

Digitalization Of The Supply Chain And Improvement Of Human Resource Competencies As Drivers Of The Future Economy

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Abstract. This study aims to analyze the role of supply chain digitalization and human resource competency improvement in driving Indonesia's future economic growth. In the era of Industry 4.0 and moving towards Society 5.0, digital transformation in the supply chain is key to improving efficiency, transparency, and national competitiveness. On the other hand, strengthening the capacity and adaptability of human resources is necessary so that technology can be utilized optimally. The methodology used in this study is descriptive quantitative, with an additional qualitative approach through literature studies and secondary data analysis from national and international reports related to digitization, supply chain management, and HR competency development in the digital economy framework. The results of the study show that the integration of digital technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and Enterprise Resource Planning (ERP) systems in the supply chain can accelerate the flow of goods and information. However, without adaptive and competent human resources, digitization will not have the maximum impact. This research contributes to providing strategic policy recommendations for the government and industry players to strengthen digital infrastructure and expand human resource competency development programs. Thus, the synergy between technology and human resources can become the main driver of inclusive and sustainable economic development in Indonesia.

Keywords: Digitalization, supply chain, human resource competencies, future economy, Indonesia's development

1. INTRODUCTION

In recent years, digital transformation has become a key pillar in supporting the growth and sustainability of global industries, including in Indonesia, where technological developments such as the Internet of Things (IoT), Artificial Intelligence (AI), cloud computing, and Enterprise Resource Planning (ERP) systems have driven a major revolution in how supply chains are designed, managed, and integrated across industrial sectors. Supply chain digitization not only improves operational efficiency, but also accelerates information flow, optimizes inventory, and strengthens overall business process transparency [1]. Approximately 58% of Indonesian companies have begun to adopt digital-based supply chain management systems to increase their competitiveness in an increasingly competitive global market. However, despite advances in technological infrastructure, the success of digitization is largely determined by the readiness of human resources (HR) to absorb, manage, and adapt to rapid and complex digital changes [2], where the development of HR competencies, especially in terms of digital literacy, data analysis skills, critical thinking, and sensitivity to new technologies, is fundamental in supporting the acceleration of comprehensive digital transformation [2].

In an era of globalization and rapid technological advancement, digital transformation has become a key factor in supporting business growth and sustainability in various sectors, including in Indonesia [3]. Changes in

consumer behavior and technological developments have encouraged both small and large businesses to be more responsive and adaptive [1]. One sector that has undergone significant changes is the retail business, both traditional businesses such as stalls and conventional markets, as well as modern businesses such as minimarkets, supermarkets, and e-commerce [4].

Product creativity and innovation are key factors that influence the growth and success of Micro, Small, and Medium Enterprises (MSMEs) [5]. In the face of increasingly fierce competition, MSMEs need to develop quality products that can meet the needs and demands of an ever-changing market [6].

Traditional businesses generally still rely on manual processes, while modern businesses have adopted technologies such as Point of Sales (POS) applications, automatic stock monitoring systems, and the use of cloud-based platforms [7]. This difference has a direct impact on operational efficiency and information transparency, especially in supply chain management [8].

Human resource development must be sustainable through digital training in order to become agents of change, not just passive actors [9]. Unfortunately, most studies still discuss supply chain digitalization and human resource development separately [10].

Therefore, the main objective of this study is to design a supply chain digitization model that is integrated with a strategy for improving human resource (HR) competencies, in order to create synergy between technological infrastructure and human readiness in facing the challenges of digital transformation in the industrial sector. Through this approach, it is hoped that a supply chain system can be built that is not only efficient and adaptive to technological developments, but also supported by human resources with high digital literacy, analytical skills, and strong competitiveness at the global level.

2. LITERATURE REVIEW

The era of digitalization has fundamentally changed the paradigm of business management, including supply chain management and human resource development. In the context of the Indonesian economy, which is dominated by micro, small, and medium enterprises (MSMEs), digital transformation presents both challenges and strategic opportunities to improve competitiveness and operational efficiency. This literature review examines various aspects related to supply chain digitalization and human resource competency improvement based on relevant previous studies.

