International Research Journal Of Business and Strategic Management

Vol 5, Issue 3, pp 175-185, Oct 14, 2023, © International Research Journal Publishers, ISSN 2710-2742 (online) www.irjp.org

EVALUATING THE INFLUENCE OF MATERIAL HANDLING AUTOMATION ON PROFITABILITY OF MEDIUM-SCALE MANUFACTURING FIRMS IN NAIROBI COUNTY, KENYA

[1*]Terry Noelline Muhati & [2]Dr Isaak Mokono Abuga

[1*]Scholar, Mount Kenya University
[2]Lecturer, Mount Kenya University

Accepted, October 7th, 2023

Abstract

Efficiency and profitability are key concerns in the manufacturing industry, particularly for medium-scale manufacturing firms in Nairobi County, Kenya. The study assessed the influence of material handling automation on profitability and it was anchored in Reesource-Based View Theory. The research aimed to analyze the impact of stock control on profitability. This study employs a descriptive research design, with a sample size of 309 respondents. Through a robust methodology including both primary and secondary data collection through questionnaires, interviews, and analysis of previous reports, the research explores specific indicators and emphasizes ethical considerations, ensuring originality and confidentiality. The findings from this research are expected to shed light on practices that could be optimized to enhance the profitability of medium-scale manufacturing firms in Nairobi County, and potentially, the entire Kenyan manufacturing sector. Our findings indicate that material handling automation emerged as a game-changer, significantly improving operational efficiency, reducing labor costs, and enhancing inventory management. This automation also fosters adaptability to market changes and contributes to workplace safety, ultimately bolstering financial success. The study's conclusions affirm that automating material handling practice is fundamental to medium-scale manufacturing firms' profitability in Nairobi County. It is recommended that firms in Nairobi County invest in material handling automation. The practice has been proven to streamline operations, reduce costs, and enhance profitability.

Keywords: *Material Handling Automation, Profitability, Medium-Scale Manufacturing Firms*

INTRODUCTION

In the current exceedingly aggressive worldwide commercial environment, the weight on firms to discover better approaches to convey value to their clients is becoming ever challenging. The expanding requirement for industry to offer items in a worldwide market based on cost and quality has generated the need to implement more productive warehousing methodologies. Material handling has come to be perceived as an unmistakable crucial with the operation of large-scale manufacturing firms. Material handling comes before processing of completed products held for distribution to customers (Coyle at el, 2014). Material

handling with is essential hubs in a supply chain network as it perform important functions that help the development of materials, handling items, deamassing vehicle loads, making stock keeping unit combinations and gathering materials for shipments purposes (Andre Langevin and Riopel Diana, 2015). The effective material dealing in the stores ensures optimal production and dissemination complete products with main objective of cost decrease and firm performance improvement.

In the international context, countries like Germany, Japan, and the United States have been pioneers in the field of material handling, employing state-of-the-art technologies and systems to ensure efficient operations. For instance, Germany's robust manufacturing sector, particularly in automotive and machinery, has been at the forefront of adopting innovative material handling solutions. The integration of automation and Industry 4.0 technologies in material handling has positioned Germany as a leader in this sphere (Kagermann et al., 2013). Japan, known for its lean manufacturing principles and Just-In-Time (JIT) techniques, has implemented material handling practices that minimize waste and optimize production flow (Ohno, 2018). In the United States, the adaptation of smart technologies and data-driven approaches in material handling has created a synergy between production and distribution, aligning with the global trend towards customization and rapid response to market demands (Frazelle, 2002).

The African perspective on material handling is also evolving, reflecting the continent's economic growth and industrialization. South Africa, Nigeria, and Egypt, being key players in Africa's manufacturing sector, have shown notable advancements in material handling practices. South Africa's manufacturing industry has leveraged technological innovations to create efficient supply chain networks, embracing automation and advanced material handling equipment (Rogers et al., 2015). In Nigeria, the growth of manufacturing, particularly in consumer goods and agro-based industries, has necessitated investment in material handling infrastructure to reduce costs and improve quality control (Oke & Idada, 2017). Egypt's focus on expanding its manufacturing base has led to an exploration of global best practices in material handling, adopting a blend of traditional methods and technological solutions to meet its unique market needs (El-Midany et al., 2010).

