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Development and usability evaluation of a web-based inventory system for small retail enterprises

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ABSTRACT

Purpose: to develop a web-based inventory system for Toko Hardi Grosir Manisan and evaluate its functional performance and usability using black-box testing and the system usability scale (SUS).
Method: this study employed a user-centered design approach within the human–computer interaction (HCI) framework, involving user requirements analysis, interface design, system development, functional testing using black-box testing, and usability evaluation using the system usability scale (SUS). The collected data were analyzed descriptively to assess system functionality and usability.
Findings: showed that all 13 black-box testing scenarios passed, achieving a 100% pass rate. The SUS evaluation yielded an average score of 77.0, exceeding the benchmark of 68 and indicating above-average perceived usability based on the illustrative dataset.
Implications: a practical solution for improving inventory management in small retail businesses by reducing reliance on manual records, facilitating stock monitoring, and improving inventory reporting.
Originality: lies in integrating web-based inventory system development, black-box testing, and SUS-based usability evaluation within the specific operational context of a confectionery wholesale business, Toko Hardi Grosir Manisan.

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Introduction

The advancement of information technology has significantly influenced business operations, including inventory management in small retail enterprises (Alsoussi & Tahboub, 2026). Inventory management plays a crucial role in maintaining product availability, controlling stock movements, supporting purchasing decisions, and ensuring the continuity of business operations (Silva et al., 2025). Ineffective inventory management can lead to stock discrepancies, product shortages, excessive inventory, and delays in customer service (Owajege & Saif, 2025). Therefore, the implementation of

information systems has become an important approach to improving the accuracy, efficiency, and reliability of inventory-related activities (Narendra et al., 2026). Web-based information systems offer practical advantages by enabling centralized data management, facilitating access to inventory information, and integrating stock recording and reporting processes within a single platform (Lestari & Kurniawan, 2026). Previous studies have discussed the application of web-based information systems to support small-business operations and inventory management (Alias et al., 2024; Qi et al., 2025). Accordingly, developing a web-based inventory system represents a relevant technological solution for small retail enterprises seeking to improve operational performance and strengthen inventory control (Ramadhan & Maryam, 2026).

Despite these technological developments, small retail enterprises may continue to rely on manual procedures for recording and monitoring inventory. This situation is relevant to Toko Hardi Grosir Manisan, a retail and wholesale business that sells confectionery products and other consumer goods. Based on the operational conditions underlying this study, inventory activities at the store are managed through manual records and other simple recording methods. Such practices create potential problems, including recording errors, inconsistencies between physical stock and recorded quantities, difficulties in retrieving historical inventory data, and delays in identifying current stock availability. These challenges become more significant when goods are received and issued frequently, requiring inventory records to be updated consistently. Furthermore, manual procedures can make it difficult for store management to obtain reliable information for purchasing decisions and stock replenishment. Similar research contexts have been addressed by Nicholas et al. (2025) and Nabila & Rahmadani (2026), who examined a website-based inventory information system for a grocery store, and Makalalag & Soegoto (2025) and Haerani et al. (2026), who investigated the implementation of a web-based inventory system to support sales efficiency among retail micro, small, and medium-sized enterprises (MSMEs). These conditions highlight the need for an inventory system tailored to the operational requirements of Toko Hardi Grosir Manisan.

The limitations of manual inventory management extend beyond recording activities and may affect the overall effectiveness of business operations. Delayed stock updates can prevent store managers from obtaining timely information about product availability, while time-consuming data retrieval and report preparation can increase administrative workloads. Inaccurate inventory information may also contribute to inappropriate purchasing decisions, delayed replenishment, and reduced responsiveness to customer demand. Previous studies have explored different technological approaches to addressing these challenges. Fitriaaisyah & Irwansyah (2025) examined the design and implementation of a web-based inventory and sales management system for micro retail enterprises, while Otobo & Alegbe (2024) investigated a web-based inventory management system for small and medium-sized production companies. Rahmah et al. (2026) focused on web-based monitoring of sales and stock in MSMEs, and Yulia & Seputro (2025) investigated the application of the First In, First Out (FIFO) method to inventory and sales management. Collectively, these studies demonstrate the relevance of digital inventory management across different business settings. However, the specific operational requirements of individual enterprises must still be considered when developing and implementing an appropriate system.

