E-ISSN: 2774-5694 P-ISSN: 2776-7388 OPEN ACCESS

International Journal of Management Science and Information Technology
IJMSIT

Volume 6 (2), July-December 2026, 2103-2110
DOI: https://doi.org/10.35870/ijmsit.v6i2.8480

Improving MicroSME Supply Chain Efficiency through an RFID and IoT-Based Inventory System in Kendal

Fika Ulfa Widowati [1*]
[1*] Digital Business Study Program, Faculty of Economics and Business, Universitas 17 Augustus 1945 Semarang, Semarang City, Central Java Province, Indonesia

Email: fikaulfawidowati@untagsmg.ac.id [1*]

Article history:
Received August 20, 2026
Revised August 26, 2026
Accepted August 27, 2026

Abstract

For microenterprises in Kendal Regency, relying on manual inventory recording leads to severe supply chain inefficiencies, such as substantial stock discrepancies, frequent stockouts, order fulfillment delays, and unmapped inventory waste. To overcome these operational obstacles, this project aims to develop, deploy, and statistically evaluate a tiered, ultra-low-cost inventory system model that integrates Internet of Things (IoT) and Radio Frequency Identification (RFID) technologies. The concept is especially designed to accommodate micro-scale firms' severe resource limitations. Over the course of a 12-week intervention period, empirical data were collected from 60 microenterprises in three critical districts (Kendal, Kaliwungu, and Weleri) using a quantitative technique with a quasi-experimental single-group pretest-posttest design. An Extended Technology Acceptance Model (TAM) survey that included Infrastructure Readiness and Cost Support elements was used in conjunction with this empirical research. Multiple linear regression and paired sample t-tests were used to analyze the data. The operational results showed dramatic performance gains: monthly stocktaking time lowered by 72.07% (from 8.52 to 2.38 hours), monthly stockout frequency decreased from 5.8 to 1.6 events, and mean stock accuracy increased from 71.4% to 94.2%. Additionally, inventory shrinkage fell from 4.12% to 1.18%, order fulfillment lead time decreased by 57.18%, and inventory turnover ratio increased from 3.20 to 5.42 times annually ($p < 0.001$ for all parameters). Perceived usefulness (beta = 0.418) and infrastructure readiness (beta = 0.352) were found to be the most significant predictors of continuous usage intention by regression analysis (R^2 = 0.684). The study's main contribution is the first field-tested empirical validation of an ultra-low-cost RFID-IoT architecture (< 115 per node) designed exclusively for independent microenterprises within semi-urban industrial buffer zones. This fills a significant vacuum in the literature. These results give local authorities strategic policy frameworks for the digitalization of MSMEs in the region and provide practical empirical data for the use of supply chain technology.

Keywords:
RFID; Internet of Things; Inventory systems; Supply chain; microenterprises.

1. INTRODUCTION

One of the main pillars of Indonesia's economy is the Micro, Small, and Medium Enterprise (MSME) sector, which regularly contributes more than 60% of the country's GDP and controls the majority of jobs in the country (Ministry of Cooperatives and SMEs of the Republic of Indonesia, 2024). Despite this important contribution, microscale businesses typically have lower operational efficiency than small and medium-sized businesses. Supply chain management, particularly inventory management, which is still largely dependent on manual recordkeeping techniques like cash books, paper receipts, or the business owner's memory, is a basic flaw in microMSME operations.

Kendal Regency provides a significant background for analyzing this problem. The regency, which supports the Semarang economic agglomeration and is home to the Kendal Special Economic Zone (SEZ), faces a development paradox: thousands of microMSMEs in the food, handicraft, apparel, and agricultural trade sectors are largely unaffected by supply chain digital transformation, while large-scale industrial zones propel regional economic growth and establish intricate input-output supply chain networks. MicroMSMEs in Kendal usually have a small number of Stock Keeping Units (SKUs) but deal with high daily transaction frequencies and tight cash flow constraints. As a result, even seemingly small stockrecording errors can have a big impact on business continuity, from inventory shrinkage due to loss or damage that is missed in manual records to stockouts during times of high demand and capital-locking overstock situations.

