

Enhancing Business Operations through Technology: A Community-Driven Inventory System for Dymas Kulit Home-Based Leather Craft Business

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Diterima: 10 Juli 2025 | Dipublikasikan: 25 Juli 2025

ABSTRAK

Pengabdian masyarakat ini bertujuan untuk membantu Toko Dymas Kulit, sebuah usaha kerajinan kulit rumahan di Magetan, Jawa Timur, dengan mengembangkan dan menerapkan sistem manajemen persediaan berbasis web untuk menggantikan proses pencatatan manual. Sistem baru yang dibangun menggunakan PHP dengan framework CodeIgniter dan MySQL ini dirancang untuk meningkatkan akurasi dan efisiensi manajemen persediaan dengan mengotomatisasi tugas-tugas seperti pelacakan pergerakan stok dan pembuatan laporan secara real-time. Sebagai hasilnya, toko mengalami pengurangan lebih dari 50% waktu yang digunakan untuk pemeriksaan inventaris, memungkinkan staf untuk fokus pada kegiatan bisnis penting lainnya. Kepuasan pengguna sangat tinggi, dengan skor System Usability Scale (SUS) sebesar 73,3, mencerminkan kemudahan penggunaan sistem tersebut. Inisiatif ini tidak hanya menyelesaikan tantangan operasional di Toko Dymas Kulit, tetapi juga memberdayakan karyawan dengan keterampilan baru, memberikan model yang berharga bagi usaha kecil lainnya di komunitas untuk meningkatkan operasional mereka melalui teknologi.

Kata kunci: Sistem Manajemen Persediaan; Dukungan Komunitas; Teknologi Informasi; Efisiensi Operasional; UMKM

ABSTRACT

This community service project aimed to assist Toko Dymas Kulit, a home-based leather crafting business in Magetan, East Java, by developing and implementing a web-based inventory management system to replace its manual tracking process. The new system, built using PHP with the CodeIgniter framework and MySQL, was designed to improve the accuracy and efficiency of inventory management by automating tasks such as tracking stock movement and generating real-time reports. As a result, the store saw a reduction of over 50% in the time spent on inventory checks, allowing staff to focus on other essential business activities. User satisfaction was high, with a System Usability Scale (SUS) score of 73.3, reflecting the system's ease of use. This initiative not only solved operational challenges for Toko Dymas Kulit but also empowered its employees with new skills, offering a valuable model for other small businesses in the community to improve their operations through technology.

Keywords: Inventory Management System; Community Support; Information Technology; Operational Efficiency; MSME

INTRODUCTION

The rapid advancement of technology in the digital era has become a fundamental part of modern business operations. Technology has been widely integrated into various sectors, particularly in business, where it plays a crucial role in optimizing processes such as marketing, sales management, and inventory control. The adoption of technology enables tasks that were traditionally performed manually to be completed more efficiently, saving both time and resources (Rakhmadi & Abshar, 2024). Despite these advantages, many small businesses still struggle to incorporate technological solutions due to a lack of familiarity with digital tools, resulting in challenges in their successful implementation.

Dymas Kulit shop, a home-based leather craft business located at Jalan Imam Bonjol No 27 Kauman, Magetan, East Java, is an example of such a business. The company specializes in crafting leather goods, including shoes, sandals, bags, belts, and jackets. While the business has succeeded in its product development, its inventory management system is still based on manual processes. The practice of recording incoming and outgoing stock manually in books leads to frequent data inaccuracies, which in turn impact the overall effectiveness of inventory tracking, reporting, and management. As noted in previous studies, manual inventory management systems can lead to several operational challenges, such as delays in stock checks, as each item must be physically verified one by one to assess its status (Dursun et al., 2022; Rumetna et al., 2022).

These challenges highlight the critical need for a computerized inventory management solution to enhance the accuracy and efficiency of inventory tracking. Adopting a digital approach will not only streamline the process but also provide more reliable data management. A well-implemented system can significantly reduce the manual effort and time currently spent on inventory checks, allowing for a more seamless operation.

