

Inventory Management Model for Batik Entrepreneurs in Laweyan Batik Village Based on Web Technology

Yenni Maria Sridarta

Universitas Pignatelli Triputra; Surakarta, Indonesia

E-Mail: yenni.maria5@gmail.com

Dhian Kristaningtyas

Universitas Pignatelli Triputra; Surakarta, Indonesia

E-Mail: dhian.kristaningtyas@gmail.com

Yeremia Victor Rondonuwu

Universitas Pignatelli Triputra; Surakarta, Indonesia

E-Mail: yeremiavictor@gmail.com

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ABSTRACT

This study analyzes the effectiveness and efficiency of implementing web-based technology in inventory management to support the sustainability of batik businesses in Kampung Batik Laweyan, Surakarta. Unlike companies that have good inventory records, batik entrepreneurs in this area still use manual records with demand-based production. This study uses a qualitative approach with a field study method to gain an in-depth understanding of the inventory management problems faced by batik entrepreneurs. Data collection was conducted through interviews and Focus Group Discussions (FGD). The results of the study indicate that inventory management is not optimal due to the absence of an effective control method. Purchases of raw materials are still based on estimates without careful planning, and there is no classification of inventory costs. The implementation of the EOQ (Economic Order Quantity) method has been shown to increase efficiency by determining the optimal order quantity and the right time to reorder. The implementation of a technology-based system has been shown to be more effective than manual records, with benefits such as increased data accuracy, operational efficiency, and reduced risk of recording errors. Overall, a technology-based system is an important strategy in increasing the competitiveness and sustainability of batik businesses in the digital era.

Keywords: Inventory, System Information, Management, Accounting.

ABSTRAK

Penelitian ini menganalisis efektivitas dan efisiensi penerapan teknologi berbasis web dalam manajemen persediaan guna mendukung keberlanjutan usaha batik di Kampung Batik Laweyan, Surakarta. Berbeda dengan perusahaan yang memiliki pencatatan persediaan yang baik, para pengusaha batik di wilayah ini masih menggunakan pencatatan manual dengan produksi berbasis permintaan. Penelitian ini menggunakan pendekatan kualitatif dengan metode studi lapangan untuk memperoleh pemahaman mendalam mengenai permasalahan manajemen persediaan yang dihadapi para pengusaha batik. Pengumpulan data dilakukan melalui wawancara dan Focus Group Discussion (FGD). Hasil penelitian menunjukkan bahwa manajemen persediaan belum optimal karena tidak adanya metode kontrol yang efektif. Pembelian bahan baku masih berbasis perkiraan tanpa perencanaan yang matang, serta tidak adanya klasifikasi biaya persediaan. Implementasi metode EOQ (Economic Order Quantity) terbukti meningkatkan efisiensi dengan menentukan jumlah pesanan optimal dan waktu pemesanan ulang yang tepat. Penerapan sistem berbasis teknologi terbukti lebih efektif dibandingkan pencatatan manual, dengan manfaat seperti

peningkatan akurasi data, efisiensi operasional, serta pengurangan risiko kesalahan pencatatan. Secara keseluruhan, sistem berbasis teknologi menjadi strategi penting dalam meningkatkan daya saing dan keberlanjutan usaha batik di era digital.

Kata kunci: *Inventaris, Sistem Informasi, Manajemen, Akuntansi.*

INTRODUCTION

Inventory management is a company's ability to organize and manage the demand for goods, including raw materials, semi-finished goods, and finished goods, ensuring they are always available under both stable and fluctuating market conditions (Wagiyo & Bella, 2020). Inventory management plays a critical role in a company, including achieving a balance between operational costs and the costs of acquiring and storing goods. This is done with the aim of achieving optimal inventory levels at the lowest possible cost (Karyawati et al., 2023; Sagita et al., 2023). The goal is to maintain optimal inventory levels at the most efficient cost possible. According to Heizer & Render (2016), inventory is one of the most expensive assets for many companies, as it reflects 50% of the total invested capital. Therefore, inventory must be managed as effectively as possible, as it directly impacts the production process and the company's profits. This management process is called inventory management. Achieving production effectiveness and efficiency can also be realized through the management of raw materials and finished goods inventory (Hadi & Khairawati, 2020). As a means to enhance efficiency and effectiveness in profit management, it is necessary to utilize information technology in managing profits.

