ISSN: 2338-8412 e-ISSN : 2716-4411

Ekombis Review – Jurnal Ilmiah Ekonomi dan Bisnis
Available online at : https://jurnal.unived.ac.id/index.php/er/index
DOI: https://doi.org/10.37676/ekombis.v14i1

Analysis Of Sales Forecasting For Goods At UD LUKI In Nias Utara

[1)] Wardin Nofanolo Laoli, Idarni Harefa [2]
[1,2)] Universitas Nias
Email: [1)] nofanololaoli@gmail.com ,[2)] idarniharefa@gmail.com

How to Cite :
Laoli, W, N., Harefa, I. (2026). Analysis Of Sales Forecasting For Goods At UD LUKI In Nias Utara. EKOMBIS REVIEW: Jurnal Ilmiah Ekonomi Dan Bisnis, 14(1). DOI: https://doi.org/10.37676/ekombis.v14i1

ARTICLE HISTORY
Received [26 June 2025]
Revised [25 January 2026]
*Accepted [*27 January 2026*]*

KEYWORDS
Sales Forecasting,LSTM Neural Networks,Hybrid Approach,Data-Driven Analysis.

ABSTRACT

This study aims paper is a valuable resource for decision-makers, researchers, and practitioners interested in enhancing sales forecasting capabilities through a blend of data-driven analysis and strategic innovation. Integrating advanced LSTM neural networks with expert qualitative insights significantly enhances UD LUKI's sales forecasting accuracy. This hybrid approach not only captures complex trends and adapts to external market fluctuations but also supports better inventory management and strategic decision-making. Ultimately, continuous refinement and collaborative practices are essential for maintaining a competitive edge in the dynamic Nias Utara market.

INTRODUCTION

The significance of research on sales forecasting, particularly in the context of UD LUKI in Nias Utara, is multifaceted and deeply rooted in the contemporary business landscape. Sales forecasting is not merely a predictive exercise; it serves as a strategic tool that can enhance operational efficiency, optimize inventory management, and ultimately drive profitability. In an era characterized by rapid market changes and shifts in consumer behavior, the ability to accurately forecast sales becomes a critical determinant of a company's competitive edge. This essay will explore the various dimensions of sales forecasting research, its methodologies, and its implications for UD LUKI, drawing upon a range of scholarly sources to substantiate the discussion. To begin with, accurate sales forecasting is essential for maintaining competitiveness in today's globalized economy. As highlighted by Kolková, the precision of forecasting models directly influences a company's ability to respond to market demands and adjust its strategies accordingly (Kolková, 2020). In the context of UD LUKI, effective sales forecasting can enable the company to anticipate customer needs, manage resources efficiently, and align production schedules with expected sales volumes. This alignment is crucial for minimizing waste and ensuring that the company can meet consumer demand without overextending its resources. Moreover, the integration of advanced forecasting techniques, such as deep learning and machine learning algorithms, has revolutionized the field of sales forecasting. Research by Loureiro et al. indicates that deep neural networks can significantly improve forecasting accuracy

in sectors like fashion retail, suggesting that similar methodologies could be beneficial for UD LUKI (Loureiro et al., 2018). By leveraging these advanced techniques, UD LUKI can enhance its forecasting capabilities, allowing for more nuanced insights into sales trends and customer preferences.

This technological adoption not only improves accuracy but also provides a competitive advantage in a crowded marketplace. The application of specific forecasting methods, such as the Holt-Winters method, has also shown promise in various industries. Agusman's research emphasizes the effectiveness of this method in creating a robust sales prediction system, which could be particularly relevant for UD LUKI as it seeks to implement a systematic approach to sales forecasting (Agusman, 2023). The ability to monitor sales and input transactions in real-time can empower UD LUKI to make informed decisions based on current market conditions, thus enhancing its responsiveness to changes in consumer behavior. In addition to traditional methods, the exploration of big data analytics in sales forecasting presents a significant opportunity for UD LUKI. As noted by Ma and Xie, the utilization of big data can lead to more accurate predictions by analyzing vast amounts of historical sales data and identifying patterns that may not be immediately apparent (Ma & Xie, 2023). This approach can be particularly advantageous for UD LUKI, as it operates in a dynamic market where consumer preferences can shift rapidly. By harnessing big data, the company can gain deeper insights into its customer base, enabling it to tailor its offerings more effectively. The importance of integrating qualitative inputs with quantitative forecasting models cannot be overstated. Research by Chee et al. suggests that combining key account managers' insights with statistical models can enhance the accuracy of sales forecasts ("Improving Sales Forecasting by Combining Key Account Managers' Inputs and Models Such as SARIMA, LSTM, and Facebook Prophet", 2022). For UD LUKI, this means that incorporating the experiential knowledge of sales personnel into the forecasting process could lead to more reliable predictions. This collaborative approach not only enriches the data used for forecasting but also fosters a culture of shared responsibility for sales outcomes within the organization. Furthermore, the impact of external factors, such as economic conditions and market trends, on sales forecasting is a critical consideration. Tudor's study on the pandemic's effects on e-commerce highlights how external shocks can alter consumer behavior and demand patterns (Tudor, 2022). For UD LUKI, understanding these external influences is vital for developing resilient forecasting models that can adapt to sudden changes in the market landscape. By incorporating scenario planning and sensitivity analysis into its forecasting processes, UD LUKI can better prepare for potential disruptions and maintain operational continuity.

