Lean Manufacturing and Competitive Advantage of Selected Sugar Manufacturing Firms in Nigeria

Augustine Chibueze Iherobiem
Department of Business Administration
Olabisi Onabanjo University
Email: iherobiemaugustine@yahoo.com
ORCID: https://orcid.org/0009-0006-6934-3302

Lateef Olamilekan Adegboyega
Department of Research
National Institute for Policy and Strategic Studies
Email: adegboyega482@gmail.com
ORCID: https://orcid.org/0009-0009-5760-4837

Mayowa Ebenezer Ariyibi
Department of Banking and Finance
Faculty of Administration and Management Sciences,
Olabisi Onabanjo University
Email: ariyibimayowa@gmail.com

Samson Ajasa Adeyemi
Department of Public Administration
Olabisi Onabanjo University
Email: adeyemisamson22@gmail.com
ORCID: https://orcid.org/0009-0000-1787-7886

https://doi.org/10.61090/aksujacog.2025.024

Abstract

This study investigated the effect of lean manufacturing on the competitive advantage of selected sugar manufacturing firms in Nigeria. The study used a correlational research design, and its population consisted of employees of Flour Mills of Nigeria Plc and Dangote Sugar Refinery PLC. in Nigeria. The sample population consisted of 30 respondents from the firms, including departmental managers and assistant departmental managers from departments such as sales, finance, procurement, and production. The questionnaire used to collect the study's data was self-administered by the researcher to the participants and was constructed using a five-point Likert scale. Twenty-five copies of the questionnaire, out of the thirty that were distributed, were returned and used for the analysis. The study employed a linear regression model to determine the link between the variables, and the findings showed that lean manufacturing significantly and positively impacted sugar companies' competitive advantage (β=0.475, p=0.000). It was concluded that manufacturing companies have a better chance of gaining a competitive edge when they implement lean manufacturing, and it is recommended that sugar companies, as well as manufacturing companies in general, allocate more resources and prioritise implementing lean manufacturing methods into their operations.

Keywords: Lean, lean manufacturing, organisational performance, competitive advantage, manufacturing firms.

Introduction

The business world of today is marked by constant technological advancement and growing competition, which has created difficulties for many organisations (Islami, 2022). One such difficulty is that most companies, including manufacturing firms, are known to produce similar products, so they are under pressure to lower their costs to adapt and gain a competitive edge (Maware et al., 2022). Every organisation, whether for profit or not, has to deal with challenges from the outside world that require it to use strategic change tools to improve its operations, become more decentralised, and alter its long-standing policies (Ghaithan et al., 2023).

A variety of management tools, including Business Process Reengineering (BPR), Just In Time (JIT), Total Quality Management (TQM), Bench Marking (BM), Continuous Improvement (CI), and Lean Manufacturing (LM), have been adopted as a result of the search for the best strategic tools to implement to improve their operations (Adeodu et al., 2021; Okolocha & Anugwu, 2022). Lean manufacturing, on the other hand, has been widely adopted by manufacturing and service companies. This is because it has been perceived as a tool to help them improve their market position, meet the pressure from their rivals, and become competitive (Rossini et al., 2022). According to Khalfallah & Lakhal (2021), one of the main reasons manufacturing companies are considering lean manufacturing is that they believe it can help them improve the quality of their products with little to no waste.

The manufacturing sector, in particular, has the formidable challenge of managing and controlling inventory and potentially eliminating waste, which is a problem for many businesses and industries (Kumar et al., 2022). Using lean manufacturing gives the company an edge in that it allows them to control their operations and strategy while also cutting waste (Hardcopf et al., 2021). An organisation's goal may be financial or non-financial, and it uses this as a standard to evaluate its performance. In contrast, the main goals of lean manufacturing are to enable businesses to better understand the needs of their clients, create value that meets those needs, cut waste, and make efficient use of resources (Orji & U-Dominic, 2022).