Previous community service activities have demonstrated the substantial benefits of computerized inventory systems in small businesses (Aldi, 2022; Mokhtar & Khayyat, 2022; Saravanos & Curinga, 2023). These systems offer greater efficiency in managing both incoming and outgoing stock, allowing businesses to handle inventory transactions more effectively. Additionally, they enable faster retrieval of data, ensuring that businesses have up-to-date information at their fingertips.

By transitioning from manual to automated systems, small businesses can significantly improve their ability to monitor and track inventory. This shift leads to fewer errors, as the system provides real-time updates and accurate data. Ultimately, such a transition contributes to enhanced operational efficiency, enabling businesses to make better decisions and operate more competitively (Elvis Pawan et al., 2021; Fandi et al., 2023).

This community service project focuses on the development of a web-based inventory management system for Toko Dymas Kulit. The goal of this project is to provide the business with an alternative method of inventory management that is computerized, ensuring more accurate data, greater time efficiency, and simplified processes. The system will serve as a tool for better inventory data management, ultimately helping the store to manage its inventory more effectively and efficiently.

METHOD OF IMPLEMENTATION

In developing the inventory management system, the waterfall model was adopted as the primary development approach. The waterfall is a classical software engineering model that follows a sequential and structured flow—from requirements analysis, design, implementation, testing, to maintenance. This model was chosen because it aligns well with the nature of community service activities, which typically operate within a limited timeframe, have specific objectives, and involve small business partners who require practical and directly applicable solutions. The structured phases in the waterfall model allowed the implementation team to plan and execute the workflow in a clear and measurable way that could be easily communicated to all stakeholders.

While software development in academic research often explores iterative models such as Agile or Scrum for greater flexibility, such approaches are less applicable in the context of community service, which prioritizes tangible results and immediate impact for the partner. Therefore, this article does not focus on a deep methodological comparison, but rather emphasizes the implementation process and its effect on improving the partner's operational efficiency. The waterfall model proved to be effective in supporting this goal, as its linear structure served as a practical guide throughout the development stages with the partner.

The implementation of this community service activity was carried out in a structured and systematic manner, as illustrated in Figure 1. The process aimed to develop and implement a web-based inventory management system for Toko Dymas Kulit, transforming the manual inventory management process into an automated and efficient solution. The steps taken in the implementation are detailed below.

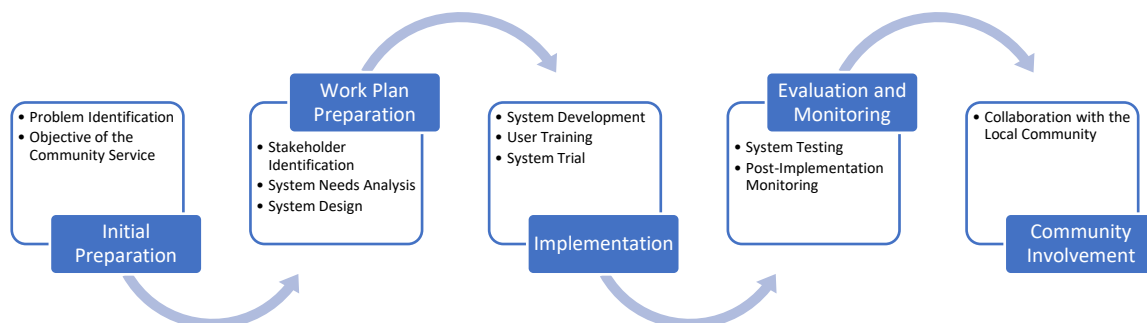


Figure 1: Flowchart of the Structured Implementation Process for Web-Based Inventory Management System at Toko Dymas Kulit

Initial Preparation

Dymas Kulit Shop had been using a manual system for managing its inventory, which involved handwritten records in books. This method caused several issues, such as data inaccuracies, slow stock checks, and challenges in tracking the inflow and outflow of items. This inefficiency led to potential losses, missed opportunities for better stock management, and a lack of real-time data on inventory levels (Jannah et al., 2023). The manual method also required considerable time and effort to manage, and often caused discrepancies between the recorded data and actual stock.

