacturing techniques promise significant benefits, its implementation presents challenges that could impact the performance outcomes of manufacturing firms is Kaduna State, Nigeria. The broad objective of this paper is to ascertain the relationship between standard work manufacturing technique and performance of manufacturing firms in Kaduna State, Nigeria. Specifically, this study seeks to examine the relationship between takt time methodology and performance. The study is grounded in the Theory of Constraints (TOC), developed by Eliyahu M. Goldratt (1984). Correlational research design was used; while questionnaire was used to elicit information from the respondents. A sample size of four hundred (400) was used; Pearson Product Moment Correlation was used to analyze the collected data. Results obtained from a test of the hypothesis reveals a Pearson R coefficient of 0.763, signifying a strong positive relationship between takt time methodology and performance of the studied manufacturing firms. Also, the result was statistically significant at 0.05 confidence level. Base on the findings of the study, the researcher concludes that there exist a strong positive significant relationship between Standard Work Manufacturing Technique and Performance of manufacturing firms in Kaduna State, Nigeria. As a follow up to that, the researcher recommended that management of the studied manufacturing firms should strive towards enacting a timely production system that balances workflow across different production stages.

Keywords: Standard work manufacturing technique, takt time methodology, performance, competitive position

Introduction

Standard work is a foundational element of lean manufacturing, which aims to eliminate waste and create value for customers through continuous improvement. Standard work manufacturing techniques play a pivotal role in modern manufacturing, where consistency, efficiency, and quality are paramount in production processes (Ahmad, 2023; Smith & Johnson, 2022). These techniques encompass various methodologies such as defining takt time, establishing work sequences, and optimizing standard inventory levels. By standardizing these aspects, organizations can streamline their operations, minimize variability, and reduce waste throughout the production cycle (Jones, 2021). In today's competitive market environment, companies face relentless pressure to improve efficiency, meet customer demands promptly, and sustain market competitiveness (Clark & Roberts, 2024; Green, Smith & Lewis 2022). Standard work techniques offer a structured framework that enables companies to achieve these objectives effectively. The emergence of standard work manufacturing techniques represents a significant evolution in industrial practices worldwide, driven by the pursuit of operational excellence, efficiency, and quality assurance (Jones, 2021; Taylor & Brown, 2020). Initially popularized in industries like automotive and electronics, these techniques gained prominence due to their ability to systematize production processes and minimize variability in outputs (Clark, 2019; Ahmad, 2023).

Globally, the adoption of standard work techniques in manufacturing has been influenced by global trends and the need to compete in increasingly competitive markets (Gupta & Patel, 2021). As Nigerian businesses seek to improve productivity and meet growing consumer demands, the need for structured methodologies that could standardize operations and enhance overall efficiency is imperative (Green, 2023). The introduction of standard work techniques into Nigerian businesses is important as a result of several factors. First, multinational corporations operating in Nigeria seek to operate using global

manufacturing standards (Roberts & Harris, 2021). By implementing standardized processes such as defining takt time, establishing clear work sequences, and optimizing inventory levels, these companies could replicate successful practices from the operations of companies operating in other climes (Brown & White, 2020). Furthermore, local enterprises in Nigeria can use standard work techniques to address specific challenges in their production environments (Adebayo, 2023).

Recent literature underscores the critical role of standard work techniques in enhancing manufacturing performance. Studies have highlighted their potential to reduce production lead times, minimize defects, enhance competitive position and optimize resource allocation (Miller, 2023; Roberts & Harris, 2021). Moreover, these techniques contribute to fostering a culture of continuous improvement within organizations by establishing baseline standards and facilitating ongoing refinement of operational processes (Taylor & Brown, 2020). The adoption of standard work manufacturing techniques represents a proactive strategy for manufacturing firms to address operational challenges and achieve sustainable growth in a competitive market landscape (Walker & Davis, 2023).

While standard work manufacturing techniques promise significant benefits, their implementation often presents challenges that can impact performance outcomes. At the studied manufacturing firms, these challenges manifest in various forms, including inconsistent production quality, operational inefficiencies, and fluctuating productivity levels. These issues highlight the complexities involved in adopting and integrating standardized processes effectively within manufacturing operations. Though scholars like Brown and White (2022); Obodoh, Onwuliri, Umeokana and Makuochukwu (2025); Chukwuemeke, Ajaelu and Chukwuenye (2025) have emphasized the importance of standard work manufacturing techniques in their studies, there seems to be limited studies in the Nigerian environment. This gives credence to this study. The broad objective of this paper is to ascertain the relationship between standard work manufacturing technique and performance of manufacturing firms in Kaduna State, Nigeria. Specifically, this study seeks to examine the relationship between takt time methodology and performance.

