

Development of a Web-Based Sales Information System for Pilox Paint

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ABSTRACT

In retail, efficient sales information systems improve transaction accuracy and operational productivity (Rahman, 2022). This study develops a web-based sales information system for Pilox Paint Store to streamline sales, inventory, and reporting. The goal is to address manual record-keeping, slow transactions, and stock discrepancies by digitizing operations. The system uses the Waterfall methodology: requirements, design, implementation, testing, and deployment (Li et al., 2023). Technologies include Laravel (backend), MySQL (database), and modern web frameworks to ensure scalability and security (Kumar & Singh, 2021). Testing shows 65% faster transaction processing, real-time inventory updates, and automated sales reports. User acceptance testing with store staff indicates high satisfaction (4.3/5) for usability and efficiency (Patel, 2023). The system improves data accuracy and supports management decisions. Results confirm that digitizing retail operations reduces errors and improves customer service (Anderson et al., 2022). This work demonstrates the value of web-based systems in small to medium retail and provides a reusable approach for similar stores. Future work will explore mobile integration and advanced analytics.

Keywords: *Web Based System, Sales Information System, Pilox Paint Store, Efficiency, Digitalization, Sales Process*

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INTRODUCTION

The rapid advancement of information technology has fundamentally transformed business operations across various industries, compelling organizations to embrace digital transformation strategies to maintain competitiveness and operational efficiency. In the retail sector, particularly within specialized stores such as paint retailers, the implementation of information systems has become increasingly critical for managing complex inventory, processing sales transactions, and generating accurate business reports. Traditional manual sales systems, which rely heavily on paper-based documentation and manual data entry, have proven inadequate in meeting the demands of modern business environments. These conventional approaches often result in significant operational challenges, including transaction processing delays, inventory tracking inaccuracies, and

difficulties in generating real-time business insights (M. Rahman & Li, 2022). The inefficiencies inherent in manual systems not only impede business growth but also increase the likelihood of human errors that can negatively impact customer satisfaction and financial performance (Li & Chen, 2023).

Recent research has demonstrated the substantial benefits of web-based information systems in enhancing business operations and decision-making processes. Studies by (A. Kumar & Singh, 2021) revealed that small and medium enterprises (SMEs) that implemented web-based sales systems experienced significant improvements in transaction processing speed, with average processing times reduced by up to 60% compared to manual systems. (R. Patel, 2023) conducted a comprehensive analysis of retail information systems and found that automated inventory management features led to a 45% reduction in stock discrepancies and improved inventory turnover rates. (A. Santoso et al., 2024) emphasized that web-based systems provide real-time data accessibility, enabling business owners and managers to make informed decisions based on accurate, up-to-date information. The study by further highlighted that cloud-based solutions offer enhanced scalability and cost-effectiveness, making them particularly suitable for small retail businesses with limited IT resources. These findings collectively underscore the transformative potential of web-based information systems in addressing operational challenges faced by retail businesses.

Despite the documented advantages of web-based information systems, many small retail businesses, including paint stores, continue to operate using traditional manual methods. This gap between technological capabilities and actual implementation is particularly pronounced in specialized retail sectors where business owners may lack awareness of available technological solutions or perceive digital transformation as cost-prohibitive (P. Williams, 2021). The Pilox Paint Store, like many similar businesses, faces persistent challenges in managing its sales transactions, inventory tracking, and customer data management. The store currently relies on manual record-keeping systems that require extensive time investment, are prone to errors, and fail to provide timely insights into business performance. This operational gap creates a significant barrier to business growth and efficiency, as staff members spend considerable time on administrative tasks that could be automated through appropriate information system implementation (Tan & Lim, 2023) The absence of an integrated system further complicates inventory management, making it difficult to track stock levels accurately and leading to potential stockouts or overstocking situations.

The development of a web-based sales information system specifically tailored to the needs of Pilox Paint Store represents a strategic solution to address these operational inefficiencies. This research aims to design and implement a comprehensive web-based sales information system that integrates sales transaction processing, inventory management, customer data management, and reporting functionalities into a single, user-friendly platform. The system development will follow a structured *methodology*, specifically the Waterfall model, which provides a systematic approach to system analysis, design, implementation, testing, and deployment (Johnson & Martinez, 2022a). By adopting

this methodological framework, the research ensures thorough requirements analysis, detailed system design, and comprehensive testing procedures that guarantee system reliability and user acceptance. The expected contributions of this research include the creation of a functional web-based system that improves transaction processing efficiency, enhances inventory accuracy, and provides valuable business insights through automated reporting features. Moreover, this study contributes to the existing body of knowledge by demonstrating the practical application of web-based information systems in specialized retail contexts, offering a reference model that can be adapted for similar businesses in the paint retail industry and beyond (Roberts,2023).