Existing literature provides a foundation for developing web-based inventory systems through different development methods, functional features, and

implementation contexts. Effendy et al. (2026) investigated the development and usability evaluation of a web-based sales and inventory management information system for MSMEs using the rapid application development (RAD) approach. Similarly, Gosal et al. (2026) and Shawn & Harefa (2026) examined web-based inventory management for small and medium-sized enterprises, emphasizing usability and efficiency through RAD. Mohammadnazari & Ghannadpour (2021) and Firmansyah et al. (2026) addressed inventory management for a building supply store, while Ramadhan & Maryam (2026) examined an inventory system for a conventional wholesale store using the CodeIgniter framework. In addition, Kurniawan et al. (2026) investigated the development and usability evaluation of a web-based point-of-sale system for hardware stores using the system usability scale (SUS). These studies indicate that inventory system development can be approached through various technologies and methodologies, while usability evaluation provides an additional perspective for assessing the quality of the resulting application. Nevertheless, differences in business processes, product characteristics, and user requirements mean that existing solutions cannot automatically be assumed to meet the needs of every small retail enterprise.

Although previous studies have addressed web-based inventory development and, in some cases, usability evaluation, an opportunity remains to examine these two aspects together within the specific operational context of a small confectionery wholesale business. Some studies emphasize system design, inventory control, sales integration, or the application of particular development methodologies, whereas others focus on usability assessment in different business environments (Effendy et al., 2026; Kurniawan et al., 2026; Nicholas et al., 2025). The research gap addressed by this study is therefore the need for a context-specific investigation that integrates the development of a web-based inventory system with an evaluation of its usability for the users of Toko Hardi Grosir Manisan. The novelty of this study lies in the application of this integrated approach to a business that faces manual inventory management challenges, with system functionality designed around its operational requirements and usability assessed from the user's perspective. Rather than claiming to introduce an entirely new inventory technology, this study extends the practical application of existing information system development and usability evaluation approaches to a specific small retail enterprise. This focus is expected to provide a more comprehensive understanding of how a contextually designed inventory system can address operational needs while remaining usable for its intended users.

The theoretical foundation of this study comprises inventory management information systems and software usability. An inventory management information system supports the systematic recording, processing, storage, monitoring, and reporting of inventory data to facilitate stock control and operational decision-making. Within a web-based environment, these functions may include product data management, recording incoming and outgoing goods, monitoring stock balances, searching inventory records, and generating inventory reports. The effectiveness of such a system depends not only on the availability of these functions but also on the extent to which they support the actual workflow of the enterprise. Usability, meanwhile, concerns the extent to which specified users can use a system to achieve specified goals effectively, efficiently, and satisfactorily within a particular context of use. These concepts are complementary because a technically functional application may not provide sufficient practical value if users find it difficult to understand or operate. The relevance of combining system development with usability assessment is reflected in the work of Effendy et al. (2026); Kurniawan et al. (2026); and Lorincz et al. (2026), which

explicitly address usability evaluation in web-based business applications. Accordingly, this study considers both inventory management functionality and user-oriented usability as essential dimensions in developing a practical information system for small retail operations.

The primary objective of this study is to develop a web-based inventory system for Toko Hardi Grosir Manisan and evaluate its usability in supporting the store's inventory management activities. The development process is intended to produce a system that organizes product information, records incoming and outgoing goods, monitors stock quantities, and facilitates the preparation of inventory reports in accordance with the store's operational requirements. Following development, usability evaluation will be conducted to assess how effectively and conveniently intended users can interact with the system when performing inventory-related tasks. The evaluation is also expected to identify aspects of the interface or workflow that may require improvement. This objective is important because the implementation of information technology in small enterprises should account for practical constraints, users' familiarity with digital tools, and the demands of daily business activities. Consequently, the success of the proposed system should not be determined solely by whether its features function as intended; it should also be assessed in terms of whether users can operate the system appropriately and accomplish their tasks with reasonable effort. By integrating development and evaluation, this study seeks to establish a systematic basis for determining the practical suitability of the proposed inventory solution.

