

Radio Frequency Identification (RFID) in West Africa: Gaining ground or facing resistance?

Maricel Co^{1*}, Rohana Sham¹, Noraini Ahmad¹, Emmanuel Moses Anikor²

**Corresponding Author*

¹ School of Business, Asia Pacific University of Technology & Innovation, Kuala Lumpur, Malaysia

² Interstate Architects Limited 41, Colorado Close, Minister's Hill, Abuja, Nigeria

tp072314@mail.apu.edu.my, rohana.sham@apu.edu.my, noraini@apu.edu.my, emmanuelanikor@gmail.com
Tel: +639609428280

Abstract

This quantitative study examines the implementation of Radio Frequency Identification (RFID) technology within an international organization in Mali, West Africa, highlighting its significant impact on supply chain management. It explores the technological, organizational, and employee factors influencing RFID adoption. The findings reveal that RFID is gaining traction and driving efficiency through enhanced tracking equipment, improved inventory management, and greater data accuracy. A survey of 384 supply chain employees, analyzed using SmartPLS4, highlights the substantial benefits of RFID integration. This study provides additional knowledge to fully leverage these proactive strategies, which are essential for successful RFID implementation in organizations.

Keywords: International organization; Inventory tracking; RFID; Supply chain management

eISSN: 2398-4287 © 2025. The Authors. Published for AMER by e-International Publishing House, Ltd., UK. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>). Peer-review under responsibility of AMER (Association of Malaysian Environment-Behaviour Researchers). DOI: <https://doi.org/10.21834/e-bpj.v10i33.7207>

1.0 Introduction

The limited availability of local RFID suppliers poses a significant challenge in West Africa, impacting various sectors. RFID technology plays a crucial role in verifying product authenticity and combating counterfeit goods by enabling quick validation and enhancing inventory management (Abunike & Chinyere, 2025). For instance, an international organization in Mali utilizes RFID to track personnel, equipment, and supplies, promoting efficient inventory control and real-time monitoring (Moleme et al., 2024). Despite the global surge in adoption, technology faces hurdles in West Africa. However, as awareness grows and infrastructure develops, the adoption rate is anticipated to increase. According to Masekwana & Jokonya (2025), RFID technology is rapidly emerging as a transformative tool across various sectors globally, and West Africa is no exception. As the region grapples with modernization and efficiency challenges, RFID offers innovative solutions for supply chain management, inventory tracking, and asset management, promising to streamline processes and enhance productivity. Nevertheless, the adoption of RFID in West Africa is not without its hurdles (Elkoraichi et al., 2025).

This dynamic landscape of opportunity and challenge raises an important question: Is RFID gaining ground in West Africa, or does it face significant resistance? (Omowole et al., 2025). Therefore, choosing West Africa as a study area will reflect the current scenario on RFID implementation. This study seeks to unravel the complexities surrounding the integration of RFID technology in international organizations operating in the region, analyzing both the potential benefits it brings and the obstacles that hinder its widespread acceptance (Dai et al., 2025). According to Rajendiran (2025), RFID technology plays a crucial role in warehouse inventory management due to several key reasons, including enhancing accuracy by reducing human error in counting and tracking equipment, thereby enabling timely inventory updates. RFID also improves efficiency, allowing multiple tags to be scanned simultaneously, which speeds up check-

in and check-out processes while reducing labor costs (Awunja, 2025). Additionally, RFID provides better inventory visibility, helping minimize losses and maintain optimal stock levels, thus preventing overstock and stockouts (Immadisetty, 2025). Moreover, RFID technology aids in theft prevention by alerting management to unauthorized removals, effectively safeguarding assets.

In Africa, the status of RFID is gradually improving, though adoption rates differ significantly across countries and industries (Oluwaferanmi, 2025). There is growing interest in RFID, particularly in sectors such as warehousing, logistics, retail, and healthcare, where enhancing efficiency and optimizing inventory management is critical. However, widespread adoption faces several implementation challenges. Some international suppliers are supporting advanced technologies as part of broader digital transformation initiatives (Zhan et al., 2025). Additionally, numerous startups and established companies in the private sector are exploring RFID solutions, particularly where efficient tracking is essential (Mostafa, 2025).