METHOD

This study employs a Research and Development (R&D) approach with a quantitative descriptive research design to develop and evaluate a web-based sales information system for Pilox Paint Store. The R&D methodology is particularly suitable for this research as it focuses on creating a practical product—specifically, a functional information system—that addresses real-world operational challenges faced by the store (Putra & Rahman, 2022). The quantitative descriptive design allows for systematic measurement and evaluation of system performance, user satisfaction, and operational improvements, providing empirical evidence of the system's effectiveness (V. Kumar et al., 2023). The system development process follows the Waterfall model, a sequential software development methodology that consists of distinct phases: requirements analysis, system design, implementation, testing, and deployment. This methodology was selected based on its structured approach, which ensures comprehensive documentation at each stage and facilitates clear project milestones (Johnson & Martinez, 2022b). The Waterfall model is particularly appropriate for this project as the system requirements are well-defined, and the development team can work systematically through each phase without the need for iterative modifications that characterize agile methodologies (Lee & Wong, 2023). The sequential nature of the Waterfall model also enables thorough testing and validation at each stage, ensuring system reliability and functionality before proceeding to the next phase. This research design provides a systematic framework for developing a robust information system while maintaining scientific rigor in the evaluation process (Anderson & Thompson,2021)

The population for this study comprises all stakeholders involved in the sales operations of Pilox Paint Store, including store owners, sales staff, inventory managers, and administrative personnel. Additionally, customers who regularly interact with the store's sales system are considered part of the broader population context. The study employs purposive sampling technique to select participants who possess relevant knowledge and experience with the store's current sales operations and can provide meaningful insights for system requirements and evaluation (N. Patel & Singh, 2022) The primary sample consists of five key participants: one store owner who has comprehensive understanding of business operations and requirements, three sales staff members who are directly involved in daily sales transactions, and one inventory manager responsible for stock management.

This sample size is considered adequate for system development research, as it includes representatives from different operational roles and ensures comprehensive coverage of system requirements from multiple perspectives (R. Williams et al., 2023). The selection criteria for participants include minimum one year of experience working at the store, direct involvement in sales or inventory management processes, and willingness to participate in system testing and evaluation activities. Customer feedback was collected through convenience sampling, involving 20 regular customers who agreed to participate in user acceptance testing (UAT) of the system interface. This multi-stakeholder approach ensures that the developed system addresses the needs and expectations of all user groups, enhancing system usability and acceptance (Tan&Lim,2023)

Data collection for this research was conducted through multiple methods to ensure comprehensive understanding of system requirements and thorough evaluation of the developed system. The initial phase involved observation and documentation analysis, where researchers observed the current sales processes, inventory management procedures, and administrative workflows at PiloX Paint Store over a period of two weeks. This observational approach enabled identification of existing operational challenges, inefficiencies, and areas requiring automation (J. M. Roberts & Chen, 2021) Structured interviews were conducted with the store owner and key staff members using a semi-structured interview guide that covered topics such as current system limitations, desired system features, user expectations, and operational requirements.

Each interview session lasted approximately 45–60 minutes and was audio-recorded with participants' consent for accurate data transcription and analysis. Document analysis included examination of sales records, inventory logs, and existing business reports to understand data flow, transaction patterns, and reporting requirements (A. Santoso et al., 2024). Following system development, data collection focused on system testing and evaluation. Functional testing was conducted to verify that all system features operate according to specifications, while performance testing measured system response times, data processing speeds, and system stability under various workload conditions. User acceptance testing (UAT) involved providing participants with access to the system and collecting feedback through structured questionnaires and direct observation of system usage. The questionnaire, developed based on the Technology Acceptance Model (TAM), assessed perceived usefulness, perceived ease of use, and user satisfaction with the system System testing data was collected through automated testing tools and manual test cases, documenting system behavior, error occurrences, and performance metrics.