The role of sales forecasting in inventory management is another significant aspect that warrants attention. Effective forecasting allows companies to optimize their inventory levels, reducing the risk of stockouts or excess inventory. Research by Ravitilova et al. emphasizes the importance of employing accurate forecasting techniques to determine sales budgets, which directly influences inventory decisions (Ravitilova et al., 2023). For UD LUKI, implementing a robust sales forecasting system can lead to improved inventory turnover rates and reduced holding costs, ultimately enhancing the company's financial performance. Moreover, the integration of sales forecasting with business intelligence tools can further enhance decision-making capabilities.

As noted by Nurdin et al., business intelligence systems can facilitate data analysis and visualization, providing valuable insights that inform sales strategies (Nurdin et al., 2022). For UD LUKI, adopting such systems can streamline the forecasting process, enabling the company to make data-driven decisions that align with its strategic objectives. The significance of sales forecasting extends beyond operational efficiency; it also plays a crucial role in financial planning and resource allocation. Accurate sales forecasts enable companies to project revenue and allocate resources effectively, as highlighted by Khan et al. (Khan et al., 2020). For UD LUKI, this means that reliable forecasting can lead to better financial management, allowing the company

to invest in growth opportunities while minimizing financial risks. In the context of competitive strategy, effective sales forecasting can inform marketing and promotional efforts. Research by Wang and Aviles underscores the importance of selecting appropriate forecasting methods to enhance interpretability and accuracy (Wang & Aviles, 2023). For UD LUKI, understanding which forecasting models yield the best results can guide marketing strategies, ensuring that promotional activities are aligned with anticipated sales trends. The continuous evolution of sales forecasting methodologies necessitates ongoing research and adaptation. As noted by Pavlyshenko, machine learning models can significantly improve the accuracy of sales time series forecasting (Pavlyshenko, 2018).

For UD LUKI, staying abreast of these developments and incorporating new methodologies into its forecasting practices can ensure that the company remains competitive in an ever-changing market. Furthermore, the collaborative nature of sales forecasting, as discussed by Banabo and Ndiomu, highlights the importance of involving various stakeholders in the forecasting process (Banabo & Ndiomu, 2023). For UD LUKI, fostering collaboration between sales, marketing, and operations teams can lead to more comprehensive forecasts that account for multiple perspectives and insights. The implications of sales forecasting research extend to employee training and development as well. By investing in training programs that enhance employees' forecasting skills, UD LUKI can build a more competent workforce capable of leveraging advanced forecasting techniques. This investment in human capital can lead to improved forecasting accuracy and better overall performance. Additionally, the ethical considerations surrounding data usage in sales forecasting cannot be overlooked.

As organizations increasingly rely on data-driven approaches, ensuring that data is collected and utilized ethically is paramount. This is particularly relevant for UD LUKI, as it navigates the complexities of data privacy and consumer trust in its forecasting practices. In an effort to enhance the accuracy and effectiveness of sales forecasting at UD LUKI, this research aims to evaluate the application of advanced machine learning techniques such as LSTM and transformer architectures as alternatives to traditional methods, as well as to integrate big data analytics to uncover deep insights into consumer behavior and market trends. The study also focuses on identifying and addressing the socio-technical challenges that often hinder the implementation of modern forecasting methods by adapting these models to fit the local context of Nias Utara, which has unique market characteristics and consumer behaviors. Furthermore, the research will conduct empirical validations of various forecasting models in real-world settings and develop a hybrid framework that combines quantitative and qualitative data to generate more accurate predictions, particularly by considering the influence of external factors such as economic fluctuations and seasonal variations.

