Developing a Financial Analytics Framework for End-to-End Logistics and Distribution Cost Control

JOHN OLUWASEUN OLAJIDE[1], BISAYO OLUWATOSIN OTOKITI[2], SHARON NWANI[3], ADEBANJI SAMUEL OGUNMOKUN[4], BOLAJI IYANU ADEKUNLE[5], JOYCE EFEKPOGUA FIEMOTONGHA[6]
[1]Lipton, USA
[2]Department of Business and Entrepreneurship, Kwara State University
[3]Bank of Industry –Ogun, Nigeria
[4]Prosperis Holding Company Limited, Nigeria
[5]Data Analyst, Federal Ministry of Mines and Steel Development, Nigeria
[6]Independent Researcher, Lagos, Nigeria

Abstract- In an era marked by increasing logistical complexity and economic volatility, effective cost control across supply chains has become paramount. This paper presents a comprehensive financial analytics framework designed to enhance cost visibility, operational efficiency, and strategic decision-making within logistics and distribution networks. Drawing on existing literature and industry best practices, the framework integrates financial data sources, such as transportation, warehousing, fuel, and labor costs, into a unified analytics system that interfaces with enterprise resource planning, transportation management, and warehouse management systems. A structured methodological design introduces key performance indicators, including cost-to-serve and delivery cost per unit, enabling organizations to monitor, predict, and optimize logistics expenditures. The framework is demonstrated through a case analysis that reveals actionable insights using dashboards, trend visualizations, and variance tracking tools. Additionally, the paper discusses operational and technological challenges, including data integration and user adoption. It concludes by outlining the practical implications for supply chain managers, financial officers, and logistics professionals, while identifying future research opportunities in AI-driven forecasting and real-time analytics integration. This study contributes a scalable and adaptable model that transforms financial oversight in logistics from a reactive process to a strategic enabler of cost control.

Indexed Terms- Financial Analytics, Logistics Cost Control, Supply Chain Management, Distribution Networks, Predictive Analytics, Transportation Management Systems

I. INTRODUCTION

In recent decades, logistics and distribution have emerged as critical functions within global supply chains, increasingly shaped by complex interdependencies, volatile demand, and rising operational costs [1]. The growth of e-commerce, globalization of sourcing, and heightened customer expectations for rapid delivery have placed tremendous pressure on organizations to optimize logistics operations while maintaining financial sustainability [2]. Traditionally, logistics cost control was treated as a secondary function, focusing largely on reducing freight or warehousing expenditures [3]. However, with logistics costs now constituting a significant proportion of total supply chain expenditure—often exceeding 10% of total revenues in many sectors—the need for a more comprehensive and data-driven cost management approach is evident [4].

Moreover, disruptions such as geopolitical instability, fuel price fluctuations, and environmental compliance demands have amplified the urgency for companies to enhance visibility and control over distribution-related expenditures [5]. The lack of real-time cost intelligence, coupled with inefficient coordination between finance and logistics teams, has led to suboptimal budgeting, frequent cost overruns, and impaired decision-making [6]. As logistics networks grow more digitalized and data-rich, organizations have a unique opportunity to leverage financial analytics as a strategic tool for continuous cost control, performance monitoring, and informed forecasting across their end-to-end logistics operations [7].

This background establishes the rationale for developing a structured financial analytics framework that empowers organizations to manage and optimize logistics and distribution costs proactively. Such a framework must go beyond retrospective reporting and instead enable dynamic, predictive, and actionable insights [8]. This paper, therefore, advocates for the integration of financial intelligence into logistics decision-making, positioning analytics not only as a technical capability but also as a key enabler of strategic cost efficiency and resilience in distribution networks.

Despite advances in logistics technologies and process automation, organizations continue to grapple with fragmented cost data, limited financial transparency, and reactive cost control strategies. Traditional enterprise systems often provide logistical performance metrics, but they fall short in offering detailed financial analytics that can trace, allocate, and predict cost drivers throughout the logistics lifecycle [9]. This results in missed opportunities for strategic interventions, such as route optimization, load consolidation, or supplier renegotiation. Additionally, siloed operations between finance and logistics functions inhibit a holistic understanding of cost-to-serve, total landed costs, and variance from planned budgets [10].