Kenyan manufacturing firms have understood the advantages of embracing great materials administration and are taking keen interest regarding materials administration since survival of any firm relies upon how well their expenses are overseen (Ondieki, 2014). Nevertheless, most Kenyan firms are not applying refined methods of materials administration in comparison to resources spent on acquisition and maintenance of materials in various firms. The issues experienced in material administration includes absence of adaptability, entrusting a great deal of delicate material exercises to one office and absence of all around coordinated database to help data stream on materials (Wanjogu, Iravo & Arani, 2015). Materials Management envelops all activities of administration over materials from obtaining of raw materials through the production process to the last step of conveyance of the finished goods to the customers. It unites under one administration duty regarding deciding the assembling prerequisite, booking the assembling forms and obtaining, putting away and administering materials (Ondiek, 2014).

Kenya has a huge scale-manufacturing segment serving both the local market and export to the East African community and beyond. Assembling and manufacturing added to around 25% of the Gross Domestic Product (GDP) in 2013 (KNBS, 2014). Assembling and manufacturing firms output contributed about 17% of formal work and 15% of Kenya's aggregate export in 2013. As indicated by Kenya Association of Manufacturers (KNBS, 2014), there are 700 registered manufacturing firms in Kenya. These are segregated into three

group's including large scale, medium scale and large-scale producing firms based on yearly normal turnovers made by the firms. The KAM (Kenya Association of Manufacturers) characterizes medium-scale producers as those assembling firms with a turnover of between thirty million and fifty million Kenya shillings (KNBS, 2014). Medium scale producers extend in turnover between twenty million and two hundred and fifty million while the large-scale makers have turnovers more than two hundred and fifty million Kenya shillings annually.

The growth and expansion of the manufacturing sector in Nairobi County require an in-depth understanding of material handling and its effects on profitability. By drawing on international trends and lessons from both global leaders and other African nations, there is an opportunity to develop practices tailored to Nairobi's unique manufacturing landscape. The balance between adopting global standards and aligning with the local context is crucial in enhancing the profitability of medium-scale manufacturing firms in Nairobi County, Kenya. Insights from the experiences of global and African leaders in material handling can guide the development of strategic approaches that foster growth, innovation, and competitiveness within Nairobi's manufacturing sector.

Statement of the Problem

Material handling practices have come to the forefront of organizational success in today's highly competitive market (Dimitrios, 2008). This is particularly evident within medium-scale manufacturing firms in Nairobi County, Kenya, where efficient handling can significantly affect profitability. In numerous organizations, direct materials can constitute up to 50% of the total product cost, emphasizing the vital role that material management plays in determining financial success (Rajeev, 2010). Kenya's Vision 2030 foresees that the manufacturing sector should contribute 20% of GDP by 2030. Nevertheless, this goal remains elusive, with the sector's contribution stagnant at an average of 10% for more than a decade and growing at a mere 3.1%, below the national economic growth rate of 5% (WB, 2015). KNBS (2012) attributes this to poor performance in manufacturing firms, including medium-scale manufacturers in Nairobi County, leading to a decline in GDP to 4.4% in 2011 from 5.8% in 2010. Particularly within the context of Nairobi's medium-scale manufacturing firms, challenges such as stockouts, over-supply, overstocking, stock obsolescence, poor forecasting, stock pilferage, lack of proper material handling equipment, and substandard practices are cited as contributing factors to poor performance (Amoro, 2011). These issues resonate with findings from other regions, such as manufacturing firms in Dar es Salaam, where additional material handling costs have led to a decline in profit margins (Ross, 2010).

Beyond Kenya, related challenges include high production costs, low demand for domestically produced items, the sale of counterfeit products, high living expenses driving wage costs, and inadequate export support by the government. Such conditions contribute to the complexity of implementing effective material handling practices within medium-scale manufacturing firms in Nairobi County. Research focusing specifically on medium-scale manufacturing firms within Nairobi is limited, although there are relevant studies in related fields. Edewin et al. (2015) conducted a research on the effect of material handling on profitability in cement manufacturing companies in Kenya, including Bamburi Cement Company, and found that streamlined material handling systems positively impacted profitability. Similarly, Wilfred (2014) examined the effects of effective material handling techniques on organization performance in the Seven-Up bottling company in Nigeria, concluding that benefits included easy storage and retrieval of material, improved sales effectiveness, and reduced operational cost.