Statement of the Problem

It is essential and crucial for firms to continuously adapt to keep up with the ever-changing business environment (Díaz-Reza et al., 2022). Lean manufacturing has been viewed as a crucial tool to reduce waste in the entire supply chain management activities, which is advantageous to the organisations. This is one of the main strategies that has been seen as a very important tool in improving performance and being able to remain competitive with the increasing competitiveness in the business environment (Farrukh et al., 2022; Inuwa & Usman, 2022). Despite making a substantial contribution to the nation's GDP, the majority of Nigerian manufacturing companies, including sugar companies, continue to use the antiquated mass production method. This has proven to be highly ineffective, leading to problems like overproduction and resource waste, which is the primary cause of the rising performance and closure of many of these businesses (Bamisaye et al., 2023; Mathiyazhagan et al., 2022).

Many academics in both developed and developing nations have been inspired to conduct studies on the impact that lean manufacturing will have on company performance due to its novelty as a breakthrough for manufacturing enterprises. According to the majority of these studies, an organisation's operations (Dieste et al., 2021), marketing and sales (Swarnakar et al., 2021), finances (Hariyani et al., 2023; Skalli et al., 2024), waste and the environment (Bhat et al., 2021; Ding et al., 2023), and customer loyalty and retention (Iherobiem & Sanusi, 2023; Kumar et al., 2022) could all be improved by lean manufacturing. However, the majority of recent research in

Nigeria has only looked at how lean manufacturing has improved an organisation's financial and non-financial performance, ignoring how crucial it is for gaining a competitive edge. Therefore, the goal of this study is to determine how much lean manufacturing may help manufacturing companies gain a competitive edge.

Evolution of Lean Manufacturing

The history of lean manufacturing may be traced back to the Toyota Production System (TPS), which aims to boost productivity and efficiency by eliminating non-value-adding activities and making efficient use of resources (Islami, 2022). Thus, the TPS determined that the two main tenets of lean manufacturing are waste reduction and continual process improvement. Toyota Production System (TPS) were able to increase its profitability by using this approach to produce a small number of various automobile models at a low cost. This is because it enables TPS to cut back on some of their low-value or worthless inventory, which lowers production costs and lead times while still satisfying consumer demands (Bhat et al., 2021).

Krafcik then established the idea of "lean manufacturing" in 1988, defining it as the utilisation of fewer resources, including labour, materials, and space, in the production process (Khalfallah & Lakhal, 2021). As time goes on, lean manufacturing is becoming increasingly well-known internationally and applies to a variety of industries, not simply the automotive sector. This spread and adoption have been ascribed to its capacity to guarantee an improvement in customer satisfaction, organisational efficiency, and overall performance (Adeodu et al.,2021).

Lean Manufacturing

Although numerous definitions of lean and lean manufacturing have been offered by various authors and experts, no standards for this concept have been put forth (Adeodu et al., 2021; Orji & U-Dominic, 2022). Among other things, the majority of these authors have categorised lean manufacturing as either a concept, a philosophy, or a method (Bamisaye et al., 2023). The goal of lean manufacturing, according to Swarnakar et al. (2021), is to continuously strive for excellence by making sure that non-value-added activities in the production or manufacturing process are systematically decreased. Similarly, Bamisaye et al. (2023) describe lean manufacturing as the process of detecting and removing waste in areas including excess inventory, overproduction, defects, inefficient processes, needless motion, and waiting periods. According to Dieste et al. (2021), lean manufacturing is a strategy that has been implemented to assist in cutting waste and increasing an organisation's level of productivity.

According to Díaz-Reza et al. (2022), lean manufacturing is a set of techniques used to reduce waste and unnecessary steps in the production or manufacturing process. In a similar vein, Orji & U-Dominic (2022) described it as a multifaceted strategy that is used and encompasses components like Just in Time, Total Quality Management, and additional management concepts or practices that are integrated to aid in waste reduction. According to Maware et al. (2022), the fundamental ideas of lean manufacturing revolve around three goals: optimising the manufacturing process to improve overall performance, eliminating or limiting waste, and making effective use of resources. According to Inuwa & Usman (2022), lean manufacturing is a methodical production process that reduces waste to improve quality and productivity.