The central problem addressed in this paper is the lack of an integrated and end-to-end financial analytics framework tailored for logistics and distribution cost control. The research seeks to bridge the gap between logistics operations and financial analysis by developing a model that consolidates key financial and operational data, identifies cost leakages, and facilitates data-driven decision-making. By linking financial metrics with logistics activities, businesses can improve forecasting accuracy, enhance profitability, and allocate resources more efficiently.

The primary objectives of this research are threefold: first, to define the critical components and data inputs required for a financial analytics framework in logistics; second, to conceptualize a model that supports real-time cost monitoring, allocation, and optimization across transportation and warehousing functions; and third, to demonstrate the framework's applicability through illustrative examples or case scenarios. This paper ultimately aims to contribute to both academic discourse and industry practice by offering a structured and scalable approach to financial governance in logistics.

II. LITERATURE REVIEW

2.1 Financial Analytics in Supply Chain Management

Financial analytics has emerged as a critical tool in supply chain management, providing organizations with the means to transform raw transactional data into actionable insights that enhance decision-making [11]. In logistics, financial analytics is primarily applied to areas such as transportation spend analysis, inventory valuation, order fulfillment costs, and supplier financial performance [12]. Studies have highlighted the use of descriptive analytics to identify cost trends and anomalies, as well as diagnostic tools to trace inefficiencies back to root causes. These practices help organizations detect real-time financial bottlenecks and support resource optimization [13].

Contemporary applications extend to predictive and prescriptive analytics, where machine learning and statistical models forecast future costs based on historical patterns, seasonality, and external variables like fuel prices and tariffs [14]. Some enterprises use financial dashboards that integrate data from enterprise systems, providing logistics managers and finance executives with unified visibility over budget adherence, cost-to-serve per region or product, and the financial impact of delivery delays or route deviations [15, 16].

However, despite these advancements, the adoption of financial analytics remains uneven across industries. Research suggests that while large multinational corporations leverage advanced analytics, small and mid-sized enterprises often lack the infrastructure or expertise to implement such systems effectively [17].

Moreover, most applications remain functionally siloed, providing fragmented insights rather than holistic visibility across the end-to-end logistics network. This underscores the necessity of a more integrated and scalable financial analytics framework, especially one tailored to the nuanced cost structures of logistics operations [18, 19].

2.2 Cost Control Strategies in Logistics and Distribution

Traditional cost control strategies in logistics typically involve static budgeting, periodic variance analysis, and vendor negotiations aimed at reducing rates for transport, warehousing, and handling [20]. Cost control efforts often focused narrowly on minimizing individual expense categories without fully understanding their interdependencies or the total cost implications of operational decisions [21]. For instance, choosing a lower-cost carrier may reduce transport expenses but increase lead times and inventory holding costs, offsetting the intended savings [22].

Modern approaches, influenced by supply chain finance and real-time analytics, advocate for a more dynamic and integrated perspective. Activity-based costing (ABC) has gained traction as it enables organizations to attribute costs more accurately to specific logistics activities or customer orders [23]. Lean logistics and just-in-time distribution also promote cost control through waste reduction and improved asset utilization [24]. In tandem, digitization initiatives—such as the implementation of TMS or automated freight auditing tools—have enhanced the ability to capture granular data for ongoing financial oversight [25].

Nevertheless, the application of these strategies varies considerably by sector, maturity level, and digital readiness. A significant number of organizations continue to operate with limited real-time visibility, resulting in reactive rather than proactive cost control. Furthermore, traditional cost-saving measures often overlook hidden costs related to process inefficiencies, lost sales from stockouts, or reputational damage due to late deliveries. This reinforces the argument for a more comprehensive analytics-driven framework that allows firms to assess and control distribution costs holistically and adaptively [26, 27].

2.3 Gaps in Current Research and Practice

A review of existing literature reveals several critical gaps that hinder the effectiveness of current financial analytics models in logistics cost control. One major limitation is the lack of end-to-end integration between financial and operational data [28]. Many existing systems are designed to optimize logistics performance (e.g., delivery speed or load optimization) without concurrently tracking financial implications. As a result, cost control remains largely retrospective and segmented, offering limited value for predictive planning or strategic decision-making [29].