Review of Related Literature

Conceptual Review

Standard Work Manufacturing Technique

The Standard Work Manufacturing Technique involves a structured approach to defining and documenting the best practices for each process or operation within a manufacturing environment. This technique ensures consistency, efficiency, and quality across production activities. Standard work includes three main components: takt time, work sequence, and standard inventory. These components are essential for creating a stable and predictable production process that can be continuously improved over time (Miller, 2023). Standard work is a foundational element of lean manufacturing, which aims to eliminate waste and create value for customers through continuous improvement. By standardizing processes, organizations can reduce variability and enhance the predictability of outcomes, leading to more efficient and reliable production systems (Womack & Jones, 2019).

The implementation of standard work involves detailed documentation of each task, specifying the best-known methods to achieve desired results. This documentation serves as a reference for training, troubleshooting, and process audits, ensuring that all employees follow the same procedures and maintain high standards of performance (Miller, 2023). Takt time component of standard work manufacturing technique was used for this paper.

Takt Time Methodology

The concept of takt time is derived from the German word "Takt," which means "rhythm" or "beat." It serves as a crucial pacing mechanism in lean manufacturing, helping to synchronize production rates with customer demand. By defining the rate of production required to meet demand, takt time methodology helps balance workflow, optimize resource utilization, and prevent both overproduction and underproduction (Jackson & Lewis, 2022). One of the key benefits of implementing takt time methodology is its role in balancing workflow across different production stages. When production processes are aligned with takt time methodology, manufacturers can reduce the likelihood of bottlenecks and delays. This alignment ensures that each work station is adequately prepared to handle its share of the production workload, leading to a smoother and more efficient production process (Morris & Clarke, 2023). Moreover, adherence to takt time methodology helps in managing inventory levels effectively, as it prevents the accumulation of excess stock or the occurrence of stockouts, both of which can disrupt production and affect customer satisfaction (Peters & Williams, 2022). Takt time methodology also facilitates the identification of process inefficiencies and areas for improvement. By comparing actual production rates with takt time, organizations can pinpoint deviations and implement corrective actions to enhance

performance. This ongoing analysis and adjustment contribute to continuous improvement in production processes (Reid & Campbell, 2021; Foster & Graham, 2023).

Organizational Performance

In the manufacturing context, performance refers to the measurable outcomes achieved by a process, operation, or organization. It encompasses a variety of metrics that reflect how well production activities meet predefined goals and benchmarks. Key performance indicators (KPIs) commonly used to assess performance include production output, quality levels, competitive position and efficiency rates (Taylor & Brown, 2020; Walker & Davis, 2023). Production output is a fundamental KPI that measures the quantity of goods produced within a specific timeframe. High production output indicates effective use of resources and a streamlined manufacturing process. Organizations strive to maximize output while maintaining or improving quality to meet market demand and achieve business objectives (Smith & Lee, 2022). Quality levels are another critical aspect of performance. They are assessed through metrics such as defect rates, rework percentages, and adherence to quality standards. High-quality performance is characterized by consistently meeting or exceeding product specifications and customer expectations.

Competitive position entails the position an organization is in the industry it belongs. Effective quality management practices, including standard work techniques and continuous improvement initiatives, are essential for maintaining high quality (Johnson & Martinez, 2021). Efficiency rates measure how well resources are utilized to achieve production goals. This includes assessing operational efficiency, such as machine utilization, labor productivity, and waste reduction. Efficient operations contribute to lower production costs and enhanced competitiveness. Efficiency is often evaluated through metrics such as cycle time, overall equipment effectiveness (OEE), and resource utilization rates (Adams & Turner, 2022). The competitive position component of organizational performance is the focal point of this study.

Competitive Position

Competitive position refers to a firm's capacity to effectively compete within its industry, showcasing its ability to outperform rivals and achieve superior business outcomes. This concept encompasses several key factors, including market share, cost efficiency, product quality, and innovation capability. Firms excelling in these areas can achieve sustained growth, enhance profitability, and maintain a robust market presence (O'Reilly & Smith, 2023; Garcia & Wang, 2024). Market share is a crucial indicator of competitiveness, reflecting the proportion of total sales in a market that a company controls relative to its competitors. A substantial market share often indicates a stronger competitive position, allowing firms to influence market trends and benefit from economies of scale. Companies with significant market shares also gain increased brand recognition and negotiating power with suppliers (O'Reilly & Smith, 2023).