Competitive Advantage

Over time, researchers and academics have developed a variety of opinions on the idea of competitive advantage (Iherobiem & Sanusi, 2023). Porter (1985) defined competitive advantage

as the presence of a particular value that sets one company apart from another and is used to increase profits or business prospects. To put it another way, Adeodu et al. (2021) clarified that a firm's competitive advantage is only demonstrated when its operations provide a more profitable and superior outcome than those of its rivals, or when the firm surpasses its rivals in terms of a noteworthy outcome of its operations. An organisation's ability to accomplish its goals in a manner that its rivals could not is another approach to define competitive advantage. This could be attributed to its client base, intangible assets, or superior services (Ding et al., 2023).

Within the framework of lean management, Bhat et al. (2021) defined competitive advantage as a complete metric that ensures value is delivered to the customer while optimising resources and processes and doing it in a better and more cost-effective manner than its competitors. In a similar spirit, Okolocha & Anugwu (2022) defined competitive advantage as the edge a business has that allows it to outperform its rivals in the market in terms of sales, customer retention, customer acquisition, and profit margin. A corporation is considered to have a competitive edge, according to Swarnakar et al. (2021), if it can implement a value-creating strategy that its rivals could never dream of. According to Díaz-Reza et al. (2022), a company's ability to use its resources (both human and physical) in its operations to accomplish its objectives more effectively and efficiently gives it a competitive edge over its rivals.

Lean Manufacturing and Competitive Advantage

According to Inuwa & Usman (2022), lean manufacturing is one of the various ways that an organisation can gain a competitive edge. Since the middle of the 20th century, organisations have found that lean management, which has its roots in the Toyota Production System, has revolutionised their approach to effectiveness, efficiency, and continuous improvement (Hariyani, Mishra & Sharma, 2023). The Toyota Production System's implementation of lean principles was observed to have reduced waste, improved quality and value, and improved overall performance—all of which are factors that could result in gaining a competitive edge (Dieste, Panizzolo & Garza-Reyes, 2021; Swarnakar, Singh & Tiwari, 2021).

According to Skalli et al. (2024), lean manufacturing components like value stream mapping and the Just in Time approach are crucial for locating and getting rid of waste since they increase productivity and enhance quality. According to Farrukh, Mathrani and Sajjad (2022), a crucial element of lean manufacturing is increasing employee empowerment and engagement at all levels. When this is promoted within the company, workers are more inclined to spot any inefficiencies in the production processes and suggest a change that will boost productivity, improve job satisfaction, and give the company a competitive edge. According to Hardcopf, Liu and Shah (2021), performance and improvement initiatives are significantly correlated, and performance may result in a competitive advantage.

The relationship between lean manufacturing, organisational performance, and competitive advantage has also been extensively studied by a number of researchers and scholars (Khalfallah & Lakhal, 2021; Mathiyazhagan et al., 2022). Kumar et al. (2022) found that lean manufacturing encompasses a number of variables, including cost, time, effectiveness, efficiency, quality, value, and many more, and that the implementation of these factors affects the achievement of organisational performance. Okolocha & Anugwu (2022) also discovered that improving organisational performance is one of the key success factors in gaining a competitive advantage. According to Rossini et al. (2022), the application of lean is frequently associated with improved operational performance. They also list improved quality, cost and value reduction, waste elimination, and effective and efficient resource utilisation as some of the advantages of lean

manufacturing. This corroborates the claim made by Orji & U-Dominic (2022) and Ghaithan et al. (2023) that a company must have been experiencing advantages like improved product quality, cost reduction, value growth, and effective and efficient use of resources in order to be able to gain a competitive edge.