Another deficiency lies in the inadequate representation of contextual cost drivers—such as environmental conditions, customer demand variability, or geopolitical disruptions—which often fall outside traditional accounting systems [30]. Additionally, the misalignment between financial reporting cycles and real-time operational activities impedes the ability of businesses to respond swiftly to cost deviations or inefficiencies [31]. Current academic frameworks tend to address these areas in isolation, failing to provide a unified methodology that captures both operational dynamics and financial impact in tandem.

Lastly, there is a notable scarcity of domain-specific frameworks tailored to logistics and distribution environments. While generic business intelligence models exist, they often require significant customization to account for industry-specific challenges such as multi-modal transport costs, reverse logistics, and fluctuating fuel surcharges [32]. This points to a pressing need for an integrated, logistics-centric financial analytics framework—one that consolidates disparate data sources, supports real-time monitoring, and facilitates strategic cost control across the entire distribution value chain [33].

III. METHODOLOGICAL FRAMEWORK

3.1 Conceptual Framework Design

The proposed financial analytics framework is structured to facilitate real-time, end-to-end cost visibility and control across logistics and distribution networks. It comprises three core components: data aggregation, analytical processing, and decision support. The framework begins with the aggregation of both financial and operational data from multiple logistics functions, including transportation, warehousing, labor, and fuel consumption. This data is then processed through analytical engines that apply rules-based models, machine learning algorithms, and statistical forecasting methods to derive actionable insights.

At the center of the model is a financial analytics dashboard that integrates key performance indicators (KPIs) and variance metrics [34]. These visualizations are tailored for multiple stakeholders—finance managers, logistics coordinators, and executive leadership—ensuring cross-functional alignment [35]. Decision support is enhanced through alerts, scenario modeling, and predictive cost simulations, allowing for timely interventions and strategic adjustments in logistics operations. For example, the system may flag high variance in fuel expenses on a given route, prompting investigation or route optimization [36].

The framework emphasizes modularity and scalability, enabling firms of different sizes and technological maturities to adopt and tailor the model to their unique operational contexts. Each module—such as freight cost analysis, warehouse efficiency monitoring, or delivery cost benchmarking—can operate independently or as part of the full suite. This approach facilitates phased implementation, promotes user adoption, and reduces upfront costs. Ultimately, the design aims to translate complex logistics expenditures into transparent, traceable, and optimizable financial outcomes.

3.2 Data Sources and Key Financial Metrics

The robustness of the financial analytics framework depends heavily on the quality and breadth of its data inputs. Core data sources include transportation management logs (e.g., shipment tracking, carrier invoices), warehouse operations data (e.g., labor hours, storage costs), procurement records (e.g., packaging materials, fuel purchases), and enterprise financial ledgers [37]. In addition, external data such as fuel price indices, toll charges, and currency exchange rates may be integrated to refine cost calculations and forecasting accuracy [10].

Key financial metrics have been selected based on their relevance to distribution cost control and alignment with strategic logistics objectives. These include cost-to-serve (total cost incurred to deliver a product to a customer or location), delivery cost per unit (aggregated delivery costs divided by shipment volume), and variance from planned logistics budget. Other important KPIs encompass transportation cost per mile, warehouse cost per square meter, and labor cost per order processed. Together, these indicators enable granular monitoring and benchmarking of logistics performance.

To ensure data consistency and relevance, the framework applies standardization protocols such as common data formats, time-based cost tracking, and normalization techniques across business units. Data cleansing and validation routines are also embedded to address issues of missing, duplicate, or outdated information [38]. The integration of structured (e.g., ERP data tables) and unstructured data (e.g., scanned invoices, driver notes) ensures a comprehensive and context-rich view of logistics costs. By aligning metrics with real-time data streams, the framework enables proactive financial oversight and continuous performance improvement [39].

3.3 Integration with Existing Logistics Systems

A critical success factor for the proposed framework is its seamless integration with existing logistics technology infrastructures, particularly ERP, TMS, and WMS platforms [40]. These systems already serve as repositories for large volumes of operational and transactional data. The framework is designed to interface with these platforms through application programming interfaces (APIs), data connectors, and middleware solutions that enable automated data extraction and synchronization without disrupting ongoing operations [41].

In ERP systems, such as SAP or Oracle, financial and procurement modules provide detailed records on vendor payments, asset depreciation, and internal cost allocations. By connecting to these systems, the framework can retrieve actual logistics expenditures and reconcile them with planned budgets or forecast models [42]. Meanwhile, integration with TMS enables real-time tracking of transportation activities, lane-specific costs, and carrier performance, which are essential for assessing route efficiency and optimizing delivery strategies [43].