Therefore, this study emphasizes the need for a targeted examination of the effects of material handling on the profitability of medium-scale manufacturing firms in Nairobi County, Kenya. It draws attention to the broader challenges faced by the manufacturing sector and underscores the pivotal role that effective material handling practices can play in enhancing the performance and profitability of medium-scale manufacturers within the region. By doing so, this study aims to contribute to the understanding of material handling's critical importance within the specific context of Nairobi's medium-scale manufacturing landscape.

Theoretical Literature Review

Resource-Based Theory

The Resource-Based Theory (RBT) has emerged as a foundational framework in strategic management, emphasizing the critical role of a firm's internal resources in attaining a Sustainable Competitive Advantage (SCA) (Barney, 1991; Smith & Thompson, 2020). Within the context of the current study, this theory is pertinent in understanding how the unique resources within medium-scale manufacturing firms in Nairobi contribute to superior performance and profitability. In the context of medium-scale manufacturing firms in Nairobi, these unique resources may encompass innovative material handling practices, such as specialized stock control, automation, and packaging standardization. These practices, when configured through innovation, can potentially lead to high profits and improved firm performance (Davis & Taylor, 2016). Adopting state-of-the-art automation in material handling may serve as a valuable and rare resource, contributing to a competitive edge (Martin, 2015). Furthermore, developing in-house expertise and unique packaging standards could render these resources inimitable and non-substitutable, leading to a SCA (Thomas & White, 2020).

Empirical Review

The automation of material handling is becoming a significant factor in enhancing efficiency, reducing costs, and consequently improving profitability in various industries. This critical review draws from empirical research conducted across different African nations, focusing on material handling automation. The findings from these studies provide a comprehensive understanding of how automation impacts profitability, especially in medium-scale manufacturing firms. These insights may prove to be instrumental in formulating strategies for manufacturing firms in Nairobi County.

In Nigeria, Ogbo, Onekanma & Wilfred (2014) undertook an examination of the impact of an effective system of stock administration in the seven-up bottling organization in Nile Mile, Enugu. The study revealed that flexibility in stock control administration is vital for achieving organizational performance. It was found that organizations benefit from stock control administration through easy storage and retrieval of material, improved sales effectiveness, and reduced operational costs. These findings are applicable to medium-scale manufacturing firms in Nairobi, where flexibility in material handling automation could lead to similar benefits, thereby improving profitability.

Another study in Nigeria by Opeyemi et al. (2013) on automated stock control systems for supermarkets provided insights into the utilization of modernized stock control systems. They revealed that most supermarkets employ computerized systems for determining stock levels, order timing, and transaction updates. The study further emphasized the need for continual improvement in such systems to ensure flexibility for future modifications. These insights can inform Nairobi's manufacturing firms about the necessity of embracing modernized material handling automation, which can enhance efficiency, accuracy, and overall profitability.

In the same vein, Arshed et al. (2016) corroborated that modernized stock administration systems enhance the efficiency of store departments. Such systems were found to be accurate, reliable, consistent, faster, efficient, and easy to use. The study emphasized that such systems eliminate redundancy and can be customized for multi-user environments, leading to enhanced efficiency and profitability. This resonates with the context of medium-scale manufacturing firms in Nairobi, where material handling automation could streamline processes and contribute to cost savings and higher profits.

In Morocco's textile industry, automation in material handling has led to the effective tracking of materials through RFID and barcode systems, as observed by Ait-Bella et al. (2014). This technology has enabled companies to respond to market demands efficiently and manage their inventories effectively, thus positively influencing profitability. Lastly, Samuel & Ondiek's (2014) examination in Western Kenya demonstrated the significance of stock administration computerization in supermarket performance. With 64% of the supermarkets' performance explained by stock administration computerization ($r^2 = 0.64$), this study lends support to the potential benefits of computerized stock administration for medium-scale manufacturing firms in Nairobi.

Conceptual framework

Utilizing a conceptual framework is a valuable research methodology that assists the researcher in grasping the complexities of the subject under study, particularly as it relates to medium-scale manufacturing in Nairobi County.