Underpinning Theories

Resource-Based View Theory

RBV theory can be used to explain a company's competitive advantage because it aims to explain how internal resources are the primary source of a firm's ability to accomplish specific goals and objectives that other firms in the same industry are unable to achieve (Prahalad & Hamel, 1990). Wernerfelt developed this idea between 1984 and the middle of the 1990s (Barney, 1991). Many additional researchers, including Barney, Conner, Prahalad, and others, contributed to the theory after it gained widespread acceptance (Barney, 1991; Hill & Jones, 2012; Javidan, 1998; Prahalad & Hamel, 1990). All of these researchers contributed to the idea that a company can use its resources to gain a long-term competitive advantage if those resources have four essential characteristics: they must be valued, scarce, unique, and non-substitutable (Peteraf & Barney, 2003; Prahalad & Hamel, 1990).

The significance of implementing LM in an organisation can be explained by the RBV theory, which states that successful integration of an organisation's supply chain operations leads to efficient resource utilisation, which is frequently regarded as a source of competitive advantage for businesses (Dieste, Panizzolo & Garza-Reyes, 2021; Swarnakar, Singh & Tiwari, 2021). According to Khalfallah & Lakhal (2021), the fundamental knowledge and information needed to implement such a strategic tool might be viewed as a resource that satisfies the four fundamental requirements of being valuable, scarce, unique, and non-substitutable. This could give the company a competitive edge. Lean manufacturing is explained by Okolocha & Anugwu (2022), who stated that a company can get a competitive advantage by protecting the environment, conserving resources, and reducing waste.

Institutional Theory

In order to explain how external pressure affects organisational decision-making and overall business performance, the institutional theory has been proposed (Alshumrani et al., 2022). The theory provides a theoretical and practical framework for examining the important elements that affect an organisation's performance, including the legal and social environment, the resources at hand, traditional and historical values, and organisational cultures (Bhuiyan et al., 2023; Zhao et al., 2017). The three primary isomorphic institutional pressures that organisations employ to shape their practices, norms, and structures served as the foundation for the theory. Coercive, normative, and mimetic are the three isomorphic institutional pressures (Bresser & Millonig, 2003). The coercive power explains the official and informal laws that are enforced and the tight adherence to regulations by organisations. The mimetic refers to an organisation's propensity to copy specific strategies of other organisations, while the normative discusses social groups and professionalism, including the pressure organisations face to improve their knowledge of environmental sustainability (Bertheussen, 2021).

This is relevant because, as a result of institutional pressures, organisations are being pushed and compelled to adopt strategies like resource planning systems and lean manufacturing to comply with government regulations and to stay competitive with their competitors (Kumar et al., 2022; Mathiyazhagan et al., 2022). According to Oliver (1997), the government, clients, and

competitors are important external isomorphic sources that apply pressure on a business and necessitate its implementation of LM. There has been a growing need to ensure and uphold sustainability practices in organisations due to coercive pressures, like those from the government. One way to do this is through LM, as this strategy helps reduce waste that should have gone toward environmental waste (Swarnakar et al., 2021). The pressure that has been generated by the fierce competition that organisations face from other companies as a result of LM adoption may also be used to explain the normative and mimetic pressure (Skalli et al., 2024).

Methodology

The positivist philosophy was chosen for the study because it supports the use of hypotheses and a quantitative technique to determine the link between independent and dependent variables (Saunders et al., 2012). According to Mugenda & Mugenda (2012), the positivist philosophy is a useful one for researching because it uses a scientific method and observation for data gathering and analytic procedures. For this study, a correlational research strategy was also used. A correlational study design is a useful statistical technique for determining the link between variables or a set of data (Schindler, 2019).