The use of information technology is one way to keep up with and adapt to the development of technology. Adapting to technology is necessary because many businesses, especially Micro, Small, and Medium Enterprises (MSMEs), have not yet utilized information technology, including the batik industry. According to the Head of the Cooperatives and MSMEs Service of Central Java Province, MSMEs in Central Java are expected to maximize the role of the digital market in 2023 to keep up with technological developments and use MSMEs to increase people's income (Nazzala, 2022). Micro, Small, and Medium Enterprises (MSMEs) play a crucial role in boosting Indonesia's economic growth. They are also significant in job creation, increasing local economic growth, fostering innovation and creativity, stimulating regional economic development, diversifying the economy, and contributing to taxes and state revenues (Sirait et al., 2024; Asraf et al., 2024; Kasolati & Kamilah, 2024).

The increase in economic growth was also felt in one of the villages in Laweyan District, Surakarta City, which later became known as Laweyan Batik Village. Batik is a traditional art form that has existed since the time of the kingdoms in Indonesia and is one of the nation's proud cultural heritages. Batik is known for its distinctive patterns and colors and holds high artistic and aesthetic value (Liu et al., 2021). UNESCO even recognized batik as a significant and valuable cultural heritage in 2009. Almost every region in Indonesia has its own unique batik art. With the growing public interest in batik, it has been mass-produced on both a factory scale and an MSME scale, including in Laweyan Batik Village, Surakarta City. As the production of batik increases, effective inventory management is needed for batik, including raw materials, semi-finished materials, and finished products. In order for a business to operate more efficiently and effectively, raw material purchasing activities must be planned using the right method, one of which is the Economic Order Quantity (EOQ) inventory management method.

Economic Order Quantity (EOQ) is the number of orders within a certain period that must be such that the sum of the ordering cost and the storage cost are equal. This method is one of the inventory management techniques that minimizes the total cost of ordering and storage (Heizer & Render, 2016). The EOQ model is one of the most widely used methods for raw material inventory management because it is both simple and efficient (Aida & Kantun, 2023). Previous studies have proven that EOQ is an

effective and efficient inventory management method. Research conducted by Prihasti and Nugraha (2021) showed a reduction in inventory costs in raw material inventory. Another study related to EOQ by Tiloly et al. (2022) demonstrated an optimal order quantity in a general logistics company. The use of information technology also influences the efficiency and effectiveness of inventory management. Research conducted by Fahruliansyah and Paryanti (2023) states that the use of information technology can increase the efficiency and effectiveness of inventory management.

However, some of the studies conducted are on companies with fairly good inventory records. This contrasts with the research conducted in Kampung Batik Laweyan, where inventory records are minimal and even manually maintained by batik entrepreneurs. In addition to being MSMEs, the businesses in this area are home-based, with batik production carried out only when there is demand. This condition clearly requires initial research to determine whether inventory management needs to be implemented in the area. Furthermore, it is important to assess whether the use of information technology in the process of recording and managing profits can be properly utilized by business owners in Kampung Batik Laweyan, considering that their businesses are home-based. Based on the information provided, this study aims to analyze the effectiveness and efficiency of implementing web-based technology for inventory management in supporting the sustainability of batik businesses in Kampung Batik Laweyan. Through this study, it is hoped that the importance of inventory management will be recognized as a key factor in supporting the sustainability of batik businesses.

LITERATURE REVIEW

Inventory management is an important part of a business that functions to maintain and manage inventory, including the processes of ordering, storing, using, and selling inventory. In inventory management, several aspects must be considered, including the arrival time of goods to be reordered, the quantity of goods stored to ensure they are neither excessive nor insufficient, and safety stock to anticipate delays in supply (Meyliawati & Suprianto, 2020). The main objective of inventory management is to optimize the availability of goods to meet customer demand, avoid stockouts, and reduce storage costs (Soeltanong & Sasongko, 2021; Olaniyi & Pugal, 2024). In practice, inventory management involves various important concepts, such as lead time, which determines the time needed to fulfill orders; Economic Order Quantity (EOQ), which helps determine the optimal order quantity; and stock management methods such as FIFO (First In, First Out), LIFO (Last In, First Out), and Just-in-Time (JIT), which aim to improve storage efficiency. Additionally, ABC analysis is used to classify inventory based on its relative value, enabling it to be managed with an appropriate approach. Efficient inventory management contributes to increased operational efficiency, reduced holding costs, and improved service quality for customers.