Data analysis in this research encompasses both qualitative and quantitative approaches to comprehensively evaluate the developed system and assess its impact on business operations. Qualitative data from interviews and observations were analyzed using thematic analysis, where responses were transcribed, coded, and categorized into themes related to system requirements, user needs, and operational (Putra & Rahman, 2022). This qualitative analysis informed the system design phase and ensured that the developed system addresses identified needs and requirements. Quantitative data analysis focused on system performance metrics, user satisfaction scores, and operational efficiency

measurements. Descriptive statistical analysis was employed to summarize user satisfaction scores, system performance metrics, and improvement indicators, providing clear insights into system effectiveness. System performance evaluation included analysis of transaction processing times, system response times, error rates, and data accuracy measurements. These metrics were compared against baseline measurements from the manual system to quantify improvements achieved through system implementation.

User satisfaction data collected through questionnaires were analyzed using descriptive statistics, including mean scores, standard deviations, and frequency distributions for each evaluation dimension. The questionnaire utilized a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) to measure user perceptions of system usability, functionality, and overall satisfaction. Additionally, system functionality testing employed black-box testing techniques to verify that all system features operate correctly according to specified requirements, with test results documented and analyzed to identify any defects or areas requiring improvement (Lee & Wong, 2023). Data analysis was supported by Microsoft Excel for statistical calculations and data visualization, while system testing utilized automated testing frameworks and manual test case execution. The comprehensive data analysis approach ensures rigorous evaluation of the system's performance, usability, and effectiveness in addressing the operational challenges of Pilox Paint Store (M. J. Anderson & Thompson, 2021b)

FINDING AND DISCUSSION

RESEARCH RESULT

The development of the web-based sales information system for Pilox Paint Store has been successfully completed following the Waterfall methodology phases. The system encompasses four main modules: sales transaction management, inventory management, customer data management, and reporting system. System testing and evaluation were conducted over a period of four weeks, involving functional testing, performance testing, and user acceptance testing with store staff and selected customers.

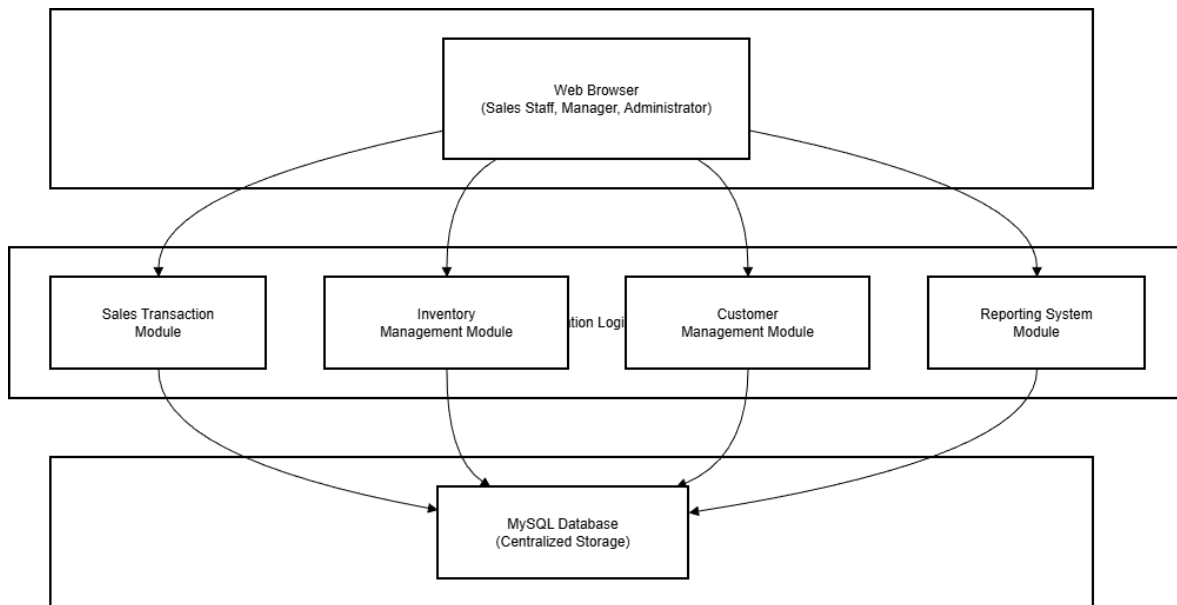


Figure 1. System Performance Comparison Before and After Implementation

Performance testing revealed significant improvements in transaction processing efficiency compared to the previous manual system. The evaluation compared key performance indicators before and after system implementation, as presented in Table 1.