The primary objective of this community service activity was to introduce a more efficient, accurate, and computerized inventory management system. The goal was to replace the manual process with a web-based system, designed to provide real-time data on stock levels, streamline the process of managing incoming and outgoing goods, and reduce human error. This system was expected to enhance operational efficiency, allowing the store owner and employees to focus on other areas of their business while

the system handled inventory management.

Work Plan Preparation

The success of this community service project required collaboration between several key stakeholders. These included the store owner of Toko Dymas Kulit, the store manager, and the developers responsible for creating the inventory management system. The store owner and manager played crucial roles in providing insights into the store's operations, while the developers worked to design and build the system. This collaborative effort ensured that the system would address the specific needs of the business.

The first step in the work plan was to gather detailed information about the store's operations, focusing on the current inventory management process (Pratama et al., 2023; Thesing et al., 2021). This was done through interviews with the store owner and manager, as well as direct observations of how inventory was tracked. The goal of this phase was to identify pain points in the existing system, define the essential features the new system needed to have, and outline the desired outcomes of the transition to a computerized system. The analysis helped the developers to understand the core needs of the business and ensured that the system would meet these needs.

Based on the needs analysis, the system design phase began. The developers selected appropriate technologies, including PHP as the programming language, the CodeIgniter framework, and MySQL for database management. This choice of technology was based on its efficiency, ease of use, and scalability. The system was designed to handle core functions such as managing item data, tracking incoming and outgoing goods, generating reports, and managing user access. The design also ensured that the system would be user-friendly, so that the store employees could operate it without extensive technical knowledge.

Implementation

The system development phase involved coding and integrating the various components of the inventory management system. The developers wrote the code for features such as adding, editing, and deleting item data, tracking stock movement, and generating reports (Christanto & Singgalen, 2023; Sinha & Das, 2021). The system was built incrementally, with continuous testing to ensure that each feature functioned as intended. During this phase, feedback from the store manager and employees was collected to make necessary adjustments and ensure the system was tailored to their specific needs.

Once the system was developed, it was important to ensure that the users (store employees and admin) could effectively use the system. A series of training sessions were conducted to guide them through the system's features, including how to input new data, manage inventory, and generate reports. These sessions were practical and hands-on, allowing users to familiarize themselves with the system in a supportive environment. Additionally, tutorial materials were provided for future reference, and ongoing support was offered to address any questions or issues that arose.

Following the completion of the system development and training, a trial run was conducted to test the functionality of the system in a real-world environment. During this phase, the system was used to manage actual inventory transactions, and any bugs or issues were identified and resolved. The trial also tested the reliability and usability of the system, ensuring that it was easy to navigate and met the operational needs of the store. Feedback from the users was collected, and adjustments were made based on their experiences.

Evaluation and Monitoring

The system underwent thorough testing to ensure its functionality. Black-box testing was performed to verify that the system's features worked correctly based on the inputs provided by the users, without focusing on the underlying code. This testing helped identify any discrepancies or issues in the system's behavior. Additionally, System Usability Scale (SUS) testing was carried out to assess the ease of use and user satisfaction with the system (Alsagaby & Alharbi, 2021; Ramadani et al., 2022). The results of these tests were used to evaluate the system's effectiveness and identify areas for improvement.

After the system was implemented and tested, plans were made to monitor its performance over time. This included tracking how the system was being used, identifying any further challenges, and offering technical support to users when needed. Regular maintenance checks were scheduled to ensure the system continued to function smoothly and that updates or fixes could be applied as necessary. This post-implementation phase helped ensure the system's long-term success and usability.

Community Involvement

One of the key elements of this community service project was the active involvement of the store owner and employees in the process. They were not only participants in the initial needs analysis but were also directly engaged in the design, implementation, and testing phases. This hands-on involvement allowed them to have a sense of ownership over the system and contributed to its effectiveness. Through the training and support provided, the store staff gained new skills in using technology for business management, empowering them to handle inventory more efficiently and make informed business decisions. This community engagement helped bridge the gap between traditional methods and modern technology, providing a lasting impact on the business and the local community.