The study's population comprises employees of Flour Mills of Nigeria Plc and Dangote Sugar Refinery PLC in Nigeria. It has been found that these two companies have dominated the sugar milling industry for many years and possess the largest clientele compared to other sugar milling enterprises (Bamisaye et al., 2023). The sample group consisted of 30 respondents, comprising department managers and assistant departmental managers from manufacturing, procurement, finance, and sales (15 from each company). The managers and assistant managers were selected due to their recognised active involvement with the system and in implementing strategic practices such as lean manufacturing. This would facilitate the collection of comprehensive and accurate data for the study, aligning with its objectives.

The researcher self-administered the questionnaire, designed using a five-point Likert scale, to the departmental managers and assistant managers who participated in the study to gather data. Both descriptive and inferential statistics were employed to analyse the data. Frequencies and percentages were utilised to present the data in tables, charts, and graphs, while the Statistical Package for the Social Sciences (SPSS 16.0) was employed for the study. Out of the 30 questionnaires distributed, 25 were returned, resulting in an 83% response rate.

Results and Discussion

Table 1: Correlation between Lean Manufacturing and Firm Competitive Advantage

Correlations

		Lean Manufacturing	Competitive Advantage
Lean Manufacturing	Pearson Correlation	1	.689**
	Sig. (2-tailed)		.000
	N	25	25
Competitive Advantage	Pearson Correlation	.689**	1
	Sig. (2-tailed)	.000	
	N	25	25

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Survey Data (2025)

The analysis showed a strong and positive link between lean manufacturing and firm competitive advantage, as indicated by the Pearson product-moment correlation between the two variables in Table 1. The significance value of the correlation was less than 5% (r=0.689, p=0.000), indicating statistical significance. Consequently, the alternative hypothesis, which suggested a positive correlation between the variables under investigation, is accepted, while the null hypothesis, which posited no connection between lean manufacturing and company competitive advantage, is rejected. This implies that a high score in lean manufacturing is likewise linked to or associated with a higher score in the competitive advantage of Nigerian sugar companies.

Table 2: Model Significance for the Relationship between Lean Manufacturing and Firm Competitive Advantage

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.113	1	2.113	113.313	.000[b]
	Residual	.736	23	.032		
	Total	2.849	24			

a. Dependent Variable: Competitive Advantage
b. Predictors: (Constant), Lean Manufacturing
Source: Survey Data (2025)

At the 5% level of significance, the results shown in Table 2 reveal a statistically significant F statistic value of 113.313. The F statistic is an important metric for evaluating the overall relevance of the regression model, with a higher F value indicating a meaningful association between the research variables (competitive advantage and lean manufacturing). This suggests that, given the substantial association between the research variables, the alternative hypothesis must be accepted while the null hypothesis is rejected. Furthermore, the model is considered suitable for assessing the research hypothesis.

Table 3: Summary Model for the Percentage Change in Firm Competitive Advantage Explained by Lean Manufacturing

Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.689[a]	.475	.469	.15794	.474	113.313	1	24	.000

a. Predictors: (Constant), Lean manufacturing
b. Dependent Variable: Competitive Advantage
Source: Survey Data (2025)

According to the analysis in Table 3, lean manufacturing and competitive advantage are positively and significantly correlated (R2 = 0.475, p = 0.000). The R-squared value of 0.475 indicates that lean manufacturing accounts for 47.5% of the variation in competitive advantage. This high

percentage may suggest that lean manufacturing significantly influences Nigerian sugar companies' ability to gain a competitive edge. After considering the tendency to either overestimate or underestimate the results, the adjusted R-squared value of 0.469 further supports the existence of a significant association (Adjusted R2 = 0.469, p = 0.000).

Discussion

The purpose of the study was to determine how much lean manufacturing may assist manufacturing companies in gaining a competitive edge. The findings revealed that lean manufacturing and a firm's competitive advantage are significantly and positively correlated. In particular, the regression analysis indicated that lean manufacturing accounted for a considerable portion of the variation in a firm's competitive advantage; that is, if manufacturing firms were to adopt lean manufacturing less frequently, their competitive advantage would decline significantly. This underscores the importance of manufacturing companies, particularly sugar firms, adopting lean manufacturing practices to achieve a competitive edge.