According to projections from Coherent Market Insights (2024), despite its currently low market share in Africa, RFID adoption is expected to rise significantly by 2030, indicating a trend towards increased integration across various sectors in the region (Kineber et al., 2024). This study aims to investigate the key factors influencing the implementation of RFID technology, focusing on organizational, employee, and technological aspects within the West African context. Ultimately, the goal is to develop a solution model that stimulates and sustains a strategic management implementation plan for efficient supply chain operations. Additionally, the model will take into account the unique challenges faced in the region, ensuring that it is both practical and effective in promoting long-term operational efficiency and competitiveness.

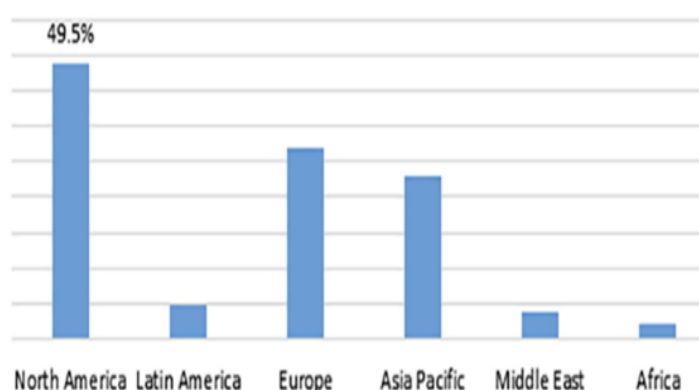


Fig. 1: Global RFID Market Share
(Source: Coherent Market Insights (2024))

1.1 Problem Statement

In general, while RFID technology presents promising opportunities for growth and efficiency globally, its adoption in West Africa reflects a dual narrative of opportunity and challenges. On the other hand, RFID has the potential to revolutionize various sectors, including international organizations currently operating in West Africa, by enhancing supply chain management, improving inventory tracking, and facilitating efficient logistics operations. However, these organizations face significant barriers that hinder widespread implementation.

Key challenges include high initial costs and issues with local manufacturing capabilities (Abyaneh et al., 2024). Additionally, there are limited literature studies on RFID in the region (Haswika et al., 2024). Addressing these challenges is essential for unlocking the full potential of RFID and ensuring its acceptance and integration within international organizations in West Africa.

1.2 Objectives

The primary objective of this study is to determine the opportunities and challenges in the implementation of Radio Frequency Identification (RFID) technology in an international organization in West Africa by focusing on the impact of technological, organizational, and employee factors on the effective adoption of RFID in supply chain operations. Additionally, it aims to identify strategies to overcome the challenges hindering its adoption.

2.0 Literature Review

2.1 Challenges and opportunities of RFID

This literature review explores existing research on the adoption, challenges, and opportunities associated with RFID technology in the West African context. Studies by Shahhin & Kasim (2025) indicate that RFID is being gradually integrated into sectors such as agriculture, healthcare, and logistics in West Africa. For example, a study by Adebayo et al. (2020) highlights the use of RFID in agricultural supply chains to improve traceability and reduce post-harvest losses. Similarly, health institutions are exploring RFID for patient identification and medication tracking, thereby enhancing service delivery (Ogunniyi & Ajayi, 2021).

Despite the potential benefits, the rate of adoption remains uneven across the region. Factors contributing to this disparity include infrastructure limitations, high costs of implementation, and a lack of technical expertise. The study by Mensah et al. (2019) discusses how regulatory frameworks and government initiatives could facilitate wider adoption, emphasizing collaboration between stakeholders.

Resistance to RFID technology in West Africa can be attributed to multiple factors. Concerns regarding data security and privacy are significant, as highlighted by Nwogugu (2022). Furthermore, organizational culture and resistance to change present additional barriers to widespread adoption of this approach. Many businesses are hesitant to invest in new technologies without clear evidence of return on investment (ROI). Infrastructure deficits also pose challenges. The inconsistent electricity supply and limited internet access in many areas hinder the effective implementation of RFID systems. As noted by Ndubisi (2021), without reliable technology infrastructure, the potential benefits of RFID remain largely untapped. Despite these challenges, several opportunities exist for leveraging RFID technology in West Africa. The increasing emphasis on digital transformation and e-governance plays a crucial role in creating a conducive environment for RFID adoption. Furthermore, the expansion of mobile technology can provide alternative platforms for implementing RFID solutions, as illustrated by the work of Koffi et al. (2023).

Therefore, this study investigates the challenges and opportunities of RFID implementation linked to organizational, employee, and technological factors within international organizations that drive innovation and investment in RFID technologies (Paul et al., 2025). It is essential to equip the workforce with the necessary skills to manage these technologies effectively (Omoniyi, 2024).