RESULTS OF THE ACTIVITY

The web-based inventory management system was successfully deployed at Toko Dymas Kulit, replacing the previous manual inventory tracking method. The system is now fully operational and includes several core features such as the management of item data, tracking of incoming and outgoing goods, report generation, and user management. With these features, the store is able to handle inventory more efficiently and accurately, reducing human error and streamlining operational workflows.

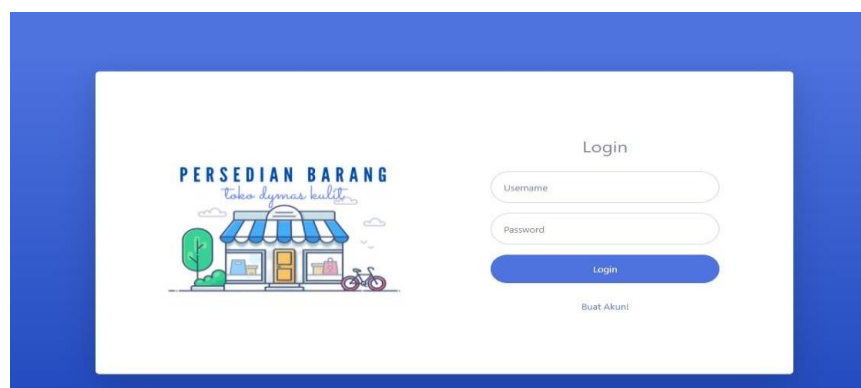


Figure 2: Login Page of the Inventory Management System

The login page of the system requires users to enter their username and password in order to access the dashboard and other functionalities. This page ensures that only authorized personnel can manage the inventory system, adding a layer of security. Additionally, it features a "Create New Account" link, providing a seamless process for new users to register and begin using the system, as shown in Figure 2.

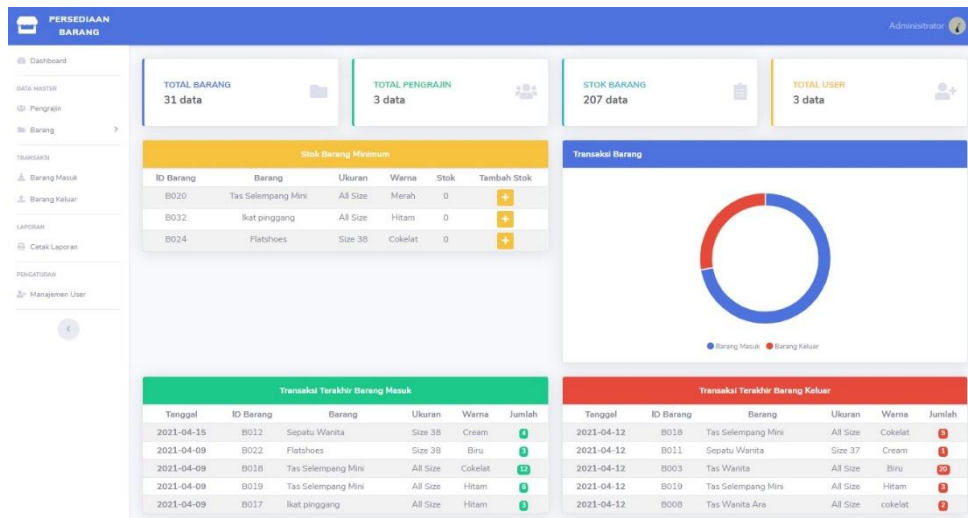


Figure 3: Dashboard Overview of the Inventory Management System

The system's dashboard, shown in Figure 3, appears after a successful login and functions as a centralized control panel. It provides an overview of the inventory status, recent transactions, and key performance indicators (KPIs), such as minimum stock levels. The dashboard also includes pie charts that visualize data on incoming and outgoing stock, allowing users to easily monitor inventory changes at a glance. This consolidated view of data greatly improves the store's ability to efficiently manage and track inventory.

