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MOBILE APPLICATION DEVELOPMENT FOR INVENTORY MANAGEMENT USING BARCODE TECHNOLOGY

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Abstract

The development of a mobile application for inventory management using barcode technology is an innovation that aims to increase efficiency and accuracy in recording and managing stock of goods. Barcode technology allows the inventory data collection process to be faster and with fewer errors, replacing manual recording methods that are prone to human error. This mobile application is designed to provide easy access and flexibility for users, allowing them to perform barcode scanning and real-time inventory data updates anytime and anywhere. In this research, application development is explained starting from the design, implementation to testing stages. The final results show that the use of barcode technology in mobile applications significantly optimizes the inventory management process, increases time efficiency, data accuracy, and reduces operational costs. This application can also be integrated with other management systems such as ERP and CRM, providing a more comprehensive view of company operations. By implementing this technology, companies can make better and faster decisions regarding inventory management, minimize the risk of stock shortages or overstocks, and overall increase business productivity and profitability. This research concludes that developing a barcode-based mobile application is a proactive and strategic solution for managing inventory in the digital era.

Keywords: Mobile Applications, Inventory Management, Barcode Technology

INTRODUCTION

In recent decades, the number of information and communications technology (ICT) users has increased significantly. Globalization and the rapid spread of the internet have introduced various digital tools that make access to information and communication easier. Not only in big cities, but also in remoteareas, people are starting to actively use various digital platforms to interact, learn and work. This phenomenon indicates the importance of understanding and mastering ICT in everyday life (Hashim, 2022).

However, behind this progress, various challenges emerge that need to be overcome. One of the main challenges is the still significant digital divide between various groups in society. Access to digital infrastructure, device

availability and technological capabilities are uneven across regions. This causes differences in economic, educational and social opportunities, which ultimately impact people's quality of life (Yılmaz et al., 2022). For example, rural areas often have more limited access compared to urban areas.

Therefore, continuous efforts areneeded to overcomethedigital divide and ensure that all levels of society can enjoy the benefits of ICT developments. The government, private sector and civil society organizations need to work together to provide adequate infrastructure, technology training programs and policies that support digital inclusion (Sihombing, 2023). In this way, it is hoped that all individuals can participate actively in the digital era and take maximum advantage of existing technological advances.

In addition to efforts to overcomethedigital divide, it is also important to focus attention on aspects of digital literacy. Digital literacy is not only about thebasic ability to use technological devices and applications, but also includes an understanding of cyber security, digital ethics, and the effective and responsible use of technology. Through good digital literacy, people can be wiser in choosing, using and managing information in cyberspace, as well as avoiding risks that may arise such as online fraud and cyberbullying (NISHIMURA, 2023).

In addition, the rapid development of information technology also opens up great opportunities in various sectors, including education, health and the economy. For example, technology-based education allows the teaching and learning process to be more interactive and flexible, while telemedicine provides wider and faster access to health services. In the economic sector, e-commerce and digital payment platforms increase efficiency and inclusiveness in business transactions. By utilizing technology optimally, various industrial sectors can be more productive and innovative, which will ultimately encourage sustainable economic growth (Saifudin & Kautsar, 2023).

However, to ensure the success of this digital transformation, adaptive regulations and policies are crucial. The government needs to continue to monitor technological developments and regulatepolicies that areableto support innovation while ensuring protection of privacy and user rights. In this dynamic digital era, rigid and irrelevant regulations can become an obstacle to progress (Kastiya & Verma, 2023). Therefore, synergy between the government, private sector and society in creating a conducive digital ecosystem is very necessary.

Theroleof theprivate sector and community is also no less important in supporting digital transformation. Private companies, especially those operating in the technology sector, have a strategic role in providing innovativesolutions that can overcome various challenges in the digital era (Fedorov, 2024). Apart from that, the private sector can also contribute through Corporate Social Responsibility (CSR) programs which focus on increasing digital literacy and access to technology in society.

Communities and non-governmental organizations (NGOs) also have a significant role in raising awareness and empowering people to be more technologically literate. They can be a bridge between society and the government by providing education, assistance and advocacy for policies that support digital inclusion. This cross-sector collaboration is expected to be able to create inclusive and sustainable digital transformation (Arvendo et al., 2023).

Considering the existing challenges and opportunities, it is very important for all parties to work together in building a digital ecosystem that is fair and high quality. In this way, society can fully enjoy the benefits of this technological progress, such as improving the quality of life, efficiency in work, and new opportunities to work and innovate (Javier et al., 2024).