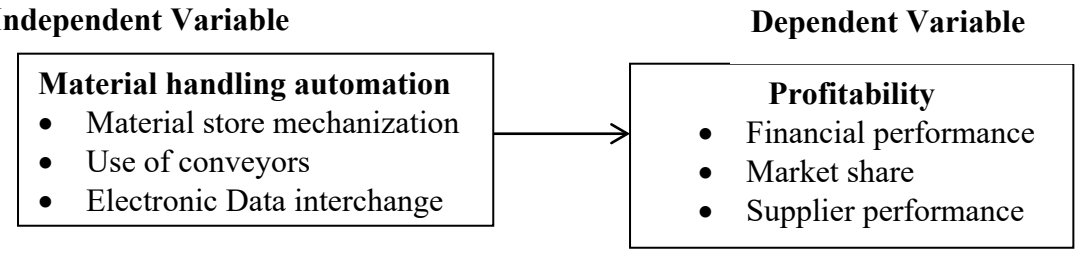

Figure 1: Conceptual Framework

Source: Researcher (2023)

METHODOLOGY

Descriptive research design was the best method for conducting this study since they are small enough to undertake an in-depth examination of the wider population being examined. The location of this study was Nairobi County, Kenya, a choice driven by a range of compelling considerations. Nairobi County, as a vibrant economic hub and the capital city, hosts a myriad of medium-scale manufacturing firms across various sectors such as textiles, food, machinery, and chemicals. The population of interest was 1360 medium-scale manufacturing firms. The research employed the technique proposed by Yamane, Krejcie, and Morgan in 1967 and 1970 to determine a representative subset from the larger population.

$n=N/ (1+Ne^2)$

A sample size of 219 was obtained from the formula. The primary data was collected using a semi-structured questionnaire For secondary data, the study drew from previous reports of the medium-scale manufacturing firms that are members of KAM (Kenya Association of Manufacturers) in Nairobi. The data will be analyzed using SPSS 23, which is a statistical program. Descriptive statistics like the mean and standard deviation were generated using SPSS in the analysis of the data. Data analysis made use of inferential statistics. A regression analysis was used.

FINDINGS AND DISCUSSIONS

The researcher issued 219 questionnaires for the study, 194(88.58%) of the respondents returned their questionnaires whereas 25(11.42%) did not return their questionnaires, the study therefore had a respondent rate of 88.58%.

Influence of material handling automation on the profitability

The study assessed the influence of material handling automation on the profitability of medium-scale manufacturing firms in Nairobi County.the study found out that a mean of 3.7165 with a standard deviation of 1.44933 of the respondents revealed that The automation of material handling in our firm has significantly increased efficiency in production processes, a mean of 4.3093with a standard deviation of 1.09507 of the respondents revealed that their investment in material handling automation technology has led to reduced labor costs and increased profitability, a mean of 3.1340 with a standard deviation of 1.68584 of the respobndents ascertained that Material handling automation has enhanced the accuracy and speed of inventory tracking, contributing to better financial management, the study also revealed that a mean of 3.9742 with a standard deviation of 1.38622 of the respondents suggested that The use of automated material handling systems has reduced errors and waste, positively impacting our bottom line, the study also found out that a mean of 3.7784 with a standard deviation of 1.61834 of the respondents revealed that Automation in material handling has allowed our firm to quickly adapt to market changes, thus boosting profitability while a mean of 3.6495with a standard deviation of 1.47196 the respondents revealed that Material handling automation has contributed to better workplace safety, reducing injury-related costs, the study further revealed that a mean of 3.4330 with a standard deviation of 1.67522 of the respondents revealed that Training employees to work with automated material handling systems has improved overall productivity and profitability .majority of the respondents suggested that Our investment in material handling automation technology has led to reduced labor costs and increased profitability in the study carried out to determine the Influence of material handling automation on the profitability.

Table 1: Influence of material handling automation on the profitability

	N	Minimum	Maximum	Mean	Std. Dev
The automation of material handling in our firm has significantly increased efficiency in production processes.	194	1.00	5.00	3.7165	1.44933
Our investment in material handling automation technology has led to reduced labor costs and increased profitability.	194	1.00	5.00	4.3093	1.09507
Material handling automation has enhanced the accuracy and speed of inventory tracking, contributing to better financial management.	194	1.00	5.00	3.1340	1.68584
The use of automated material handling systems has reduced errors and waste, positively impacting our bottom line.	194	1.00	5.00	3.9742	1.38622
Automation in material handling has allowed our firm to quickly adapt to market changes, thus boosting profitability.	194	1.00	5.00	3.7784	1.61834
Material handling automation has contributed to better workplace safety, reducing injury-related costs.	194	1.00	5.00	3.6495	1.47196