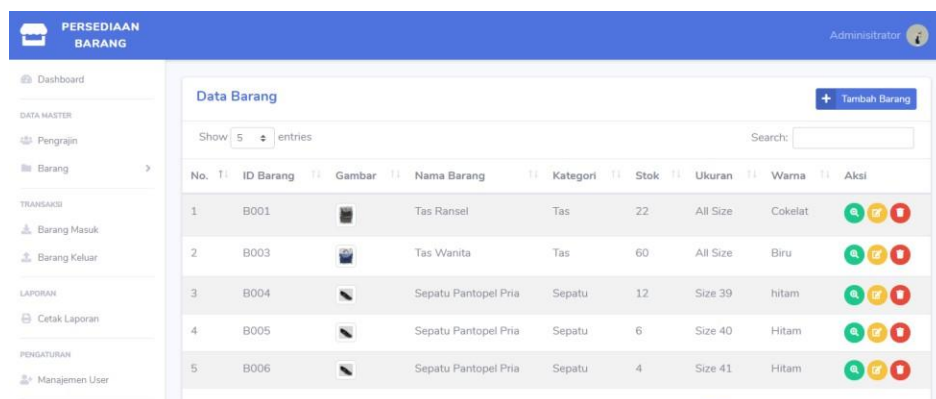


Figure 4: Item Management Page of the Inventory System

Figure 4 presents the item management page, where users can view, add, edit, or delete product data. This page is essential for maintaining accurate records of all items in the inventory, allowing staff to quickly access and update product information such as item names, categories, sizes, colors, and photos. With this feature, the process of updating inventory has become faster and more accurate.

Figure 5: Add New Item Form in the Inventory Management System

Figure 5 illustrates the form used to add new items to the system. Users can input essential details such as item name, category, size, color, and upload photos of the products. The form is simple to use, enabling staff to efficiently add new products to the inventory with minimal effort. This feature has streamlined the product entry process, which was previously done manually, reducing errors and ensuring that all relevant product information is captured accurately.

The new system has led to significant improvements in the store's operational efficiency. Inventory tracking is now more accurate, and store staff no longer need to manually update stock levels. The system automatically updates inventory data in real-time, reducing the risk of stock discrepancies and ensuring that the store's stock levels are always up to date.

The store owner reported that the time spent on inventory checks has been reduced by over 50%, freeing up staff to focus on other business tasks, such as customer service and sales. Additionally, the system's reporting capabilities have made it easier to monitor stock levels, predict future inventory needs, and make more informed purchasing decisions.

No.	ID Barang Masuk	Tanggal	Pengrajin	ID Barang	Nama Barang	Ukuran	Warna	Jumlah Masuk	User	Aksi
1	T-BM-210409022	2021-04-09	Joko M	B022	Flats shoes	Size 38	Biru	3	Administrator	
2	T-BM-210409021	2021-04-09	Subrisno	B018	Tas Selempang Mini	All Size	Cokelat	12	Administrator	
3	T-BM-210409020	2021-04-09	Budi Darmawan	B019	Tas Selempang Mini	All Size	Hitam	6	Administrator	
4	T-BM-210409019	2021-04-09	Budi Darmawan	B017	Ikat pinggang	All Size	Hitam	3	Administrator	
5	T-BM-210409018	2021-04-09	Joko M	B008	Tas Wanita Ane	All Size	cokelat	7	Administrator	

Figure 6: Incoming Items Page of the Inventory Management System

Figure 6 shows the incoming items page, where records of new stock arrivals are managed. This page allows users to input and track data on items entering the store's inventory. Each entry is linked to the corresponding product, ensuring that stock levels are updated automatically as items are received. This feature helps prevent errors and ensures that the store has accurate records of all incoming goods.

No.	ID Barang Keluar	Tanggal	ID Barang	Nama Barang	Ukuran	Warna	Jumlah Keluar	Tujuan Barang	User	Aksi
1	T-BK-210412005	2021-04-12	B018	Tas Selempang Mini	All Size	Cokelat	5	Toko Dymas Kult Ji Sawo	Ziaa	
2	T-BK-210412004	2021-04-12	B011	Sepatu Wanita	Size 37	Cream	1	Toko Dymas Kult Ji Sawo	Ziaa	
3	T-BK-210412003	2021-04-12	B003	Tas Wanita	All Size	Biru	20	Toko Dymas Kult Ji Sawo	Administrator	
4	T-BK-210412002	2021-04-12	B019	Tas Selempang Mini	All Size	Hitam	3	Ruko Blok M Magetan	Administrator	
5	T-BK-210412001	2021-04-12	B008	Tas Wanita Ara	All Size	cokelat	2	Toko Dymas Kult Ji Sawo	Administrator	

Figure 7: Outgoing Items Page of the Inventory Management System

Figure 7 displays the outgoing items page, where users can track products that have been sold or removed from inventory. The page makes it easy to update the system whenever an item is sold or otherwise removed, ensuring that the system reflects the most current stock data. This feature has minimized discrepancies and enabled more efficient management of inventory.