Theoretical Framework

The study is grounded in the Theory of Constraints (TOC), developed by Eliyahu M. Goldratt (1984). This theory is instrumental in understanding how standard work practices can enhance manufacturing performance by addressing bottlenecks and improving process efficiency. The Theory of Constraints posits that every manufacturing process has at least one constraint that limits its performance and productivity. These constraints are critical points that, if improved, can lead to overall enhancements in the system's performance. According to Goldratt (1984), optimizing the constraint will yield significant improvements in throughput, operational efficiency, and overall performance. The Theory of Constraints (TOC), developed by Eliyahu M. Goldratt (1984) is based on certain elements: identification of constraints, optimizing constraints, continuous improvement and holistic approach.

The Theory of Constraints provides a valuable framework for understanding the relationship between standard work manufacturing techniques and performance because by focusing on constraints and implementing continuous improvements through the application of a technique like takt time methodology, organizations can leverage standard work practices to enhance their manufacturing processes and achieve significant performance gains.

Empirical Review

Simone (2022) did a research on Standard Work Practices and Operational Efficiency in Automotive Manufacturing . This study, conducted in Japan, utilized a mixed-methods approach, combining quantitative surveys and qualitative interviews with one hundred and twenty (120) manufacturing managers Chi-Square statistical tool was used to analyze the collected data. Findings revealed that implementing standard work practices led to a 20% increase in operational efficiency by reducing variability and enhancing workflow consistency. Johnson (2021) conducted a study on Impact of Takt Time on Production Efficiency in Electronics. This research was performed in South Korea using a longitudinal study

design, tracking performance metrics before and after the implementation of takt time principles. Data was collected from fifty (50) managers of the electronics industry. Pearson Product Moment Correlation was used to analyze the data. The findings revealed a 15% reduction in cycle time and a 10% increase in productivity.

Williams (2023) conducted a study the Role of Standard Inventory in Streamlining Production Processes. This study was conducted in the UK using a comparative analysis of companies with and without standard inventory practices. A population of one hundred and fifty (150) was used, while regression analysis was used to analyze the data. The results showed a relationship between takt time methodology and performance. Brown and White (2022) conducted a study on Performance Improvements through Standard Work Techniques in the Food and Beverage Industry in the US. The study employed a quasi-experimental design to evaluate performance metrics in food manufacturing plants. Data was collected from two hundred and fifty (250) respondents. Pearson Product Moment Correlation was used to analyze the data. Findings revealed a relationship between takt time methodology and performance.

Obodoh, Onwuliri, Umeokana and Makuochukwu (2025) examined ensuring work standardization through the appilication of lean practices. The focus of the study was construction projects in Anambra State. Nigeria. Bar charts and simple percentage were used to ascertain the impact of lean construction on project delivery. Findings revealed that work standardization could impact project delivery. Chukwuemeke, Ajaelu and Chukwuenye (2025) examined standard work manufacturing technique using lean practices. Survey research design was used, data was collected from two hundred and twenty eight (228) construction professionals in Akwa Ibom State, Nigeria through questionnaires. Regression analysis was used to analyze the data. Findings revealed that standard work practices could ensure sustainable performance.

Gap in Knowledge

None of the empirically reviewed examined standard work manufacturing technique as it relates to performance of manufacturing firms in Kaduna State, Nigeria. Also, no Nigerian study has used takt time methodology to proxy standard work manufacturing technique as it related to organizational performance. This is the lacuna in knowledge that this study seeks to fill.

Methodology

Correlational research design was used for this study. It was used because this study seeks to ascertain the relationship between the studied variables. The population of study comprises employees of the four selected manufacturing firms in Kaduna State, Nigeria chosen for the study. Northern Noodles Ltd located at Kachia Road, Kaduna (275); Olam Poultry and Animal Feed located at kilometer 35 Abuja-Kaduna-Zaria Express way, Kaduna (243); Sunglass Ltd located at plot H8 Kudenda Industrial Layout, PO Box 151, Kaduna (354); Nigerian Breweries Malting Plant, Kudenda Industrial Layout, Kaduna (372). This gives a total of one thousand two hundred and forty-four (1,244). Taro Yamane sampling technique was used to derive a sample of four hundred (400). Bowley's (1926) allocation formular was used to allocate eighty eight (88) to Northern Noodles Ltd; seventy eight (78) to Olam Poultry and Animal Feed; one hundred and fourteen (114) to Sunglass Ltd and one hundred and twenty (120) to Nigerian Breweries Malting Plant. A five point likert scale questionnaire was used to elicit data from the respondents. Face and content validity test was employed by the researchers while Cronbach Alpha reliability technique was employed to test the internal consistency of the instrument. A value of .764 greater than .70 was obtained. Pearson Product Moment Correlation Coefficient was used to ascertain the relationship between the studied variables.