Research on supply chain digitalization has grown rapidly in the last decade, in line with advances in information and communication technology. However, research focusing on integrating technology with human capacity development, particularly in the context of micro enterprises, is still limited. This creates a knowledge gap that needs to be filled through comprehensive and applicable research.

This literature review was compiled to provide a solid theoretical foundation for research on the synergy between supply chain digitalization and human resource competency improvement. The literature review is organized into several interrelated main themes, ranging from the basic concepts of supply chain digitalization, the role of information technology, the digital transformation of MSMEs, to strategies for developing human resource competencies in the digital era.

2.1 *The Concept of Supply Chain Digitalization*

Supply chain digitization has become a new paradigm in modern business operations management. Serang and Ardanugraha [1] assert that supply chain digitization not only improves operational efficiency, but also accelerates information flow, optimizes inventory, and strengthens overall business process transparency. Their research shows that information transparency in the supply chain has a significant effect on decision-making speed, logistics performance, and business partner trust.

Widowati et al. [11] in their research on supply chain digitalization and company performance argue that the integration of digital technology in the supply chain has a positive impact mediated by internal integration. This indicates that the success of digitalization depends not only on technology adoption but also on the organization's ability to integrate systems internally.

2.2 *Technology in the Digital Supply Chain*

Technological developments such as the Internet of Things (IoT), Artificial Intelligence (AI), cloud computing, and Enterprise Resource Planning (ERP) systems have driven a major revolution in the way supply chains are designed, managed, and integrated across industrial sectors. Mustafa [4], in his research on SME collaboration systems based on supply chain management, emphasizes the importance of designing systems that can increase the competitiveness of MSMEs through effective collaboration.

Jamal et al. [12] analyzed the use of information technology in optimizing Supply Chain Management, showing that the implementation of information technology can significantly improve the efficiency and effectiveness of supply chains. Their research highlights the importance of information system integration in creating responsive and adaptive supply chains.

2.3 *Digital Transformation in the MSME Sector*

Angraini et al. [3] in their systematic review of the digital transformation of Indonesian MSMEs explain that digital transformation has become a key factor in supporting business growth and sustainability in various sectors. Changes in consumer behavior and technological developments are encouraging both small and large businesses to be more responsive and adaptive.

Andy and Widiono [7] examined technological innovations in sales management through web-based Point of Sales applications for MSMEs. Their research shows that POS applications can improve operational efficiency and information transparency in MSME business management. Afrizal et al. [13] made a similar point when they designed a desktop-based cashier application using the Rapid Application Development method, showing that simple but effective technological solutions can be applied to MSMEs.

3. RESEARCH METHODOLOGY

This study uses a mixed methods approach, combining descriptive quantitative methods to measure the level of digitization and human resource readiness, as well as exploratory qualitative methods to gain an in-depth understanding of supply chain dynamics and the challenges of implementing digital technology in traditional retail businesses.

Data collection used observation sheets compiled based on indicators of digital literacy, frequency of technology use, operational time efficiency, and attitudes toward technology [14]. Data sources consisted of primary data (respondents who owned small grocery stores) and secondary data from the latest literature on MSME digitalization, supply chain management, and human resource development. Data analysis was conducted using quantitative descriptive methods to measure the extent of the impact of digitalization [15], and qualitative thematic methods to identify challenges and opportunities in the digital transformation process [11].

Identify and map the current supply chain, particularly in the micro-business sector such as grocery stores. The methods used for this stage are field observation, semi-structured interviews, and business document analysis (if available). Visual aids such as SIPOC diagrams (Supplier, Input, Process, Output, Customer) and Business Process Mapping (BPM) are used to describe the flow of business activities, from procurement of goods, stock recording, to sales transactions to customers [16]. This identification aims to find gaps in efficiency and the potential for technology integration in daily operational processes [17].