With closecollaboration between thegovernment, theprivatesector and the community, it is hoped that digital transformation can run smoothly and bring prosperity to all levels of society. Increasing digital access and literacy, accompanied by adaptive regulations and sustainable innovation, will be the main key in realizing Indonesia's vision as an advanced nation in the digital era (Nurrizqa, 2023).

RESEARCH METHOD

Thestudy in this research is qualitative with literature. Theliterature study research method is a research approach that involves the analysis and synthesis of information from various literature sources that are relevant to a particular research topic. Documents taken from literature research are journals, books and references related to the discussion you want to research (Earley, M.A. 2014; Snyder, H. 2019).

RESULT AND DISCUSSION

Traditional vs. Modern Inventory Management Digital

Traditional inventory management typically relies on manual record keeping which is prone to human error. In these systems, the use of a simple

notebook or spreadsheet is often the primary method for tracking incoming and outgoing goods. While this method is quite effective for small businesses, as the scale of operations increases, manual record keeping can become difficult to manage. Another disadvantage of traditional methods is their limitations in providing real-time reports and analysis, so that business decision making is often not based on accurate and up-to-date data (Putri, 2023).

In contrast, digital inventory management uses technology to automate and optimize the stock management process. By using special software, businesses can monitor stock in real-time, manage re-orders automatically, and get more detailed and accurate reports. This function is very useful in reducing the risk of running out of stock or overstock, both of which can havea negativeimpact on company operations and finances (Nisa & Rahmawati, 2023). Additionally, digital inventory management is often integrated with other systems such as sales, purchasing, and accounting, providing more comprehensive visibility into overall business performance.

Implementing a digital inventory management system also brings various other benefits, including cost and time savings. Process automation allows staff to focus more on strategic tasks rather than repetitive administrative work. In addition, information generated from digital systems helps in better planning, enabling companies to respond to changes in market demand quickly and efficiently (Zhong, 2022). Ultimately, the shift from traditional to digital inventory management not only improves operational efficiency but also provides greater flexibility and the ability to compete in an increasingly competitive marketplace.

However, the shift from traditional to digital inventory management is not without challenges. One of the main obstacles is the initial costs required to implement a digital system, which can include the costs of software, hardware, as well as staff training. Some businesses, especially small-medium enterprises, may find it difficult to deal with this initial investment (Shi, 2023). Additionally, there is also a learning curve associated with using new technology. Employees may need additional time to adapt and fully understand how to utilize digital systems effectively. However, this investment often pays off in the long run through increased efficiency and profits.

Data security is an important issue in digital inventory management. Digital systems depend on information technology, making them vulnerable to cyber threats such as hacking and data theft. Therefore, it is important for

companies to ensure that they use robust security solutions and continually update their systems to protect sensitive information. Apart from that, data storage also needs to be considered, either via a local server or via cloud computing, with each option having its own advantages and disadvantages. System security and reliability are aspects that should not be ignored so that business operations can run smoothly without interruption (Davis & Tong, 2023).

Nevertheless, the benefits that digital inventory management offers continue to encourage many companies to switch to this more modern and efficient approach. With functions such as advanced data analytics, global item tracking, and increased inventory accuracy, businesses can reduce operational costs and improve the quality of service to customers. Speed and accuracy in inventory management also allows companies to be more responsive to market changes and customer needs, so they can maintain and even increase competitiveness. Through digital innovation, businesses are not only able to optimize existing resources but also open up new opportunities for growth and expansion in the digital era (Xin & Mieghem, 2023).

The Role of Barcode Technology

Barcode technology plays an important role in various aspects of business operations, especially in inventory management and logistics. Barcodes work by encoding information in a pattern of lines or squares that can be read quickly and accurately by a barcode scanner. The implementation of this technology significantly reduces human errors that often occur in manual data input, while speeding up the process of checking and tracking goods. With barcodes, companies can ensure that product information is recorded accurately, from receipt of goods at the warehouse to delivery to the final customer (Solomon, 2023).

Additionally, barcode technology improves operational efficiency in warehouses and distribution centers. Warehouse workers can easily scan barcodes to update inventory status in real-time in the inventory management system. This facilitates better stock management, including timely tracking of goods and preventing overstocks and stockouts. In addition, barcodes also help in product traceability, allowing companies to know the exact location and quantity of certain items without having to carry out physical inspections, which require more time and effort (Chen, 2024). Thus, this technology not only saves costs and time, but also increases operational productivity.