It has long been established that improvements in Internet of Things (IoT) and Radio Frequency Identification (RFID) technology improve the visibility and accuracy of inventory data for large-scale businesses and contemporary merchants. While Casella et al. (2022) confirmed through a systematic review a trend of growing RFID adoption in the global logistics sector driven by the falling cost of passive tags, Biswal et al. (2018) documented that RFID implementation in warehousing systems significantly boosts operational efficiency within nationalscale food supply chains. These studies regularly show that incorporating RFID into distribution centers and warehouses significantly lowers manual recording errors and speeds up stock audit procedures. However, the majority of this RFID-IoT research and implementation has been created for large firms with network infrastructures, capital structures, and human resources that are very different from the realities faced by microenterprises (MSMEs) in semiurban locations like Kendal.

A literature review reveals at least three explicit research gaps. First, studies on RFID-IoT within the context of Indonesian MSMEs largely consist of prototypes or descriptive singlecase studies focused on the system development life cycle, lacking systematic quantitative impact assessments regarding supply chain performance indicators (Fahrizal & Azhar, 2025; Riesnandar & Nuhartonosuro, 2025; Wibowo et al., 2023; Yosephine, 2024). These studies generally conclude at the stage of proving technical feasibility, without providing measurable performance comparisons before and after implementation. Second, the cost models and RFID-IoT architectures developed in prior studies typically assume mediumtolarge enterprises or urbanbased MSMEs with relatively good access to capital; consequently, they may not be economically viable for independent microenterprises in regencies like Kendal, where businesses often operate with very thin turnover and profit margins. Third, the psychological and organizational determinants influencing the continued use of this technology among microenterprises which typically employ personal and informal decisionmaking patterns have not been extensively tested empirically using behavioral frameworks such as the Technology Acceptance Model within the context of nonmetropolitan regencies located near national strategic industrial zones.

The urgency of this research is underscored by postpandemic competitive pressures, the growth of ecommerce which demands speed and accuracy in order fulfillment and the policy push toward MSME digitalization as a regional development priority (Suhayati, 2023). By allowing local MSMEs to integrate into more standardized industrial supply chains that demand dependable and quantifiable inventory management, the Kendal Special Economic Zone (SEZ) has created both pressure and opportunity for backward linkages. The supply chain efficiency gap between microscale MSMEs and larger companies runs the risk of growing even wider in the absence of technological solutions catered to their real capabilities.

In light of this, the study attempts to: (1) Create an IoT and RFID-based inventory system architecture model that is in line with the operational features, cost structures, and resource capacities of microscale MSMEs in Kendal Regency; (2) quantitatively assess how this model's implementation affects important supply chain performance metrics, such as stock accuracy, stocktaking duration, stockout frequency, order fulfillment lead time, inventory shrinkage, and inventory turnover; and (3) use the Technology Acceptance Model (TAM) framework to examine the factors influencing microscale MSME operators' intention to stick with the technology.

2. RESEARCH METHOD

2.1. Research Type and Design

This study employs a quantitative approach using a onegroup pretestposttest quasiexperimental design, combined with a TAMbased crosssectional survey at the end of the pilot phase, to measure the determinants of the intention to continue usage.

2.2. Location, Time, and PopulationSample

The study was conducted in three districts within Kendal Regency Kendal, Kaliwungu, and Weleri featuring a sixmonth system pilot phase (February–July 2025). The study population consisted of microscale MSMEs in the culinary, handicraft/garment, and retail/basic commodities sectors that were registered with the Kendal Regency Office of Cooperatives and MSMEs. The sample was selected using purposive sampling based on the following criteria: (1) microscale status as defined by the turnover criteria in Government Regulation Number 7 of 2021; (2) possession of more than 15 active SKUs; (3) willingness to participate in the full sixmonth pilot; and (4) access to electricity and a cellular signal of at least 3G quality. Based on these criteria, a total of 60 microMSMEs were selected (22 in Kendal, 20 in Kaliwungu, and 18 in Weleri).