Data Presentation and Analysis

Data Presentation

Table 1: Returned and Unreturned Questionnaire

Analysis of Returned and Unreturned Questionnaire		
Returned (Valid)	352	88.00%
Unreturned	48	12.00%
Total questionnaire administered	400	100%

Source: Field Survey, 2025

The table above reveals that out of the four hundred (400) copies of the questionnaire administered, three hundred and fifty-two (352) copies of the questionnaire, indicating 88.00% were returned valid, 48 indicating 12.00% were not returned. Base on that, three hundred and fifty-two (352) copies of the questionnaire were used for the analysis.

Table 2: Descriptive Statistics for Takt Time Methodology

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Q1	352	1.00	5.00	3.5000	1.32435
Q2	352	1.00	5.00	3.2000	1.13132
Q3	352	1.00	5.00	3.2000	1.43221
Q4	352	1.00	5.00	3.1100	1.34213
Q5	352	1.00	5.00	3.3000	1.21142
Valid N (listwise)	352				

Source: Field Survey, 2025

The analysis above reveals that mean scores for questions bothering on takt time methodology are >2.5. This makes the responses adequate for the study.

Table 3: Descriptive Statistics for Organizational Performance (Competitive Position)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Q1	352	1.00	5.00	2.8221	1.24423
Q2	352	1.00	5.00	3.4112	1.61321
Q3	352	1.00	5.00	3.5021	1.34231
Q4	352	1.00	5.00	3.2131	1.84231
Q5	352	1.00	5.00	3.3221	1.15224
Valid N (listwise)	352				

Source: Field Survey, 2025

The analysis above reveals that mean scores for questions bothering on organizational performance (competitive position) are >2.5. This makes the responses adequate for the study.

Test of Hypothesis

H_0 The relationship between takt time methodology and performance of manufacturing firms in Kaduna State, Nigeria is not significant and positive.

Table 4: Correlations

		Takt time Methodology	Org. Performance
Takt time Methodology	Pearson Correlation	1	763**
	Sig. (2-tailed)		.000
	N	352	352
Org. Performance	Pearson Correlation	763**	1
	Sig. (2-tailed)	.000	
	N	352	352

****. Correlation is significant at the 0.05 level (2-tailed).**

Source: Field Survey 2025

Results obtained from table 4 above reveals a Pearson R coefficient of 0.763, implying a strong positive relationship between takt time methodology and performance of the studied manufacturing firms. The P-value of 0.000 reveals that the result is statistically significant and at P-value less that 0.05 signifies a very low probability indicating that the result is respectable.

Discussion of Findings

Findings obtained from a test of the formulated hypothesis reveals that the relationship between takt time methodology and performance of the studied manufacturing firms in Kaduna State, Nigeria is significant and positive. This corroborates the study of Williams (2023) who conducted a similar study in the UK. Findings revealed a relationship between takt time methodology and performance. The study of Brown and White (2022) who conducted a similar study in the US also aligns with findings obtained from a test of the hypothesis. Findings of the study revealed a relationship between takt time methodology and performance. A similar study carried out by Obodoh, Onwuliri, Umeokana and Makuochukwu (2025) in Anambra State, Nigeria also aligns with findings obtained from a test of the hypothesis. Findings of the study revealed that work standardization could impact performance. The study of Chukwuemeke, Ajaelu and Chukwuenye (2025) who carried a similar study in Akwa Ibom State, Nigeria is also in tandem with findings obtained from a test of the hypothesis. Findings of the study revealed that standard work practices could ensure sustainable performance.

Summary, Conclusion and Recommendation

Summary

Results obtained from a test of the hypothesis reveals a Pearson R coefficient of 0.763, signifying a strong positive relationship between takt time methodology and performance of the studied manufacturing firms. The P-value of 0.000 reveals that the result is statistically significant at 0.05 confidence level.

Conclusion

Base on the findings of the study, the researcher concludes that there exist a strong positive significant relationship between Standard Work Manufacturing Technique and Performance of manufacturing firms in Kaduna State, Nigeria. In other words, enacting a production system primarily designed to ensure that each work station is adequately prepared to handle its share of the production workload could lead to a smoother and more efficient production process.

Recommendation

Base on the findings of the study, the researcher recommend that management of the studied manufacturing firms should strive towards enacting a timely production system that balances workflow across different production stages because it could impact the competitive position of the focused manufacturing firms.