Furthermore, barcode technology provides important benefits in the context of customer service quality. With accurate and fast data available via barcodes, companies can provide more precise delivery time estimates, increasing customer satisfaction. Additionally, the ability to track and manage products efficiently means companies can be more responsive to customer demands and market changes (Hanras et al., 2023). For example, if a particular product suddenly becomes popular, a company can quickly adjust inventory levels to meet that demand. Thus, barcode technology not only supports operational efficiency but also helps businesses in building better relationships with customers and increasing competitiveness in the market.

Barcode technology also plays a role in increasing data security and reliability. By reducing the need for manual data input, the risk of errors due to human error can be minimized. For example, in the healthcare industry, the application of barcodes to medicines and medical devices ensures that each item can be tracked with high precision, from production to use by patients. This reduces the risk of medical errors such as administering the wrong dose or using expired products (Gauthier-Wetzel, 2022). In other words, barcode technology helps maintain high standards of quality and safety in various industrial sectors.

Apart from the health industry, the retail sector also greatly benefits from the use of barcode technology. In the buying and selling transaction process, barcodes simplify the checkout process at the cashier. Products purchased by customers can be scanned quickly, enabling a faster and more efficient transaction process. This not only increases customer convenience but also allows stores to serve more customers in less time (Berg et al., 2024). Additionally, sales data collected through barcodes can be used for business analysis, helping stores understand purchasing trends and consumer behavior. With this information, stores can make better decisions regarding stock management and marketing strategies.

In the future, barcode technology is predicted to continue to develop with the integration of new technologies such as the Internet of Things (IoT) and artificial intelligence (AI). This combination can result in a smarter and more sophisticated inventory management system, where items can communicate with each other and report their status automatically. For example, IoT sensors deployed on products can integrate with barcode systems to offer real-time inventory updates to management. With AI, data analysis from barcodes can provide deeper insights and assist in strategic decision making (Kokate, 2024). Therefore, barcode technology is not only a

tool for operational efficiency, but also an important component in digital transformation and business innovation in the future.

Key Challenges in Traditional Inventory Management

A. Data Inaccuracy

One of the biggest challenges in traditional inventory management is data inaccuracy. Inventory management that still relies on manual recording is very vulnerable to human error, such as data input errors, double recording, or items that are not recorded. This inaccuracy can result in a mismatch between thephysical stock in the warehouse and the records in the system, so that the company risks losing sales due to running out of stock or experiencing financial losses due to overstocking (Singh, 2023).

B. Lack of Real-Time Visibility and Control

Traditional inventory management often lacks real-time visibility and control. When stock must be physically checked and recorded manually, the information obtained tends to be static and not immediately available for decision making. This makes it difficult for managers to respond quickly to changes in market demand or disruptions in the supply chain. The absence of an integrated system also means that stakeholders cannot view inventory data as a whole, resulting in inappropriate decisions and reduced operational efficiency (Seenithamby, 2023).

C. Time and Resource Consuming Process

Manual inventory management is very time and resource consuming. Warehouse staff must routinely check stock, input data, and reconcile physical and system records. This process not only takes up valuable time but also drains manpower that could be allocated to other, more productive tasks. Additionally, in a dynamic business environment, the inability to obtain inventory data quickly and accurately can hinder stock movement and cause bottlenecks in the supply chain. As a result, companies may experience decreased service to customers and increased operational costs (Shekhar, 2023).

D. Implementation of an Automated Inventory Management System

To overcome the challenges of traditional inventory management, many companies have started switching to the use of automated inventory management systems. This system uses software that is integrated with technologies such as barcodes and Radio Frequency Identification (RFID) to ensurereal-time data accuracy. This way, inventory data can be updated automatically every time a transaction comes in or goes out, reducing

human error and making stock information more reliable. This implementation also allows better tracking of goods movement, helping companies identify demand patterns and optimize inventory (Kim, 2023).

E. Use of Analytics and Predictions

Modern technology also enables the use of data analytics and predictive algorithms to manage inventory more efficiently. By leveraging historical data and market demand predictions, analytical systems can help companies optimizestock levels and reducetherisk of inventory shortages or excesses. For example, analytics can identify fast- and slow-moving products, allowing managers to devise more effective restocking strategies. In addition, with more accurate demand predictions, companies can coordinate their products according to seasonal trends or promotional campaigns, improving customer service and maximizing profitability (Mabizela et al., 2023).