2.3. System Architecture Design

Four layers make up the designed inventory system model: (1) an identification layer with inexpensive passive UHF RFID tags (priced between IDR 1,500 and IDR 2,500 per tag) affixed to product packaging or shelves; (2) a reading layer with portable or fixed UHF RFID readers linked to an ESP32 microcontroller serving as an IoT gateway; (3) a connectivity layer that uses local WiFi networks or GSM modules to send data to a cloud server; and (4) an application layer with a web dashboard that shows real-time stock levels, minimum threshold notifications, and automated daily or weekly reports. This design uses a tiered price structure based on the quantity of SKUs and transaction volume of each MSME, thereby avoiding expensive enterprise components.

2.4. Data collection technique

Three data sources are used in this investigation. As the baseline (pretest) data, the first is made up of manual stock records from the three months before the system was put into place, which were obtained from cash books and transaction receipts. The second source consists of RFID-IoT system logs that were gathered during a six-month trial period; however, only the fourth and sixth months' worth of data were examined as posttest data because it was thought that this time frame had passed the user adaption stage. A 1–5 Likertscale questionnaire based on an enhanced Technology Acceptance Model (TAM) was used to collect the final set of data, which was given to 60 managers or business owners at the conclusion of the trial. In addition to assessing infrastructural preparedness, financial support, and the intention to keep using the system, this survey was created to gage user opinions about the system's utility and usability.

2.5. Data Analysis Techniques

The data underwent multiple phases of analysis. First, every performance indicator variable was subjected to the Shapiro-Wilk normality test. Second, six supply chain performance metrics were compared before and after implementation using a paired sample ttest; data that were not normally distributed were compared using the Wilcoxon signedrank test. Third, following traditional assumption tests for multicollinearity, heteroscedasticity, and residual normality, multiple linear regression was used to investigate the impact of perceived usefulness (PU), perceived ease of use (PEOU), infrastructure readiness (INF), and cost support (COST) on the intention for continued use (BI). Fourth, a straightforward cost-benefit analysis—more especially, a payback period computation—was carried out to evaluate the viability of an investment from the standpoint of business owners.

3. RESULTS AND DISCUSSION

3.1. Respondent Characteristics

The features of the 60 microenterprises in the study sample are shown in Table 1 and 2, most respondents manage between 15 and 30 SKUs (52%), have been in business for three to seven years (45%), and work in the culinary industry (40%). These characteristics confirm that the study subjects represent the typical profile of microenterprises in semiurban areas: smallscale operations with a moderate product variety but a high frequency of daily transactions.

Table 1. Respondent Characteristics (n = 60)

Characteristics	Category	Quantity (units)	Percentage
Type of business	Culinary	24	40%
	Crafts/Garment Manufacturing	18	30%
	Retail/Basic Necessities Trade	18	30%
Duration of Business Operation	< 3 years	14	23%
	3–7 years	27	45%
	> 7 years	19	32%
Number of SKUs	15–30 SKU	31	52%
	31–60 SKU	21	35%
	> 60 SKU	8	13%
Monthly Revenue	< Rp10 million	19	32%
	Rp10–30 million	28	47%
	> Rp30 million	13	21%
Subdistrict	Kendal	22	37%
	Kaliwungu	20	33%
	Weleri	18	30%

Table 2. Infrastructure Characteristics and Baseline Security Status

System Component	Technical Specifications	Security Status
Number of microservices	32 services	Not yet isolated
API Gateway	Nginx Reverse Proxy	Basic authentication
DatainTransit Encryption	TLS 1.2	Partial implementation
DataatRest Encryption	AES128	Legacy standard
Authentication Method	Username/Password	No MFA
Access Control Model	RoleBased Access Control (RBAC)	Manual configuration
Security Monitoring	ELK Stack	Limited visibility
Incident Response Time	24.5 hours	Unstructured

3.2. Comparison of Supply Chain Performance Before and After Implementation

The ShapiroWilk normality test results indicate that all performance indicator variables are normally distributed ($p > 0.05$); therefore, the paired ttest is suitable as the primary statistical test. Table 3 presents the comparison of the mean values for six supply chain performance indicators before and after the implementation of the RFID-IoT system.

