

DEVELOPMENT AND USABILITY EVALUATION OF A WEB-BASED POS FOR HARDWARE STORES USING SUS

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Abstract

Small retail businesses such as hardware stores often manage sales, stock, and reporting manually, which can lead to recording errors, slow reporting, and limited decision support. This study develops a web-based Point of Sale (POS) application for a hardware store environment and evaluates its usability using the System Usability Scale (SUS). The POS system supports product and category management, transaction processing (discount and tax), sales reporting with date-range filtering, best-selling product summaries, and CSV export for spreadsheet-based bookkeeping. The research method follows a design-and-build approach, supported by functional validation using black-box testing and usability measurement using SUS. Usability testing involved five respondents who performed task scenarios including creating transactions, opening sales reports, filtering by date range, and exporting CSV data. The SUS results show respondent scores of 40.0, 82.5, 67.5, 77.5, and 90.0, with an average score of 71.5 (SD = 19.41). The average score indicates the system is acceptable and generally usable, although variability suggests different learning needs across users. The study concludes that a web-based POS with integrated reporting and export features can meet operational needs of small hardware stores and achieves an acceptable usability level. Recommendations include improving onboarding and simplifying certain workflows for new users.

Keywords: Point of Sale, Web-based System, Hardware Store, Usability, System Usability Scale

Abstrak

Usaha ritel skala kecil seperti toko bangunan masih banyak yang mengelola penjualan, stok, dan pelaporan secara manual sehingga berpotensi menimbulkan kesalahan pencatatan, keterlambatan laporan, dan minim dukungan pengambilan keputusan. Penelitian ini mengembangkan aplikasi Point of Sale (POS) berbasis web untuk konteks toko bangunan dan mengevaluasi usability menggunakan System Usability Scale (SUS). Sistem POS mendukung pengelolaan produk dan kategori, transaksi penjualan (diskon dan pajak), pelaporan penjualan dengan filter rentang tanggal, ringkasan produk terlaris, serta ekspor CSV untuk kebutuhan pembukuan berbasis spreadsheet. Metode penelitian menggunakan pendekatan rancang bangun yang didukung validasi fungsional melalui pengujian black-box dan pengukuran usability menggunakan SUS. Uji usability melibatkan lima responden yang menjalankan skenario tugas seperti membuat transaksi, membuka laporan penjualan, menerapkan filter rentang tanggal, dan mengekspor data CSV. Hasil SUS menunjukkan skor responden sebesar 40,0; 82,5; 67,5; 77,5; dan 90,0 dengan rata-rata 71,5 (SD = 19,41). Nilai rata-rata tersebut mengindikasikan sistem berada pada kategori dapat diterima (acceptable), meskipun terdapat variasi yang menunjukkan kebutuhan pembiasaan/pendampingan bagi pengguna baru. Kesimpulan penelitian menunjukkan POS berbasis web dengan fitur pelaporan dan ekspor data dapat memenuhi kebutuhan operasional toko bangunan dan mencapai usability yang memadai. Rekomendasi pengembangan meliputi peningkatan onboarding dan penyederhanaan alur bagi pengguna pemula.

Kata kunci: Point of Sale, Sistem Berbasis Web, Toko Bangunan, Usability, System Usability Scale

INTRODUCTION

Hardware stores commonly manage a wide variety of products with frequent daily transactions and dynamic inventory updates. In many small retail contexts, sales recording and reporting are still performed manually or semi-manually, which increases the risk of input errors, delayed reporting, and difficulties in tracing transaction histories when discrepancies occur. As a result, operational decision-making, especially for sales monitoring and inventory replenishment, becomes less effective (Hanelt, Bohnsack, Marz, & Antunes Marante, 2021; Philbin, Viswanathan, & Telukdarie, 2022; Verhoef et al., 2021).

A Point of Sale (POS) system can support retail operations by integrating transaction recording, product management, and sales reporting in a structured manner. However, the success of POS adoption in small businesses is not determined solely by feature completeness. Usability is a critical factor, referring to the extent to which a system can be used effectively, efficiently, and with user satisfaction to achieve specific goals. Recent digital transformation literature emphasizes that user experience and usability strongly influence successful adoption and continued use of digital systems in small-business contexts (Philbin et al., 2022; Verhoef et al., 2021).