Management is the art of getting work done through others and the process of planning, organizing, coordinating, and controlling resources to achieve goals effectively and efficiently (Griffin & Ebbert, 2007; Jani & Suryadinata, 2023; Ramdhan & Rahayu, 2024). "Effective" means that goals are achieved according to plan, while "efficient" means that tasks are carried out correctly, organized, and on schedule. Management functions, first introduced by Henry Fayol in the early 20th century, are basic elements in running a business. These functions include planning, which involves determining the best goals and strategies by evaluating various alternatives before acting; organizing, which involves dividing large activities into smaller ones to facilitate supervision and determining the tasks and responsibilities of each individual; and directing, which focuses on ensuring that all group members work to achieve goals according to the managerial plan.

Inventory consists of raw materials, goods in process, or finished goods held by a company to ensure smooth operations in meeting consumer demand. It is a major part of working capital that is constantly changing. Inventory also represents a significant

portion of working capital, which, according to research, can reach up to 50% of the company's assets. In its management, various costs are associated with inventory. According to Managerial Accounting (Hansen & Mowen, 2007; Weygandt et al., 2018), if inventory consists of materials or goods purchased from external sources, the costs incurred include ordering costs and storage costs. If inventory is produced internally, the costs include setup costs and storage costs. Ordering costs cover the costs of placing and receiving orders, such as administration, documentation, shipping insurance, and unloading. Setup costs are related to the preparation of equipment and production facilities, including idle wages of production workers, costs of unused facilities, and trial costs. Storage costs include insurance, inventory taxes, obsolescence, opportunity costs of funds tied up in inventory, handling, and storage space. Ordering costs also include the costs of ordering raw materials, shipping costs if borne by the company, and unloading costs. Meanwhile, setup costs involve the expenses associated with preparing equipment for the production of specific materials or components.

Economic Order Quantity (EOQ) is a method used to optimize a company's inventory by determining the optimal quantity of raw material purchases that minimizes costs (Sutrisno, 2013). EOQ can be calculated through several factors, namely ordering costs, storage costs, and inventory costs (Heizer & Render, 2016). Ordering costs are calculated using the SO/Q formula, storage costs are calculated using $CQ/2$, and inventory costs are calculated using $SQ/Q + CQ/2$. EOQ itself is calculated using the formula $\sqrt{(2SO/C)}$, while the ordering frequency is calculated using $F = D/Q$, the ordering period is calculated using $T = (\text{Number of Days})/(\text{Order Frequency})$, and the reorder point (ROP) is calculated using $EOQ/(\text{Production Turnover Length}) \times \text{Lead Time}$, or plus safety stock if necessary. By implementing the EOQ method, companies can efficiently control inventory, determine the optimal order quantity, and establish the correct reorder point. To address delays or fluctuations in raw materials, companies can examine safety stock, EOQ, and ROP to maintain an effective and efficient inventory balance, ultimately fostering good inventory management.

Information Systems are a series of interacting elements that collect, manage, store, process, and deliver information to support decision-making, control, coordination, analysis, and operations within an organization or business environment (Gupta, 2011; Aisyah et al., 2023; Timoti & Setyarani, 2023). The main components of Information Systems include data (raw facts in various forms), software (programs for managing data), hardware (physical components such as computers and networks), networks (communication infrastructure), processes (data processing stages), and people (users and system managers). Information Systems come in various types, such as Management Information Systems (MIS), Financial Information Systems (FIS), and Human Resource Information Systems (HRIS), all aimed at increasing operational efficiency, assisting decision-making, and improving organizational performance. In the digital era, Information Systems are generally based on computers and information technology, which is why they are often referred to as Computer-based Information Systems.

Information system development is a complex process aimed at finding solutions to information management problems and business processes (Nunamaker et al., 1990; Mukhlis & Tyas, 2024; Mervita et al., 2024). The two main approaches used are the structured and object-oriented approaches (Fadhil et al., 2023). The structured approach emphasizes a systematic method with stages such as system analysis to identify needs, system construction based on the analysis, coding for design implementation, testing to ensure quality, and system maintenance for updates and improvements. Meanwhile, the object-oriented approach focuses on the concept of objects in the system, starting from analysis (Inception) to determine goals, design (Elaboration) to detail object interactions, construction (Construction) for implementation in program code, and system transition (Transition), which includes testing, launching, and adapting the system to the production environment. The structured approach is more suitable for projects with clear business processes, while the object-oriented approach is more

suitable for complex and dynamic systems. The choice of approach depends on the characteristics of the project, the development team, and the final goal of the system to be developed (Fadhil et al., 2023).

