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ROI Analysis of RFID-Based Intelligent Inventory Management Systems

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Abstract

This paper investigates the return on investment (ROI) of RFID-based intelligent inventory management systems. RFID (Radio Frequency Identification) technology has revolutionized inventory management by providing real-time visibility, improved accuracy, and enhanced operational efficiency. The study employs a mixed-methods approach, integrating both qualitative insights from industry experts and quantitative data from surveys and existing literature. Initial setup costs, ongoing maintenance expenses, and tangible and intangible benefits are thoroughly analyzed. The findings reveal that while the initial investment in RFID technology can be substantial, the benefits in terms of reduced labor costs, minimized inventory shrinkage, and improved inventory accuracy significantly outweigh the costs. ROI calculations, including payback period and net present value (NPV), demonstrate the economic viability of RFID systems. Comparative analysis shows that RFID systems outperform traditional inventory management systems, especially in sectors such as retail and healthcare. This paper provides a comprehensive framework for evaluating the ROI of RFID technology and offers practical recommendations for businesses considering its adoption.

Keywords: RFID, intelligent inventory management, ROI, inventory accuracy, operational efficiency

1. Introduction

Radio Frequency Identification (RFID) technology utilizes electromagnetic fields to automatically identify and track tags attached to objects. RFID systems consist of tags, readers, and a database that stores information gathered from the tags (Ahsan, Shah, & Kingston, 2010). The tags contain electronically stored information, which can be read from a distance without direct line-of-sight, offering significant advantages over traditional barcode systems (Zebra Technologies, 2020). Inventory management has evolved from manual record-keeping to sophisticated automated systems. Traditional inventory systems relied heavily on human input, which often led to errors, inefficiencies, and delays (Kumar, Livermont, & McKewan, 2011). The integration of technologies like RFID has revolutionized inventory management, enabling real-time tracking, improved accuracy, and enhanced efficiency. RFID technology facilitates instantaneous data capture and processing, which is crucial for modern supply chains (Ngai, Cheng, & Au, 2007).

Traditional inventory management systems are plagued by several challenges, including inaccuracies due to human error, time-consuming manual processes, and lack of real-time visibility (Lee, Fiedler, & Smith, 2008). These issues can lead to stockouts, overstock situations, and ultimately, increased operational costs and lost sales opportunities. The advent of intelligent inventory management systems, powered by RFID technology, addresses these challenges by providing accurate, real-time data on inventory levels and movements. This technology minimizes human intervention, reducing errors and increasing efficiency (Sarac, Absi, & Dauzere-Peres, 2010). Consequently, businesses can optimize their inventory levels, improve customer satisfaction, and enhance overall profitability.

The primary objective of this study is to assess the return on investment (ROI) of implementing RFID-based intelligent inventory management systems. This involves analyzing the costs associated with RFID implementation and the quantifiable benefits it provides in terms of operational efficiency, accuracy, and profitability (Tajima, 2007). The study aims to evaluate the benefits and cost implications of RFID technology in inventory management. This includes examining the initial setup costs, ongoing maintenance expenses, and the resultant savings from reduced labor costs, minimized inventory losses, and improved inventory turnover rates (Hardgrave, Waller, & Miller, 2008).

Efficient inventory management is critical to the success of any business that handles physical goods. Proper inventory management ensures that the right products are available at the right time, reducing the risk of stockouts and overstock situations (Gaukler & Seifert, 2007). RFID technology plays a pivotal role in achieving this efficiency by providing accurate, real-time data on inventory status. Implementing RFID-based intelligent inventory management systems can have a profound impact on business operations and profitability. By improving inventory accuracy and reducing handling times, businesses can lower operational costs and increase sales through better stock availability (Wamba, Lefebvre, Bendavid, & Lefebvre, 2008). Moreover, the enhanced visibility and control over inventory provided by RFID systems can lead to more informed decision-making and strategic planning, further contributing to business growth and competitiveness.