After mapping the actual conditions, the next step is to model the supply chain digitization. According to Adi and Kristin [18], modeling is carried out using a systems approach with the help of Data Flow Diagrams (DFDs) to describe the flow of data in the digitization process, as well as Entity Relationship Diagrams (ERDs) to show the relationships between entities such as suppliers, goods, transactions, and customers in a digital context. To clarify user interactions with the digital system, Unified Modeling Language (UML) is also used. This model is modular in nature so that it can be implemented in stages in accordance with the capabilities of micro businesses [13].

In line with a study conducted by Jamal et al. [12], which supports the successful implementation of supply chain digitization, this study also analyzes human resource (HR) competencies as a key determining factor. Based on the results of observations and interviews, it was found that low digital literacy, lack of experience in using technology, and limited access to training were the main causes of the slow digital system by micro-businesses such as grocery stores [19]. The evaluation was conducted by increasing the frequency of technology use and changing attitudes towards digitalization [20]. With this approach, improving HR competencies is expected to be a direct solution to technological barriers and encourage sustainable digital transformation.

4. RESULTS AND DISCUSSION

This study was conducted to examine the extent to which supply chain digitization and human resource competency improvement contribute to operational efficiency and increased competitiveness of micro businesses, particularly small shops. Using a mixed-method approach consisting of descriptive quantitative and exploratory

qualitative analysis, this study obtained empirical results that describe the actual conditions, challenges, and potential for digital transformation that can be applied at the micro business scale.

4.1 Mapping the Actual Conditions of the Grocery Store Supply Chain

Based on field observations and semi-structured interviews with grocery store business owners, it was found that the operational system used is still very manual and conventional. The process of procuring goods from suppliers, recording inventory, and transactions with customers are done by hand without an integrated system. This causes a number of problems such as recording errors, undetected stockouts, slow service, and inefficiency in operational management.

The SIPOC diagram and Business Process Mapping used in the mapping stage show that the supply chain process runs in a flow that has not been digitized and does not have well-documented historical data. As a result, shop owners find it difficult to make strategic decisions, such as adding stock, identifying best-selling products, or managing suppliers.

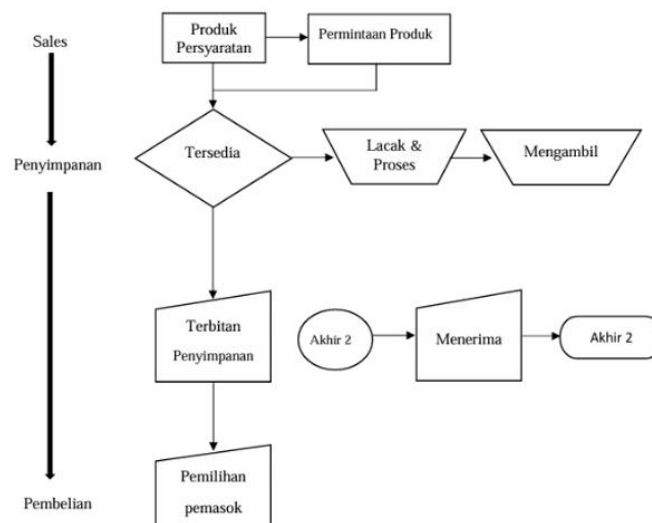


Figure 1. Mapping the Actual Conditions of the Grocery Store Supply Chain

Representation of the mapping of the actual conditions of the supply chain in micro businesses such as grocery stores, emphasizing the logical flow of the product fulfillment process, starting from the sales department, through the storage system, to the process of purchasing or procuring products from suppliers. This diagram illustrates how the actual process that takes place in grocery stores is still manual, not yet digitized, and highly dependent on the instant decisions of business owners based on direct observation of product availability. This type of modeling is crucial for understanding the critical points that cause inefficiencies in the grocery store supply chain, so that it can later become the basis for more structured and technology-based system improvements.