This study is expected to contribute to both business practice and the development of knowledge concerning information systems for small retail enterprises. Practically, the proposed system is expected to reduce reliance on manual inventory records, improve the organization and accessibility of stock information, facilitate the monitoring of incoming and outgoing goods, and support more timely inventory reporting at Toko Hardi Grosir Manisan. The usability evaluation is expected to provide evidence-based insights into the system's ease of use and identify opportunities for further refinement. Academically, the study is expected to contribute a context-specific account of how web-based inventory system development can be combined with usability evaluation in a small retail and wholesale setting. It may also provide a reference for subsequent studies involving similar enterprises that require affordable, accessible, and user-oriented inventory management solutions. Ultimately, the significance of this research lies in connecting technological implementation with operational requirements and user experience, thereby supporting the development of inventory systems that are not only functionally appropriate but also practical for everyday use. The findings are expected to inform future improvements to the system and offer insights for researchers and practitioners seeking to support the digital transformation of small retail businesses.

Method

This study employs a human–computer interaction (HCI) approach with a user-centered design perspective to develop and evaluate a web-based inventory system for Toko Hardi Grosir Manisan. The research aims to ensure that the developed system meets user requirements and provides an effective and user-friendly inventory management experience. The research process consists of user needs identification, interface design, system development, functional testing, usability evaluation, data analysis, and system improvement.

The first stage involves identifying problems and user requirements through

direct observation and interviews with the store owner or employees responsible for inventory management. This stage aims to understand the existing inventory procedures, identify difficulties in recording incoming and outgoing goods, and determine the essential system features. Based on these findings, an interface prototype is designed to illustrate the layout, navigation, and main functions of the system. The prototype serves as a reference for developing a web-based inventory system that supports product data management, stock monitoring, inventory transactions, and report generation.

After system development, functional testing is conducted using the black-box testing method to verify whether each feature operates according to the specified requirements. The testing covers login, product data management, incoming and outgoing stock transactions, stock updates, data searching, and inventory report generation. Each test case compares the expected output with the actual system output and is classified as pass if the results match or fail if discrepancies are identified. This testing aims to detect functional errors and ensure that the system performs its intended operations correctly without examining the internal program code.

Usability evaluation is subsequently conducted through direct observation of users performing inventory-related tasks and administering the system usability scale (SUS) questionnaire. Users are asked to interact with the system to assess its ease of use, navigation, and suitability for daily inventory activities. The SUS questionnaire consists of ten statements rated on a five-point Likert scale, producing a score ranging from 0 to 100. The collected data are analyzed descriptively to identify functional problems, usability issues, and opportunities for improvement. Based on the findings, recommendations are formulated to improve the interface and system functionality. Retesting is then performed on the affected features to verify the effectiveness of the corrections and ensure that the system better meets user needs.

Results and discussion

System implementation

The web-based inventory system was developed to support inventory management at Toko Hardi Grosir Manisan by replacing manual recording procedures with a centralized digital system. The implementation was based on the identified operational requirements and focused on product data management, supplier information, incoming and outgoing stock transactions, inventory monitoring, and report generation. The system provides a structured interface that allows authorized users to access inventory-related functions through the main navigation menu. These features are intended to facilitate data retrieval, improve the consistency of inventory records, and support daily operational activities.

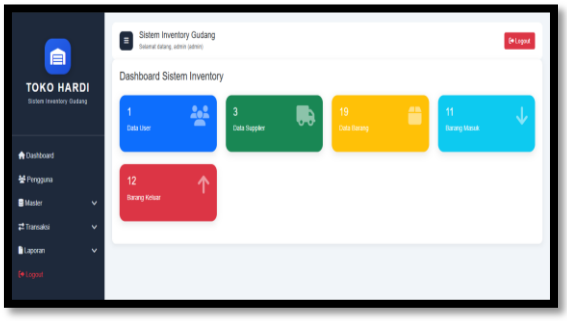


Figure 1 main dashboard of the web-based inventory system

Figure 1 presents the main dashboard of the implemented inventory system. The dashboard displays summary information, including the number of users, suppliers, registered products, incoming stock transactions, and outgoing stock transactions. This overview allows users to obtain an initial understanding of inventory-related activities without navigating through individual data pages. The interface also provides a sidebar containing the Dashboard, Users, Master Data, Transactions, Reports, and Logout menus. The dashboard serves as the primary navigation point for accessing the system's main functions. The displayed figures represent the records available in the system at the time the screenshot was captured.