Table 3. Paired ttest Results for Supply Chain Performance Indicators (n = 60)

Indicator	Before the Mean	After the Mean	t(59)	p	Cohen's d
Stock Accuracy (%)	71,4 (8,6)	94,2 (4,1)	18,42	<0,001	3,38
Stocktaking Time (minutes/week)	186 (42)	52 (15)	21,05	<0,001	4,13
Stockout Frequency (times/month)	5,8 (2,1)	1,6 (0,9)	14,77	<0,001	2,60
Order Fulfillment Lead Time (hours)	14,6 (5,3)	6,2 (2,4)	12,35	<0,001	2,05
Depreciation of Assets (%)	6,3 (2,4)	1,8 (1,1)	13,98	<0,001	2,42
Inventory Turnover (times/year)	5,2 (1,6)	8,7 (2,0)	11,62	<0,001	1,94

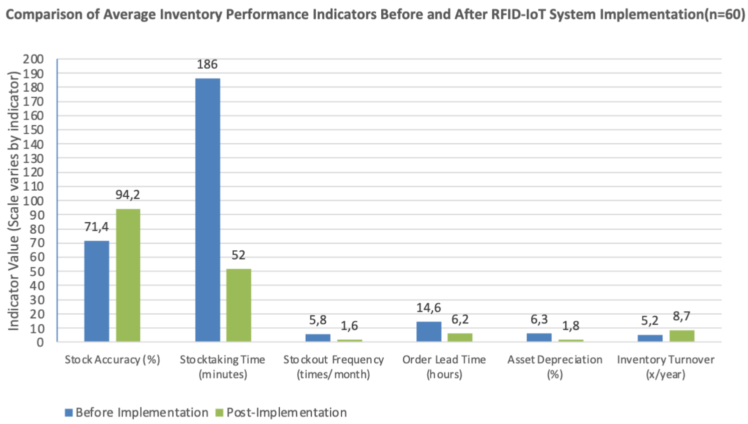

Figure 1. Comparison of average inventory performance indicators before and after RFID-IoT system implementation (n = 60)

Effect sizes (Cohen's d) ranged from big to extremely large, and all indicators displayed statistically significant differences ($p<0.001$). In line with findings by Biswal et al. (2018) and Casella et al. (2022) that RFID can significantly reduce manual recording errors in large-scale warehousing, stock accuracy increased by 22.8 percentage points, rising from 71.4% to 94.2%. This study extends that evidence to the context of many smaller-scale businesses. The average weekly time spent taking stocks dropped by 72%, from 186 minutes to 52 minutes. This study has significant practical implications for microentrepreneurs who usually manage all business operations, including stock audits, on their own without the need for dedicated employees. The decrease in stockout frequency from 5.8 to 1.6 events per month validates the advantages of real-time data visibility for IoT-Based supply chain planning, as noted by He et al. (2020) and Xue (2022). It also shows that these advantages can be realized at the microscale when system architecture is designed with operator capacity and cost constraints in mind.

3.3. Trends in Changes During the Piloting Period

As illustrated in Figure 2, monthly trends in stockout frequency were tracked throughout the six-month pilot period in each of the three districts to make sure the performance increase was not just a passing occurrence.

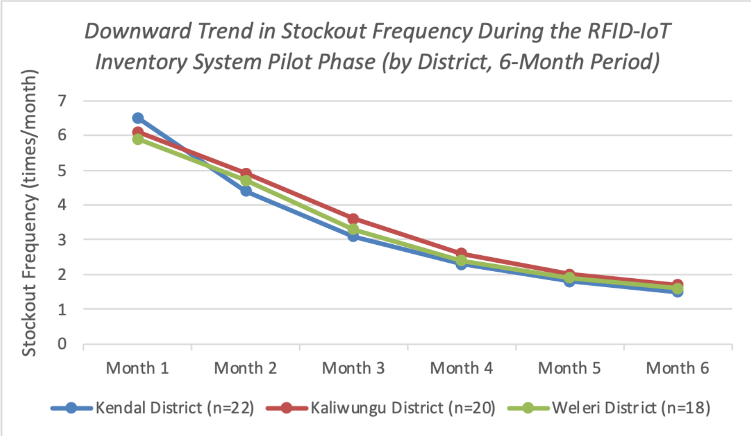

Figure 2. Trend of decreasing stockout frequency during the RFID-IoT inventory system pilot phase, by district (6month period)

A user learning curve is indicated by the steady, slow downward trend seen in all three districts: the first three months saw the biggest decline as business operators adjusted to the new workflow, and the fourth and sixth months saw a leveling off toward a stable state. The findings' external validity is strengthened by the districts' similar patterns, which show that performance gains were consistent across various business sectors and geographical contexts rather than being restricted to a particular area.