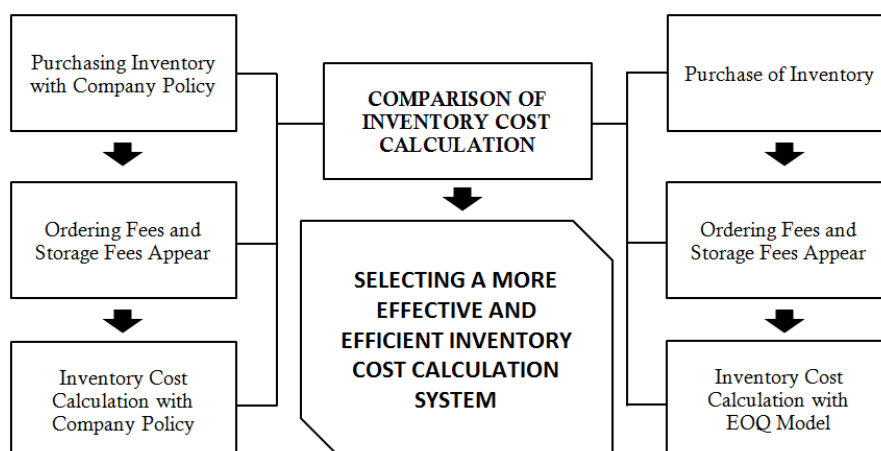


Figure 1. Research Model

METHODS

This research is a field study, which is research conducted directly on-site to understand the problem in depth and obtain accurate information. With this method, researchers can uncover findings or realities that occur in society. In this study, the research was conducted directly in Kampung Batik Laweyan, Surakarta City, to obtain data related to web-based technology for inventory management. The approach used in this study is qualitative, aiming to gain an in-depth understanding of the phenomenon being studied. Qualitative research emphasizes the use of theoretical foundations to ensure the research remains focused and aligned with the facts occurring in the field. The data used is descriptive, in the form of words, sentences, pictures, or recordings, which cannot be measured in numbers (Sugiyono, 2021). Data collection was carried out through interviews and Focus Group Discussions (FGD), allowing researchers to obtain direct perspectives from batik business owners regarding the inventory management system used. The steps in qualitative descriptive research include identifying significant problems, formulating the problems clearly, determining the objectives and benefits of the research, reviewing relevant literature, compiling a conceptual framework, designing research methods, and collecting, organizing, and analyzing data using appropriate statistical techniques. By following these steps, the study provides a comprehensive understanding of an effective inventory management system that supports batik businesses in Laweyan.

RESULTS

Laweyan Batik Village, located in Laweyan District, Surakarta City, Central Java, is one of the villages situated in the heart of Surakarta City, offering a strategic location. Most of the residents in Laweyan Batik Village run batik businesses, which is why the area is known as Laweyan Batik Village. The batik produced here comes in various types, patterns, motifs, and production sizes. Additionally, the manufacturing processes vary, contributing to the diversity in batik production in the area. This diversity in production also reflects the variation in inventory management practices.

Currently, Kampung Batik Laweyan still relies on a completely manual inventory management system without using information technology to support its inventory management needs. The main processes involve requesting goods from vendors, recording incoming goods, receiving product requests from customers, and recording outgoing goods. Given the ongoing development of technology and the need to increase efficiency and accuracy, improvements are required in the inventory management

system through the implementation of information technology-based solutions. Additionally, the process of goods entering and leaving when sold does not follow a clear procedure.

To improve efficiency and accuracy in inventory management, it is highly recommended to implement an information technology-based inventory management system. By using the right technology, several processes can be automated, such as real-time stock monitoring, automatic notifications when stocks are running low, and integration of purchasing processes directly with vendors. In addition, information technology helps record and track transactions more accurately, reducing the potential for human error in recording. In the current system, the recording of incoming goods can be done by multiple users, which can lead to inaccuracies in the latest stock information. Since stock checking is done manually, delays in receiving information become a problem. Furthermore, errors in filling out incoming and outgoing goods requests can cause discrepancies, and inaccurate recording of goods can lead to differences between the actual physical stock and the numbers recorded in the system.