2.2 Technological Factors

Technological factors refer to advancements, innovations, tools, and changes in technology that impact organizational operations, production of goods and services, and interactions with customers and markets (Madanchian & Taherdoost, 2025).

In the study by Amin et al. (2024), Infrastructure Readiness, Cost of Implementation, and Technical Competence are identified as the most critical aspects of the technological factor. Reliable electricity and internet connectivity are essential for effective RFID implementation, and regions with robust infrastructure are more likely to adopt it successfully. However, the financial investment required for RFID systems, including software, hardware and maintenance, can be a deterrent, especially for small and medium-sized enterprises (SMEs) (Mohammed et al., 2025). Additionally, the level of technical expertise among personnel significantly impacts the effectiveness of RFID system implementation and maintenance (Crooks & Haddud, 2025).

H₁: Assessing the landscape of RFID Implementation: gaining ground or facing resistance through Technological Factors.

2.3 Employee Factors

Employee factors refer to the individual characteristics and internal conditions of an employee, including their motivation, knowledge, skills, abilities (KSAs), and personal life, which impact their performance, engagement, and behavior at work (Mishra et al., 2025).

Employee factors play a significant role in the successful implementation of RFID technology within an organization. Key aspects include training and skill development, acceptance and attitude towards technology, involvement in the process, and communication (Almandoz, 2025). Employees must be adequately trained to use RFID systems effectively; a lack of knowledge or skills can lead to improper usage and decreased productivity (Shahhin & Kasim, 2025). Employee openness to new technology significantly impacts implementation; positive attitudes can lead to better adaptation, while resistance can hinder progress.

H₂: Assessing the landscape of RFID Implementation: gaining ground or facing resistance through Employee Factors.

2.4 Organizational Factors

Organizational factors refer to internal elements such as structure, culture, leadership, policies, and resources that significantly impact individual and group behavior within an organization.

Change Management and Leadership Support are critical organizational factors in successfully implementing RFID technology within an organization (Rahman et al., 2025). The culture of the organization significantly influences its openness to embracing new technologies. Often, resistance to change arises from a lack of understanding regarding the benefits and potential return on investment (ROI) associated with RFID systems (Wahab et al., 2025).

Thus, strong leadership commitment to adopting new technologies is crucial for creating an environment that promotes innovation and experimentation with RFID solutions (Hinneh & Sangal, 2025).

H₃: Assessing the landscape of RFID Implementation: gaining ground or facing resistance through Organizational Factors.

Fig. 2 illustrates the research framework for the study, featuring three key hypotheses. The first investigates the impact of technological factors on RFID adoption in supply chain management, determining whether it leads to gaining ground or facing resistance. The second assesses the role of organizational factors in successful implementation. The third investigates employee-related factors, emphasizing how training and motivation affect RFID adoption. This framework aims to provide a comprehensive understanding of the elements influencing RFID integration in West African organizations.

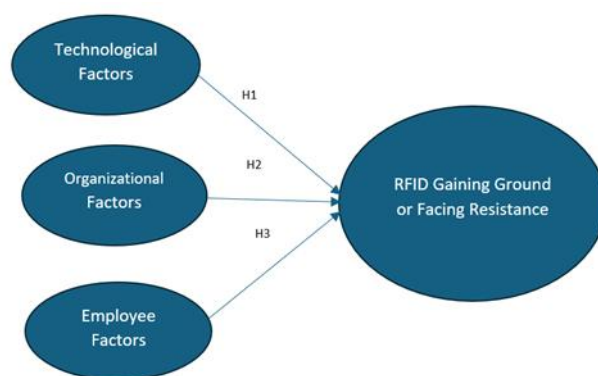


Fig. 2: Research Framework

3.0 Methodology

This study employed a solid quantitative research approach, following the methodology outlined by Zhu et al. (2025). A non-probability sampling method was utilized to collect responses from 384 supply chain professionals with diverse backgrounds, enhancing the study's representativeness. Questionnaires were systematically distributed via Microsoft Forms, utilizing a Likert scale (1 to 5) to ensure precise data collection, and the analysis was conducted using SmartPLS 4.1.0.9. Prior to the analysis, demographic information was carefully examined using Microsoft Power BI, yielding valuable insights into the participant demographic. Comprehensive checks for validity, reliability, and response bias confirmed the robustness of the questionnaire employed in this research (Ali et al., 2022). Adhering to the highest ethical standards, ethical approval was obtained from the senior management of international organizations, ensuring full compliance with their guidelines and reinforcing the integrity of the study.