A collaborative approach will also be implemented by involving various stakeholders so that the forecasting outputs are not only comprehensive and applicable but are also supported by ethical data management practices, thereby providing a long-term positive impact on the overall performance and growth of the organization. To enhance the accuracy and effectiveness of sales forecasting at UD LUKI, this research endeavors to evaluate the use of advanced machine learning techniques—including LSTM and transformer architectures—as alternatives to traditional methods.

It further seeks to integrate big data analytics to extract profound insights into consumer behavior and market trends. The study aims to identify and address socio-technical challenges by adapting forecasting models to the unique local context of Nias Utara, conducting empirical validations in real-world settings, and developing a hybrid framework that combines quantitative and qualitative data. By adopting a collaborative approach that involves multiple stakeholders and upholds ethical data management practices, UD LUKI can achieve long-term improvements in performance and sustainable growth.

LITERATURE REVIEW

The premises of sales forecasting encompass a range of theories, methodologies, and practical considerations that guide organizations in making informed decisions regarding inventory management, production planning, and marketing strategies. This essay will explore the fundamental premises underlying sales forecasting, drawing on relevant literature to provide a comprehensive understanding of the topic. One of the primary premises of sales forecasting is the reliance on historical sales data to predict future performance. Historical data serves as the foundation for various forecasting models, as it provides insights into past sales trends, seasonal patterns, and consumer behavior. Fildes et al. emphasize that effective sales forecasting begins with a thorough analysis of historical sales data, which can be aggregated at different levels—from individual products to overall market trends Fildes et al. (2022). This aggregation allows businesses to identify patterns that can inform future sales predictions, making it a cornerstone of the forecasting process. Another essential premise is the distinction between qualitative and quantitative forecasting methods. Qualitative methods rely on expert judgment, market research, and consumer insights, while quantitative methods utilize statistical techniques and mathematical models to analyze numerical data. Yu discusses the importance of combining both approaches to enhance forecasting accuracy, particularly in industries where historical data may be limited or unreliable (Yu, 2022). For UD LUKI, integrating qualitative insights from sales personnel with quantitative data analysis can lead to more nuanced forecasts that account for various influencing factors.

The integration of advanced technologies, particularly artificial intelligence (AI) and machine learning, represents a significant advancement in sales forecasting methodologies. Recent studies have shown that AI techniques, such as Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM) networks, can outperform traditional forecasting methods by capturing complex patterns in data (Li & Yu, 2023). This technological shift allows businesses to process large volumes of data more efficiently and accurately, thereby improving the reliability of sales forecasts. For UD LUKI, adopting AI-driven forecasting models could enhance its ability to respond to market fluctuations and consumer demands. Furthermore, the consideration of external factors is a critical premise in sales forecasting. Factors such as economic conditions, competitive dynamics, and consumer trends can significantly influence sales outcomes. Ravitilova et al. highlight the importance of incorporating these external variables into forecasting models to enhance their accuracy and relevance (Ravitilova et al., 2023). For UD LUKI, understanding how external factors impact sales can inform strategic decision-making and help the company navigate challenges in a dynamic market environment. The role of collaboration among stakeholders in the sales forecasting process is another important premise. Effective forecasting requires input from various departments, including sales, marketing, and operations. Banabo and Ndiomu emphasize that involving multiple stakeholders can lead to more comprehensive forecasts that reflect diverse perspectives and insights (Banabo & Ndiomu, 2023). For UD LUKI, fostering collaboration among teams can enhance the accuracy of sales predictions and ensure that forecasts are actionable and aligned with organizational goals. Moreover, the ethical considerations surrounding data usage in sales forecasting are increasingly relevant in today's data-driven landscape. As organizations collect and analyze vast amounts of data, ensuring ethical practices in data handling becomes paramount. Nurdin et al. stress the importance of ethical data practices in business intelligence systems, which are integral to effective sales forecasting (Ma & Xie, 2023). For UD LUKI, addressing ethical considerations in forecasting practices is essential for maintaining consumer trust and compliance with regulations. The dynamic nature of consumer behavior is another premise that underpins sales forecasting. As noted by Rosário and Raimundo, advancements in technology and changes in consumer preferences can significantly impact purchasing behaviors (Rosário & Raimundo, 2021). This necessitates that businesses continuously adapt their

forecasting models to account for evolving consumer trends. For UD LUKI, staying attuned to shifts in consumer behavior will be crucial for developing accurate sales forecasts that reflect current market realities. Additionally, the importance of continuous improvement and validation of forecasting models is a key premise in the field. As highlighted by Ma and Xie, organizations must regularly assess the performance of their forecasting models and make necessary adjustments to enhance accuracy (Ma & Xie, 2023). This iterative process ensures that forecasting methodologies remain relevant and effective in a rapidly changing business environment. For UD LUKI, implementing a systematic approach to model validation can lead to improved forecasting outcomes over time. The impact of seasonality and cyclical trends is another critical premise in sales forecasting.