WMS integration supports the monitoring of storage utilization, labor productivity, and inventory movement, all of which influence distribution costs [44]. For instance, inefficiencies in picking processes or excess dwell time in warehouses can be detected and costed accordingly. The framework's design also supports data interoperability, allowing firms to incorporate cloud-based logistics solutions or third-party logistics provider systems [45]. This ensures that even in distributed or outsourced logistics environments, cost data remains centralized and analyzable. Through such system-level harmonization, the framework fosters enterprise-wide visibility, accountability, and precision in logistics cost management [46].

IV. APPLICATION AND CASE ANALYSIS

4.1 Hypothetical Case Study

To illustrate the applicability of the proposed financial analytics framework, consider a mid-sized e-commerce company with a regional distribution network spanning three major urban centers and six secondary hubs. The company manages its transportation through a mix of third-party carriers and in-house fleets, while warehousing is outsourced to logistics partners operating on monthly cost-plus contracts. The organization currently faces cost overruns due to fuel price volatility, uneven warehouse utilization, and last-mile inefficiencies.

By implementing the framework, the company begins aggregating cost data from its TMS and warehouse partners into a centralized analytics dashboard. Cost-to-serve analysis identifies that serving Zone C (a rural area) incurs 30% higher delivery costs per unit than other regions due to low shipment density and multiple delivery attempts. Predictive modeling further highlights that delivery volumes to Zone C spike after promotions, allowing the company to adjust staffing and routing strategies during campaign periods proactively.

As a result, the firm implements region-specific delivery policies and negotiates fixed-rate contracts with regional carriers for Zone C. Warehouse metrics also uncover significant downtime at the suburban storage facility, prompting a reallocation of inventory and staff. Within one fiscal quarter, the company reports a 12% reduction in logistics overhead and improved forecasting accuracy for logistics expenditures. This case study underscores the framework's ability to convert fragmented operational data into precise, financially driven actions.

4.2 Cost Control Insights and Visualizations

The effectiveness of financial analytics is significantly enhanced by how data insights are visualized and communicated to decision-makers. Within the framework, cost control dashboards display interactive KPIs such as delivery cost per unit, transport cost by carrier, and monthly budget variance. These dashboards support drill-down capabilities, allowing users to view trends by region, carrier, or product line. For example, an upward trend in average cost per delivery in Zone B triggers an alert, prompting a closer examination of order volumes, fuel costs, and service level adherence.

Trend analysis tools help uncover seasonal or recurring patterns. A heat map visualization reveals that delivery costs are highest on Mondays, likely due to order backlogs from weekend promotions. Armed with this insight, operations teams adjust dispatch schedules and inventory allocation to spread workloads more evenly across the week. Similarly, warehouse analytics charts show labor productivity rates and their direct correlation with pick-and-pack costs per SKU.

Variance tracking features compare forecasted versus actual costs across logistics functions. A variance waterfall chart breaks down why total transport costs exceeded the budget in Q2, highlighting spikes in diesel prices, underutilized vehicles, and emergency shipments. These visual tools not only enable faster root-cause analysis but also support scenario simulations. Users can model the financial impact of routing changes, shifts in order volume, or carrier negotiations, thereby transforming cost control from a reactive to a proactive discipline within logistics operations.

4.3 Risk Factors and Limitations

While the proposed framework offers substantial value in optimizing logistics costs, several risks and limitations must be acknowledged. One of the most critical challenges is data quality and consistency. Many logistics datasets are manually recorded, leading to errors, delays, and gaps that can compromise the accuracy of financial insights. In multi-stakeholder environments, data may originate from disparate systems with incompatible formats or reporting structures, requiring significant preprocessing and validation efforts.

Integration with legacy systems poses another risk. Older ERP or TMS platforms may lack modern APIs or have limited interoperability, hindering real-time data sharing and analytics execution [47]. Even when integration is feasible, ensuring data governance, system security, and compliance with data privacy laws introduces additional complexity. Furthermore, analytics models—especially those incorporating machine learning—require regular tuning and validation to maintain relevance as operational conditions change [48].