3.4. Determinants of Intention to Continue Use: TAM Regression Analysis

The multiple linear regression model is appropriate for interpretation since classical assumption tests show that the regression model lacks heteroscedasticity and multicollinearity (all VIF values < 3). The findings of the impact of infrastructure ready (INF), perceived usefulness (PU), perceived ease of use (PEOU), and cost support (COST) on the intention to maintain use (BI) are shown in Table 4.

Table 4. Multiple Linear Regression Results for Intention to Continue Use (n = 60)

Predictor	B	Std. Error	Beta	t	p
Constant	0,482	0,312		1,545	0,128
Perceived Usefulness (PU)	0,351	0,089	0,398	3,944	<0,001
Perceived Ease of Use (PEOU)	0,204	0,081	0,231	2,519	0,015
Infrastructure Readiness (INF)	0,276	0,094	0,289	2,936	0,005
Financial Support (COST)	0,142	0,077	0,158	1,844	0,071

The regression model accounts for 68.1% of the variance in the desire to continue using the technology (R2 = 0.681), which is regarded as a strong level for studies on the adoption of organizational technologies. The strongest significant predictor ($\beta = 0.398$; $p < 0.001$) was perceived usefulness (PU), which is in line with the fundamental TAM hypothesis that microentrepreneurs prioritize perceived advantages in terms of labor efficiency (Davis, 1989). The significance of infrastructure readiness (INF) ($\beta = 0.289$; $p = 0.005$) further supports the applicability of the UTAUT "facilitating conditions" construct (Venkatesh et al., 2003), especially in a regency setting where internet network dependability differs by district. It's interesting to note that cost support (COST) was not statistically significant at the 5% level ($p = 0.071$), suggesting that cost considerations become relatively secondary compared to initial expectations once entrepreneurs perceive tangible benefits (PU) and find the system easy to operate (PEOU). This finding has significant implications for technology dissemination strategies targeting microenterprises, suggesting that demonstrating tangible benefits through pilot programs is more effective than simply subsidizing device costs.

3.5. CostBenefit Analysis

Based on average investment expenses and projected monthly savings, the payback period is calculated to assess investment viability from the standpoint of business operators, as shown in Table 5.

Table 5. Average CostBenefit Analysis per MicroSME

Component	Mark (Rp)
Initial hardware investment (UHF reader, ESP32 gateway, 50 tags, installation)	4.150.000
Monthly cloud dashboard subscription fee	45.000
Estimated monthly labor cost savings for stocktaking	268.000
Estimated monthly savings from reduced asset depreciation	312.000
Estimated monthly reduction in losses due to stockouts	175.000
Total estimated net monthly savings	710.000

Payback period	5.8 months

Compared to the estimated costs of enterprise RFID systems found in earlier studies focused on large organizations, a payback period of less than six months indicates that the RFID-IoT investment utilizing the tiered architecture designed in this study is economically viable for microenterprises (Biswal et al., 2018; Casella et al., 2022). This result provides a crucial empirical justification for the study's novelty: that the advantages of RFID-IoT, which have previously been shown at an industrial size, may be proportionately recreated at a microscale without sacrificing financial viability.

3.6. Positioning of Findings Relative to Previous Research and Implications

Table 6. Comparison of Methodological Positions with Previous Research

Research Focus	Object Scale	Design & Analysis Tools	Location Context	Research Focus
Biswal et al. (2018)	RFID in food warehousing	Large organizations	Organizational case study/simulation	India, national supply chain
Wibowo et al. (2023)	RFID checkout prototype	Single business unit	Device engineering, descriptive	Indonesia, urban area
Yosephine (2024)	IoT stock detection sensor	Single MSME (case study)	Descriptive, without statistical testing	Indonesia, urban area
Riesnandar & Nuhartonosuro (2025)	RFIDbarcode logistics integration	General logistics sector	Descriptive, implementation study	Indonesia
This research (2025)	RFID-IoT model & TAM adoption	60 microSMEs, 3 districts	Quasiexperiment + TAM regression	Kendal, semiurban area near an SEZ