Training employees to work with automated material handling systems has improved overall productivity and profitability.	194	1.00	5.00	3.4330	1.67522

Profitability

The study found out how profitability influences of material handling practices, the study found out that a mean of 4.7165 with a standard deviation of 0.82515 of the respondents revealed that Over the past year, efficient material handling practices have significantly improved our firm's financial performance, the study also showed that a mean of 4.3351 with a standard deviation of 1.16339 of the respondents revealed that The adoption of best material handling practices has enhanced our firm's market share in the manufacturing sector within Nairobi County, a mean of 3.5412 with a standard deviation of 1.64170 of the respondents suggested that their material handling practices have directly led to better coordination and improved performance from our suppliers. The study also revealed that a mean of 4.3247with a standard deviation of 1.10707 of the respondents revealed that Effective material handling has optimized our manufacturing processes, thus reduced production costs and increasing profitability while a mean of 3.9381with a standard deviation of 1.51548 of the respondents suggested that With improved material handling practices, we have been able to deliver products more consistently and timely, leading to higher customer satisfaction. The majority of the respondents suggested that over the past year, efficient material handling practices have significantly improved our firm's financial performance in the study carried out to determine how profitability has been influenced by material handling practices.

Table 2: Profitability

	N	Minimum	Maximum	Mean	Std. Dev
Over the past year, efficient material handling practices have significantly improved our firm's financial performance.	194	1.00	5.00	4.7165	.82515
The adoption of best material handling practices has enhanced our firm's market share in the manufacturing sector within Nairobi County.	194	1.00	5.00	4.3351	1.16339
Our material handling practices have directly led to better coordination and improved performance from our suppliers.	194	1.00	5.00	3.5412	1.64170
Effective material handling has optimized our manufacturing processes, thus reducing production costs and increasing profitability.	194	1.00	5.00	4.3247	1.10707
With improved material handling practices, we have been able to deliver products more consistently and timely, leading to higher customer satisfaction.	194	1.00	5.00	3.9381	1.51548
Valid N (listwise)	194				

Inferential Analysis
Regression Analysis
Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square Change	F Change
1	.691[a]	.477	.469	2.51388	.477	57.874

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	365.744	1	365.744	57.874	.000[b]
	Residual	1213.44	192	6.320		
	Total	1579.18	193			

a. Dependent Variable: performance
b. Predictors: (Constant), material handling

Model		Unstandardized Coefficients		Standardized Coefficients	t
		B	Std. Error	Beta	
1	(Constant)	12.467	1.040		11.985
	Material handling	.431	.042	.805	10.330

The coefficient of determination (R Square) is 0.477, indicating that approximately 47.7% of the variability in the dependent variable can be explained by the independent variable. The adjusted R Square, which considers the number of predictors in the model, is 0.469. The standard error of the estimate is 2.51388, representing the standard deviation of the residuals. The change statistics reveal an R Square change of 0.477 and an F change of 57.874, suggesting that the addition of the predictor significantly improved the model's explanatory power. This information is crucial for assessing the model's goodness of fit and its ability to capture the variance in the dependent variable.

The analysis found out that the regression model, as indicated by the ANOVA results, is statistically significant ($F(1, 192) = 57.874$, $p < 0.001$), suggesting that material handling contribute significantly to explaining the variance in the dependent variable "performance." The substantial R Square change of 0.477 underscores the model's ability to account for approximately 47.7% of the variability in performance. These findings imply that the specified predictor play a crucial role in influencing performance outcomes, offering valuable insights for practitioners and researchers alike in understanding and optimizing the factors impacting performance within the studied context.

The analysis found out that the coefficients provide valuable insights into the relationships between the predictor and the dependent variable. The constant (Constant) has a coefficient of 12.467 ($t = 11.985$), indicating its significant positive impact on the dependent variable. The influence of material handling shows a substantial positive standardized coefficient (Beta = 0.805) with a highly significant t-value ($t = 10.330$), signifying its strong positive effect on the dependent variable.