If the interface and workflow are difficult to understand, users may avoid using the system consistently, which can reduce perceived usefulness and intention to use (Astiti, Prayoga, & Imbayani, 2023; Mangambe, Pontoh, & Datu, 2025; Nur, Ikwanto, & Indriani, 2024). These findings are consistent with technology-acceptance studies in SMEs, where perceived ease of use and usefulness remain key predictors of adoption and continued use (Astiti et al., 2023; Putri, Aini, Solekah, & Istiqomah, 2023).

Technology adoption in small retail settings is strongly influenced by perceived usefulness and perceived ease of use. When POS workflows are unclear or require extra effort, users may resist consistent usage even if the system provides complete features. This aligns with recent Technology Acceptance Model (TAM) evidence in SMEs, where perceived ease of use and perceived usefulness, which are closely related to interface usability, remain key predictors of adoption intention and continued use of digital systems (Astiti et al., 2023; Mangambe et al., 2025; Nur et al., 2024).

To evaluate usability, the System Usability Scale (SUS) is widely used as a simple and reliable

questionnaire consisting of 10 items rated on a 1–5 Likert scale. Recent evidence shows that SUS remains frequently applied in information system development studies during 2021–2025, indicating its continued relevance as a practical usability measure (Yani, Nazhifah, & Pradika, 2025). SUS has been applied broadly across interactive systems and provides a practical benchmark for interpreting usability levels and user acceptance (Budiman, 2025; Nugroho, 2025).

Prior research has shown that SUS is robust for quick usability assessment and that score interpretation can be supported by empirical benchmarks and acceptability ranges. Empirical evaluation work provides guidance for understanding SUS score meaning beyond a raw number, supporting clearer reporting of usability outcomes (Deshmukh & Chalmeta, 2024; Hyzy et al., 2022; Yani et al., 2025).

Based on these needs, this study designs and develops a web-based POS application for a hardware store context, featuring sales transactions, sales reporting with date-range filtering, best-selling product summaries, and CSV export for spreadsheet-based bookkeeping (Antonius, Darmanto, & Willay, 2025; As'ari & Hadiwandura, 2025). In addition to system development, this study evaluates the usability of the application using SUS with five respondents. The contributions of this work are: (1) a web-based POS artifact tailored to hardware store operations, (2) measurable usability evidence using SUS, and (3) practical recommendations for improving usability based on observed score variations.

This study addresses two research questions: (1) how to design and implement a web-based POS application that supports sales transactions and reporting for a hardware store, and (2) what usability level the application achieves based on SUS evaluation results.

RESEARCH METHODS

Types of research

This study uses a design-and-evaluation approach to develop a web-based Point of Sale (POS) application and assess its usability. The approach aligns with Design Science Research, where an artifact is built to address a real problem and then evaluated using appropriate methods (Guntara, Nugraha, & Ridlo, 2023; Huseynli, Bub, & Ogbuachi, 2022; Muntean & Militaru, 2022). The work consists of (1) system development based on identified operational needs of a hardware store, (2) functional verification using black-box testing,

and (3) usability evaluation using the System Usability Scale (SUS) questionnaire (Hakim, Kurniawan, Wijaya, & Suprapti, 2025; Yani et al., 2025).

Time and Place of Research

The study was conducted from January to February 2026 in a local hardware-store context using a web-based POS application accessed through a web browser. The POS application was operated locally by users for testing purposes, while the SUS questionnaire was administered online using Google Forms.

Research Target / Subject

The research subjects were prospective users of the POS system. A total of five respondents (R1–R5) participated in usability testing. Although the participant number was limited ($n = 5$), small samples are commonly used in formative usability evaluations to efficiently identify major usability issues, while acknowledging that additional issues may emerge with larger samples (Pati & Umar, 2022; Salam, Rahmawati, Novita, Satria, & Rafi'i, 2022). Respondents were asked to perform representative tasks using the POS application and then complete the SUS questionnaire. Respondent identities were anonymized using codes to protect privacy.