Operational limitations include user adoption and change management. Logistics staff may lack the training to interpret financial dashboards or resist using analytics-driven workflows that diverge from traditional practices [49]. Moreover, overreliance on quantitative metrics may overlook qualitative factors such as customer satisfaction or partner relationships, which also affect logistics outcomes. Therefore, while the framework provides a strong foundation for cost control, its success depends on robust implementation planning, continuous data stewardship, and stakeholder engagement [50].

V. CONCLUSION AND FUTURE DIRECTIONS

5.1 Key Findings and Contributions

This study proposed a robust financial analytics framework specifically tailored to enhance cost visibility and control across logistics and distribution networks. Through structured integration with existing operational systems, the framework facilitates comprehensive data aggregation, enabling detailed tracking of expenditures associated with transportation, warehousing, fuel, and labor. By transforming raw data into insightful KPIs such as cost-to-serve and delivery cost per unit, it supports data-driven decision-making that directly aligns operational activities with financial outcomes.

One of the key contributions of the framework is its modular design, which allows organizations to implement cost analytics progressively, without overhauling their existing infrastructure. This flexible architecture enables both small-scale logistics teams and large distribution networks to leverage the benefits of financial transparency. Moreover, the incorporation of visualization tools enhances stakeholder communication by simplifying complex financial data into accessible, interactive formats.

The framework also introduces a shift from traditional, reactive cost tracking to proactive, predictive logistics financial management. It equips organizations with the tools necessary not only to monitor historical performance but also to anticipate cost drivers and simulate strategic responses. This represents a significant advancement in aligning logistics management with corporate financial planning and performance optimization.

5.2 Practical Implications for Industry

The proposed framework holds significant value for various logistics stakeholders. For supply chain managers, it offers a granular view of cost drivers along the logistics continuum, from origin to final delivery. With this visibility, managers can identify inefficiencies—such as underutilized assets or excessive last-mile costs—and make informed tactical decisions that directly influence profitability and service levels. The real-time monitoring features also enable agile responses to operational disruptions.

Chief Financial Officers benefit from the ability to link logistics operations to broader financial goals and cost-containment strategies. The framework bridges the gap between finance and operations by providing reconciled, validated data streams that can be used for budgeting, forecasting, and performance benchmarking. CFOs gain access to dashboards that align with corporate reporting standards, enhancing both compliance and transparency in cost reporting.

For operational teams, the system simplifies complex financial metrics into actionable insights. With access to targeted alerts and variance analyses, these teams can adjust daily workflows to align with cost efficiency targets. The use of scenario modeling tools also empowers teams to test the impact of changes—such as rerouting shipments or renegotiating carrier rates—before implementing them, thereby reducing risk and improving decision confidence across the logistics function.

5.3 Future Research Avenues

Although the framework establishes a solid foundation for logistics cost control, future research can explore its enhancement through advanced technologies. One promising direction is the integration of artificial intelligence to support autonomous decision-making in cost management. Machine learning models could be trained on historical cost patterns to detect anomalies, recommend cost-optimized routing strategies, or forecast budget overruns before they materialize.

Another area of advancement lies in predictive analytics for real-time logistics cost forecasting. By incorporating dynamic data sources such as fuel price indices, weather forecasts, and traffic conditions, the model could simulate future expenditure scenarios and proactively suggest mitigating actions. This would be especially valuable in volatile or high-risk environments where costs can fluctuate rapidly.

Future studies may also investigate the application of real-time IoT tracking data within the financial analytics framework. By capturing live sensor data from fleets, containers, and warehouse assets, organizations could correlate physical asset movement directly with cost implications. This would close the feedback loop between operational activity and financial impact, elevating the precision and timeliness of logistics cost control efforts. Researchers could further evaluate the framework's scalability and adaptability across different industries and geographies to validate its generalizability and long-term value.

REFERENCES

[1] J. Mangan and C. Lalwani, *Global logistics and supply chain management*. John Wiley & Sons, 2016.

[2] T. Kiessling, M. Harvey, and L. Akdeniz, "The evolving role of supply chain managers in global channels of distribution and logistics systems," *International Journal of Physical Distribution & Logistics Management,* vol. 44, no. 8/9, pp. 671-688, 2014.