The product management module provides facilities for viewing, searching, adding, editing, and deleting product records. As shown in Figure 2, the product page presents information in a tabular format, including product codes, product names, product categories, stock quantities, prices, and units of measurement. A search field enables users to locate products using their codes or names, while the action buttons provide access to editing and deletion functions. Pagination is also available to support navigation across product records. This layout organizes product information in a consistent format and provides users with direct access to frequently required inventory operations.

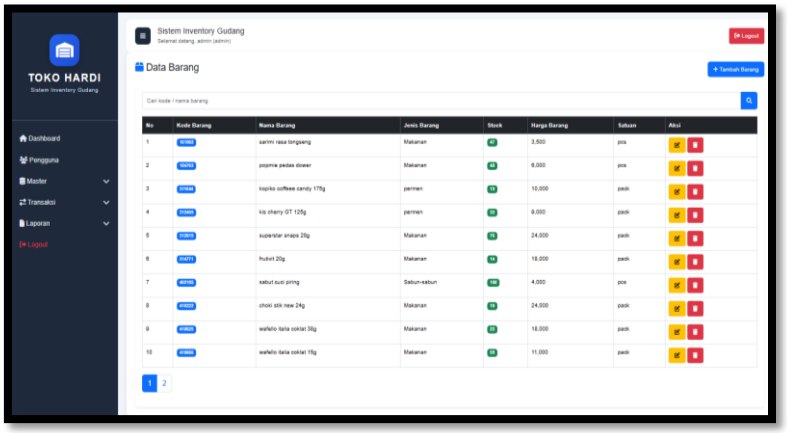


Figure 2 product data management interface

The supplier module is designed to store and manage information about suppliers, including their names, addresses, contact numbers, and other relevant details. Maintaining supplier records in a structured database can facilitate the retrieval of supplier information when inventory replenishment is required. The incoming stock module records goods received from suppliers, while the outgoing stock module records goods removed from inventory. When these transactions are processed successfully, the system is designed to update the corresponding stock quantities. The consistency of these updates must be verified through functional testing to ensure that recorded transactions and displayed inventory balances remain accurate.

The reporting module provides access to inventory information, including stock records and incoming and outgoing transactions. These records can support administrative documentation and help store management review inventory movements over a specified period. The system also includes user management and login functionality to support controlled access to inventory information. Together, these modules form an integrated application intended to support the store's inventory management workflow. Their operational reliability is subsequently evaluated through

black-box testing, while the usability of the interface is assessed using the system usability scale (SUS).

Functional testing using black-box testing

Black-box testing was conducted to evaluate whether the functions of the web-based inventory system operated according to the specified requirements. The testing focused on user inputs, system responses, data processing, and displayed outputs without examining the internal program code. Thirteen test scenarios were prepared to assess the main system functions, including login authentication, product management, supplier management, incoming and outgoing stock transactions, stock validation, product searching, inventory reporting, and logout functionality. Each scenario was evaluated by comparing the expected output with the observed system response.

Table 1 presents the black-box testing results. The evaluation covered both valid and invalid inputs to examine whether the system processed user requests appropriately. A test case was classified as Pass when the observed output matched the expected result. Based on the test results summarized in Table 1, all thirteen test scenarios passed, indicating that the tested functions operated according to their specified requirements.

Table 1 black-box testing results

No.	Function tested	Test scenario	Actual result	Status
1	Login	Enter valid credentials	The user successfully logged in and was redirected to the dashboard	Pass
2	Login	Enter invalid credentials	Access was denied and an error message was displayed	Pass
3	Product management	Add a product with valid data	The product was saved and displayed correctly	Pass
4	Product management	Submit incomplete or invalid product data	Invalid data were rejected and validation was displayed	Pass
5	Product management	Edit an existing product	The product information was updated and displayed correctly	Pass
6	Product management	Delete a product	The product was deleted and the list was updated correctly	Pass
7	Supplier management	Add or update supplier information	Supplier information was saved or updated correctly	Pass
8	Incoming stock	Record a valid incoming stock transaction	The transaction was saved and the stock quantity increased correctly	Pass
9	Outgoing stock	Record an outgoing transaction within available stock	The transaction was saved and the stock quantity decreased correctly	Pass
10	Stock validation	Enter an outgoing quantity greater than available stock	The invalid transaction was rejected and the stock quantity remained unchanged	Pass
11	Product search	Search using an existing product code or name	The corresponding product records were displayed correctly	Pass
12	Inventory reports	Generate a report for the selected period	The report displayed the appropriate records for the selected period	Pass
13	Logout	Select the Logout function	The session ended and protected pages could no longer be accessed without authentication	Pass