Procedure

This study employed a Design Science Research (DSR) approach to develop and evaluate a web-based Point of Sale (POS) application. The research procedure included:

1. **Requirement identification:** identifying core POS needs for a hardware store (transaction processing, product and category management, reporting, and data export).
2. **System development:** implementing the POS as a web-based application supporting local use.
3. **Functional testing:** validating each feature using black-box testing to ensure expected outputs for given inputs.
4. **Usability testing:** conducting user task trials followed by SUS questionnaire completion.
5. **Data analysis:** calculating SUS scores per respondent and summarizing descriptive statistics (mean, standard deviation, minimum, and maximum).

Data, Instruments, and Data Collection Techniques

Data collected in this study were obtained through task-based trials and a questionnaire. The collected data include: (1) functional test outcomes (pass/fail) from black-box testing, (2) SUS questionnaire responses (10 items using a 1–5 Likert scale) collected via Google Forms and recorded in Google Sheets, and (3) system documentation in the form of screenshots used to demonstrate key outputs (transaction screen, sales report screen, best-selling products panel, and CSV export evidence).

The instruments used were:

- **Black-box test checklist** to validate core functions (product/category management, transaction calculation, report filtering, export, and transaction deletion).
- **SUS questionnaire** consisting of 10 standard items rated on a 1-5 scale (Hakim et al., 2025; Yani et al., 2025).

Before completing the SUS questionnaire, each respondent performed task scenarios that represent typical POS usage, including:

- Creating sales transactions (adding items, applying discount/tax as needed, and saving the transaction).
- Opening the sales report and applying date-range filtering.
- Viewing the best-selling product summary.
- Exporting transaction data to CSV and verifying the file output.
- Deleting an incorrect transaction (if applicable) and confirming report updates.

Data analysis technique

The system was developed using HTML, CSS, and JavaScript as a web-based application running in a browser environment, with browser LocalStorage used as a lightweight database for managing product and transaction data. SUS scoring was calculated following the standard method (Hakim et al., 2025; Yani et al., 2025):

- For odd-numbered items (1, 3, 5, 7, 9), the contribution is (response - 1).
- For even-numbered items (2, 4, 6, 8, 10), the contribution is (5 - response).

The total SUS score is obtained by summing all contributions and multiplying by 2.5, producing a score range of 0-100. Descriptive statistics (mean, standard deviation, minimum, maximum) were computed to summarize usability results.

RESULTS AND DISCUSSION

System implementation

A web-based Point of Sale (POS) application was developed to support a hardware-store context. The system provides modules for product management, category management, transaction processing (cart, subtotal, discount, tax, and total), sales reporting with date-range filtering, best-selling product summaries, and CSV export for spreadsheet-based bookkeeping. The application is intended for local store usage through a web browser and does not require public hosting.

Figure 1 shows the transaction screen with cart contents and pricing components. Figure 2 presents the sales report popup including selected date range, revenue (omzet), transaction count, and daily summary. Figure 3 displays the best-selling products panel ranked by quantity or revenue. Figure 4 shows the CSV export feature and evidence of exported file output.

Functional testing (black-box)

Black-box testing was performed to verify whether each function produced the expected output for given inputs. The results confirm that core features operated correctly, including product/category management, transaction calculations, report generation and filtering, CSV export, and deletion of incorrect transactions

Table 1. Black-box testing summary

No.	Feature/Test Case	Expected result	Result
1	Add new product	Product saved and shown in product list	Pass
2	Edit product	Product information updated correctly	Pass
3	Delete product	Product removed from list	Pass
4	Add category	Category saved and selectable	Pass
5	Transaction : add item to cart	Quantity and subtotal updated	Pass
6	Apply discount	Total updated based on discount	Pass
7	Apply tax (PPN)	Total updated based on tax value	Pass
8	Save transaction	Transaction stored and appears in report	Pass

9	Report: date-range filter	Report displays only selected range	Pass
10	Best-selling products	Ranking displayed correctly (qty/revenue)	Pass
11	Export CSV	CSV file generated and downloadable	Pass
12	Delete wrong transaction	Transaction removed and report updates	Pass

Usability evaluation (SUS)

Usability was evaluated using the System Usability Scale (SUS) after respondents completed the task scenarios. The obtained SUS scores are presented in Table 2.