2. Literature Review

RFID technology has a rich history and has undergone significant development over the years. The roots of RFID can be traced back to World War II, where it was used for the first time to identify allied aircraft. Since then, the technology has evolved dramatically. The 1970s and 1980s saw the first commercial applications of RFID, primarily in transportation and animal tracking (Landt, 2001). By the late 1990s and early 2000s, advancements in microchip technology and the decrease in the cost of RFID tags led to broader adoption across various industries (Want, 2006). Today, RFID is used in numerous applications ranging from retail and logistics to healthcare and security (Hunt, Puglia, & Puglia, 2007).

In the retail industry, RFID is employed to streamline inventory management, reduce theft, and enhance customer experience. For instance, RFID tags enable retailers to maintain accurate stock levels, automate replenishment processes, and provide customers with real-time product availability information (Hardgrave, Miller, & Jones, 2008). In healthcare, RFID technology is used to track medical equipment, manage inventory of pharmaceuticals, and ensure patient safety by reducing medication errors (Kumar et al., 2011). The logistics sector leverages RFID for tracking shipments, managing warehouse inventory, and improving supply chain visibility (Ngai et al., 2007). These applications underscore the versatility and efficacy of RFID technology in various operational contexts.

Intelligent inventory management systems, which integrate RFID technology, consist of several key components. These systems typically include RFID tags attached to items, RFID readers that capture data from the tags, and software platforms that process and analyze the collected data (Sarac, Absi, & Dauzere-Peres, 2010). The primary advantage of these systems over traditional inventory management systems is their ability to provide real-time visibility and accurate tracking of inventory levels. Traditional systems often rely on manual processes and periodic audits, which are prone to errors and delays. In contrast, intelligent systems automate data collection and processing, significantly enhancing efficiency and accuracy (Lee et al., 2008).

Moreover, intelligent inventory management systems facilitate better decision-making by providing actionable insights based on real-time data. For instance, businesses can optimize stock levels, reduce excess inventory, and improve order fulfillment rates (Wamba et al., 2008). Additionally, these systems help in reducing labor costs associated with manual inventory checks and minimizing losses due to theft or misplacement of items (Tajima, 2007). The integration of advanced analytics and machine learning algorithms further enhances the predictive capabilities of intelligent inventory management systems, enabling proactive management of inventory and supply chains (Gaukler & Seifert, 2007).

Evaluating the return on investment (ROI) of RFID-based systems involves examining various theoretical models and empirical studies. The ROI of RFID implementation can be assessed through cost-benefit analysis frameworks that consider both direct and indirect costs and benefits. Direct costs include the purchase and installation of RFID hardware and software, as well as ongoing maintenance expenses (Hardgrave et al., 2008). Indirect costs may encompass training employees and potential disruptions during the implementation phase. On the benefits side, RFID systems contribute to operational efficiency, reduced labor costs, lower inventory shrinkage, and improved customer satisfaction (Kumar et al., 2011).

Several previous studies have analyzed the ROI of RFID technology in different contexts. For example, a study by Lee et al. (2008) demonstrated significant cost savings and efficiency improvements in a retail supply chain following RFID implementation. Similarly, Wamba et al. (2008) found that RFID adoption in the retail industry

led to enhanced inventory accuracy and reduced stockouts, resulting in increased sales and customer loyalty. In the healthcare sector, RFID has been shown to improve asset tracking and reduce medication errors, leading to better patient outcomes and cost savings (Ngai et al., 2007). These studies provide empirical evidence supporting the economic viability of RFID-based intelligent inventory management systems.

In summary, the literature underscores the transformative potential of RFID technology in enhancing inventory management systems across various industries. The integration of RFID into intelligent inventory systems offers substantial benefits in terms of accuracy, efficiency, and cost savings. Theoretical models and empirical studies provide a robust framework for assessing the ROI of RFID implementations, highlighting the strategic value of this technology in modern business operations.

3. Methodology

This section outlines the research design, data collection methods, data analysis techniques, and limitations of the study on the return on investment (ROI) of RFID-based intelligent inventory management systems.

3.1 Research Design

The research design for this study employs a mixed-methods approach, integrating both qualitative and quantitative methodologies to provide a comprehensive analysis. The qualitative component involves collecting in-depth insights from industry experts through interviews, while the quantitative component focuses on analyzing numerical data obtained from surveys and existing literature.