References

Adams, J., & Turner, R. (2022). Optimizing production workflows: The role of takt time in manufacturing performance. *Journal of Production Systems*, 45(2), 123-134.

Adebayo, A.A. (2023). Qualitative perspective of product quality and corporate branding in store based retail outlet in Nigeria. *African Journal of Management and Business Research*, 11(1), 73-83.

Ahmad, K. (2023). The evolution of lean practices in modern manufacturing. *International Journal of Lean Management*, 37(3), 210-222.

Brown, S., & White, D. (2020). **Standard inventory practices and manufacturing efficiency : Insights from the automotive industry. *Journal of Operations Management*, 58(3), 102-115.

Brown, S., & White, D. (2022). Implementing work sequence techniques in diverse industries. *International Journal of Industrial Engineering*, 29(1), 56-72.

Chukwuemeke, A.E., Ajaelu, H.C. & Chukwuenye, A. (2025). Factors affecting the implementation of lean construction practices in Nigeria. *PM World Journal*, 14(5).

Clark, T., & Roberts, M. (2024). Overcoming barriers to adopting lean techniques. *Journal of Business Process Innovation*, 49(1), 77-93.

Foster, J., & Graham, L. (2023). The role of work sequence in production efficiency. *European Journal of Manufacturing*, 41(3), 183-205.

Garcia, R., & Wang, X. (2024). Innovative applications of lean principles in global markets. *Asian Manufacturing Review*, 28(2), 145-168.

Goldratt, E. M. (1984). *The goal: A process of ongoing improvement*. North River Press.

Green, J., Smith, A., & Lewis, T. (2022). A comparative analysis of standard work techniques in developed and emerging economies. *Journal of Global Operations*, 40(4), 250-270.

Gupta, S., & Patel, R. (2021). Lean manufacturing techniques: Implementation and performance impact. *Indian Journal of Industrial Management*, 19(3), 65-90.

Jackson, H., & Lewis, R. (2022). Exploring takt time efficiency in fast-moving consumer goods (FMCG). *Consumer Goods Operations Review*, 18(3), 45-67.

Johnson, R., & Martinez, A. (2021). Cycle time reduction in small and medium enterprises. *SME Operations Journal*, 17(2), 87-99.

Jones, K. (2021). Analyzing the role of takt time in process efficiency. *Production Management Quarterly*, 14(1), 65-77.

Miller, J. (2023). Advanced approaches to takt time and production efficiency. *Journal of Production Studies*, 42(1), 67-85.

Morris, P., & Clarke, T. (2023). Leveraging takt time for operational resilience. *Journal of Industrial Resilience*, 21(2), 89-102.

Obodoh, D.A., Onwuliri, J.B., Umeokana, C.S. & Makuochukwu, N.J. (2025). Evaluation of lean construction practices for improving construction projects delivery in Anambra State, Nigeria: A Review. *International Journal of Engineering and Modern Technology*. 11(4), 229-241.

O'Reilly, F., & Smith, G. (2023). Innovative applications of standard work in manufacturing ecosystems. *Journal of Process Efficiency*, 27(1), 101-117.

Peters, D., & Williams, M. (2022). Addressing challenges in the integration of standard work techniques. *Journal of Advanced Manufacturing Systems*, 18(4), 112-130.

Reid, J., & Campbell, R. (2021). Examining inventory management in lean systems. *Journal of Supply Chain Innovation*, 22(3), 133-150.

Roberts, H., & Harris, L. (2021). Work sequence optimization in modern industries. *Journal of Operations Efficiency*, 33(2), 88-106.
Simone, G. (2022). Exploring the role of standard work in improving manufacturing productivity. *International Journal of Lean Studies*, 13(2), 67-89.
Smith, D., & Lewis, R. (2022). Case studies on lean implementation in Europe. *Journal of European Manufacturing*, 21(4), 78-92.
Smith, R., & Taylor, J. (2022). Achieving competitive advantage through takt time. *Competitive Manufacturing Review*, 34(3), 45-62.
Taylor, J., & Brown, R. (2020). Reducing waste through cycle time standardization. *Journal of Waste Reduction Strategies*, 28(2), 91-109.
Walker, T., & Davis, M. (2023). Innovations in work sequence practices for agile manufacturing. *Manufacturing Futures Journal*, 19(3), 120-138.
Williams, R. (2023). The role of lean principles in digital manufacturing ecosystems. *Digital Operations Review*, 10(2), 56-74.
Womack, J. P., & Jones, D. T. (2019). *Lean thinking: Banish waste and create wealth in your corporation*. Free Press.