Although the implementation process was generally successful, there were some challenges encountered, particularly during the initial phase of system adoption. A few employees initially struggled to adapt to the new system, as they were more accustomed to the manual process. Some found it difficult to navigate the digital interface, particularly in the early stages.

To address these issues, additional training sessions were conducted, focusing on hands-on practice and providing more in-depth explanations of the system's functionality. The developers also offered direct support to resolve any technical issues that arose during the transition. Over time, the staff became more comfortable with the system, and the challenges faced in the early stages were successfully mitigated.

Form Laporan

Laporan Transaksi ☒ Barang Masuk ☐ Barang Keluar

Tanggal 03/17/2021 - 04/15/2021

Cetak

Figure 8: Reports Page of the Inventory Management System

Figure 8 shows the reports page, where users can generate reports based on inventory transactions. The system allows the super admin to select transaction types and dates to generate printable reports, providing detailed insights into stock movement. These reports are crucial for decision-making, as they provide accurate data on sales and stock levels, helping the store manager plan for future needs.

The involvement of the store owner and employees was essential throughout the entire project, from the initial needs analysis to the system's final implementation. Their active participation in the development process ensured that the system was tailored to their specific needs, and their engagement fostered a sense of ownership and

empowerment.

The training sessions provided the staff with the necessary skills to operate the system, enhancing their digital literacy and business management capabilities. The store owner expressed that the training sessions had a significant impact, as they not only helped staff become more proficient with technology but also improved the overall efficiency and competitiveness of the business.

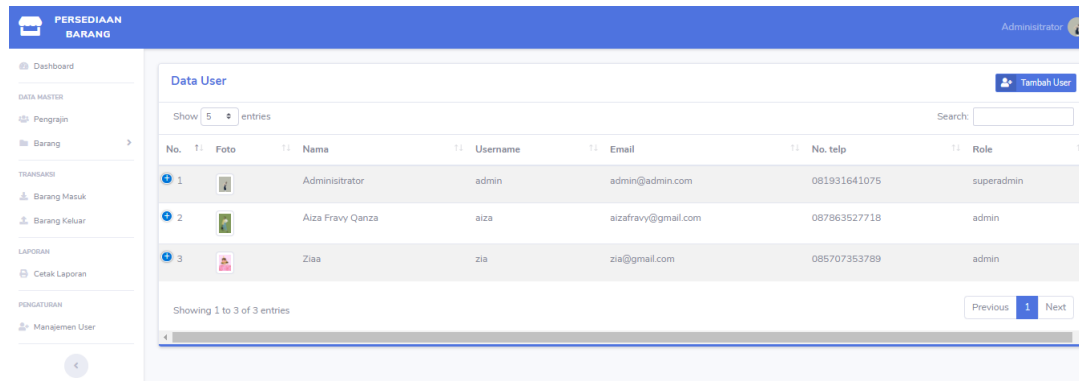


Figure 9: User Management Page

Figure 9 depicts the user management page, which is accessible only to the super admin. This page allows the super admin to create, modify, or delete user accounts and manage user roles and permissions. This feature ensures that the store owner has full control over the system's access and usage, providing an added layer of security and customization.

During the training sessions and post-implementation evaluations, the store owner and employees expressed high satisfaction with the system's ease of use and functionality. The system's user-friendly interface made the transition from manual to digital inventory management smooth for the store staff, who reported feeling more confident and empowered to manage inventory data.