Many businesses experience fluctuations in sales due to seasonal variations, holidays, and economic cycles. Zhang et al. emphasize the need for forecasting models that can effectively account for these seasonal effects to improve accuracy (Zhang et al., 2020). For UD LUKI, understanding the seasonal dynamics of its market will be essential for developing reliable sales forecasts that inform inventory management and production planning. Moreover, the use of advanced statistical techniques, such as time series analysis and regression modeling, is fundamental to sales forecasting. These techniques allow businesses to analyze historical data and identify trends that can inform future predictions. Wang and Aviles discuss the significance of employing both univariate and multivariate time series forecasting methods to capture the complexities of sales data (Wang & Aviles, 2023). For UD LUKI, leveraging these statistical techniques can enhance the robustness of its forecasting models. Finally, the premise of aligning sales forecasting with overall business strategy is crucial for organizational success. Effective sales forecasting should not only inform operational decisions but also support strategic planning and resource allocation. Acito et al. highlight the relationship between sales forecasts and market power, suggesting that accurate forecasts can provide valuable insights into a firm's competitive positioning (Acito et al., 2019). For UD LUKI, aligning forecasting efforts with strategic objectives will ensure that the organization can effectively respond to market opportunities and challenges.

dimensions of sales forecasting is the methodological approach used to generate forecasts. This can be broadly categorized into qualitative and quantitative methods. Qualitative methods rely on expert judgment, market research, and consumer insights, while quantitative methods utilize statistical techniques and mathematical models to analyze numerical data. The combination of both approaches can enhance forecasting accuracy, particularly in industries where historical data may be limited or unreliable. For UD LUKI, integrating qualitative insights from sales personnel with quantitative data analysis can lead to more nuanced forecasts that account for various influencing factors. Another important dimension is the level of aggregation in sales forecasting. Aggregated forecasting supports strategic decisions at different levels, including overall market sales, chain-level forecasts, and individual store forecasts. This hierarchical approach allows businesses to tailor their forecasting efforts to specific operational needs, ensuring that forecasts are relevant and actionable. For UD LUKI, understanding the appropriate level of aggregation for its sales data will be crucial for effective decision-making. The incorporation of advanced technologies, particularly artificial intelligence (AI) and machine learning, represents a significant advancement in sales forecasting methodologies. Recent studies have shown that AI techniques can outperform traditional forecasting methods by capturing complex patterns in data. This technological shift allows businesses to process large volumes of data more efficiently and accurately, thereby improving the reliability of sales forecasts. For UD LUKI, adopting AI-driven forecasting models could enhance its ability to respond to market fluctuations and consumer demands. Furthermore, the dimension of external factors plays a crucial role in sales forecasting. Factors such as economic conditions, competitive dynamics, and consumer trends can significantly influence sales outcomes. Incorporating these external variables into forecasting models can enhance their accuracy and relevance. For UD

LUKI, understanding how external factors impact sales can inform strategic decision-making and help the company navigate challenges in a dynamic market environment. The role of collaboration among stakeholders in the sales forecasting process is another important dimension. Effective forecasting requires input from various departments, including sales, marketing, and operations. Involving multiple stakeholders can lead to more comprehensive forecasts that reflect diverse perspectives and insights. For UD LUKI, fostering collaboration among teams can enhance the accuracy of sales predictions and ensure that forecasts are actionable and aligned with organizational goals. Additionally, the ethical considerations surrounding data usage in sales forecasting are increasingly relevant in today's data-driven landscape. As organizations collect and analyze vast amounts of data, ensuring ethical practices in data handling becomes paramount. Addressing ethical considerations in forecasting practices is essential for maintaining consumer trust and compliance with regulations. The dynamic nature of consumer behavior is another dimension that underpins sales forecasting. Advancements in technology and changes in consumer preferences can significantly impact purchasing behaviors.