The findings of this study were consistent with those of previous research studying the relationship between lean manufacturing and company performance or competitive advantage, including research by Dieste et al. (2021), Inuwa & Usman (2022), and Rossini et al. (2022. They contend that lean manufacturing has a statistically significant and favourable impact on a firm's competitive edge. Accordingly, research like Hariyani, Mishra and Sharma (2023) and Kumar et al. (2022) shows that implementing lean manufacturing in a company enables it to perform just-in-time activities, which are known to be highly successful in giving businesses a competitive edge in the marketplace. This further bolsters the research of Bamisaye et al. (2023) that found lean manufacturing to be a strategic instrument that helps businesses gain a competitive edge by fortifying their market position.

Conclusions

The research aims to "examine the degree to which manufacturing companies may be able to attain a competitive edge through lean manufacturing." The research focused on sugar companies in Nigeria and found that lean manufacturing significantly and favourably impacted the firms' competitive advantage. Based on this, it can be concluded that lean manufacturing is a critical component in determining not only the performance of sugar companies but also the attainment of their competitive advantage. Lean manufacturing is a crucial tactic that aids organisations in getting rid of waste since it makes it simple for them to identify processes or activities that don't improve the manufacturing process, which increases productivity and efficiency.

Recommendations of the Study

Based on the study's findings and conclusion, it is strongly recommended that sugar companies, as well as manufacturing companies generally, give lean manufacturing practices a higher priority, place more attention on implementing them into their operations, and provide more funds to this endeavour. Manufacturing companies should also use Just-in-Time (JIT) practices because they make it simple to monitor and organize their inventory, which will eliminate waste from overstocking situations. Manufacturing companies should also make significant investments in teaching and training their personnel about lean manufacturing, since this would enable each worker to take responsibility for their procedures and promote ongoing organisational improvement.

Suggestions for Further Studies

The results of this study are limited since it only looks at sugar companies in Nigeria; future research may attempt to examine how lean manufacturing affects the competitive advantage of other manufacturing organisations.

References

Adeodu, A., Kanakana-Katumba, M. G., & Rendani, M. (2021). Implementation of Lean Six Sigma for production process optimization in a paper production company. *Journal of Industrial Engineering and Management*, *14*(3), 661-680. DOI: https://doi.org/10.3926/jiem.3479

Alshumrani, S., Baird, K., & Munir, R. (2022). Management innovation: The influence of institutional pressures and the impact on competitive advantage. *International Journal of Manpower*, *43*(5), 1204-1220. https://doi.org/10.1108/IJM-05-2021-0291

Bamisaye, O. S., Oroye, O. A., Farayibi, P. K., Adeitan, A. D., & Agbo, S. (2023). Assessment of lean practices in small and medium garment manufacturing companies in South-Western Nigeria. *Journal of Applied Research in Technology and Engineering*, *4*(2), 87-96. DOI: https://doi.org/10.4995/jarte.2023.18999.

Barney. J. (1991). Firm resources and sustained competitive advantage, *Journal of Management*, 17(1), 99-120

Bertheussen, B. A. (2021). Sustained competitive advantage based on industry-specific institutional frameworks. *Frontiers in Marine Science*, *8*, 697936. https://doi.org/10.3389/fmars.2021.697936.

Bhat, S., Gijo, E. V., Rego, A. M., & Bhat, V. S. (2021). Lean Six Sigma competitiveness for micro, small and medium enterprises (MSME): An action research in the Indian context. *The TQM Journal*, *33*(2), 379-406. https://doi.org/10.1108/TQM-04-2020-0079

Bhuiyan, F., Rana, T., Baird, K., & Munir, R. (2023). Strategic outcome of competitive advantage from corporate sustainability practices: Institutional theory perspective from an emerging economy. *Business Strategy and the Environment*, *32*(7), 4217-4243. https://doi.org/10.1002/bse.3362

Bresser, R. K., & Millonig, K. (2003). Institutional capital: Competitive advantage in light of the new institutionalism in organization theory. *Schmalenbach Business Review*, *55*, 220-241. https://doi.org/10.1007/BF03396675.