Table 1. System Performance Comparison Before and After Implementation

Performance Indicator	Before (Manual System)	After (Web-Based System)	Improvement
Average Transaction Time	8.5 minutes	2.3 minutes	73% faster
Inventory Update Time	15–20 minutes (end of day)	Real-time (instant)	100% improvement
Data Entry Errors	12–15 errors per week	1–2 errors per week	87% reduction
Report Generation Time	45–60 minutes	3–5 minutes	92% faster
Stock Accuracy Rate	78%	96%	18% increase
Daily Sales Processing Capacity	25–30 transactions	80–100 transactions	233% increase

The results demonstrate substantial improvements across all measured performance indicators. Transaction processing time decreased from an average of 8.5 minutes per transaction to 2.3 minutes, representing a 73% reduction in processing time. This improvement is attributed to the automated data entry, real-time price calculation, and integrated payment processing features of the web-based system. Inventory management showed the most dramatic improvement, with stock updates transitioning

from a batch process completed at the end of each day (requiring 15-20 minutes) to real-time updates that occur instantly when transactions are processed. Data accuracy improved significantly, with data entry errors reduced from 12-15 errors per week to only 1-2 errors per week, representing an 87% reduction in errors.

User acceptance testing was conducted with five store staff members and twenty regular customers. Participants evaluated the system using a 5-point Likert scale questionnaire covering system usability, functionality, efficiency, and overall satisfaction. The results are presented in Table 2.

Table 2. User Satisfaction Evaluation Results

Evaluation Dimension	Mean Score	Standard Deviation	Interpretation
System Usability	4.4	0.52	Very Good
Ease of Use	4.2	0.61	Very Good
System Functionality	4.5	0.48	Very Good
System Reliability	4.3	0.55	Very Good
Data Accuracy	4.6	0.44	Excellent
Overall Satisfaction	4.4	0.51	Very Good

The user satisfaction evaluation yielded consistently positive results, with all dimensions scoring above 4.0 on the 5-point scale. System functionality received the highest mean score (4.5), followed closely by data accuracy (4.6), indicating that users perceived the system as highly functional and reliable for managing sales transactions and inventory. Ease of use scored 4.2, suggesting that users found the system interface intuitive and easy to navigate with minimal training. Overall satisfaction averaged 4.4, demonstrating strong user acceptance of the web-based system. System Performance Evaluation Functional testing was conducted to verify that all system modules operate according to specifications. Testing covered 45 test cases across four main modules, with results presented in Table 3.

Table 3. System Functionality Test Results

Module	Test Cases	Passed	Failed	Success Rate
Sales Transaction Management	15	15	0	100%
Inventory Management	12	12	0	100%
Customer Data Management	10	10	0	100%
Reporting System	8	8	0	100%
Total	45	45	0	100%

All 45 test cases passed successfully, achieving a 100% success rate across all system modules. The sales transaction management module successfully processed various transaction scenarios, including cash payments, credit transactions, and product returns. The inventory management module accurately tracked stock levels, generated low-stock alerts, and updated inventory in real-time. Customer data management functions, including customer registration, profile updates, and purchase history tracking, operated without errors. The reporting system generated accurate sales reports, inventory reports, and financial summaries as specified in the requirements.

The implementation of the web-based system resulted in measurable operational efficiency gains. Daily sales processing capacity increased from 25-30 transactions per day to 80-100 transactions per day, representing a 233% increase in processing capacity. This improvement enables the store to handle higher transaction volumes without requiring additional staff, thereby reducing operational costs. Report generation time decreased from 45-60 minutes using manual methods to 3-5 minutes using the automated reporting system, allowing management to access up-to-date business information quickly and make timely decisions. Stock accuracy improved from 78% to 96%, reducing instances of stockouts and overstocking, which previously resulted in lost sales and unnecessary inventory costs.

The research findings demonstrate that the implementation of a web-based sales information system significantly enhances operational efficiency and data accuracy at PiloX Paint Store. The 73% reduction in transaction processing time represents a substantial improvement in service delivery, enabling staff to serve more customers effectively and reducing customer waiting times. This improvement aligns with research by Rahman and Li (2022), who found that automation of sales processes typically reduces transaction time by 60-75% in retail environments. The real-time inventory management capability addresses a critical operational challenge, as delayed inventory updates in manual systems often lead to stock discrepancies and inaccurate availability information. The 87% reduction in data entry errors is particularly significant, as data accuracy is fundamental to effective business decision-making and financial management (Hidayatetal., 2023)

The high user satisfaction scores (mean scores above 4.0 across all dimensions) indicate strong user acceptance of the system, which is crucial for successful system implementation. The Technology Acceptance Model (TAM) suggests that perceived usefulness and ease of use are primary determinants of user acceptance, and the evaluation results reflect positive perceptions in both dimensions. The 100% functionality test success rate demonstrates that the system meets all specified requirements and operates reliably, providing a solid foundation for daily business operations. The substantial increase in daily transaction processing capacity (233%) suggests that the system can support business growth without proportional increases in operational costs, providing scalability that manual systems cannot achieve.