The flow begins with two main inputs, namely “Required Products” and “Product Demand.” In the context of a grocery store, product demand usually comes from customers who come directly to the store to buy their daily necessities. Meanwhile, “required products” can refer to the types of goods that must be available on a regular basis, such as rice, cooking oil, instant noodles, soap, or cigarettes. After receiving a request, the shop owner will directly check the availability of the product in the shop. This process is often done visually and based on memory, because most shops do not have a well-documented stock recording system.

The “Available” stage is the first decision point in the flow. If the product is available, the shop owner immediately proceeds to the “Track & Process” stage, which in this context means manually recording the request or directly serving the customer. This process is then followed by “Retrieving” the product from the shelf or display case to give to the customer. All of these processes are usually carried out by one person, namely the shop owner or attendant, without an integrated system or digital tools, making them highly prone to recording errors, sudden stock shortages, or even forgetting customer requests.

However, if at the “Available” stage it is found that the item is unavailable

or almost out of stock, the process will move on to the “Storage Issuance” stage, which in practice is a reminder or record of stock requirements by the shop owner, often done verbally, manually on paper, or even just relying on memory. Next, the flow moves to the “Supplier Selection” stage, which is when the shop owner decides where to repurchase the product. Grocery shop owners have several regular supplier options, such as wholesale agents, local distributors, or modern wholesale stores (such as supermarkets or wholesale centers), and this selection usually depends heavily on proximity, product availability, and selling price.

After the product is purchased from the supplier, the goods will enter the “Receiving” stage, which means that the product has been received by the store and is ready to be resold to customers. However, in the actual flow of a grocery store, this receiving process is not always accompanied by proper recording. Products are usually immediately rearranged on the sales shelves without a systematic quantity and quality checking procedure. Next, the diagram shows the “End 2” symbol, which indicates that the supply chain process is complete for one demand cycle. This symbol also appears after “Storage Release,” indicating that under certain conditions, the process can be delayed or stopped if there is no purchase decision (for example, due to lack of capital or rising prices).

Mapping these actual conditions shows that the supply chain of grocery stores is linear, reactive, and not yet digitized. The absence of a digital storage system means that store owners can only respond to shortages after demand occurs or when stocks are completely empty. Additionally, minimal or even non-existent recording processes result in a lack of historical transaction and stock data that would be useful for future purchase planning. The lack of integration between consumer demand and available stock makes grocery store inventory management vulnerable to stock-out, overstocking, and sudden purchases at higher prices.

By understanding the current situation, it is clear that there is a significant need to implement a more modern, efficient, and data-driven supply chain management system, even on a micro scale. The digitization process with tools such as stock recording using simple applications, order integration with suppliers, and periodic demand analysis can be a feasible initial solution for grocery stores. The mapping model as shown in the figure can also be used as a baseline to compare the initial conditions with the conditions after digitization or stock management training.

Overall, this diagram illustrates the actual conditions of the supply chain process in traditional grocery stores. This mapping is important as a basis for designing strategies to increase the capacity and operational efficiency of grocery stores, whether through managerial training, the introduction of simple digital technology, or the provision of micro-logistics platforms that are directly connected to small businesses. Therefore, mapping the actual conditions not only serves as an analytical tool, but also as a starting point for designing contextual, applicable solutions that are in line with the adaptability of MSME players in the micro-retail sector.

4.2 Designing a Supply Chain Digitalization Model

After mapping the actual conditions, the next step is to design a digital system that suits the needs and capacity of the grocery store. Modeling is carried out using tools such as Data Flow Diagrams (DFDs) to illustrate the data flow from the procurement process to the transaction.