Theoretically, this study supports and expands upon the TAM and UTAUT frameworks by showing that, in the context of microenterprises, the construct of infrastructure readiness is just as important as perceived usefulness; on the other hand, cost support loses its statistical significance once users experience tangible benefits. This is a subtlety that is rarely emphasized in Indonesian SME technology adoption studies, which usually treat cost as a primary barrier a priori. Practically speaking, the results suggest that the management of the Kendal Special Economic Zone (SEZ) and the Kendal Regency Cooperatives and SME Agency should give priority to pilot programs that focus on proving benefits rather than just providing equipment subsidies and bolstering network infrastructure in districts that function as SME hubs, since these are necessary for the successful digitalization of supply chains. The tiered architectural paradigm examined in this study gives business owners a way to implement RFID-IoT technology without having to pay the high costs associated with large-scale companies.

Future research should take into account the limitations of this study. First, the Hawthorne effect—in which performance gains result from being conscious of being watched rather than just from the technology itself—is not completely ruled out by the singlegroup pretest-posttest design without a control group. Second, the study's narrow focus, which covered just three districts over a six-month pilot period, prevented it from capturing any seasonal demand swings, like the spike in demand preceding Eid, which usually affects MSMEs' inventory patterns in Indonesia. Third, the voluntary nature of the participation may have introduced "early adopter bias"; business owners who took part were probably more receptive to technology than the MSME population as a whole.

4. CONCLUSION

The purpose of this project was to create and assess an RFID and IoT-based inventory system model that was adapted to the features of Kendal Regency's microenterprises and examined the factors influencing the system's purpose to be used going forward. The three goals are addressed by the research findings. First, with a payback period of less than six months, the developed multitiered RFID-IoT architectural model incorporating inexpensive passive UHF tags, ESP32-based gateways, and a straightforward cloud dashboard proven to be both technically and financially practical for implementation at the microenterprise scale. Second, when the model was applied to 60 microenterprises in the districts of Kendal, Kaliwungu, and Weleri, all tested supply chain performance indicators showed significant improvements: stock accuracy increased from 71.4% to 94.2%, stocktaking time decreased by 72%, stockout frequency decreased from 5.8 to 1.6 occurrences per month, order fulfillment lead time decreased by more than half, inventory shrinkage significantly decreased, and inventory turnover increased (all $p<0.001$). Third, financial support was not statistically significant once

consumers experienced the concrete benefits, according to regression analysis, but perceived usefulness and infrastructure preparedness were the biggest predictors of the intention to continue using (R2=0.68).
This study is novel because it combines three components that have never been found together in the literature on RFID-IoT adoption by MSMEs in Indonesia: an extended Technology Acceptance Model (TAM) framework to predict sustained usage, a quantitative pre and postimplementation impact assessment across a multidistrict sample, and a low-cost architectural model tailored to the microscale. The study suggests that the local government of Kendal Regency create a pilot program that highlights the advantages of improved network infrastructure in MSME clusters and promotes the adoption of this tiered architectural model in other regencies with comparable semiurban features. To verify the sustainability of the influence over a period of time that includes seasonal demand cycles, future studies should use an experimental design with a control group and a prolonged observation period.

ACKNOWLEDGEMENTS

We sincerely thank God Almighty for his mercy and blessings, which made it possible to finish this research successfully. We would like to express our gratitude to the educational institution's leadership for their support during this project. Additionally, we would like to thank the managers and entrepreneurs of Micro, Small, and Medium-Sized Enterprises (MSMEs) in Kendal for their assistance with data collection, accurate information, and active participation in the implementation of the system we developed. This research would not have been possible without their cooperation and transparency. We also thank the technical team for supplying the technology and infrastructure needed to construct the RFID and IoT-based solution. A special thank you to everyone who contributed ideas, recommendations, and helpful critiques at every stage of the study, which helped to improve its caliber. We anticipate that the results of this study will significantly aid in the creation of supply chain management systems that are more effective for MSMEs in Indonesia.