[3] R. Bhatnagar and C. C. Teo, "Role of logistics in enhancing competitive advantage: A value chain framework for global supply chains," *International journal of physical distribution & logistics management,* vol. 39, no. 3, pp. 202-226, 2009.

[4] L. G. Mattsson, "Reorganization of distribution in globalization of markets: the dynamic context of supply chain management," *Supply Chain Management: An International Journal,* vol. 8, no. 5, pp. 416-426, 2003.

[5] J. R. McIntyre and E. F. Travis, "Global supply chain under conditions of uncertainty: Economic impacts, corporate responses, strategic lessons," in *Corporate strategies under international terrorism and adversity*: Edward Elgar Publishing, 2006.

[6] C. Rice and A. B. Zegart, *Political risk: How businesses and organizations can anticipate global insecurity*. Twelve, 2018.

[7] O. O. Aroge, "Assessment Of Disruption Risk In Supply Chain The Case Of Nigeria's Oil Industry," University of Bradford, 2019.

[8] O. H. Olayinka, "Leveraging Predictive Analytics and Machine Learning for Strategic

Business Decision-Making and Competitive Advantage," *International Journal of Computer Applications Technology and Research,* vol. 8, no. 12, pp. 473-486, 2019.

[9] D. J. Sedgley and C. F. Jackiw, *The 123s of ABC in SAP: using SAP R/3 to support activity-based costing*. John Wiley & Sons, 2002.

[10] G. Wang, A. Gunasekaran, E. W. Ngai, and T. Papadopoulos, "Big data analytics in logistics and supply chain management: Certain investigations for research and applications," *International journal of production economics,* vol. 176, pp. 98-110, 2016.

[11] F. Kache and S. Seuring, "Challenges and opportunities of digital information at the intersection of Big Data Analytics and supply chain management," *International journal of operations & production management,* vol. 37, no. 1, pp. 10-36, 2017.

[12] I. V. Rozados and B. Tjahjono, "Big data analytics in supply chain management: Trends and related research," in *6th international conference on operations and supply chain management*, 2014, vol. 1: Bali, p. 13.

[13] O. Famoti *et al.*, "Agile Software Engineering Framework for Real-Time Personalization in Financial Applications."

[14] E. Hofmann and E. Rutschmann, "Big data analytics and demand forecasting in supply chains: a conceptual analysis," *The international journal of logistics management,* vol. 29, no. 2, pp. 739-766, 2018.

[15] E. O. Alonge and E. D. Balogun, "Innovative Strategies in Fixed Income Trading: Transforming Global Financial Markets."

[16] O. S. Adanigbo, F. S. Ezeh, U. S. Ugbaja, C. I. Lawal, and S. C. Friday, "Advances in Blockchain and IoT Applications for Secure, Transparent, and Scalable Digital Financial Transactions," *institutions,* vol. 28, p. 30.

[17] C. F. Foley and K. Manova, "International trade, multinational activity, and corporate finance," *Annual Review of Economics,* vol. 7, no. 1, pp. 119-146, 2015.

[18] S. C. Friday, M. N. Ameyaw, and T. O. Jejeniwa, "Conceptualizing the Impact of Automation on Financial Auditing Efficiency in Emerging Economies."

[19] O. Famoti *et al.*, "Data-Driven Risk Management in US Financial Institutions: A Business Analytics Perspective on Process Optimization."

[20] S. W. Anderson and H. C. Dekker, "Strategic cost management in supply chains, part 1: Structural cost management," *Accounting horizons,* vol. 23, no. 2, pp. 201-220, 2009.

[21] D. M. Lambert and J. R. Stock, *Strategic logistics management*. Irwin Homewood, IL, 1993.

[22] A. B. N. Abbey, N. L. Eyo-Udo, and I. A. Olaleye, "Implementing Advanced Analytics for Optimizing Food Supply Chain Logistics and Efficiency."

[23] G. Cokins, *Performance management: Integrating strategy execution, methodologies, risk, and analytics*. John Wiley & Sons, 2009.

[24] A. L. Junge, *Conceptualizing and capturing digital transformation's customer value–a logistics and supply chain management perspective*. Universitätsverlag der TU Berlin, 2020.

[25] D. W. Webster and G. Cokins, *Value-based management in government*. John Wiley & Sons, 2020.

[26] B. A. Mayienga *et al.*, "A Conceptual Model for Global Risk Management, Compliance, and Financial Governance in Multinational Corporations."