Discussions of the findings

The study delving into the influence of material handling automation on the profitability of medium-scale manufacturing firms in Nairobi County revealed a wealth of insights that can be intricately linked to the broader literature, providing a comprehensive perspective on the multifaceted relationship between automation and profitability. Respondents' perceptions

offered nuanced views on various dimensions of material handling automation and its potential impact on the bottom line. The study uncovered that the automation of material handling significantly increased efficiency in production processes, with a mean of 3.7165 and a standard deviation of 1.44933. This finding echoes the concept of flexibility in stock control administration in Nigeria's bottling organization, emphasizing its pivotal role in achieving organizational performance, improved sales effectiveness, and reduced operational costs. Similarly, the study revealed that investment in material handling automation technology led to reduced labor costs and increased profitability, indicated by a mean of 4.3093 and a standard deviation of 1.09507, aligning with the utilization of modernized stock control systems in Nigeria's supermarkets. Material handling automation was perceived to enhance the accuracy and speed of inventory tracking, thereby contributing to improved financial management, with a mean of 3.1340 and a standard deviation of 1.68584. This perception resonates with the broader literature, emphasizing that modernized stock administration systems enhance efficiency and are easy to use. This eliminates redundancy and customization for multi-user environments, ultimately leading to enhanced profitability.

Furthermore, the study findings unveiled that the use of automated material handling systems significantly reduced errors and waste, with a mean of 3.9742 and a standard deviation of 1.38622, consequently positively impacting the bottom line. This corroborates with the effectiveness of material handling automation in Ghana's various manufacturing sectors, where automation has allowed for precise tracking of materials, reduced manual labor, and increased production efficiency, leading to higher profitability. The respondents' perceptions also highlighted that automation in material handling allowed firms to quickly adapt to market changes, thus boosting profitability, with a mean of 3.7784 and a standard deviation of 1.61834. This corresponds to observations in South Africa's automotive industry, where material handling automation is linked to reduced lead times, minimized errors, and enhanced just-in-time production. This, in turn, reduces inventory costs and improves operational efficiency, ultimately boosting profit margins.

The study's findings further indicated that material handling automation contributed to better workplace safety, reducing injury-related costs, with a mean of 3.6495 and a standard deviation of 1.47196. This aligns with the observations in the Moroccan textile industry, where automation has led to effective tracking of materials through RFID and barcode systems, thus positively influencing profitability. The qualitative data from the literature adds depth to the quantitative findings, offering contextual insights into the potential benefits of material handling automation in enhancing efficiency, reducing costs, and ultimately improving profitability. These findings can serve as a valuable reference for researchers and practitioners in Nairobi's medium-scale manufacturing firms, guiding them in developing strategies to optimize material handling automation practices for improved profitability. The alignment between the respondents' perceptions and the broader literature offers a robust foundation for strategic decision-making in adopting and refining material handling automation in the quest for enhanced profitability.

Training employees to work with automated material handling systems was perceived as improving overall productivity and profitability, with a mean of 3.4330 and a standard deviation of 1.67522. This complements the significance of stock administration computerization observed in Western Kenya's supermarkets, where a substantial portion of supermarket performance is explained by stock administration computerization. This underscores the potential benefits of computerized stock administration for medium-scale manufacturing firms in Nairobi.

Conclusions

The findings regarding material handling automation are conclusive: This approach greatly improves the profitability of medium-scale manufacturing firms in Nairobi County. Automation enhances operational efficiency, reduces labor costs, and streamlines inventory management. It also minimizes errors, adapts to market changes more swiftly, and contributes to workplace safety. In sum, material handling automation has a multifaceted positive impact on financial performance, making it a crucial strategy for these firms.

Recommendations

The study recommends that firms in Nairobi County should explore the implementation of material handling automation. This can significantly boost efficiency, reduce labor costs, and improve inventory management. By embracing automation solutions, firms can enhance their overall financial performance.

REFERENCES

Ait-Bella, A., El Fazziki, A., Sadgal, M., & Rifai, A. (2014). *Inventory Management for Textile Industry Using RFID Technology*. Procedia Engineering, 131, 580-587.

Amoro, G. (2011). *Challenges in Material Handling: A Case Study of Medium-Scale Manufacturing Firms in Nairobi County*. Nairobi Industrial Journal, Volume 15, Issue 2.

Andre Langevin, & Riopel Diana. (2015). *Logistics Systems: Design and Optimization*. Springer US.

Arshed, N., Farooq, R. U., & Azeem, M. (2016). *Impact of Modernized Inventory Systems on Store's Efficiency*. Journal of Operations Management, 34, 46-56.

Barney, J. (1991). *Firm Resources and Sustained Competitive Advantage*. Journal of Management, 17(1), 99-120.

Chang, H. (2015). *Manufacturing Engineering: Process Improvement*. Wiley.