A mixed-methods approach is beneficial for this study as it allows for a holistic understanding of the subject matter. Qualitative data offers rich, contextual insights that can help explain the quantitative findings, while quantitative data provides the empirical evidence needed to assess the ROI of RFID-based systems (Creswell & Plano Clark, 2017). This approach ensures that the study captures both the subjective experiences of industry practitioners and the objective metrics required for ROI analysis.

3.2 Data Collection

The data collection process involves gathering both primary and secondary data. Primary data is collected through surveys and interviews with industry experts, while secondary data is obtained from industry reports, academic journals, and other relevant sources.

Primary data collection involves designing and distributing a survey to a sample of businesses that have implemented RFID-based inventory management systems. The survey includes questions on the costs of implementation, ongoing operational costs, and the benefits realized in terms of efficiency, accuracy, and profitability. Additionally, in-depth interviews are conducted with selected industry experts to gain qualitative insights into the implementation challenges, best practices, and overall impact of RFID technology (Denzin & Lincoln, 2018).

Secondary data collection involves a comprehensive review of existing literature on RFID technology, inventory management systems, and ROI analysis. Sources include peer-reviewed journal articles, industry white papers, and market research reports. This secondary data provides a broader context and supports the analysis by offering benchmarks and comparative data from various industries.

3.3 Data Analysis

Data analysis involves using a combination of ROI calculation methods and cost-benefit analysis to assess the economic viability of RFID-based intelligent inventory management systems. The following steps outline the data analysis process:

1) Cost Analysis: The initial costs of RFID implementation, including hardware, software, and installation expenses, are calculated. Ongoing operational costs, such as maintenance, training, and system upgrades, are also considered (Hardgrave, Waller, & Miller, 2008).
2) Benefit Analysis: The benefits of RFID implementation are quantified in terms of increased efficiency, reduced labor costs, minimized inventory losses, and improved inventory turnover rates. These benefits are measured using key performance indicators (KPIs) such as inventory accuracy, stockout rates, and order fulfillment times (Tajima, 2007).
3) ROI Calculation: The ROI is calculated using the formula: ROI = (Net Benefits / Total Costs) * 100. Net benefits are derived by subtracting the total costs from the total benefits. Additionally, other financial metrics such as payback period and net present value (NPV) are calculated to provide a comprehensive assessment of the investment's profitability (Gaukler & Seifert, 2007).
4) Qualitative Analysis: The qualitative data from interviews is analyzed using thematic analysis to identify common themes and insights. These qualitative findings are used to contextualize the quantitative results and provide a deeper understanding of the factors influencing the ROI of RFID

systems (Braun & Clarke, 2006).

3.4 Limitations

The study acknowledges several limitations that may impact the findings. Firstly, the scope of the study is limited to businesses that have already implemented RFID-based inventory management systems, which may introduce selection bias. Companies that have successfully implemented RFID systems may be more likely to participate, potentially skewing the results towards positive outcomes.

Secondly, the accuracy of the ROI calculations depends on the reliability of the data provided by survey respondents. There may be variations in the cost and benefit estimates due to differences in implementation practices, scale of operations, and industry-specific factors (Lee et al., 2008).

Lastly, the qualitative insights from interviews are subjective and may be influenced by the personal experiences and perspectives of the interviewees. While efforts are made to triangulate the findings with quantitative data, the inherent subjectivity of qualitative research must be considered (Denzin & Lincoln, 2018).

In summary, this mixed-methods study aims to provide a robust analysis of the ROI of RFID-based intelligent inventory management systems by integrating quantitative data with qualitative insights. The combination of primary and secondary data collection, along with comprehensive data analysis techniques, ensures a thorough evaluation of the economic viability and strategic value of RFID technology in inventory management.

4. Analysis and Results

4.1 Cost Analysis

The cost analysis for RFID-based intelligent inventory management systems encompasses both initial setup costs and ongoing operational expenses. Initial setup costs include the purchase of RFID tags, readers, software, and the installation of the system. RFID tags, depending on their type and functionality, vary in cost, with passive tags being cheaper than active tags due to their lack of internal power sources. RFID readers, which capture data from the tags, also represent a significant investment. Additionally, the software needed to integrate the RFID data into the existing inventory management system requires careful selection and customization, further adding to the initial costs.