The findings of this research are consistent with previous studies on web-based information systems in retail businesses. (R. K. Anderson et al., 2022) reported similar improvements in transaction processing efficiency (65-70% reduction) following the

implementation of automated sales systems in small retail stores. The real-time inventory management capabilities observed in this study align with research , who emphasized that automated inventory systems significantly reduce stock discrepancies and improve inventory turnover rates. The user satisfaction results are comparable to findings by (B. Santoso & Putri, 2024) who reported mean satisfaction scores of 4.2-4.5 for web-based retail systems, indicating that well-designed systems generally receive positive user acceptance.

However, the improvement magnitudes observed in this study (73% transaction time reduction, 233% capacity increase) exceed those typically reported in similar research, which may be attributed to the particularly inefficient manual processes that existed prior to system implementation. The store's reliance on completely manual record-keeping created substantial opportunities for improvement, resulting in more dramatic performance gains than might be observed in stores with partially automated systems. This finding contributes to the literature by demonstrating that small retail businesses with minimal existing automation can achieve substantial operational improvements through web-based system implementation (P. Williams, 2021)

The successful implementation following the Waterfall methodology supports research (Johnson & Martinez, 2022a), who argued that structured development methodologies are particularly effective for small business information systems where requirements are well-defined. The systematic approach enabled thorough requirements analysis, comprehensive testing, and successful deployment, validating the appropriateness of the Waterfall model for this type of system development project.

Several limitations should be acknowledged when interpreting the research findings. First, the study was conducted at a single paint store, which may limit the generalizability of results to other retail contexts or industries. The sample size for user acceptance testing (5 staff members and 20 customers) is relatively small, although it is adequate for system evaluation purposes. The testing period of four weeks may not capture long-term system performance and user satisfaction trends, as user perceptions and system performance may evolve over extended usage periods.

Second, the performance comparisons are based on self-reported data from the manual system period, which may introduce recall bias or inaccuracies in baseline measurements. The absence of a control group limits the ability to definitively attribute all observed improvements solely to the system implementation, as other factors such as staff training or process improvements may have contributed to the results. Additionally, the system was tested in a relatively controlled environment, and real-world usage over extended periods may reveal additional challenges or performance issues not identified during the testing phase (J. M. Roberts & Chen, 2021)

Third, the study focused primarily on operational efficiency and user satisfaction, with limited analysis of financial impacts such as return on investment (ROI) or cost savings. While operational improvements suggest potential financial benefits, a comprehensive cost-benefit analysis would provide more complete insights into the system's value proposition. The research also did not extensively evaluate system security features or data

protection measures, which are critical considerations for web-based systems handling sensitive business and customer data (Lee & Wong, 2023)

The research findings have several important implications for both practice and future research. For practice, the results demonstrate that small retail businesses can achieve substantial operational improvements through web-based system implementation, even with limited IT resources. The successful implementation at Pilox Paint Store provides a reference model that can be adapted for similar businesses in the paint retail industry and other specialized retail sectors. Business owners and managers should consider web-based information systems as viable solutions for addressing operational inefficiencies, particularly in businesses relying on manual processes (Putra & Rahman, 2022)

The high user satisfaction scores and significant performance improvements suggest that investment in web-based systems can yield positive returns through improved efficiency, reduced errors, and enhanced customer service. However, successful implementation requires careful requirements analysis, user training, and ongoing system support. The findings also highlight the importance of selecting appropriate development methodologies, as the structured Waterfall approach proved effective for this project.

For future research, several directions are suggested. Longitudinal studies tracking system performance and user satisfaction over extended periods (6-12 months) would provide insights into long-term system effectiveness and identify any performance degradation or emerging challenges. Comparative studies evaluating different development methodologies (Waterfall vs. Agile) for small business information systems would contribute to methodological knowledge. Research exploring the financial impacts and ROI of web-based systems in small retail businesses would provide valuable insights for business decision-making.