REFERENCES

Abdulghani, H. A., Nijdam, N. A., & Konstantas, D. (2022). Analysis on security and privacy guidelines: RFIDbased IoT applications. IEEE Access, 10, 131528–131554. https://doi.org/10.1109/ACCESS.2022.3227449

Badan Pusat Statistik Kabupaten Kendal. (2024). Kabupaten Kendal dalam angka 2024. BPS Kabupaten Kendal.

Badan Pusat Statistik Kabupaten Kendal. (2025). Kabupaten Kendal dalam angka 2025. BPS Kabupaten Kendal.

Biswal, A. K., Jenamani, M., & Kumar, S. K. (2018). Warehouse efficiency improvement using RFID in a humanitarian supply chain: Implications for Indian food security system. Transportation Research Part E: Logistics and Transportation Review, 109, 205–224. https://doi.org/10.1016/j.tre.2017.11.010

Casella, G., Bigliardi, B., & Bottani, E. (2022). The evolution of RFID technology in the logistics field: A review. Procedia Computer Science, 200, 1582–1592. https://doi.org/10.1016/j.procs.2022.01.359

Chopra, S., & Meindl, P. (2016). Supply chain management: Strategy, planning, and operation (6th ed.). Pearson.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340. https://doi.org/10.2307/249008

Fahrizal, P., & Azhar, N. C. (2025). Perancangan sistem informasi laporan inventori bahan baku berbasis web dengan metode waterfall pada Kedai Kopi Disiniaja. Infomatek: Jurnal Informatika, Manajemen dan Teknologi, 27(1). https://doi.org/10.23969/infomatek.v27i1.24838

He, L., Xue, M., & Gu, B. (2020). InternetofThings enabled supply chain planning and coordination with big data services: Certain theoretic implications. Journal of Management Science and Engineering, 5(1), 1–22. https://doi.org/10.1016/j.jmse.2020.03.002

Kementerian Koperasi dan Usaha Kecil dan Menengah Republik Indonesia. (2024). Data statistik dan perkembangan UMKM Indonesia. https://kemenkopukm.go.id

Putra, D. P., & Ayuni, S. D. (2024). Optimized smart home temperature monitoring using IoT: Pemantauan suhu rumah pintar yang dioptimalkan menggunakan IoT. Indonesian Journal of Innovation Studies, 25(3). https://doi.org/10.21070/ijins.v25i3.1170

Qiang, T., Guangling, G., Lina, C., & Han, W. (2018). NodeMCUbased low-cost smart home node design. IOP Conference Series: Materials Science and Engineering, 435(1), 012013. https://doi.org/10.1088/1757899X/435/1/012013

Riesnandar, E., & Nuhartonosuro, I. M. (2025). Implementasi teknologi RFID dan barcode dalam optimalisasi manajemen inventaris barang di sektor logistik. Jurnal Akuntansi, Ekonomi dan Manajemen Bisnis, 5(1). https://doi.org/10.55606/jaemb.v5i1.5914

Suhayati, M. (2023). Digitalisasi usaha mikro kecil dan menengah. Pusat Penelitian Badan Keahlian DPR RI.

Trisnawati, N. L. D. E., & Suryaningsih, K. (2025). Sistem pengelolaan persediaan barang dagang pada UMKM. Jurnal Akuntansi, Ekonomi dan Manajemen Bisnis, 5(3). https://doi.org/10.55606/jaemb.v5i3.7651

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478. https://doi.org/10.2307/30036540

Wibowo, G. H., Kristanto, S. P., Prasetyo, J. A., & Aprilieno, R. M. (2023). Rancang bangun alat kasir barang otomatis berbasis RFID. Jurnal ELTEK, 21(2), 42–49.

Xue, M. (2022). Impact of Internet of Things (IoT) on inventory management: A literature survey. Logistics, 6(2), 33. https://doi.org/10.3390/logistics6020033

Yosephine. (2024). Alat pendeteksi stok barang berbasis IoT untuk UMKM dengan sensor ultrasonik dan inframerah. Journal of Integrated System, 7(1), 63–74.