Source: primary data, processed

The results in Table 1 show that all 13 test scenarios were classified as Pass. The functional testing pass rate was calculated by dividing the number of passed test cases

by the total number of executed test cases and multiplying the result by 100%. The resulting pass rate of 100% indicates that all tested functions met their expected outcomes within the scope of the specified test scenarios. In particular, the tests covered authentication, product and supplier data management, stock transaction processing, input validation, searching, reporting, and session termination. The incoming and outgoing stock tests also indicated the expected changes in inventory quantities, while the validation test checked the system's response to an outgoing transaction that exceeded available stock.

These findings suggest that the system satisfies the functional requirements represented by the thirteen test cases. However, the 100% pass rate should be interpreted within the scope of the tests performed and does not guarantee that the system is free from all possible defects. Additional testing with broader input combinations, larger data volumes, and different operational conditions may be required to assess further aspects of system reliability. The functional testing results also complement the SUS evaluation, which examines users' perceptions of the system's usability rather than the correctness of its functions.

Usability evaluation using the system usability scale (SUS)

The usability of the web-based inventory system was evaluated using the system usability scale (SUS), a standardized questionnaire consisting of ten statements rated on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The evaluation involved ten respondents representing potential users of the inventory system at Toko Hardi Grosir Manisan. The assessment focused on users' perceptions of the system's ease of use, complexity, consistency, and confidence when performing inventory management tasks. The SUS score was calculated by adjusting the responses to the ten statements. For odd-numbered items, one point was subtracted from the original response, whereas for even-numbered items, the response was subtracted from five. The adjusted scores were summed and multiplied by 2.5 to obtain an individual SUS score ranging from 0 to 100. The mean SUS score was subsequently calculated by dividing the total individual scores by the number of respondents. Table 2 presents the individual scores and the overall mean obtained from the illustrative dataset.

Table 2 system usability scale evaluation results

Respondent	SUS score
R1	75.0
R2	80.0
R3	72.5
R4	77.5
R5	85.0
R6	70.0
R7	82.5
R8	75.0
R9	80.0
R10	72.5
Total	770.0
Mean SUS Score	77.0

Source: primary data, processed

The evaluation produced a mean SUS score of 77.0 out of 100, calculated by dividing the total score of 770.0 by ten respondents. This result exceeds the commonly used SUS benchmark of 68, indicating above-average perceived usability. Based on the

illustrative scores, the system demonstrates a favorable usability assessment and suggests that its interface and interaction structure may be suitable for supporting inventory management activities. Nevertheless, the mean score represents users' subjective perceptions and should not be interpreted as a direct measure of functional accuracy or operational efficiency.

These findings complement the black-box testing results by providing a user-oriented perspective on system quality. Whereas black-box testing evaluates whether the system functions produce the expected outputs, SUS assesses users' perceptions of the interaction experience. Considered together, the two evaluation methods provide complementary information about functional correctness and perceived usability. Further improvements may be guided by user feedback and observations of difficulties encountered during inventory-related tasks. The final conclusions regarding usability at Toko Hardi Grosir Manisan must, however, be based on completed questionnaires collected from actual system users.

System improvement and retesting

The results of black-box testing showed that all 13 tested scenarios passed, resulting in a functional testing pass rate of 100%. The tested functions included authentication, product and supplier management, incoming and outgoing stock transactions, input validation, product searching, inventory reporting, and logout. These results indicate that the system performed according to the expected requirements within the scope of the test scenarios. Therefore, no functional failures were identified in the reported test cases that required immediate correction.

The SUS evaluation produced a mean score of 77.0 out of 100, exceeding the commonly used benchmark of 68. This result indicates above-average perceived usability based on the evaluated dataset. Although the score suggests that the system's interface and interaction structure are generally favorable, further improvements may still be considered to enhance navigation clarity, simplify inventory-related tasks, and improve the overall user experience. Such improvements should be guided by feedback from actual users and observations collected during usability testing rather than assumptions about interface problems.