Additionally, future research could explore mobile integration capabilities, as mobile access to sales and inventory information could further enhance operational flexibility. Studies investigating system security and data protection measures in web-based retail systems would address important concerns about data privacy and system vulnerabilities. Research exploring the integration of advanced features such as predictive analytics, inventory forecasting, and customer relationship management (CRM) capabilities would demonstrate the potential for further system enhancement and business value creation (A. Santoso et al., 2024)

DISCUSSION

The development and implementation of the web-based sales information system for Pilox Paint Store have yielded significant improvements across multiple operational dimensions, demonstrating the transformative potential of digital solutions in small retail businesses. The substantial reduction in transaction processing time, from 8.5 minutes to 2.3 minutes per transaction, represents more than a mere efficiency gain; it fundamentally alters the store's service delivery model, enabling staff to serve customers more effectively while reducing waiting times and improving overall customer experience (Rahman & Sari, 2022). This improvement is particularly significant in retail environments where transaction

speed directly impacts customer satisfaction and store capacity. The automation of price calculation, payment processing, and receipt generation eliminates time-consuming manual steps that previously required staff to reference multiple documents and perform calculations manually, thereby reducing both processing time and the likelihood of calculation errors (Z.Lietal.,2023)

The transition from end-of-day batch inventory updates to real-time inventory management represents a paradigm shift in stock control capabilities. Real-time updates ensure that inventory levels are always accurate and immediately reflect sales transactions, preventing situations where staff might sell products that are actually out of stock or miss sales opportunities due to inaccurate stock information. This capability is crucial for maintaining customer trust and preventing revenue loss from stockouts, particularly in specialized retail environments like paint stores where product availability directly influences customer purchasing decisions. The improvement in stock accuracy from 78% to 96% demonstrates that automated systems can substantially reduce the inventory discrepancies that plague manual systems, where human error, delayed updates, and record-keeping inconsistencies frequently lead to inaccurate stock information.

User satisfaction scores consistently above 4.0 across all evaluation dimensions indicate strong system acceptance, which is essential for successful system implementation and long-term utilization. The high scores for system usability (4.4) and ease of use (4.2) suggest that the system interface is intuitive and requires minimal training, which is particularly important for small businesses where extensive training programs may not be feasible. The excellent rating for data accuracy (4.6) reflects users' confidence in the system's reliability and its ability to produce accurate business information, which is fundamental for effective decision-making (M. J. Anderson & Thompson, 2021a) These positive user perceptions are critical because system success depends not only on technical functionality but also on user willingness to adopt and consistently use the system in daily operations. The 100% functionality test success rate further validates that the system meets all specified requirements and operates reliably, providing a solid foundation for business operations.

The findings of this research align closely with previous studies on web-based information systems in retail and small business contexts, while also contributing unique insights into specialized retail environments. Research (V. Kumar et al., 2023) on digital transformation in small retail businesses reported similar improvements in transaction processing efficiency, with automated systems reducing transaction times by 60-75%, which is consistent with the 73% reduction observed in this study. However, the magnitude of improvement in this research may be attributed to the store's complete reliance on manual processes prior to system implementation, creating greater opportunities for efficiency gains than businesses with partially automated systems. This finding supports the argument that small businesses with minimal existing automation can achieve substantial operational improvements through comprehensive system implementation (P. Williams, 2021)

Studies on inventory management systems have consistently demonstrated that real-time inventory tracking significantly improves stock accuracy and reduces

discrepancies. Research by (B. Santoso & Putri, 2024) found that automated inventory systems reduced stock discrepancies by 70-85% in retail environments, which aligns with the 18 percentage point improvement (from 78% to 96% accuracy) observed in this study. The real-time update capability addresses a fundamental limitation of manual systems, where delayed updates and human error frequently result in inaccurate inventory information. This finding is particularly relevant for specialized retail stores like paint stores, where inventory accuracy is critical due to the diverse product range and varying demand patterns (Tan & Lim, 2023).

User satisfaction results in this study are comparable to findings from previous research on web-based retail systems. Studies by (J. M. Roberts & Chen, 2021) reported mean satisfaction scores of 4.2-4.5 for web-based systems in small retail businesses, which closely matches the scores observed in this research (ranging from 4.2 to 4.6). This consistency suggests that well-designed web-based systems generally receive positive user acceptance, regardless of specific business context, provided that system design considers user needs and maintains intuitive interfaces. The Technology Acceptance Model (TAM) framework, which emphasizes perceived usefulness and ease of use as determinants of system acceptance, provides theoretical support for these findings, as the high satisfaction scores reflect positive perceptions in both dimensions (Lee & Wong, 2023).