The following questions presents the SUS statements that were used to gather feedback from the users:

Code	Statement
P1	I think I would use this system frequently.
P2	I found the system unnecessarily complex.
P3	I thought the system was easy to use.
P4	I needed to learn a lot of things before I could get going with this system.
P5	I think the system's features worked as expected.
P6	I encountered many inconsistencies in the system.
P7	I believe others would quickly learn how to use this system.
P8	I found the system confusing.
P9	I felt confident using this system.
P10	I needed to spend some time learning how to use this system.

To evaluate the effectiveness and user-friendliness of the web-based inventory management system, System Usability Scale (SUS) testing was conducted with the store employees. SUS is a widely used tool to measure the perceived usability of a system. The test includes ten statements that respondents are asked to rate based on their experience with the system. The questions focus on aspects such as ease of use, perceived

complexity, and overall satisfaction with the system.

These statements were designed to capture various aspects of user experience, including ease of use, intuitiveness, and overall satisfaction with the system's functionality. Respondents were asked to rate each statement on a scale from 1 (strongly disagree) to 5 (strongly agree), and the scores were then aggregated to calculate the average SUS score.

The System Usability Scale (SUS) testing was conducted to assess the user-friendliness and overall satisfaction with the web-based inventory management system. Respondents rated 10 statements on a scale from 1 (strongly disagree) to 5 (strongly agree), covering aspects such as ease of use, complexity, and user confidence in using the system.

The results from 30 respondents showed an average SUS score of 73.3, indicating that the system is generally perceived as user-friendly and functional, with a high level of user satisfaction. On average, users found the system easy to navigate and operate, particularly appreciating its ability to simplify tasks such as data entry and report generation. Feedback across the ten SUS statements consistently reflected positive impressions, reinforcing the system's effectiveness and ease of use without the need for complex operations.

CONCLUSION AND SUGGESTIONS

The implementation of a web-based inventory management system at Toko Dymas Kulit has successfully addressed the inefficiencies of the previous manual inventory method by offering a more structured, accurate, and accessible solution. The system's main features—such as item data management, tracking of stock movements, report generation, and user administration—have proven to be functional and beneficial in daily operations. The results of the System Usability Scale (SUS) testing, which yielded an average score of 73.3, reflect a high level of user satisfaction, indicating that the system is both easy to use and effective in supporting the store's workflow. Users felt more confident and competent in managing inventory using the system, and the transition to a digital platform has led to faster processes, reduced errors, and more informed business decisions. Overall, the system has made a significant contribution to enhancing the store's operational performance and has empowered the staff through the adoption of appropriate technology.

To ensure the sustainability and scalability of the system, several suggestions can be considered for future development. Regular maintenance and feature updates are important to accommodate the store's evolving needs, particularly as the business expands. Integration with other systems such as point-of-sale (POS) and accounting software, as well as the addition of automated data backup, would provide a more comprehensive and streamlined solution. Continued user training is also essential; while initial training was effective, supplementary sessions and accessible resources like user manuals or video tutorials can further improve user proficiency. Additionally, the success of this system at Toko Dymas Kulit opens the possibility for replication in other small businesses within the community. Such initiatives could foster broader digital transformation among local SMEs, contributing to a more resilient and competitive local economy. Collaborative efforts—such as community workshops or joint training sessions—can also help gather feedback, encourage innovation, and strengthen the role of technology in community-based business empowerment.

ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to the Management of Universitas

Muhammadiyah Surakarta for their unwavering support and the opportunity to carry out this community service project. Without the university's backing, this initiative would not have been possible. We look forward to continued collaboration to bring greater benefits to the community.