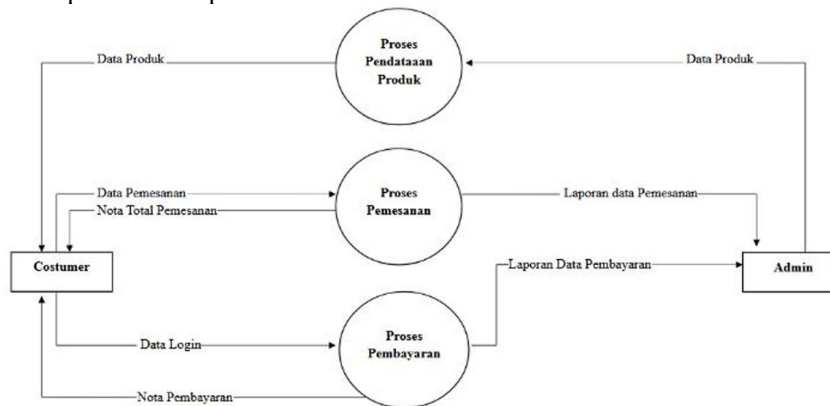


Figure 2. Data Flow Diagram (DFD) of the Digital Ordering and Payment System for Grocery Stores

Contextual level Data Flow Diagram (DFD) representation of the digital ordering and payment system designed for implementation in grocery stores. This system aims to transform conventional processes that have been carried out manually into a more efficient, integrated, and digitized system. This diagram shows two main external entities, namely Customer and Admin, as well as three core processes consisting of the Product Data Collection Process, Ordering Process, and Payment Process. The relationships between entities and processes are illustrated through data

flows that show how information is sent and received by the system, with the ultimate goal of improving transaction management efficiency, data accuracy, and shopping convenience for convenience store customers.

The system process begins with product data collection, which is an important step in ensuring that product information such as name, type, price, and stock is accurately available in the system. In this stage, the admin enters product data into the system, which will then be accessed by customers. Customers use this data as a reference when they want to place a digital product order. This information must always be updated by the admin so that the system remains relevant to the actual conditions in the shop. Once the product data is available, customers can directly access the system and enter the ordering process. At this stage, customers send their order data to the system, including the type of product desired, quantity, and other details. The system then processes the order and generates a total order receipt that is automatically sent back to the customer. Additionally, the system also sends an order data report to the admin as a form of transaction reporting and digital documentation for operational and evaluation purposes.

After placing an order, customers are directed to proceed to the payment process. At this stage, customers must log in to the system, which is an authentication requirement to maintain transaction security. After successfully logging in, customers can choose from available payment methods, such as wallet, digital, bank transfer, or QR-based payment systems. The system will then generate a payment receipt as proof of transaction and simultaneously send a payment data report to the Admin. The admin receives this report for accounting, verification, and daily sales recording purposes. This system allows all transaction activities to be recorded in real-time and can be accessed again if needed for auditing or strategic decision-making purposes.

The implementation of this digital ordering and payment system provides various benefits for grocery stores. First, this system reduces dependence on manual processes, which are prone to recording errors, transaction duplication, and delays in reporting. Second, customers get a more modern, faster, and transparent shopping experience because they can make transactions independently through digital devices. Third, administrators or shop owners can efficiently monitor all transaction activities without having to record them manually one by one. Fourth, this system can be easily integrated with other logistics and storage systems, enabling shops to become more competitive and professional.

Furthermore, this system is highly compatible with the digital transformation agenda for micro, small, and medium enterprises (MSMEs). Grocery stores as part of MSMEs require simple yet functional digital solutions to address the challenges posed by changes in modern consumption patterns. With a system such as the one described in this DFD, grocery stores not only improve their operational efficiency but also open up opportunities to connect with broader digital platforms, such as marketplaces, online payment systems, or app-based logistics services. Therefore, this DFD is not merely a data flow modeling tool but also serves as the foundation for developing an information system that can drive grocery stores to grow sustainably and adapt to technological advancements.

To support the concrete implementation of supply chain digitization, the system design developed in this study also includes software that can be used by micro-businesses. This system integrates various digital tools that are compatible with the capacity and infrastructure available in grocery stores. Some of the recommended software includes Odoo ERP (Community Edition) for stock recording, supplier management, and centralized sales transaction management. In addition, Google Spreadsheet and Google Form are also used as initial solutions for stock recording and digital ordering, which are integrated with Google Apps Script to generate automatic reports. Android-based Point of Sales (POS) applications such as Qasir and Kasir Pintar are also options because they can be used immediately for daily transactions and sales recording. The software was selected based on considerations of ease of access, low cost, and compatibility with simple digital devices such as smartphones, with the aim of creating a system that is flexible, gradual, and easy to adopt by small businesses that were previously unfamiliar with technology.