Table 1. Respondent Results

	Number of Respondents	Before	After
Using Information Systems	40	19.025	25.225
Use of Information Technology	40	45.025	63.163

The results of the respondents' calculations before and after using the system, related to effectiveness and efficiency, show an improvement in inventory management. This indicates that the use of information systems can enhance inventory management effectively and efficiently, leading to increased batik sales profits. The evaluation of the system's use is based on five indicators related to the company's information and the information system they utilize. The results demonstrate that the respondents' abilities related to the use of information technology have improved. This increase occurred due to the socialization efforts regarding the use of information technology, allowing respondents to use the system with ease. As a result of this socialization, the respondents' understanding of how to use the information system has also increased.

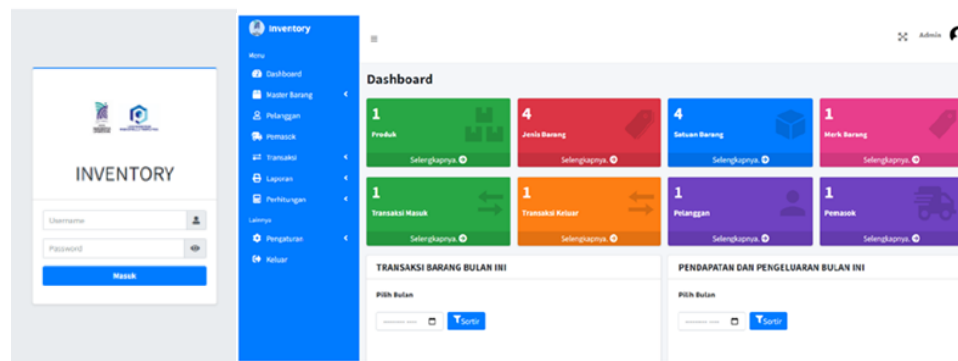


Figure 2. Inventory website initial view and inventory website dashboard view

The first step to access the inventory application in Kampung Batik Laweyan is to open the official website via a browser by visiting the address <https://batiklaweyan.id>. Once the website opens, users will be directed to the main page, which displays the inventory application used by batik entrepreneurs in Kampung Batik Laweyan. This main page provides an overview of the system used to manage inventory, income, and expenses that occur within a one-month period. After successfully logging into the system using the provided credentials, users will be presented with a dashboard as the initial display of the application. This dashboard functions as an information center, presenting data in a concise and easy-to-understand manner, offering a quick overview of the various activities occurring in the application. The dashboard includes

information related to goods transactions, including income and expenses during the one-month period. This information is very helpful for batik entrepreneurs to monitor the flow of goods more efficiently. Additionally, the dashboard presents data related to income and expenses during the same period, allowing business owners to better monitor their financial situation. There are also shortcuts to several submenus within the inventory application that can be directly accessed from the dashboard. These features are designed to increase efficiency in using the application, allowing users to easily navigate to other sections without leaving the dashboard. This application provides convenience for entrepreneurs by enabling them to manage inventory in a more structured and organized manner.

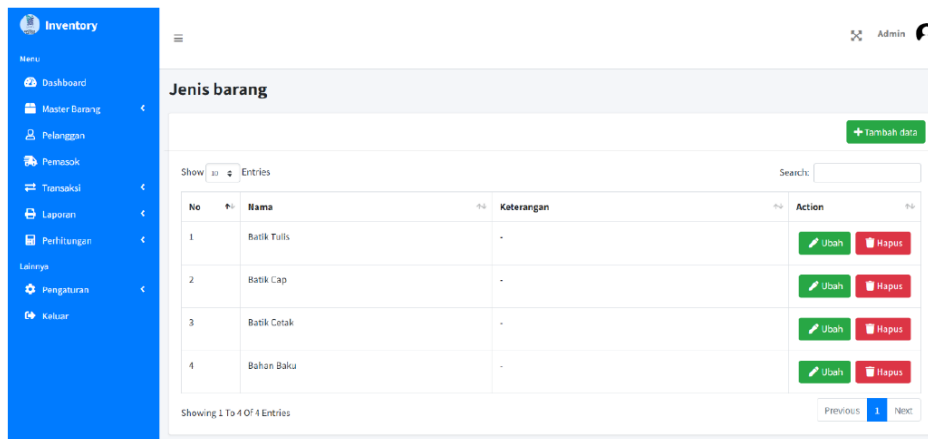


Figure 3. Item Type View

The Master Item menu, there are several options that facilitate the management of goods data, namely Type, Unit, Brand, and Product. The Type menu allows entrepreneurs to categorize goods based on their type or category, while the Unit menu is used to set the unit of measurement for goods, such as meters, kilograms, or units. The Brand menu allows the management of data related to the product brands used, and the Product menu is used to store information related to the goods themselves. With these menus, batik entrepreneurs can manage goods data systematically and adjust their management according to the needs and characteristics of their business.