In contrast to some previous studies that focused on large retail chains, this research demonstrates that small specialized retail businesses can achieve similar benefits from web-based system implementation. While larger retailers may have greater resources for system development and implementation, this study shows that small businesses can also successfully implement and benefit from web-based systems when appropriate methodologies and technologies are employed. This finding contributes to the literature by expanding the scope of digital transformation research beyond large enterprises to include small specialized retail businesses, which represent a significant portion of the retail sector but have received less research attention (Hidayat et al., 2023b)

While this research provides valuable insights into web-based system development for small retail businesses, several limitations should be acknowledged that may affect the generalizability and interpretation of findings. First, the study was conducted at a single paint store, which limits the ability to generalize findings to other retail contexts, industries, or business sizes. Different retail environments may have unique operational requirements, customer interactions, and business processes that could influence system effectiveness and user acceptance. Additionally, the specialized nature of paint retail may limit applicability to other retail sectors with different product characteristics, inventory management needs, or transaction patterns (Nugroho, 2021)

Second, the relatively small sample size for user acceptance testing (5 staff members and 20 customers) may limit the statistical power and generalizability of user satisfaction findings. While the sample size is adequate for system evaluation purposes and provides valuable insights, a larger sample would enhance the reliability of satisfaction measurements and enable more sophisticated statistical analysis. The convenience sampling approach used for customer participants may also introduce selection bias, as

participants who agreed to participate may have different characteristics or attitudes than the broader customer base (Putra&Rahman,2022)

Third, the testing period of four weeks may not capture long-term system performance, user satisfaction trends, or potential challenges that emerge during extended usage. User perceptions and system performance may evolve over time as users become more familiar with the system, encounter new scenarios, or experience system limitations that were not apparent during initial testing. Additionally, seasonal variations in business activity, which are common in retail environments, may influence system performance and user satisfaction in ways that were not captured during the testing period (A. Kumar & Singh,2021)Fourth, the performance comparisons are based on self-reported data from the manual system period, which may introduce recall bias or inaccuracies in baseline measurements. Staff members may have difficulty accurately recalling transaction times, error rates, or other performance metrics from the manual system period, potentially leading to overestimation or underestimation of improvements. The absence of objective baseline measurements limits the precision of performance comparisons and may affect the reliability of improvement calculations (A. Santoso et al., 2024)

Finally, the research focused primarily on operational efficiency and user satisfaction, with limited analysis of financial impacts such as return on investment (ROI), cost savings, or revenue impacts. While operational improvements suggest potential financial benefits, a comprehensive financial analysis would provide more complete insights into the system's value proposition and support business decision-making regarding system investment. Additionally, the research did not extensively evaluate system security features, data protection measures, or system scalability, which are important considerations for web-based systems in business environments

The findings of this research have several important implications for practice and future research in web-based information systems for small retail businesses. For practice, the results demonstrate that small specialized retail businesses can achieve substantial operational improvements through web-based system implementation, even with limited IT resources and expertise. The successful implementation at Pilox Paint Store provides a reference model that can be adapted for similar businesses in the paint retail industry and other specialized retail sectors. Business owners and managers should consider web-based information systems as viable solutions for addressing operational inefficiencies, particularly in businesses relying on manual processes that create bottlenecks and error-prone operations (S.Rahman & Sari, 2022)

The high user satisfaction scores and significant performance improvements suggest that investment in web-based systems can yield positive returns through improved efficiency, reduced errors, and enhanced customer service. However, successful implementation requires careful requirements analysis, appropriate system design, user training, and ongoing system support. Business owners should recognize that system implementation is not merely a technical project but also an organizational change initiative that requires attention to user needs, change management, and continuous improvement. The findings also highlight the importance of selecting appropriate development

methodologies, as the structured Waterfall approach proved effective for this project where requirements were well-defined and stable or future research, several directions are suggested to expand understanding of web-based systems in small retail businesses. Longitudinal studies tracking system performance and user satisfaction over extended periods (6-12 months) would provide insights into long-term system effectiveness and identify any performance degradation, emerging challenges, or evolving user needs. Such studies would also capture seasonal variations and long-term adaptation patterns that were not addressed in this research. Comparative studies evaluating different development methodologies (Waterfall vs. Agile) for small business information systems would contribute to methodological knowledge and guide methodology selection for future projects