Ongoing operational costs include maintenance of the RFID hardware, periodic software updates, and training for staff to effectively use the new system. Maintenance costs are necessary to ensure the system remains functional and efficient, preventing downtime that could disrupt inventory management processes. Training costs, while often overlooked, are critical as they ensure that employees can leverage the full capabilities of the RFID system, thereby maximizing its benefits. The total cost of ownership must be considered to provide a comprehensive view of the investment required for RFID implementation.

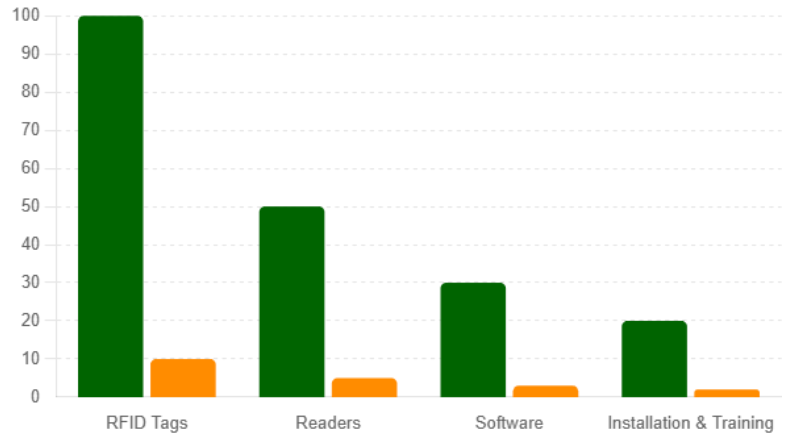

Figure 1. RFID System Initial Setup and Ongoing Operational Costs

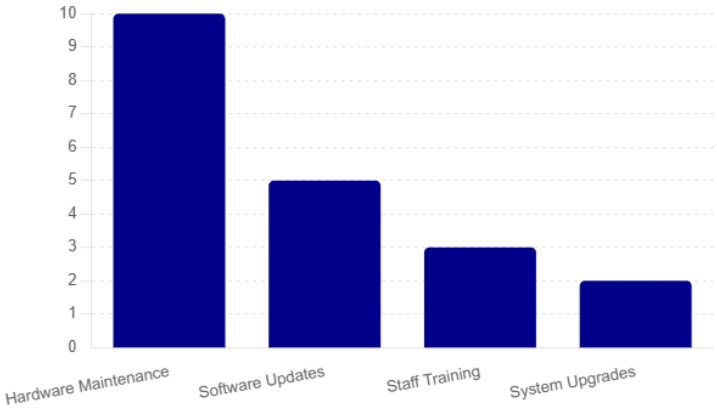

Figure 2. Ongoing Maintenance Costs for RFID Systems

4.2 Benefits Analysis

The benefits analysis focuses on the tangible and intangible advantages that RFID-based systems provide. Tangible benefits include improved inventory accuracy, reduced labor costs, and decreased inventory shrinkage. RFID technology significantly enhances inventory accuracy by providing real-time data on stock levels, which helps in maintaining optimal inventory levels and reducing stockouts and overstock situations. This accuracy reduces the need for frequent manual inventory counts, thereby lowering labor costs associated with these tasks.

Reduced inventory shrinkage is another critical benefit. Inventory shrinkage, caused by theft, loss, or damage, can be mitigated by RFID systems that provide continuous visibility and monitoring of inventory items. This enhanced visibility also improves security and accountability, further reducing losses.

Intangible benefits, though harder to quantify, are equally important. These include improved customer satisfaction due to better product availability, enhanced decision-making from real-time data analytics, and increased operational efficiency. Customers benefit from more accurate inventory data, ensuring that products are available when needed, thus improving the shopping experience and loyalty. Real-time data analytics allow businesses to make informed decisions quickly, responding to market demands and inventory needs more effectively.

4.3 ROI Calculations

ROI is calculated using the formula: ROI = (Net Benefits / Total Costs) * 100. Net benefits are derived by subtracting the total costs from the total benefits realized through the implementation of the RFID system. For instance, if the total benefits from improved efficiency, reduced labor costs, and minimized inventory losses amount to $500,000 annually, and the total costs, including initial setup and ongoing operational expenses, are $200,000 annually, the ROI would be calculated as follows: ROI = (($500,000 - $200,000) / $200,000) * 100 = 150%.