4.0 Findings

4.1 Descriptive Analysis

The study starts by analyzing the demographic profile of respondents. The survey conducted among 384 participants revealed notable demographic trends concerning age and gender distribution. As illustrated in Table 1, the majority of respondents were female, accounting for 279 individuals (72.66%), while males comprised 105 respondents (27.34%).

In terms of age demographics, the most significant representation came from participants aged 41 to 50, with 168 respondents, which constitutes 43.75% of the total sample. Following closely were the 51 to 60-year-olds, numbering 157 participants, representing 40.89%. In contrast, younger age groups showed lower representation, with only 33 respondents (8.59%) in the 21 to 30-year range, and 26 individuals (6.77%) falling within the 61 to 65 age brackets. These results highlight the predominance of middle-aged individuals in the survey, providing important insights into the workforce demographic involved in RFID technology discussions.

Table 1: Demographic Analysis

Demographic	Types	Frequency(n=384)	Percentage (%)
Gender	Female	279	72.66
	Male	105	27.34
Age Group	21-30 Years	33	8.59
	41-50 Years	168	43.75
	51-60 Years	157	40.89

The results presented in Table 2 from the measurement model analysis demonstrate that all outer loadings exceed the threshold of 0.70, aligning with the guidelines established by Hair et al. (2019). The study evaluated construct validity and reliability through two key metrics: composite reliability (CR) and Cronbach's alpha (CA). The CR values for all constructs ranged from 0.953 to 0.976, signifying a high level of reliability. Similarly, the CA values ranged from 0.907 to 0.971, significantly surpassing the recommended cutoff of 0.7. Collectively, these findings indicate that the model adheres to high-quality standards in terms of reliability and validity.

Table 2: Measurement Model-quality criteria

	Construct	Loadings	CA	CR	AVE.
H ₁	Technological Factors	0.969	0.971	0.976	0.891
H ₂	Organizational Factors	0.900	0.907	0.925	0.713
H ₃	Employee Factors	0.938	0.939	0.953	0.801

The Fornell and Larcker analysis reveals positive results for Employee Factors (0.887), Technological Factors (0.891), and Organizational Factors (0.893), all of which exceed the recommended threshold of 0.70 as outlined by Rasool et al. (2025). Meeting this threshold ensures that the constructs are sufficiently distinct from one another, establishing a solid foundation for analyzing relationships within the model. These findings underscore the importance of each factor in the successful implementation of RFID technology, highlighting that they collectively contribute to the overall effectiveness of supply chain management within the organization.

Table 3: Fornell and Larcker Analysis

	Technological Factors	Organizational Factors	Employee Factors
Technological Factors	0.891		
Organizational Factors	0.489	0.893	
Employee Factors	0.817	0.572	0.887

Table 4 results show an R² value of 0.674, indicating that 67.40% of the variation in RFID Gaining/Facing (Y) can be attributed to Technological, Organizational, and Employee Factors (X₁, X₂, and X₃), as noted by Alshami (2019). This R² value reflects the variance accounted for in the endogenous constructs and serves as a significant indicator of the model's explanatory power (Hair et al., 2019). This finding suggests a strong relationship among the factors and effectively underscores the model's overall effectiveness in explaining the dynamics of RFID adoption within the organization.

Table 4: R² value Result

Model	R-square
RFID Gaining/Facing	0.674

5.0 Discussion

The analysis highlights that Radio Frequency Identification (RFID) technology is making significant inroads in West Africa, offering valuable opportunities for international organizations aiming to improve their supply chain management. The potential of RFID to enhance operational efficiency through advanced tracking systems and refined inventory control is becoming increasingly evident.

The study's first three hypotheses indicate a positive correlation between the growing acceptance of RFID technology and the success and speed of its adoption within organizations. This correlation is closely linked to the organizations' commitment to fostering a culture of technological innovation. A strategic approach during the implementation phase is vital to minimize potential operational disruptions that may arise. Findings show that employees are comfortable with RFID technology, effectively integrating it into their daily operations. There is strong evidence suggesting that RFID can fundamentally transform supply chain operations for international organizations in the region. However, the successful deployment of this technology is heavily dependent on the robustness of the existing IT infrastructure. Organizations must ensure their technological systems are compatible with RFID solutions to maximize the benefits.