This necessitates that businesses continuously adapt their forecasting models to account for evolving consumer trends. For UD LUKI, staying attuned to shifts in consumer behavior will be crucial for developing accurate sales forecasts that reflect current market realities. Moreover, the importance of continuous improvement and validation of forecasting models is a key dimension in the field. Organizations must regularly assess the performance of their forecasting models and make necessary adjustments to enhance accuracy. This iterative process ensures that forecasting methodologies remain relevant and effective in a rapidly changing business environment. For UD LUKI, implementing a systematic approach to model validation can lead to improved forecasting outcomes over time. The impact of seasonality and cyclical trends is another critical dimension in sales forecasting. Many businesses experience fluctuations in sales due to seasonal variations, holidays, and economic cycles. Forecasting models that can effectively account for these seasonal effects are essential to improve accuracy. For UD LUKI, understanding the seasonal dynamics of its market will be essential for developing reliable sales forecasts that inform inventory management and production planning. Furthermore, the use of advanced statistical techniques, such as time series analysis and regression modeling, is fundamental to sales forecasting. These techniques allow businesses to analyze historical data and identify trends that can inform future predictions. Employing both univariate and multivariate time series forecasting methods can capture the complexities of sales data. For UD LUKI, leveraging these statistical techniques can enhance the robustness of its forecasting models. Finally, the dimension of aligning sales forecasting with overall business strategy is crucial for organizational success. Effective sales forecasting should not only inform operational decisions but also support strategic planning and resource allocation. Accurate forecasts can provide valuable insights into a firm's competitive positioning. For UD LUKI, aligning forecasting efforts with strategic objectives will ensure that the organization can effectively respond to market opportunities and challenges.

One of the most immediate consequences of effective sales forecasting is its impact on inventory management. Accurate forecasts enable businesses to maintain optimal inventory levels, reducing the risk of stockouts and overstock situations. As highlighted by Tasia et al., sales forecasting plays a vital role in assisting decision-makers in planning effective sales strategies, which directly influences inventory control Tasia et al. (2023). For organizations like UD LUKI, this means that reliable sales forecasts can lead to improved inventory turnover rates, reduced holding costs, and enhanced customer satisfaction due to better product availability. Moreover, sales forecasting significantly affects financial planning and resource allocation. Accurate sales predictions allow businesses to project revenue more reliably, which is crucial for budgeting and financial forecasting. Wahl et al. discuss how improved forecast accuracy can enhance firm value by providing a clearer picture of future earnings potential, thereby enabling better investment

decisions (Wahl et al., 2020). For UD LUKI, aligning sales forecasts with financial planning can facilitate informed decision-making regarding capital investments, operational expenditures, and strategic initiatives. The relationship between sales forecasting and marketing strategies is another critical aspect. Accurate forecasts enable organizations to tailor their marketing efforts to align with expected sales trends, optimizing promotional activities and resource allocation. Bandara et al. emphasize that in e-commerce, generating accurate sales forecasts is crucial for developing effective marketing strategies that resonate with consumer demand (Bandara et al., 2019). For UD LUKI, leveraging sales forecasts to inform marketing campaigns can enhance the effectiveness of promotional efforts, ultimately driving sales growth. Additionally, the consequences of sales forecasting extend to customer relationship management (CRM). Accurate sales forecasts can improve customer service by ensuring that businesses are well-prepared to meet customer demand. As noted by Amir et al., precise sales forecasts can enhance customer service and spur business expansion, which is beneficial for the overall economy (Amir et al., 2023). For UD LUKI, effective sales forecasting can lead to better customer engagement and satisfaction, fostering long-term relationships and loyalty. The impact of sales forecasting on supply chain management is also significant. Accurate forecasts facilitate better coordination among supply chain partners, leading to improved efficiency and reduced costs. As highlighted by Schneider et al., accurate sales forecasts can enhance the alignment of supply chain operations with market demand, ultimately improving overall supply chain performance (Schneider et al., 2021).

For UD LUKI, integrating sales forecasting into supply chain planning can lead to more responsive and agile operations, enabling the company to adapt quickly to changes in consumer demand. Furthermore, the relationship between sales forecasting and risk management is crucial. Accurate sales forecasts can help organizations identify potential risks and uncertainties in the market, allowing them to develop proactive strategies to mitigate these risks. Jat et al. emphasize that understanding the impact of offering product-linked services on risk management effectiveness can enhance financial performance (Jat et al., 2022). For UD LUKI, incorporating sales forecasting into risk management practices can lead to better preparedness for market fluctuations and disruptions.

The consequences of sales forecasting also extend to organizational performance metrics. Research by Niu et al. indicates that accurate sales forecasts can enhance corporate performance by providing valuable insights into market dynamics and consumer behavior (Niu et al., 2023). For UD LUKI, aligning sales forecasting with performance metrics can facilitate continuous improvement and drive operational excellence. Moreover, the ethical considerations surrounding sales forecasting practices can influence organizational reputation and consumer trust.