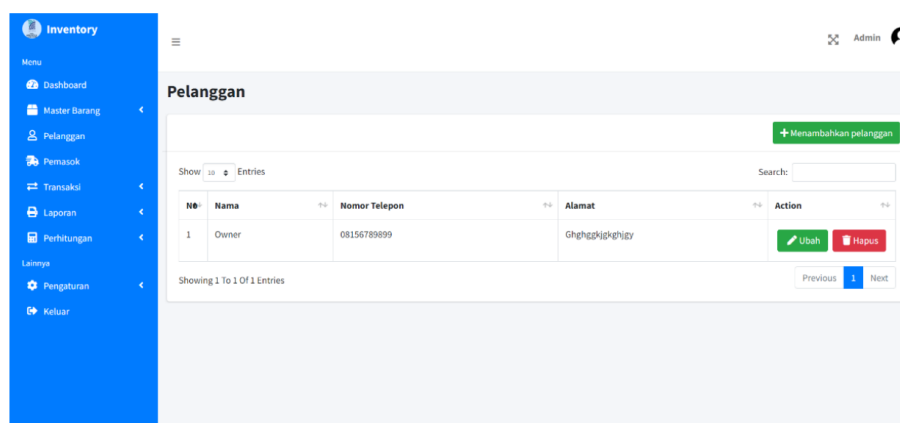


Figure 4. Customer Management and Supplier Management

The Customer Management menu plays a crucial role in improving the efficiency of customer data management. This menu allows users to add and manage customer information, enabling more effective order monitoring. Users can modify registered customer data by clicking on the available action menu, which facilitates data adjustments in response to changes, such as updates to customer addresses or contact information. As a result, customer information management becomes more flexible and

accurate. Additionally, the Supplier Management menu is equally important in managing supplier data. The main purpose of this menu is to maintain good relations between the company and suppliers, ensuring that the ordering process runs smoothly and accurately. By utilizing this menu, users can make changes or updates to supplier data, such as contact information or shipping details, to align with the company's needs. Similar to customer management, users can also modify data in this menu to ensure the information is always up-to-date and reflects current conditions. These two menus, Customer Management and Supplier Management, share similarities in function, allowing users to easily modify data to support smooth business operations. Both play an essential role in maintaining good relationships and ensuring the efficient ordering and delivery of goods or services.