Table 2. SUS score per respondent

Respondent	SUS Score
R1	40.0
R2	82.5
R3	67.5
R4	77.5
R5	90.0
Mean	71.5
Standard deviation (SD)	19.41
Minimum–Maximum	40.0–90.0

The average SUS score of 71.5 indicates that the system is generally usable and acceptable for the tested users. According to commonly used SUS interpretation guidelines, a score of 71.5 falls within the “Good” usability range (Grade B) and is considered above the average usability benchmark (Bangor et al., 2008; Lewis, 2018). This suggests that the developed POS system provides satisfactory usability for most users. However, the relatively high score variance (SD = 19.41) indicates differences in user familiarity or learning needs. The lowest score (R1 = 40.0) suggests that some users may require clearer guidance or simplified workflow cues, while higher scores (e.g., R5 = 90.0) indicate that the system can be perceived as highly usable once users understand the interface and task flow.

Discussion

The integration of reporting and CSV export features provides practical value for small hardware stores beyond basic transaction recording. Date-range filtering supports routine

monitoring (daily/weekly), best-selling product summaries support inventory decision-making, and CSV export enables lightweight bookkeeping without requiring additional systems. Based on the SUS findings, usability improvements should prioritize learnability for first-time users, such as onboarding guidance (tooltips or short instructions), clearer labels, and confirmations for critical actions (e.g., transaction deletion), consistent with common usability and human-centered design recommendations (Manuri, Decataldo, Sanna, & Brizzi, 2023).

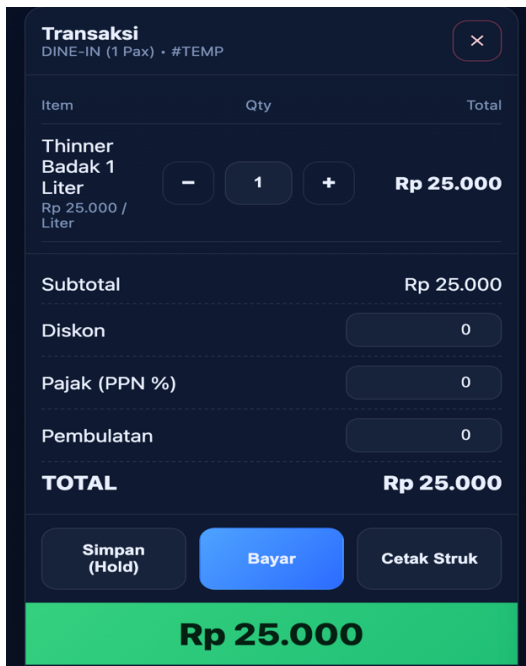


Figure 1. Transaction page showing cart contents and pricing components (subtotal, discount, tax, and total)

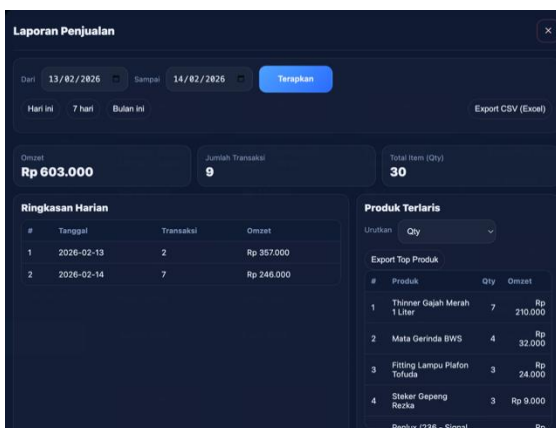


Figure 2 Sales report popup showing date range, revenue (omzet), transaction count, and daily summary.

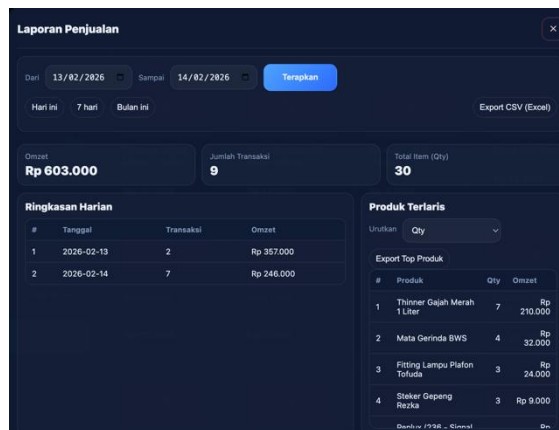


Figure 3 Best-selling products panel (ranked by quantity/revenue)