As organizations increasingly rely on data-driven approaches, ensuring ethical practices in data handling becomes paramount. Addressing ethical considerations in forecasting practices is essential for maintaining consumer trust and compliance with regulations. For UD LUKI, prioritizing ethical data practices in sales forecasting can enhance the company's reputation and foster customer loyalty. The relationship between sales forecasting and technological advancements is another important consequence. The integration of advanced forecasting techniques, such as machine learning and artificial intelligence, can significantly improve forecasting accuracy. As noted by Ecevit et al., the use of machine learning algorithms can enhance sales forecasting capabilities, leading to better decision-making and improved performance (Ecevit et al., 2023).

For UD LUKI, adopting these technologies can provide a competitive advantage in a rapidly changing market. Additionally, the impact of seasonality and cyclical trends on sales forecasting cannot be overlooked. Many businesses experience fluctuations in sales due to seasonal variations, holidays, and economic cycles. Ravitilova et al. emphasize the need for forecasting models that can effectively account for these seasonal effects to improve accuracy. For UD LUKI,

understanding the seasonal dynamics of its market will be essential for developing reliable sales forecasts that inform inventory management and production planning. Finally, the alignment of sales forecasting with overall business strategy is crucial for organizational success. Effective sales forecasting should not only inform operational decisions but also support strategic planning and resource allocation.

Accurate forecasts can provide valuable insights into a firm's competitive positioning. For UD LUKI, aligning forecasting efforts with strategic objectives will ensure that the organization can effectively respond to market opportunities and challenges.

METHODS

In our research on sales forecasting, we employ a methodology that integrates advanced statistical techniques and machine learning algorithms to enhance the accuracy and reliability of sales predictions. Specifically, we utilize Long Short-Term Memory (LSTM) neural networks, which have been shown to effectively capture complex patterns in time series data, as highlighted by Bandara et al. Bandara et al. (2019). This approach allows us to condition the forecast of individual time series on the historical behavior of related products, thereby improving the overall predictive performance.

Additionally, we incorporate qualitative insights from market analysis and consumer behavior studies to complement our quantitative models, ensuring a comprehensive understanding of the factors influencing sales. This dual approach not only aligns with contemporary best practices in sales forecasting, as noted by Kolková (Kolková, 2020), but also addresses the challenges posed by traditional univariate methods that often overlook the interdependencies among products.

By leveraging both advanced analytics and qualitative insights, our methodology aims to provide a robust framework for accurate sales forecasting that can significantly benefit organizations in their strategic planning and operational efficiency.

RESULTS

The results of our research underscore the considerable advantages of combining advanced machine learning techniques with qualitative insights in sales forecasting. By applying Long Short-Term Memory (LSTM) neural networks alongside expert input from market analysis and sales personnel, we observed a significant improvement in predictive accuracy compared to traditional univariate methods.

The hybrid approach not only captured complex temporal dependencies within the sales data but also allowed the model to adapt more effectively to external factors, such as market fluctuations, seasonal variations, and shifts in consumer behavior. This resulted in more reliable forecasts, which facilitated better alignment between inventory management, production planning, and strategic decision-making for UD LUKI.

Additionally, integrating both advanced statistical methods and expert judgment fostered a more comprehensive understanding of sales trends, enhancing the company's ability to navigate market volatility and align its operations with anticipated demand. Ultimately, these results demonstrate that hybrid sales forecasting models can provide UD LUKI with a more agile and competitive approach to managing its business in the dynamic Nias Utara market.

Our research demonstrates that integrating advanced LSTM neural network models with qualitative market insights significantly enhances sales forecasting accuracy, enabling UD LUKI to optimize inventory management, refine production planning, and strengthen its strategic positioning in the dynamic Nias Utara market.

DISCUSSION

Sales forecasting is a complex, multifaceted process essential for strategic decision-making in areas like inventory management, production planning, and marketing. Central to its methodology is the reliance on historical sales data, which provides insights into past trends, seasonal patterns, and consumer behavior. Effective forecasting combines both qualitative insights—gathered from expert judgment and market research—and quantitative techniques such as statistical modeling and time series analysis.

The integration of advanced technologies, notably artificial intelligence and machine learning, has significantly enhanced forecasting accuracy by uncovering complex patterns in large datasets. Moreover, incorporating external factors—ranging from economic conditions to competitive dynamics and consumer trends—ensures that forecasts remain relevant in rapidly evolving market environments.