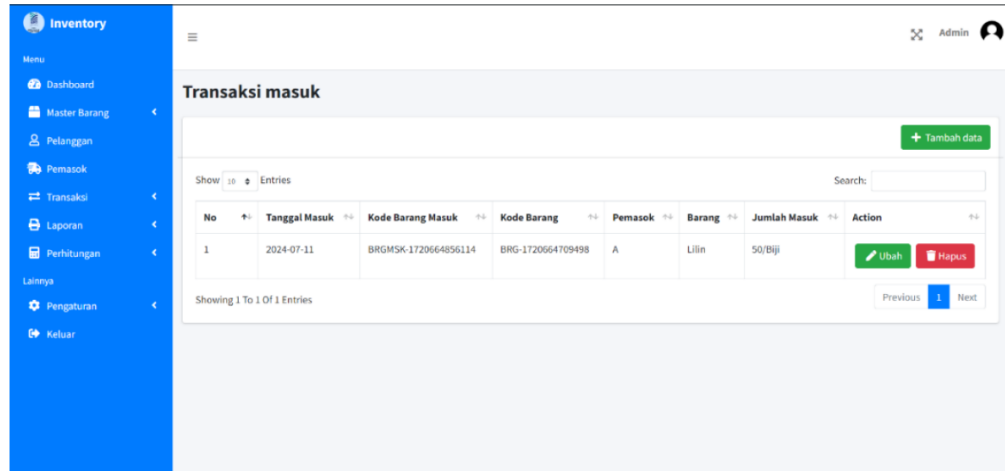


Figure 5. Transaction Menu Display

The Transaction menu contains two main options: incoming transactions and outgoing transactions, which serve as the center for managing and recording all activities related to the movement of goods in the business process. Incoming transactions are used to document all goods received in the warehouse. These goods can come from various sources, such as purchases, production outputs, or returns from customers. With this feature, companies can ensure that every item received is recorded accurately and monitored properly. Meanwhile, the outgoing transaction menu is designed to record all goods issued from the warehouse. Goods may be issued for various reasons, such as sales, deliveries to customers, internal use by the company, or goods that are damaged and no longer usable. This feature allows companies to maintain clear records of the movement of outgoing goods, which is crucial for stock management and operational planning. Additionally, in the outgoing transaction menu, customers are provided with the convenience of modifying data according to their needs. This feature offers flexibility, ensuring that recorded transactions align with company conditions and policies, while facilitating more efficient inventory management. Overall, these two menus play an important role in ensuring the smooth running of business processes by documenting and managing every movement of goods that occurs within the company.

No	Kode Barang	Barang	Stok Awal	Jumlah Masuk	Jumlah Keluar	Jumlah Stok
1	BRG-1720664709498	Lilin	12	50	12	50

Figure 6. Stock Report View

The report menu is designed to make it easier for users to compile, manage, and analyze various reports needed to monitor the company's operational performance and support the decision-making process. Through this menu, users can access various types of reports related to the flow of goods and stock. The Incoming Goods Report is used to record and analyze goods received by the company, providing information on the quantity and type of goods received. The Outgoing Goods Report presents data on goods that have been issued or sold, making it easier to manage inventory and calculate turnover. Meanwhile, the Stock of Goods Report provides an overview of the condition of the inventory available in the warehouse or store, including remaining stock and goods that need to be replenished. These three reports are interconnected and function to provide accurate and real-time information to support smooth operations and informed decision-making in inventory management.

Keterangan:
 S : Kebutuhan Bahan Baku Dalam Setahun
 O : Biaya Pesan Setiap Kali Pesan
 C : Biaya Simpan Per Unit

Rumus: $\sqrt{(2 \times S \times O) / C}$

Tanggal	S	O	C	Hasil	Action
No Data Available In Table					

Figure 7. EOQ Calculation View and Profile Settings Menu

The calculations presented in this section relate to the inventory management model used in the study, namely Economic Order Quantity (EOQ). This EOQ model aims to help companies determine the optimal order quantity that minimizes the total costs associated with inventory. In the calculation menu, several elements are calculated, such as Order Cost, which refers to the costs incurred each time an order is placed, and Holding Cost, which is the cost incurred due to storing goods in inventory. Additionally, there is Inventory Cost, which includes all costs related to inventory as a whole, and EOQ Cost, which refers to the total cost calculated using the EOQ model to determine the most efficient order quantity. The next menu includes Order Frequency, which shows how often orders are placed, and Order Period, which describes the

duration between each order. ReOrder Point is the last menu, determining the reorder point, which is the inventory level at which a reorder must be placed to avoid stock shortages. In addition to the calculation menu, this website also provides general settings related to website configuration and user profiles, facilitating inventory management by system managers and users.

CONCLUSION

The results of the study show that Kampung Batik Laweyan, Surakarta City has not managed inventory optimally because there is no effective control method. Purchases of raw materials are still based on estimates and the records of business owners, without careful planning, which makes the process inefficient. In addition, there is no classification of inventory costs. By implementing the EOQ (Economic Order Quantity) method, inventory control can be more structured, allowing companies to determine the optimal order quantity and reorder time, thus minimizing costs and maximizing profits. The comparison between manual recording and the use of technological systems also shows significant differences, with entrepreneurs feeling more efficient and effective using information technology. The developed website has proven to meet the needs of entrepreneurs in Kampung Batik Laweyan. The application of information technology in inventory management provides significant benefits, such as operational efficiency and effectiveness. The manual processes previously carried out can now be automated, saving time and reducing the risk of human error in recording and reporting stock. Information technology also improves data accuracy, enabling more reliable decision-making. With an automated system, errors in inventory management can be minimized. In addition, technology allows for better tracking of inventory, identifying demand patterns, and optimizing stock. The implementation of information technology-based management systems has a major impact, such as inventory optimization, increased productivity, higher competitiveness, and reduced costs and risk of errors. Information technology is an important strategy for increasing the efficiency and competitiveness of batik entrepreneurs in the era of globalization.

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