REFERENCES

- Aldi, F. (2022). Web-Based New Student Admission Information System Using Waterfall Method. *Sinkron*, 7(1), 111–119. <https://doi.org/10.33395/sinkron.v7i1.11242>
- Alsagaby, S. A., & Alharbi, M. T. (2021). Cancer in saudi arabia (CSA): Web-based application to study cancer data among saudis using waterfall model. *Journal of Multidisciplinary Healthcare*, 14, 2333–2343. <https://doi.org/10.2147/JMDH.S326168>
- Christanto, H., & Singgalen, Y. (2023). Analysis and Design of Student Guidance Information System through Software Development Life Cycle (SDLC) and Waterfall Model. *Journal of Information Systems and Informatics*, 5(1), 259–270. <https://doi.org/10.51519/journalisi.v5i1.443>
- Dursun, M., Goker, N., & Mutlu, H. (2022). Evaluation of Project Management Methodologies Success Factors Using Fuzzy Cognitive Map Method: Waterfall, Agile, And Lean Six Sigma Cases. *International Journal of Intelligent Systems and Applications in Engineering*, 2022(1), 35–43. <https://doi.org/10.1039/b0000000x>
- Elvis Pawan, st, Rosiyati Thamrin, nd H., Patmawati Hasan, rd, Sariyati Bei, th H., Paulisen Matu, th, Studi Teknik Informatika STIMIK Sepuluh Nopember Jayapura, P., & Jayapura Selatan Jayapura -Papua, P. (2021). Using Waterfall Method to Design Information System of SPMI STIMIK Sepuluh Nopember Jayapura. In *International Journal of Computer and Information System (IJCIS) Peer Reviewed-International Journal* (Vol. 02). <https://ijcis.net/index.php/ijcis/index>
- Fandi, F., Imaniawan, D., Pratmanto, D., Rijanandi, T., & Silvia, A. (2023). *Designing an Animal Adoption and Social Media Information System using the SDLC Waterfall Method* (Vol. 17, Issue 1). <https://ejurnal.teknokrat.ac.id/index.php/teknoinfo/index>
- Jannah, A., Meuraxa, A. M., & Azzahrah, A. (2023). Web Based E-Commerce System Design at EXO Shop Using The Waterfall Method. *Hanif Journal of Information Systems*, 1(1), 1–5. <https://doi.org/10.56211/hanif.v1i1.3>
- Mokhtar, R., & Khayyat, M. (2022). A Comparative Case Study of Waterfall and Agile Management. *SAR Journal - Science and Research*, 52–62. <https://doi.org/10.18421/sar51-07>
- Pratama, Y. A., Laksono, P. W., & Liquidanu, E. (2023). Web Design: Develop the Decision Support System for Judgement Additional Order (JAO) Using Waterfall Method. In C. N. Rosyidi, P. W. Laksono, W. A. Jauhari, & M. Hisjam (Eds.), *Proceedings of the 6th Asia Pacific Conference on Manufacturing Systems and 4th International Manufacturing Engineering Conference* (pp. 257–269). Springer Nature Singapore.
- Rakhmadi, A., & Abshar, M. D. U. (2024). Identifikasi dan Edukasi Daerah Rawan Banjir Menggunakan Sistem Informasi Geografis Pendekatan Geospasial pada Kabupaten Karanganyar. *J-ABDIMASTEK*, 3(1).
- Ramadani, S. S., Kurniawan, H., & Wijaya, R. F. (2022). Online Attendance System Website-Based at the Village Hall Office Paya Bakung Using the Waterfall Method. *Journal of Applied Engineering and Technological Science*, 4(1), 505–511.
- Rumetna, M. S., Lina, T. N., Rajagukguk, I. S., Pormes, F. S., & Santoso, A. B. (2022). Payroll Information System Design Using Waterfall Method. *International Journal of*

- Advances in Data and Information Systems*, 3(1).
<https://doi.org/10.25008/ijadis.v3i1.1227>
- Saravanos, A., & Curinga, M. X. (2023). Simulating the Software Development Lifecycle: The Waterfall Model. *Applied System Innovation*, 6(6).
<https://doi.org/10.3390/asi6060108>
- Sinha, A., & Das, P. (2021). Agile Methodology Vs. Traditional Waterfall SDLC: A case study on Quality Assurance process in Software Industry. *2021 5th International Conference on Electronics, Materials Engineering and Nano-Technology, IEMENTech 2021*. <https://doi.org/10.1109/IEMENTech53263.2021.9614779>
- Thesing, T., Feldmann, C., & Burchardt, M. (2021). Agile versus Waterfall Project Management: Decision Model for Selecting the Appropriate Approach to a Project. *Procedia Computer Science*, 181, 746–756.
<https://doi.org/https://doi.org/10.1016/j.procs.2021.01.227>