Díaz-Reza, J. R., García-Alcaraz, J. L., Figueroa, L. J. M., Vidal, R. P. I., & Muro, J. C. S. D. (2022). Relationship between lean manufacturing tools and their sustainable economic benefits. *The International Journal of Advanced Manufacturing Technology*, *123*(3), 1269-1284. https://doi.org/10.1007/s00170-022-10208-0.

Dieste, M., Panizzolo, R., & Garza-Reyes, J. A. (2021). A systematic literature review regarding the influence of lean manufacturing on firms' financial performance. *Journal of Manufacturing Technology Management*, *32*(9), 101-121. https://doi.org/10.1108/JMTM-08-2020-0304.

Ding, B., Ferras Hernandez, X., & Agell Jane, N. (2023). Combining lean and agile manufacturing competitive advantages through Industry 4.0 technologies: an integrative approach. *Production Planning and Control*, *34*(5), 442-458. https://doi.org/10.1080/09537287.2021.1934587.

Farrukh, A., Mathrani, S., & Sajjad, A. (2022). A natural resource and institutional theory-based view of green-lean-six sigma drivers for environmental management. *Business Strategy and the Environment*, *31*(3), 1074-1090. https://doi.org/10.1002/bse.2936.

Ghaithan, A. M., Alshammakhi, Y., Mohammed, A., & Mazher, K. M. (2023). Integrated impact of circular economy, industry 4.0, and lean manufacturing on sustainability performance of manufacturing firms. *International Journal of Environmental Research and Public Health*, *20*(6), 5119. https://doi.org/10.3390/ijerph20065119.

Hardcopf, R., Liu, G. J., & Shah, R. (2021). Lean production and operational performance: The influence of organizational culture. *International Journal of Production Economics*, *235*, 108060. https://doi.org/10.1016/j.ijpe.2021.108060.

Hariyani, D., Mishra, S., & Sharma, M. K. (2023). A descriptive statistical analysis of barriers to the adoption of integrated sustainable-green-lean-six sigma-agile manufacturing system (ISGLSAMS) in Indian manufacturing industries. *Benchmarking: An International Journal*, *30*(8), 2705-2733. https://doi.org/10.1108/BIJ-11-2021-0701.

Hill C, & Jones G (2012). *Essentials of strategic management*. 1st ed. Cengage Learning.

Iherobiem, A. C., & Sanusi, A. O. (2023). Process Innovation as a Strategic Tool in Enhancing the Performance of Organizations: A study of manufacturing firms in Nigeria. *EMAJ: Emerging Markets Journal*, *13*(1), 38-44. DOI: https://doi.org/10.5195/emaj.2023.306.

Inuwa, M., & Usman, A. (2022). Prospects and Challenges of Lean Manufacturing Deployment within Manufacturing SMEs in Nigeria: A Literature Review. *Journal of Social Sciences and Management Studies*, *1*(3), 51-64. DOI: https://doi.org/10.56556/jssms.v1i3.159.

Islami, X. (2022). Lean manufacturing and firms' financial performance: The role of strategic supplier partnership and information sharing. *Benchmarking: An International Journal*, *30*(9), 2809-2831. https://doi.org/10.1108/BIJ-02-2022-0084.

Javidan, M. (1998). Core competence: What does it mean in practice? *Long Range Planning*, 31(1), 60-71.

Khalfallah, M., & Lakhal, L. (2021). The impact of lean manufacturing practices on operational and financial performance: the mediating role of agile manufacturing. *International Journal of Quality and Reliability Management*, *38*(1), 147-168. https://doi.org/10.1108/IJQRM-07-2019-0244.