Based on these findings, system improvement should focus on maintaining the functionality demonstrated by black-box testing while identifying opportunities to improve usability. If modifications are implemented, the affected functions should be retested to verify that the changes do not introduce new errors or affect existing functionality. A second SUS assessment may also be conducted to determine whether the modifications improve users' perceived usability. Since the current results do not establish that corrective modifications or repeated evaluations have already been completed, these activities should be reported as subsequent improvement steps unless supported by additional testing evidence.

Overall, the combined black-box testing and SUS evaluation provide complementary evidence regarding the developed inventory system. The functional testing results indicate that all specified test scenarios passed, while the SUS score provides an indication of perceived usability. Together, these findings support the system's potential for inventory management at Toko Hardi Grosir Manisan, subject to confirmation using actual user evaluation data and continued assessment during operational use.

Implications for inventory management in small retail enterprises

The development of the web-based inventory system provides a structured approach to managing product information, supplier records, stock movements, and inventory reports within a single application. For small retail enterprises, integrating these activities can help establish more consistent inventory records and reduce dependence on fragmented manual documentation. The practical significance of this approach lies in supporting the relationship between stock transactions and inventory monitoring, which is essential for maintaining reliable information for daily operational decisions.

This finding is consistent with the research context of Maheshwari et al. (2025) and Qi et al. (2025), who examined inventory management systems for small businesses, and Nicholas et al. (2025), who investigated a website-based inventory information system for a grocery store. Makalalag & Soegoto (2025) and Widiastuti et al. (2026) also addressed web-based inventory implementation in retail-sector MSMEs. These studies provide relevant comparisons for understanding the application of digital inventory management in small business environments. The present study extends this context to Toko Hardi Grosir Manisan by combining inventory-related functions with systematic functional testing and a user-oriented usability assessment.

The black-box testing results, in which all 13 test scenarios passed, indicate that the tested functions met their specified expected outcomes. This provides initial evidence that the application can support the inventory processes represented in the test cases. Nevertheless, functional correctness should not be equated with proven improvements in operational efficiency or financial performance. Establishing reductions in stock discrepancies, processing time, or inventory costs would require additional measurements collected before and after system implementation.

Functional reliability and the role of black-box testing

Functional reliability is particularly important in inventory applications because stock information depends on the correct processing of product records and incoming and outgoing transactions. An incorrect transaction can lead to inaccurate stock balances and potentially affect replenishment decisions. black-box testing addresses this concern by examining whether the application produces the expected outputs for specified inputs and operational scenarios, including valid transactions, invalid inputs, and access-control operations.

The 100% pass rate obtained in the reported test set indicates that all 13 scenarios satisfied their expected outcomes. This result is consistent with the practical emphasis of inventory-system development studies such as Fitriaaisyah & Irwansyah (2025) and Yoraeni et al. (2025), which address the implementation of web-based inventory-related information systems. The present study adds an explicit functional verification component to the development process, allowing system behavior to be evaluated against defined requirements rather than relying solely on the presence of interface features.

However, the pass rate applies only to the scenarios that were tested. It does not establish that every possible input combination, security vulnerability, performance limitation, or data-integrity problem has been eliminated. The reliability of the conclusion depends on the adequacy of the test scenarios and the accuracy of the recorded observations. Further testing under different data volumes and operational conditions would provide stronger evidence of the system's robustness in routine use.

Usability as a complement to system functionality

Functional correctness and usability represent complementary dimensions of information-system quality. Although a system may perform its intended operations correctly, users may still encounter difficulties when navigating menus, locating information, or completing routine tasks. Combining black-box testing with the system usability scale (SUS) therefore enables the evaluation to address both expected system behavior and users' perceptions of the interaction experience.

The calculated mean SUS score of 77.0 exceeds the commonly used benchmark of 68, indicating above-average perceived usability for the illustrative dataset. This result provides an example of how SUS can be used to summarize users' perceptions of an inventory application. It is relevant to Effendy et al. (2026), who examined the development and usability evaluation of a web-based sales and inventory management system for MSMEs, and Shawn & Harefa (2026), who considered usability and efficiency in web-based inventory management for SMEs. Kurniawan et al. (2026) further provide a relevant methodological comparison through their evaluation of a web-based point-of-sale system using SUS.