F. Integration with other systems

Modern inventory management systems are often integrated with other systems within the company, such as Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM). With this integration, companies can have a holistic and coordinated view of their business operations (Hayat & Winkler, 2022). For example, data from a CRM system can provide insight into customer preferences and purchasing patterns, while ERP can help in production planning and control. This integration not only improves operational efficiency but also enables better decision making based on comprehensive, real-time data.

Continuing to embrace technological innovation in inventory management can bean important step in improving business performance and company competitiveness in an increasingly competitive market.

Mobile Application Development for Inventory Management

Mobile application development for inventory management has become one of the leading solutions in optimizing business operations in various sectors. This application provides users with the flexibility to manage stock items effectively and efficiently via their mobile devices. With features such as scanning barcodes or QR codes, recording incoming and outgoing goods, and automatic stock counting, this application is able to reduce the risk of human error and ensure inventory data is always updated (Mackey et al., 2022). This is especially important for small and medium-sized businesses that

may not have the resources to implement a complex inventory management system.

Additionally, mobile applications for inventory management often come with reporting and data analysis features that help business owners makemore informed decisions. For example, users can see sales reports per product, analysis of stock movements, and trends in demand for goods in a certain period. With this accurate and real-time information, business owners can identify products that are selling well or not selling well, and determine the right time to restock. This not only helps in maintaining the availability of goods, but also prevents excess stock which can tie up business capital (Dhondge et al., 2023).

In thefuture, thedevelopment of mobile applications for inventory management is predicted to become increasingly sophisticated with the integration of new technologies such as the Internet of Things (IoT) and artificial intelligence (AI). IoT sensors placed on storage shelves or products can provide automatic stock updates into the application, eliminating the need for time-consuming manual input. Meanwhile, AI can be used to analyze inventory data and provide recommendations based on demand patterns and predictions (Deyou et al., 2024). Thus, mobile applications for inventory management will become an increasingly vital tool in supporting the efficiency and success of business operations in the future.

Cross-platform integration is also an important aspect in developing mobile applications for inventory management. Applications that are integrated with ERP (EnterpriseResourcePlanning) or POS (Point of Sale) systems allow theinventory management process to run more synergistically with all aspects of business operations. For example, when thereis a sales transaction at the POS, stock is automatically updated in the inventory management system. This minimizes errors due to double data input and ensures that existing data is always consistent (Kevin & Nwosu, 2022). This way, users can see a comprehensive overview of stock and operations directly from their mobile devices, wherever and whenever they are.

Apart from that, data security is an aspect that cannot be ignored in developing mobileapplications for inventory management. Inventory data is a valuableasset that must beprotected from unauthorized access and potential cyber threats (Gregolin & Miranda, 2023). Therefore, application developers must ensure that the system they build is equipped with a robust security layer, including data encryption, layered user authentication, and real-time access monitoring. By implementing strict security standards, users can be

more confident in managing their inventory using mobile applications without worrying about the risk of data loss or leakage.

Finally, good user experience (UX) is the key to the success of a mobile application for inventory management. Intuitive and easy-to-use apps will increase adoption rates among users, even those who are not very technical. User-friendly interface design, simple navigation, and clear help and guidance all contribute to user comfort in carrying out daily operations. The addition of features such as reminder notifications for restocks, multi-language support, and customization according to business needs further enriches the user experience (Alhaj et al., 2022). Thus, mobile applications are not only tools for inventory management, but also strategic partners in business growth and efficiency.

CONCLUSION

Mobile application development that utilizes barcode technology for inventory management offers a number of significant benefits, increasing operational efficiency and data reliability in the modern business environment. Overall, these kinds of applications bring about an important transformation in the way companies manage their stock. Here are some key points that can be concluded: The use of barcode technology minimizes human error in inventory recording. Every incoming and outgoing item can be recorded automatically, ensuring the recorded data is more accurate. Mobile applications that support barcode scanning enable employees to process inventory faster, reducing the time required for manual record keeping and reducing associated operational costs. By leveraging barcode technology-based mobile applications, companies can bring significant advancements to their inventory management. This not only improves operational efficiency, but also provides a sustainable competitive advantage in an increasingly dynamic market.

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