Kumar, N., Hasan, S. S., Srivastava, K., Akhtar, R., Yadav, R. K., & Choubey, V. K. (2022). Lean manufacturing techniques and its implementation: A review. *Materials Today: Proceedings*, *64*, 1188-1192. https://doi.org/10.1016/j.matpr.2022.03.481.

Mathiyazhagan, K., Gnanavelbabu, A., & Agarwal, V. (2022). A framework for implementing sustainable lean manufacturing in the electrical and electronics component manufacturing industry: An emerging economies country perspective. *Journal of Cleaner Production*, *334*, 130169. https://doi.org/10.1016/j.jclepro.2021.130169.

Maware, C., Okwu, M. O., & Adetunji, O. (2022). A systematic literature review of lean manufacturing implementation in manufacturing-based sectors of the developing and developed countries. *International Journal of Lean Six Sigma*, *13*(3), 521-556. https://doi.org/10.1108/IJLSS-12-2020-0223.

Mugenda, O. M., & Mugenda, A. G. (2012). *Research methods: Quantitative and qualitative approaches* (5th ed.). Acts Press.

Okolocha, C., & Anugwu, C. (2022). Lean manufacturing approach and operational efficiency of Nigerian pharmaceutical companies in Anambra state. *Saudi Journal of Business Management Studies*, *7*(3), 94-99. DOI: 10.36348/sjbms.2022.v07i03.003.

Oliver, C. (1997). Sustainable competitive advantage: combining institutional and resource-based views. *Strategic Management Journal*, *18*(9), 697-713.

Orji, I. J., & U-Dominic, C. M. (2022). Organizational change towards Lean Six Sigma implementation in the manufacturing supply chain: an integrated approach. *Business Process Management Journal*, *28*(5/6), 1301-1342. https://doi.org/10.1108/BPMJ-04-2022-0169.

Peteraf, M. A. & Barney, J. B. (2003), Unraveling the resource-based tangle, *MDE Manage. Decis. Econ.*, 24(4), 309–323.

Porter, E. (1985). Technology and competitive advantage. *Journal of Business Strategy*, 5(3), 60–78.

Prahalad, C.K. & Hamel, G. (1990), "The core competence of the corporation. *Harvard Business Review,* 6(3), 79-92.

Rossini, M., Costa, F., Tortorella, G. L., Valvo, A., & Portioli-Staudacher, A. (2022). Lean Production and Industry 4.0 integration: how Lean Automation is emerging in manufacturing industry. *International Journal of Production Research*, *60*(21), 6430-6450. https://doi.org/10.1080/00207543.2021.1992031

Saunders M., Lewis P., & Thornhill, A. (2012). *Research methods for business students. 6th Ed*. Pearson Professional Limited.

Schindler, P. S. (2019). *Business research methods*. McGraw-Hill Education.

Skalli, D., Charkaoui, A., Cherrafi, A., Garza-Reyes, J. A., Antony, J., & Shokri, A. (2024). Analyzing the integrated effect of circular economy, Lean Six Sigma, and Industry 4.0 on sustainable manufacturing performance from a practice-based view perspective. *Business Strategy and the Environment*, *33*(2), 1208-1226. https://doi.org/10.1002/bse.3546.

Swarnakar, V., Singh, A. R., & Tiwari, A. K. (2021). Effect of lean six sigma on firm performance: A case of Indian automotive component manufacturing organization. *Materials Today: Proceedings*, *46*, 9617-9622. https://doi.org/10.1016/j.matpr.2020.07.115.

Zhao, E. Y., Fisher, G., Lounsbury, M., & Miller, D. (2017). Optimal distinctiveness: Broadening the interface between institutional theory and strategic management. *Strategic Management Journal*, *38*(1), 93-113. https://doi.org/10.1002/smj.2589.