tanggal	waktu	id	metode	subtotal	diskon	ppn	pembulatan	total	idagar	produk	varian	qty	harga_satuan	total_jml
2026-02-14	14:37:36	183640-015-40d-6432-4b73633d0bc	CASH	25000	0	0	0	25000	25000	Thinner Badak 1 Liter		1	25000	25000
2026-02-14	14:38:46	2049778-5008-4919-4610-5b0d8f0b484	CASH	24000	0	0	0	24000	24000	Mata Gerinda BWS		4	6000	24000
2026-02-14	14:38:59	4946665-7423-4802-4719-4a6d46420126f	TRANSFER	10000	0	0	0	10000	10000	Penak	204 - Signal Red	2	5000	10000
2026-02-14	14:39:38	4946665-7423-4802-4719-4a6d46420126f	CASH	4000	0	0	0	4000	4000	Steker Gampang Rezka		1	4000	4000
2026-02-14	14:39:46	2120846-6746-4726-61fa-45216a66682	CASH	30000	0	0	0	30000	30000	Paku Pagar		2	15000	30000
2026-02-14	14:39:53	08118540-6746-4726-61fa-45216a66682	CASH	15000	0	0	0	15000	15000	Cing Tembok Kaca 440 ml		1	15000	15000
2026-02-14	14:39:59	62201689-4532-44c3-8a1f-051d4a24a545	CASH	8000	0	0	0	8000	8000	Fiting Lampu Plafon Tolu		1	8000	8000
2026-02-14	14:39:59	4a023aa-004-4407-4401-15880190710	TRANSFER	10000	0	0	0	10000	10000	Thinner Gajah Merah 1 Liter		5	3000	15000
2026-02-14	14:39:59	4a023aa-004-4407-4401-15880190710	TRANSFER	10000	0	0	0	10000	10000	Syal Raga		2	5000	10000
2026-02-14	14:39:59	4a023aa-004-4407-4401-15880190710	TRANSFER	10000	0	0	0	10000	10000	Leak Proof Head		2	5000	10000
2026-02-14	14:39:59	4a023aa-004-4407-4401-15880190710	TRANSFER	10000	0	0	0	10000	10000	Steker Gampang Rezka		3	3000	9000
2026-02-14	14:39:59	82714810-1008-4056-8a7f-4a0219138466	CRS	164000	0	0	0	164000	164000	Thinner Gajah Merah 1 Liter		2	30000	60000
2026-02-14	14:39:59	82714810-1008-4056-8a7f-4a0219138466	CRS	164000	0	0	0	164000	164000	Mata Gerinda BWS		1	8000	8000
2026-02-14	14:39:59	82714810-1008-4056-8a7f-4a0219138466	CRS	164000	0	0	0	164000	164000	Olak Premium		2	40000	80000
2026-02-14	14:39:59	82714810-1008-4056-8a7f-4a0219138466	CRS	164000	0	0	0	164000	164000	Fiting Lampu Plafon Tolu		2	8000	16000

Figure 4. CSV export feature and evidence of exported transaction data opened in spreadsheet software.

CONCLUSIONS AND SUGGESTIONS

Conclusion

This study developed a web-based POS application for a hardware-store context and evaluated its usability using the System Usability Scale (SUS). Black-box testing confirmed that core functions operated as expected, including product/category management, transaction processing, reporting with date-range filtering, best-selling product summaries, CSV export, and transaction deletion. The usability evaluation resulted in a mean SUS score of 71.5 (SD = 19.41, min-max = 40.0-90.0), indicating that the system is generally usable and acceptable for the tested users. Variations in scores suggest that first-time user learnability remains a key area for improvement.

Suggestion

Future improvements should focus on enhancing learnability and reducing variability in user experience, such as adding brief onboarding guidance (tooltips/short instructions), clearer labels for pricing components (discount/tax/rounding), and confirmation dialogs

for critical actions (e.g., deleting transactions). Further studies may involve a larger and more diverse respondent group, compare SUS results before and after interface refinements, or complement SUS with qualitative feedback to identify specific usability issues.

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