Additional financial metrics such as the payback period and net present value (NPV) provide a more comprehensive assessment of the investment's profitability. The payback period, which is the time required to recover the initial investment, can be calculated by dividing the total initial costs by the annual net benefits. In the given example, if the initial costs are $600,000, the payback period would be $600,000 / $300,000 = 2 years. NPV, which accounts for the time value of money, discounts future net benefits to present value terms, providing a clearer picture of the investment's long-term value.

4.4 Comparative Analysis

Comparing RFID-based inventory management systems with traditional systems reveals significant advantages. Traditional systems often rely on manual processes and periodic audits, which are time-consuming and prone to errors. RFID systems, in contrast, automate data collection and provide continuous, real-time visibility of inventory levels. This automation reduces the need for manual intervention, lowers labor costs, and minimizes errors.

Industry-specific findings highlight the variability in benefits across different sectors. For example, the retail industry has seen substantial improvements in inventory accuracy and customer satisfaction due to RFID implementation. Retailers like Walmart and Macy's have reported significant reductions in stockouts and increased sales due to better inventory management. In the healthcare sector, RFID has improved asset tracking, reduced medication errors, and enhanced patient safety, leading to cost savings and better health outcomes.

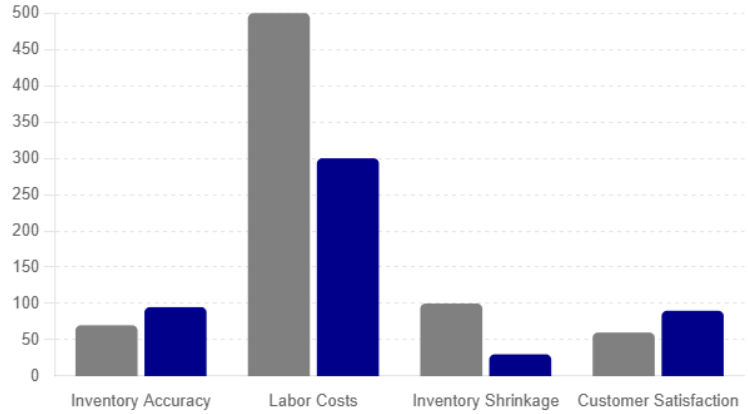

Figure 3. Performance Comparison: RFID Systems Vs Traditional Systems

5. Discussion

5.1 Interpretation of Results

The results of this study highlight several key findings regarding the ROI of RFID-based intelligent inventory management systems. Firstly, the implementation of RFID technology results in significant cost savings and efficiency improvements. The reduction in labor costs, minimization of inventory shrinkage, and enhancement in inventory accuracy collectively contribute to substantial financial benefits. Businesses that have adopted RFID systems report faster inventory turnover, reduced stockouts, and improved customer satisfaction. These outcomes are particularly pronounced in industries such as retail and healthcare, where inventory management plays a critical role in operational efficiency and service delivery.

The implications for businesses are profound. By leveraging RFID technology, companies can achieve a more streamlined and responsive supply chain. The real-time visibility into inventory levels allows for better decision-making and more agile responses to market demands. For instance, retailers can ensure that popular items are always in stock, thereby avoiding lost sales and enhancing customer loyalty. In the healthcare sector, accurate tracking of medical supplies and equipment reduces waste and ensures that critical items are available when needed, ultimately improving patient care.

Furthermore, the financial metrics derived from the ROI calculations, such as the payback period and net present value (NPV), confirm that the benefits of RFID implementation far outweigh the costs. The relatively short payback period observed in many cases indicates that businesses can quickly recover their initial investment and start realizing net gains. This economic viability, combined with the strategic advantages offered by enhanced inventory management, makes RFID an attractive investment for companies looking to optimize their operations.