Additionally, organizational factors play a crucial role in the success of RFID implementation. Strong leadership commitment and active employee support are essential drivers for effective adoption. Effective leadership is key in allocating necessary resources, aligning strategic goals, and managing the complexities involved in process modifications.

Moreover, developing a culture of technological acceptance within an organization is crucial for confronting the challenges encountered during RFID system deployment. The rate and success of RFID adoption can vary widely based on how effectively organizations promote innovation and gauge employee satisfaction with the RFID tools provided. By creating an environment that fosters technological acceptance and encourages open discussions about its uses, organizations can significantly enhance the overall success of RFID implementation.

The practical implications of these findings can be invaluable for sectors such as warehousing, logistics, retail, and healthcare in tracking and inventory management. They emphasize the interconnectedness of technological, organizational, and employee factors as essential components in harnessing the transformative potential of RFID technology in supply chain operations. By recognizing and

addressing these factors, organizations can streamline their transition to RFID-enhanced processes, resulting in improved efficiency and a competitive advantage in the marketplace.

6.0 Conclusion and Recommendations

In conclusion, this study underscores the significant role of technological, organizational, and employee-related factors in effectively navigating the operational opportunities and challenges associated with the implementation of Radio Frequency Identification (RFID) technology within an international organization in West Africa. The findings reveal a substantial potential for growth, driven by technological advancements and collaborative efforts among key stakeholders.

The research presents various strategies related to technological factors, proposing tailored solutions such as forming strategic partnerships with technology providers and emphasizing the importance of investing in local manufacturing initiatives to support RFID adoption. It also highlights the exploration of funding opportunities from international development agencies as a means to alleviate the financial burdens associated with implementing RFID technology. Together, these strategies aim to enhance the feasibility and effectiveness of RFID integration in supply chain management.

Crucially, the study emphasizes the necessity of engaging employees and cultivating a culture of technology adoption throughout the RFID implementation process. This involves soliciting feedback and addressing employees' concerns in real time. By fostering a sense of ownership, organizations can enhance acceptance and commitment to the new technology.

To ensure the stability and effectiveness of RFID implementation, organizations must invest in infrastructure improvements, including upgrading IT systems, ensuring reliable internet connectivity, and establishing a robust data management framework to support the integration of RFID technology across various departments. Leadership plays a pivotal role in this transition; executives should actively promote RFID initiatives by clearly communicating the strategic benefits, such as improved operational efficiency, reduced waste, and enhanced customer satisfaction. Maintaining open lines of communication regarding potential return on investment and competitive advantages associated with RFID technology is vital.

Moreover, organizations should implement comprehensive training programs to equip employees with the necessary skills and knowledge for successful RFID utilization. Such training should encompass both technical skills and a broader understanding of the implications of RFID technology on supply chain dynamics and operational processes.

Future research should broaden its focus to include various industries within Mali implementing RFID technology. By examining diverse applications across sectors such as retail, logistics, agriculture, and healthcare, future studies can provide deeper insights into the transformative potential of RFID and its ability to address unique industry challenges. By adopting these recommendations, organizations can significantly enhance their operational efficiency and strengthen their competitiveness in an increasingly technology-driven business landscape. With strategic investments, employee engagement, and commitment to ongoing research, the full transformative potential of RFID can be realized in West Africa.

Acknowledgements

The authors would like to express their sincere appreciation to the higher management, warehouse employees, and managers of the International Organization in West Africa for their valuable support throughout this research project. Their cooperation and insights have significantly contributed to the success of this study.

Paper Contribution to Related Field of Study

The study provides valuable insights into the effective integration of RFID technology within the international organization in Mali and the broader context of West Africa. It serves as a catalyst for further exploration and investment in technological solutions, aimed at enhancing both local and international supply chain operations.

References

- Almondoz, R. Z. (2025). Effects of Automation on Employee Attitudes in a Small-and-Medium Enterprise (SME) (Doctoral dissertation, Charleston Southern University).
- Amin, A., Bhuiyan, M. R. I., Hossain, R., Molla, C., Poli, T. A., & Milon, M. N. U. (2024). The adoption of Industry 4.0 technologies by using the technology organizational environment framework: The mediating role to manufacturing performance in a developing country. *Business Strategy & Development*, 7(2), e363.
- Dai, F., Li, F., Ma, J., & Chen, Q. (2025). Intelligent Warehouse Based on Radio Frequency Identification and Recurrent Neural Network. In *International Conference on Frontiers of Electronics, Information and Computation Technologies* (pp. 271-280). Springer, Singapore.
- David, N., & Ohanado, U. (2024). Leveraging emerging technologies for operational optimization and business model innovation in African enterprises. *Nigerian Journal of Technology*, 43(4), 829-838.
- Decarli, N., Guerra, A., & Guidi, F. (2025). Introduction to Radio-Frequency Identification (RFID) and RFID Positioning.
- Elkoraichi, Y., Elfezazi, S., & Belhadi, A. (2025). Analysis of barriers to blockchain technology adoption in the African agri-food supply chain. *Discover Sustainability*, 6(1), 289.