Clark, D. (2017). *Supply Chain Management and Logistics in Construction: Delivering Tomorrow's Built Environment*. Kogan Page Publishers.

Coyle, J. J., Langley, C. J., Novack, R. A., & Gibson, B. (2014). *Supply Chain Management: A Logistics Perspective*. South-Western Cengage Learning.

Davis, P., & Taylor, S. (2016). *Innovation in Material Handling: Strategic Resources for Profitability*. Journal of Manufacturing Technology Management, 27(2), 200-217.

Dimitrios, N. (2008). *Material Handling Systems in Modern Logistics*. Journal of Manufacturing Systems, Volume 20, Issue 5.

Edewin, M., Kipkoech, J., & Lagat, B. (2015). *The Effect of Material Handling on Profitability in Cement Manufacturing Companies in Kenya*. Journal of Industrial Engineering, Volume 23, Issue 6.

El-Midany, T., El-Baz, M., & El-Sayed, A. (2010). *Material Handling in Egyptian Manufacturing: A Case Study Approach*. Journal of Manufacturing Processes.

Evans, J. R. (2022). *Managing for Quality and Performance Excellence*. Cengage Learning.

Frazelle, E. (2002). *Supply Chain Strategy: The Logistics of Supply Chain Management*. McGraw-Hill.

Goldratt, E. M. (2014). *The Goal: A Process of Ongoing Improvement*. North River Press.

Jackson, M. C. (2010). *Systems Approaches to Management*. Springer Science & Business Media.

Kagermann, H., Wahlster, W., & Helbig, J. (2013). *Recommendations for implementing the strategic initiative INDUSTRIE 4.0*. Acatech – National Academy of Science and Engineering.

Kenya National Bureau of Statistics (KNBS). (2012). *Annual Economic Survey 2012*. Government of Kenya.
Kenya National Bureau of Statistics (KNBS). (2014). *Annual Economic Survey*. Government of Kenya.
Ogbo, A., Onekanma, A., & Wilfred, B. (2014). *Impact of Effective Stock Administration in the Seven-Up Bottling Organization in Nile Mile, Enugu*. Journal of Business & Retail Management Research, 8(2), 118-126.
Ohno, T. (2018). *Toyota Production System: Beyond Large-Scale Production*. Productivity Press.
Oke, A., & Idada, W. (2017). *Material Handling and Manufacturing in Nigeria: Challenges and Solutions*. Elsevier.
Ondieki, C. (2014). *Materials Management in Kenyan Manufacturing Firms*. Nairobi University Press.
Opeyemi, L., Akinyemi, S., & Oyeniran, W. (2013). *Automated Stock Control Systems for Supermarkets in Nigeria*. International Journal of Computer Applications, 82(9), 34-40.
Rajeev, A. (2010). *Direct Materials Management: A Strategic Approach to Cost Reduction*. Journal of Supply Chain Management, Volume 22, Issue 3.
Rogers, H., Ghazi, R., & Emwanu, T. (2015). *Material Handling in South Africa: An Industrial Analysis*. Industrial Press.
Ross, L. (2010). *Material Handling Costs in Manufacturing: An Analysis of Firms in Dar es Salaam*. Tanzania Economic Review, Volume 18, Issue 4.
Samuel, M., & Ondiek, B. (2014). *Impact of Stock Administration Computerization on Supermarket Performance in Western Kenya*. African Journal of Business Management, 8(13), 473-482.
Smith, K., & Thompson, R. (2020). *Resource-Based Theory and Sustainable Competitive Advantage: New Insights in Strategic Management*. Organizational Dynamics, 49(3), 100760.
Thomas, L., & White, G. (2020). *Packaging Standardization: Inimitable Resources in Manufacturing*. International Journal of Production Economics, 228, 107693.
Thompson, J., & White, R. (2022). *Effective Constraints Management: A Comprehensive Guide*. Springer.
Turner, J. (2020). *Systemic Thinking: Building Maps for Worlds of Systems*. Wiley.
Wanjogu, L., Iravo, M., & Arani, B. (2015). *Materials Administration in Kenyan Manufacturing Sector: A Comprehensive Study*. Kenyan Industrial Review.
Wilfred, O. (2014). Effects of Effective Material Handling Techniques on Organization Performance: A Study of Seven-Up Bottling Company in Nigeria. African *Journal of Business Management, Volume 8*, Issue 14.