[27] C. I. Lawal, S. C. Friday, D. C. Ayodeji, and A. Sobowale, "Strategic Framework for Transparent, Data-Driven Financial Decision-Making in Achieving Sustainable National Development Goals."

[28] M. Abramowicz, "Information markets, administrative decisionmaking, and predictive cost-benefit analysis," *The University of Chicago Law Review,* pp. 933-1020, 2004.

[29] J. K. Shank and V. Govindarajan, *Strategic cost management: the new tool for competitive advantage*. Simon and Schuster, 1993.

[30] M. Kadry, H. Osman, and M. Georgy, "Causes of construction delays in countries with high geopolitical risks," *Journal of construction*

engineering and management, vol. 143, no. 2, p. 04016095, 2017.

[31] J. Manners-Bell, *Supply chain risk management: understanding emerging threats to global supply chains*. Kogan Page Publishers, 2017.

[32] V. Oree, S. Z. S. Hassen, and P. J. Fleming, "Generation expansion planning optimisation with renewable energy integration: A review," *Renewable and Sustainable Energy Reviews,* vol. 69, pp. 790-803, 2017.

[33] T. J. Pettit, K. L. Croxton, and J. Fiksel, "Ensuring supply chain resilience: development and implementation of an assessment tool," *Journal of business logistics,* vol. 34, no. 1, pp. 46-76, 2013.

[34] M. N. Bahar, "A Process Model for Designing Performance Dashboard Using Visualization Techniques," University of Malaya (Malaysia), 2020.

[35] J. Piela, "Key performance indicator analysis and dashboard visualization in a logistics company," 2017.

[36] E. Irannezhad, C. G. Prato, and M. Hickman, "An intelligent decision support system prototype for hinterland port logistics," *Decision Support Systems,* vol. 130, p. 113227, 2020.

[37] M. Groot, *A primer in financial data management*. Academic press, 2017.

[38] Z. Zhang, Z. Yuan, G. Ni, H. Lin, and Y. Lu, "The quality traceability system for prefabricated buildings using blockchain: An integrated framework," *Frontiers of engineering management,* vol. 7, no. 4, pp. 528-546, 2020.

[39] C. Batini, C. Cappiello, C. Francalanci, and A. Maurino, "Methodologies for data quality assessment and improvement," *ACM computing surveys (CSUR),* vol. 41, no. 3, pp. 1-52, 2009.

[40] W. Lorchirachoonkul, "Development of end-to-end global logistics integration framework with virtualisation and cloud computing," Citeseer, 2013.

[41] N. Andiyappillai, "Factors influencing the successful implementation of the warehouse management system (WMS)," *International Journal of Computer Applications,* vol. 177, no. 32, pp. 21-25, 2020.

[42] M. A. Rashid, L. Hossain, and J. D. Patrick, "The evolution of ERP systems: A historical perspective," in *Enterprise resource planning: Solutions and management*: IGI global, 2002, pp. 35-50.

[43] S. L. Koh, A. Gunasekaran, and T. Goodman, "Drivers, barriers and critical success factors for ERPII implementation in supply chains: A critical analysis," *The Journal of Strategic Information Systems,* vol. 20, no. 4, pp. 385-402, 2011.

[44] R. Gwynne, *Warehouse management: a complete guide to improving efficiency and minimizing costs in the modern warehouse*. Kogan Page Limited, 2014.

[45] M. Hompel and T. Schmidt, *Warehouse management: automation and organisation of warehouse and order picking systems*. Springer Science & Business Media, 2006.

[46] U. S. J. Salmon, *SAP HANA for ERP Financials*. Espresso Tutorials GmbH, 2014.

[47] P. P. Ray, "A survey of IoT cloud platforms," *Future Computing and Informatics Journal,* vol. 1, no. 1-2, pp. 35-46, 2016.

[48] A. M. Pagano and M. Liotine, *Technology in supply chain management and logistics: Current practice and future applications*. Elsevier, 2019.

[49] S. Vashisth, A. Linden, J. Hare, and P. Krensky, "Hype cycle for data science and machine learning, 2019," *Gartner Research,* 2019.

[50] S. Foster, "Data Science within Supply Chain Management: An Analysis of Skillset Relevance," Capella University, 2020.