Fawunija, S. (2025). RFID-Based Employee Management System for Sbotech Oy.

Hinne, P. J., & Sangal, A. (2025). Navigating the technological landscape: An assessment of the advantages and disadvantages of technology adoption in the logistics and supply chain industry in India.

Iglesias Yepes, J. (2025). Transforming Hospital Clinic de Barcelona Logistics through RFID: An In-Depth Study of Implementation, Validation and Economic Assessment.

Immadisetty, A. (2025). Real-Time Inventory Management: Reducing Stockouts and Overstocks in Retail. *Journal of Recent Trends in Computer Science and Engineering (JRTCSE)*, 13(1), 77-88.

Jerez-Jerez, M. J. (2025). A study of employee attitudes towards AI, its effect on sustainable development goals and non-financial performance in independent hotels. *International Journal of Hospitality Management*, 124, 103987.

Leteane, O., Ayalew, Y., & Motshegwa, T. (2025, May). Factors Influencing the Successful Deployment of Blockchain and IoT-based Supply Chain Systems in Resource-Constrained Environments. In *2025 IEEE/ACM Symposium on Software Engineering in the Global South (SEiGS)* (pp. 21-26). IEEE.

Madanchian, M., & Taherdoost, H. (2025). Barriers and Enablers of AI adoption in human resource management: a critical analysis of organizational and technological factors. *Information*, 16(1), 51.

Masekwana, F., & Jokonya, O. (2025). Factors affecting the adoption of RFID in the food supply chain: A Systematic Literature Review. *Frontiers in Sustainable Food Systems*, 8, 1497585.

Mishra, S., Singh, S., & Tripathy, P. (2025). Linkage between employee satisfaction and employee performance: A case in banking industry. *Global Business Review*, 26(1), 137-148.

Mohammed, A. S., Amoah, C., & Abdulai, I. B. (2025). Technology integration on infrastructure to support educational needs in a college in Ghana. *Infrastructure Asset Management*, 1-17.

Mostafa, M. (2025). The Impact of Artificial Intelligence on Organizational Growth in Retail Sector A Mixed Method Thematic Analysis Using the TOE Framework. Available at SSRN 5295359.

Oluwaferanmi, A. (2025). Assessing the Cost-Effectiveness of Technological Innovations in Ghana's Port Operations: A Case Study on the Balance Between Investment Costs, Time Savings, and Economic Benefits for Stakeholders.

Omoniye, R. O. (2024). Strategies to Develop a Skilled Workforce in the Technology Industry (Doctoral dissertation, Walden University).

Omowole, B. M., Olufemi-Philips, A. Q., Ofadile, O. C., Eyo-Udo, N. L., & Ewim, S. E. (2024). Barriers and drivers of digital transformation in SMEs: A conceptual analysis. *International Journal of Frontline Research in Multidisciplinary Studies*, 5(2), 019-036.

Paul, P. O., Eyo-Udo, N. L., Onukwulu, E. C., Agho, M. O., Benoit, A., & Abbey, N. (2025). Innovative supply chain solutions for disease control in rural areas: A data-driven approach.

Shahhin, S., & Kasim, N. (2025). Study on RFID Implementation on Safety Vest for Real-time Human Safety Prevention in Construction Site.

Wahab, S. N., Hamzah, M. I., & Sohal, A. (2025). Leveraging top management support for blockchain-driven innovations in logistics and supply chain. *Asia-Pacific Journal of Business Administration*.

Yulasteriyani, Y., Putri, C. A., Istiqoma, I., Abror, M. Y., & Sartika, D. D. (2025). Sustainable Livelihood Level of the Community in Kalampadu Village, Ogan Ilir Regency:

Zhan, H., Hwang, B. G., & Krishnankutty, P. (2025). Embracing digital transformation for sustainable development: Barriers to adopting digital twin in asset management within Singapore's energy and chemicals industry.