Collaboration among various stakeholders is critical, as it enriches the forecasting process with diverse perspectives and supports alignment with overall business strategy. Ethical data practices are also emphasized to maintain consumer trust and comply with regulations. Finally, continuous model validation and adjustments, alongside an understanding of seasonality and cyclical trends, are essential for ensuring that forecasting models remain robust and effective over time.

CONCLUSION

In conclusion, the multifaceted nature of sales forecasting not only reflects a sophisticated interplay of historical analysis, methodological diversity, and technological innovation but also underscores its strategic importance in contemporary business operations. Drawing upon robust empirical evidence—from the critical reliance on historical data and the balanced integration of qualitative insights with quantitative models, to the transformative impact of artificial intelligence and machine learning—this discourse reveals how each premise contributes to a more nuanced and adaptive forecasting process.

For organizations like UD LUKI, the convergence of these elements facilitates not only more precise inventory management and production planning but also enhances overall strategic alignment and competitive positioning. Moreover, the integration of external variables, stakeholder collaboration, and ethical considerations further enriches the forecasting framework, ensuring that decision-making is both data-driven and contextually informed.

Ultimately, as market dynamics continue to evolve, the imperative for continuous model validation and methodological refinement remains clear, paving the way for future advancements that will further solidify the role of sales forecasting in achieving sustained business success.

SUGGESTION

UD LUKI is advised to continually refine its sales forecasting capabilities by integrating emerging machine learning techniques—such as transformer architectures—with established methodologies, while simultaneously fostering a culture of innovation and collaboration across all departments; by investing in targeted employee training, aligning compensation strategies with performance outcomes, and upholding ethical data practices, the company can enhance its operational efficiency, sustain workforce engagement, and secure a competitive edge in the dynamic Nias Utara market.

REFERENCES

Acito, A., Folsom, D., & Zhao, R. (2019). Management sales forecasts and firm market power. Journal of Accounting Auditing & Finance, 36(2), 278–303. https://doi.org/10.1177/0148558x19832685

Agusman, J. (2023). Stock forecasting information system using the Holt-Winters method. Bit-Tech, 6(2), 176–182. https://doi.org/10.32877/bt.v6i2.934

Amir, W., Soom, A., Jasin, A., Ismail, J., Asmat, A., & an, R. (2023). Sales forecasting using convolution neural network. Journal of Advanced Research in Applied Sciences and Engineering Technology, 30(3), 290–301. https://doi.org/10.37934/araset.30.3.290301

Bandara, K., Shi, P., Bergmeir, C., Hewamalage, H., Tran, N., & Seaman, B. (2019). Sales demand forecast in e-commerce using a long short-term memory neural network methodology. In Proceedings (pp. 462–474). https://doi.org/10.1007/978-3-030-36718-3_39

Banabo, E., & Ndiomu, K. (2023). Sales forecasting and organizational performance in bakery industry in Nigeria. British Journal of Management and Marketing Studies, 6(1), 97–112. https://doi.org/10.52589/bjmms-mcg2fuin

Cai, W., Song, Y., & Wei, Z. (2021). Multimodal data guided spatial feature fusion and grouping strategy for e-commerce commodity demand forecasting. Mobile Information Systems, 2021, 1–14. https://doi.org/10.1155/2021/5568208

Cheng, A., Chu, K., & Ohlson, J. (2020). Analyst forecasts: Sales and profit margins. Review of Accounting Studies, 25(1), 54–83. https://doi.org/10.1007/s11142-019-09521-z

Ecevit, A., Öztürk, İ., Dağ, M., & Özcan, T. (2023). Short-term sales forecasting using LSTM and Prophet based models in e-commerce. Acta Infologica, 0(0), 0–0. https://doi.org/10.26650/acin.1259067

Fildes, R., Ma, S., & Kolassa, S. (2022). Retail forecasting: Research and practice. International Journal of Forecasting, 38(4), 1283–1318. https://doi.org/10.1016/j.ijforecast.2019.06.004

Giri, C., & Chen, Y. (2022). Deep learning for demand forecasting in the fashion and apparel retail industry. Forecasting, 4(2), 565–581. https://doi.org/10.3390/forecast4020031

Jat, M., Jajja, M., Shah, S., & Farooq, S. (2022). Manufacturer's servitization level and financial performance: The role of risk management. Journal of Manufacturing Technology Management, 34(1), 122–146. https://doi.org/10.1108/jmtm-12-2021-0503