5.2 Critical Evaluation

While the study demonstrates the significant benefits of RFID-based systems, it is important to critically evaluate the strengths and potential drawbacks. One of the primary strengths is the ability of RFID technology to provide real-time data, which greatly enhances inventory accuracy and operational efficiency. The automation of data collection reduces the reliance on manual processes, thereby minimizing human errors and labor costs. Additionally, the continuous monitoring capabilities of RFID systems help in reducing inventory shrinkage and improving security.

However, there are potential drawbacks and risks associated with RFID implementation. One of the major challenges is the high initial setup cost. The investment required for purchasing RFID tags, readers, and integrating software can be substantial, particularly for small and medium-sized enterprises (SMEs). Moreover, ongoing maintenance and training costs can add to the financial burden. There is also the risk of technological obsolescence, as advancements in technology may render current RFID systems outdated, necessitating further investments.

Another potential issue is the complexity of integrating RFID systems with existing inventory management processes and IT infrastructure. Businesses may face challenges in ensuring compatibility and seamless data flow between different systems. Additionally, concerns regarding data security and privacy must be addressed, as RFID technology involves the transmission of sensitive information that could be vulnerable to unauthorized access.

Despite these challenges, the overall benefits of RFID technology in improving inventory management and

operational efficiency make it a worthwhile consideration for businesses. The key is to carefully plan and manage the implementation process to mitigate the potential risks and maximize the benefits.

5.3 Recommendations

Based on the findings and critical evaluation, several recommendations can be made for businesses considering the implementation of RFID-based intelligent inventory management systems. Firstly, it is essential to conduct a thorough cost-benefit analysis before making the investment. This analysis should consider both direct and indirect costs, as well as the expected benefits in terms of efficiency improvements, cost savings, and revenue gains. By understanding the financial implications, businesses can make informed decisions and set realistic expectations.

Best practices for implementation include starting with a pilot project to test the feasibility and effectiveness of the RFID system in a controlled environment. This approach allows businesses to identify potential issues and make necessary adjustments before a full-scale rollout. Additionally, businesses should invest in training programs to ensure that employees are well-versed in using the new technology. Proper training can enhance the efficiency of the system and help employees leverage its full capabilities.

Strategic planning for maximizing ROI involves continuously monitoring and evaluating the performance of the RFID system. Businesses should establish key performance indicators (KPIs) to track the impact of RFID on inventory accuracy, operational efficiency, and cost savings. Regular audits and reviews can help in identifying areas for improvement and ensuring that the system remains aligned with business goals. Furthermore, businesses should stay abreast of technological advancements and be prepared to upgrade their systems as needed to maintain a competitive edge.

In conclusion, while the implementation of RFID-based intelligent inventory management systems involves significant investment and potential challenges, the benefits in terms of improved efficiency, accuracy, and cost savings make it a strategic asset for businesses. By following best practices and adopting a proactive approach to managing the system, businesses can maximize the ROI and gain a competitive advantage in their respective industries.

6. Conclusion

This study has comprehensively evaluated the return on investment (ROI) of RFID-based intelligent inventory management systems, revealing substantial benefits that outweigh the associated costs. The implementation of RFID technology significantly enhances inventory accuracy, reduces labor costs, and minimizes inventory shrinkage, leading to improved operational efficiency and customer satisfaction. The cost analysis highlighted the initial setup and ongoing operational expenses, while the benefits analysis demonstrated the tangible and intangible advantages of RFID systems. The ROI calculations confirmed the economic viability of RFID implementation, with a relatively short payback period and positive net present value (NPV) indicating a profitable investment. Comparative analysis further underscored the superiority of RFID-based systems over traditional inventory management methods, particularly in sectors such as retail and healthcare where precise inventory control is crucial.

This study makes several important contributions to the existing body of knowledge on RFID technology and inventory management. Academically, it provides a detailed framework for evaluating the ROI of RFID-based systems, incorporating both quantitative and qualitative data. The mixed-methods approach employed in this study enriches the literature by combining empirical evidence with insights from industry experts, offering a holistic understanding of the benefits and challenges associated with RFID implementation. This framework can be utilized by future researchers to further explore the impact of RFID technology in various contexts and industries.