After the data flow is visualized through DFD, the next step is to map the relationships between key entities in the digitization system. Entity Relationship Diagram (ERD) is used to identify important entities such as suppliers, goods, transactions, and customers.

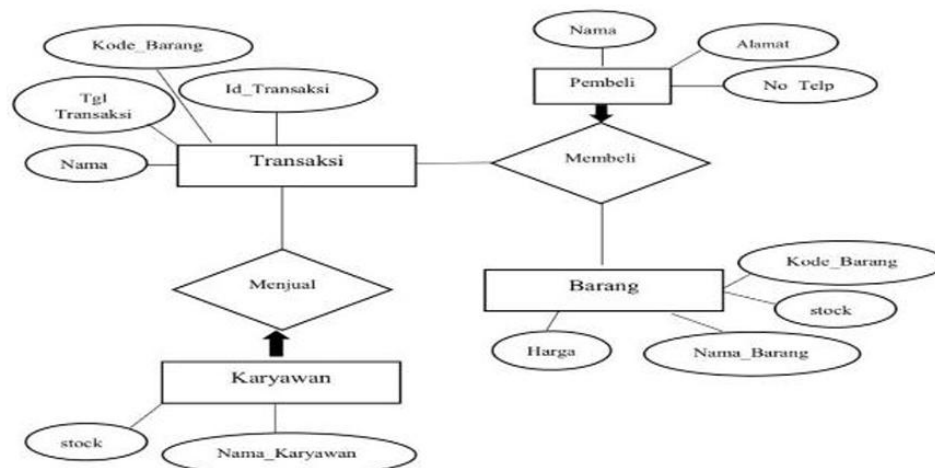


Figure 3. Entity Relationship Diagram (ERD) of suppliers, goods, transactions, and customers

Entity Relationship Diagram (ERD) representing the relationships between important entities in the sales information system at a grocery store, namely the entities Transaction, Goods, Buyer, and Employee. This ERD helps to illustrate the data structure and the interrelationships between the information used in the sales business process, starting from buyer data input, transaction processing, to goods data management and employee involvement. This diagram is the basis for database design because it explains what entities must be stored, the attributes of each entity, and how these entities are interrelated.

The first main entity is Transaction, which has attributes such as Transaction_ID, Transaction_Date, Name, and Item_Code. This entity is the center of all activities in the system because it records all sales and purchase processes that occur between buyers and sellers. Transactions are related to the Buyer entity through the “Purchased” relationship, which describes that each transaction is made by a buyer. The Buyer entity itself has attributes such as Name, Address, and Phone Number, which are used to identify who made the purchase and how to contact them. The “Buy” relationship is one-to-many, meaning that one buyer can make many transactions.

Furthermore, the Goods entity is also directly related to the Transaction entity through the “Purchase” relationship. Every transaction involves one or more items purchased by the buyer. The Item entity has important attributes such as Item_Code, Item_Name, Stock, and Price, which describe the identity and stock information of the items sold. This relationship shows that transactions cannot occur without clear item data, making it crucial that the item entity is accurately maintained in the system.

In addition, there is also an employee entity, which is described as being related to the transaction entity through the “Sell” relationship. This explains that each transaction is recorded or served by an employee. The Employee entity has the attributes Employee_Name and Stock, which indicate who is responsible for serving sales and may also be in charge of stock management. The relationship between Transactions and Employees is one-to-many, because one employee can handle many transactions in a day. This is important for the purposes of tracking employee performance and reconciling sales activities.

The entire ERD structure shows how buyer data, item data, transaction activities, and employee roles are interconnected in a single integrated system. This system can be used to build a digital cashier application or Point of Sale (POS) system for a simple yet effective grocery store. By using the ERD as a reference in database development, data management can be carried out more systematically, avoiding data redundancy, and facilitating the generation of important reports such as daily transaction counts, best-selling products, and identification of regular customers.