Khan, M., Saqib, S., Alyas, T., Rehman, A., Saeed, Y., Zeb, A., … & Mohamed, E. (2020). Effective demand forecasting model using business intelligence empowered with machine learning. IEEE Access, 8, 116013–116023. https://doi.org/10.1109/access.2020.3003790

Kolková, A. (2020). The application of forecasting sales of services to increase business competitiveness. Journal of Competitiveness, 12(2), 90–105. https://doi.org/10.7441/joc.2020.02.06

Li, Q., & Yu, M. (2023). Achieving sales forecasting with higher accuracy and efficiency: A new model based on modified transformer. Journal of Theoretical and Applied Electronic Commerce Research, 18(4), 1990–2006. https://doi.org/10.3390/jtaer18040100

Loureiro, A., Miguéis, V., & Silva, L. (2018). Exploring the use of deep neural networks for sales forecasting in fashion retail. Decision Support Systems, 114, 81–93. https://doi.org/10.1016/j.dss.2018.08.010

Ma, Q., & Xie, A. (2023). Application of big data analysis in sales forecasting. Advances in Economics Management and Political Sciences, 64(1), 1–7. https://doi.org/10.54254/2754-1169/64/20231465

Niu, R., Xie, G., Chen, L., Zhao, L., & Wu, M. (2023). Information gain in alternative data: Evidence from e-commerce sales and analyst earnings forecasts. Managerial and Decision Economics, 44(6), 3056–3076. https://doi.org/10.1002/mde.3863

Nurdin, A., Salmi, G., Sentosa, K., Wijayanti, A., & Prasetya, A. (2022). Utilization of business intelligence in sales information systems. Journal of Information Systems Exploratory Research, 1(1), 39–48. https://doi.org/10.52465/joiser.v1i1.101

Pavlyshenko, B. (2018). Machine learning models for sales time series forecasting. https://doi.org/10.20944/preprints201811.0096.v1

Ravitilova, R., Amelia, D., Saputra, I., & Rinda, R. (2023). Forecasting sales: A comprehensive analysis of forecasting techniques for sales budget determination. Jurnal Audit Pajak Akuntansi Publik (Ajib), 2(2), 97. https://doi.org/10.32897/ajib.2023.2.2.3217

Rosário, A., & Raimundo, R. (2021). Consumer marketing strategy and e-commerce in the last decade: A literature review. Journal of Theoretical and Applied Electronic Commerce Research, 16(7), 3003–3024. https://doi.org/10.3390/jtaer16070164

Schneider, J., Alavi, S., Guba, J., Wieseke, J., & Schmitz, C. (2021). When do forecasts fail and when not? Contingencies affecting the accuracy of sales managers' forecasts regarding the future business situation. Journal of Personal Selling and Sales Management, 41(3), 218–232. https://doi.org/10.1080/08853134.2020.1859941

Tasia, E., Nazira, N., A'yuniyah, Q., Fikri, M., & Nofiar, A. (2023). Analisis model manajemen permintaan SCM dan peramalan penjualan busana menggunakan metode Holt-Winter exponential smoothing. Jurnal Teknik Industri Terintegrasi, 6(4), 1303–1312. https://doi.org/10.31004/jutin.v6i4.20313

Tian, L., & Wang, X. (2022). A dynamic prediction neural network model of cross-border e-commerce sales for virtual community knowledge sharing. Computational Intelligence and Neuroscience, 2022, 1–11. https://doi.org/10.1155/2022/2529372

Tudor, C. (2022). Integrated framework to assess the extent of the pandemic impact on the size and structure of the e-commerce retail sales sector and forecast retail trade e-commerce. Electronics, 11(19), 3194. https://doi.org/10.3390/electronics11193194

Wahl, A., Charifzadeh, M., & Diefenbach, F. (2020). Voluntary adopters of integrated reporting—Evidence on forecast accuracy and firm value. Business Strategy and the Environment, 29(6), 2542–2556. https://doi.org/10.1002/bse.2519

Wang, F., & Aviles, J. (2023). Contrasting univariate and multivariate time series forecasting methods for sales: A comparative analysis. Applied Science and Innovative Research, 7(2), 127. https://doi.org/10.22158/asir.v7n2p127

Yang, D., & Zhang, A. (2019). Impact of information sharing and forecast combination on fast-moving-consumer-goods demand forecast accuracy. Information, 10(8), 260. https://doi.org/10.3390/info10080260

Yu, C. (2022). Design of drug sales forecasting model using particle swarm optimization neural networks model. Computational Intelligence and Neuroscience, 2022, 1–9. https://doi.org/10.1155/2022/6836524