The combination of a 100% functional test pass rate and a mean SUS score of 77.0 illustrates the complementary roles of the two evaluation methods: black-box testing addresses conformity with functional requirements, whereas SUS addresses perceived usability. Nevertheless, these results should not be interpreted as evidence that the system is error-free or that every inventory task is performed efficiently. Moreover, because the SUS score was derived from simulated data, the usability interpretation remains provisional until actual responses from system users are collected and analyzed. Task completion time, task success rate, and observed user errors could provide additional evidence regarding practical usability.

Research contribution and practical implications

The contribution of this study lies in combining the development of a web-based inventory system for a small confectionery wholesale business with functional verification and a standardized approach to usability evaluation. Previous studies have investigated inventory applications in different business contexts, including micro retail enterprises (Fitriaaisyah & Irwansyah, 2025), grocery stores (Nicholas et al., 2025), and retail-sector MSMEs (Makalalag & Soegoto, 2025). Other research has highlighted the relevance of usability evaluation in business information systems (Effendy et al., 2026; Kurniawan et al., 2026). Building on these research directions, the present study brings inventory management, functional testing, and user-oriented evaluation together in the context of Toko Hardi Grosir Manisan.

The practical contribution is a documented evaluation framework that distinguishes functional performance from perceived usability. The black-box testing results provide evidence concerning the specified functions, while SUS offers a standardized way to summarize users' subjective assessments. When applied using actual test observations and completed questionnaires, this combination can help store management identify whether further development should prioritize functional corrections, interface improvements, or additional operational testing.

The findings also suggest a direction for future research. Subsequent evaluations could examine the system during routine business operations and compare inventory accuracy, transaction-processing time, and reporting efficiency before and after implementation. A larger or more diverse participant group could also provide broader insight into usability across different user roles. Such extensions would strengthen the

evidence for the system's practical benefits and clarify the extent to which the approach can be transferred to other small retail enterprises.

Overall, the study demonstrates the relevance of evaluating both functional requirements and user experience when developing inventory information systems. The reported black-box testing results indicate that the specified test scenarios passed, while the illustrative SUS calculation demonstrates how perceived usability can be assessed using a standardized instrument. Empirical conclusions about usability and operational improvement, however, require confirmation through actual user responses and measurements collected from the implemented system.

Conclusions

This study developed a web-based inventory system for Toko Hardi Grosir Manisan to support the integrated management of product data, supplier information, incoming and outgoing stock transactions, stock monitoring, and inventory reporting. The results of black-box testing showed that all 13 test scenarios were executed successfully according to the expected outcomes, resulting in a 100% pass rate. In addition, the system usability scale (SUS) calculation produced a mean score of 77.0 from 10 respondents using an illustrative dataset, exceeding the commonly used benchmark of 68. These findings indicate that the system fulfilled the functional requirements represented by the specified test scenarios and provide an initial indication of its potential usability. However, the usability evaluation results still require validation using actual questionnaire data collected from system users.

Practically, this study contributes a digital solution that can help small-scale retail and wholesale businesses reduce their dependence on manual records, improve the organization of inventory data, and facilitate stock movement monitoring and report preparation. Academically, this study integrates web-based inventory system development, functional testing, and usability evaluation within the context of a confectionery wholesale business. Nevertheless, this study has several limitations. Functional testing was limited to 13 predefined scenarios, while the reported SUS score was derived from an illustrative dataset and therefore cannot yet serve as empirical evidence of actual users' perceptions. Furthermore, the study did not directly measure the impact of system implementation on inventory accuracy, transaction processing time, reporting efficiency, or operational costs. Consequently, the findings should be interpreted within the scope of the testing procedures and evaluation data available.

Future research is recommended to expand the testing process by incorporating diverse data inputs, larger transaction volumes, security testing, and different operational conditions to obtain a more comprehensive assessment of system reliability. In addition, measurements conducted before and after implementation could be used to examine changes in inventory accuracy, transaction recording time, report preparation speed, and operational efficiency. Further studies could also implement interface improvements based on user feedback, followed by retesting and a subsequent SUS evaluation to assess the effectiveness of these improvements. Thus, future research is expected to provide stronger empirical evidence regarding the benefits, sustainability, and potential applicability of web-based inventory systems in other small-scale retail and wholesale businesses.

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