In the context of digitizing small shops, the use of ERD is very strategic. This diagram not only shows the logical structure of the system, but also helps in developing information system modules that are in line with the actual workflow in the field. The development of an ERD-based system enables small shops to transform from manual practices to a digital system that supports operational efficiency, improves transaction recording accuracy, and builds a customer database that can be used for more personalized marketing strategies. Therefore, this ERD is an important first step in designing a modern sales information system that can be applied on a micro scale, such as small shops.



Figure 4. Unified Modeling Language (UML) business owners, customers, and digital systems

A UML Use Case Diagram designed to illustrate the flow of interaction between key users and the digital system implemented in grocery stores. In the context of MSME digital transformation, particularly grocery stores, this type of modeling is crucial for designing information systems that meet the real needs of users. This diagram includes two main actors, namely the Customer and the Owner, each of whom

has different roles and functions in the business process. At the center of this diagram is a digital system called “Warung Kelontong,” which acts as a system entity that manages all operational functions.

From the Customer's perspective, there are two main use cases or functionalities, namely “Place Order” and “Make Payment”. The “Place Order” use case represents the customer's activity of selecting and ordering goods through the system, whether through an application, website, or other digital systems. This illustrates the digitization of the purchasing process, which was previously done manually at the shop location. Next, the “Making Payments” use case describes customer activities in completing transactions after ordering goods. Payments can be made through digital methods such as bank transfers, e-wallets, QRIS, or other methods integrated into the system.

Meanwhile, from the Owner's perspective, there are four use cases that describe the responsibilities and roles of owners in running their businesses digitally. First, “Inventory Manager” is a function for managing inventory data, ensuring that goods are available and updated regularly. Second, “Report Reviewer” describes the owner's activities in reviewing important reports such as sales, inventory, and daily financial transactions. Third, “Notification Recipient” functions as an automatic notification received by the owner from the system regarding incoming transactions, customer requests, or restocking reminders. Finally, “Product Inventory” plays a role in monitoring real-time data on available product stock, including the quantity, type, and status of products that have been sold or not.

With this model, a digital system for grocery stores can be built based on real needs and clear responsibilities. This Use Case Diagram emphasizes the importance of interaction between system users (humans) and digital system functionality, where customers focus on purchasing services, and owners focus on operations and supervision. This model also shows that the digital store system is not just a transaction tool, but a complete management system that includes automatic recording, reporting, and notification, so that it can help store owners make more time and data-driven business decisions.

Overall, this diagram is very helpful in the early stages of designing a digital-based grocery store information system. With UML modeling like this, system developers can easily understand who the actors involved are, what activities must be provided in the system, and how the interaction flows. This is very important in building a user-friendly, efficient system that can increase the competitiveness of grocery stores in the digital era.

4.3 Human Resource Competency Improvement Strategy

Improving human resource (HR) competencies is a crucial factor in supporting the success of digitalization, especially in micro businesses that still rely heavily on manual systems. To address this challenge, a short training program with a hands-on approach was conducted, designed to equip business owners with basic skills in managing their businesses digitally. The training covers three main aspects, namely an introduction to digital technologies relevant to micro businesses, the use of digital stock and transaction recording applications, and the systematic creation of data-based business reports.

In addition to improved cognitive abilities and adaptive attitudes toward technology, post-training measurements showed significant quantitative improvements in operational efficiency and accuracy. Based on observations and data analysis before and after the training intervention, several key changes were found that demonstrated the effectiveness of the HR competency improvement strategy on the performance of micro-enterprises, particularly among program participants who owned small grocery stores.

First, there was a significant decrease in administrative errors, from 18% to 6%, after businesses began implementing digital recording systems. These administrative errors included mistakes in recording daily transactions, loss of stock data, and discrepancies between purchase and sales reports. This decrease was due to the use of Android-based Point of Sales (POS) applications and integrated digital worksheets such as Google Spreadsheets, which enable automatic recording and minimize data duplication. With this system in place, every transaction is immediately recorded digitally, making the verification and reporting process more accurate and transparent.