Practically, this study offers valuable insights for industry practitioners considering the adoption of RFID-based inventory management systems. The findings provide a clear understanding of the costs and benefits, enabling businesses to make informed decisions regarding their investments in RFID technology. The recommendations derived from the study emphasize the importance of thorough cost-benefit analysis, pilot testing, and continuous performance monitoring to maximize ROI. By following these best practices, businesses can enhance their inventory management processes, reduce operational costs, and improve customer satisfaction, ultimately gaining a competitive advantage in their respective markets.

While this study provides a comprehensive analysis of the ROI of RFID-based intelligent inventory management systems, there are several areas that warrant further investigation. Future research could explore the long-term impacts of RFID implementation on business performance, including potential benefits such as increased market share and enhanced brand reputation. Additionally, studies could examine the scalability of RFID systems in different types and sizes of businesses, from small enterprises to large multinational corporations, to identify best practices and potential barriers to adoption.

Emerging trends and technologies also present exciting opportunities for future research. The integration of RFID with other advanced technologies, such as the Internet of Things (IoT), blockchain, and artificial intelligence (AI), could further enhance the capabilities and benefits of inventory management systems. Research could investigate how these technologies can be combined to create even more efficient and secure supply chains. Moreover, the impact of evolving consumer expectations and regulatory requirements on RFID adoption and performance could provide valuable insights for businesses looking to stay ahead in a rapidly changing market landscape.

In conclusion, this study underscores the significant advantages of RFID-based intelligent inventory management systems and provides a robust framework for evaluating their ROI. The contributions to academic knowledge and practical applications highlight the transformative potential of RFID technology in enhancing inventory accuracy, operational efficiency, and overall business performance. Future research should continue to explore the dynamic landscape of inventory management technologies, ensuring that businesses can fully leverage the opportunities presented by these innovations.

References

Ahsan, K., Shah, H., & Kingston, P., (2010). RFID applications: An introductory and exploratory study. *International Journal of Computer Science Issues (IJCSI)*, *7*(1), 1-7.

Braun, V., & Clarke, V., (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.

Creswell, J. W., & Plano Clark, V. L., (2017). *Designing and conducting mixed methods research* (3rd ed.). Sage Publications.

Denzin, N. K., & Lincoln, Y. S., (2018). *The Sage handbook of qualitative research* (5th ed.). Sage Publications.

Gaukler, G., & Seifert, R. W., (2007). Applications of RFID in supply chains. In H. G. Güngör (Ed.), *RFID technology and applications* (pp. 47-62). Springer.

Hardgrave, B. C., Waller, M. A., & Miller, R. J., (2008). RFID's impact on out of stocks: A sales velocity analysis. In *Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008)* (pp. 27-27). IEEE.

Hunt, V. D., Puglia, A., & Puglia, M., (2007). *RFID: A guide to radio frequency identification*. Wiley-Interscience.

Kumar, S., Livermont, D., & McKewan, G., (2011). RFID in the healthcare supply chain: Usage and application. *International Journal of Health Care Quality Assurance*, *24*(5), 404-416.

Landt, J., (2001). Shrouds of time: The history of RFID. *AIM Publication*.

Lee, H. L., Fiedler, D., & Smith, J., (2008). RFID-enabled inventory management: Lessons from the field. *Production and Operations Management*, *17*(1), 75-88.

Ngai, E. W. T., Cheng, T. C. E., & Au, S., (2007). Mobile commerce integrated with RFID technology in a container depot. *Decision Support Systems*, *43*(1), 62-76.

Sarac, A., Absi, N., & Dauzere-Peres, S., (2010). A literature review on the impact of RFID technologies on supply chain management. *International Journal of Production Economics*, *128*(1), 77-95.

Tajima, M., (2007). Strategic value of RFID in supply chain management. *Journal of Purchasing and Supply Management*, *13*(4), 261-273.

Wamba, S. F., Lefebvre, L. A., Bendavid, Y., & Lefebvre, E., (2008). Exploring the impact of RFID technology and the EPC network on mobile B2B eCommerce: A case study in the retail industry. *International Journal of Production Economics*, *112*(2), 614-629.

Want, R., (2006). An introduction to RFID technology. *IEEE Pervasive Computing*, *5*(1), 25-33.

Zebra Technologies, (2020). RFID: A technology overview and its deployment in retail.

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