Second, there has been a significant increase in operational time efficiency. Before the implementation of the digital system, the average time required to complete one sales administration cycle (from recording, stock recap, to daily reporting) was around 50–55 minutes. After training and implementing the digital system, this time was reduced to an average of 30 minutes per cycle, which means there was a 40% increase in operational time efficiency. This efficiency was mainly due to the elimination of the need for repetitive manual recording, the availability of automatic reports, and easy access to real-time data via mobile devices.

Third, in-depth interviews with training participants also showed changes in managerial behavior. Before the training, most business owners (around 70%) said they were reluctant to use digital applications because they considered them complicated and irrelevant to the scale of their businesses. However, after receiving hands-on training, 92% of participants stated that they felt more confident using technology in their daily operations. They also showed an increased awareness of the importance of digital data in decision-making, such as stock management, purchase planning, and identification of products with the highest sales.

In addition to quantitative results, the improvement in human resource competencies is also reflected in changes in mindset and adaptability to change. Business actors who previously focused only on sales activities are now beginning to see the importance of data management and supply chain efficiency as part of a sustainable business strategy. This impact not only improves individual performance but also enhances the operational professionalism of micro businesses amid the demands of the digital era.

Overall, these results reinforce the finding that the digital competence of human resources has a direct impact on the success of supply chain digitization. The integration of digital skills training, the use of simple software, and post-training mentoring has proven to be a major factor in reducing administrative errors and speeding up operational processes. Thus, improving human resource competency not only complements digital transformation, but also serves as a key catalyst in creating efficiency, accuracy, and competitiveness for micro businesses in the future.

This program successfully improved participants' understanding of the business digitization process. After participating in the training, participants demonstrated improved abilities in systematically recording business information and in making decisions based on available data. Operational efficiency also improved, as seen in the reduced time needed to carry out administrative processes and the decreased error rate in recording business data. In addition, there was an increase in the confidence of business actors in managing their businesses using digital tools, which were previously considered difficult to access or too complex.

Thus, the human resource competency improvement strategy implemented not only impacts technical knowledge but also encourages behavioral change and readiness among business actors in facing digital transformation. This improvement serves as an important foundation in the process of technology integration in the micro-business sector, as well as a first step toward a more inclusive, efficient, and sustainable economy in the digital era.

5. CONCLUSION

This study confirms that supply chain digitalization integrated with human resource competency improvement is not merely an option, but a strategic necessity in accelerating Indonesia's economic transformation, particularly in the micro-business sector, which is the backbone of the national economy.

Studies show that the dominance of manual systems in grocery stores has a direct impact on operational inefficiencies, high risk of errors, and weak competitiveness in the digital age. Through the design of a measurable digital model using Data Flow Diagrams (DFD), Entity Relationship Diagrams (ERD), and Unified Modeling Language (UML), this study has successfully mapped out concrete solutions to gradually improve the efficiency, accuracy, and transparency of micro-businesses, in line with the capacity of business actors.

Furthermore, improving human resource competency has proven to be a major catalyst in driving successful digitalization. Digital literacy training has resulted in a significant increase in business actors' understanding of technology, a decrease in administrative errors from 18% to 6%, and an increase in operational time efficiency of up to 40%. This fact shows that mastery of technology without human readiness will not have the maximum impact.

Dengan demikian, kolaborasi antara pembangunan infrastruktur digital, pemberdayaan SDM, dan penyusunan kebijakan yang pro-UMKM harus menjadi prioritas nasional untuk menciptakan ekosistem ekonomi yang lebih inklusif, adaptif, dan berkelanjutan. Sinergi teknologi dan SDM tidak hanya meningkatkan efisiensi usaha mikro, tetapi juga menjadi fondasi penting dalam mewujudkan kemandirian ekonomi Indonesia di era industri 4.0 dan society 5.0.

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