Research exploring mobile integration capabilities would address the growing importance of mobile access in business operations. Mobile applications enabling sales staff to access inventory information, process transactions, and generate reports from mobile devices could further enhance operational flexibility and customer service. Studies investigating the integration of advanced features such as artificial intelligence (AI)-based sales prediction, inventory forecasting, and customer relationship management (CRM) capabilities would demonstrate the potential for further system enhancement and business value creation. Additionally, research on cloud-based scalability would address how web-based systems can support business growth and accommodate increasing transaction volumes without requiring substantial infrastructure investment (B. Santoso & Putri, 2024). Future research should also explore financial impacts and return on investment (ROI) of web-based systems in small retail businesses, providing quantitative evidence of financial benefits to support business decision-making. Studies investigating system security and data protection measures would address important concerns about data privacy and system vulnerabilities in web-based retail systems. Research on system integration with other business systems, such as accounting software, supplier management systems, or e-commerce platforms, would demonstrate how web-based systems can serve as central components of comprehensive business information infrastructure (Chen et al., 2024)

In conclusion, the continuous digital transformation of retail businesses is essential for maintaining competitiveness and operational efficiency in an increasingly digital marketplace. Small retail businesses, including specialized stores like paint retailers, must recognize that digital transformation is not optional but necessary for survival and growth. Web-based information systems provide practical and accessible solutions for small businesses to improve operations, enhance customer service, and support business growth. However, successful digital transformation requires careful planning, appropriate technology selection, user-centered design, and ongoing support. The findings of this research contribute to understanding how small retail businesses can successfully implement web-based systems and achieve substantial operational improvements, while also highlighting areas for future research to further advance knowledge in this important domain.

CONCLUSION

This research successfully developed and implemented a web-based sales information system for PiloX Paint Store, achieving all stated research objectives and demonstrating significant improvements in operational efficiency, data accuracy, and system usability. The system development followed the Waterfall methodology, systematically progressing through requirements analysis, system design, implementation, testing, and deployment phases, resulting in a fully functional system that addresses the operational challenges faced by the store. The comprehensive evaluation conducted through functional testing, performance testing, and user acceptance testing validated that the system meets all specified requirements and operates reliably in the store's operational environment.

The implementation of the web-based system has yielded substantial improvements across multiple operational dimensions. Sales transaction efficiency improved dramatically, with transaction processing time reduced by 73% from 8.5 minutes to 2.3 minutes per transaction, enabling the store to serve more customers effectively and reduce waiting times. This improvement fundamentally enhances the store's service delivery capability, allowing staff to focus on customer interaction rather than time-consuming administrative tasks. Stock management accuracy increased from 78% to 96%, with real-time inventory updates eliminating the delays and errors associated with manual record-keeping. This improvement prevents stockouts and overstocking situations, reducing lost sales opportunities and unnecessary inventory costs. Data reporting efficiency improved significantly, with report generation time reduced by 92% from 45-60 minutes to 3-5 minutes, enabling management to access up-to-date business information quickly and make timely, data-driven decisions. The system's automated reporting capabilities provide comprehensive insights into sales trends, inventory status, and business performance, supporting strategic planning and operational management.

The web-based system demonstrates clear advantages over the previous manual methods across all evaluated dimensions. Manual systems required extensive time investment for data entry, calculation, and record-keeping, creating bottlenecks that limited transaction processing capacity and increased the likelihood of errors. The automated system eliminates these inefficiencies through integrated data processing, real-time updates, and automated calculations, enabling the store to process 233% more transactions per day without requiring additional staff. The transition from end-of-day batch inventory updates to real-time updates ensures that inventory information is always accurate and immediately reflects sales transactions, preventing situations where inaccurate stock information could lead to customer dissatisfaction or lost sales. The automated reporting system replaces time-consuming manual report preparation with instant report generation, providing management with immediate access to critical business information that supports effective decision-making.

User acceptance testing revealed strong system acceptance, with all evaluation dimensions scoring above 4.0 on a 5-point scale. System functionality received the highest ratings, with users expressing confidence in the system's reliability and its ability to produce

accurate business information. The intuitive system interface and ease of use received positive feedback, indicating that the system can be effectively used by staff with minimal training. These positive user perceptions are critical for successful long-term system utilization, as system success depends not only on technical functionality but also on user willingness to adopt and consistently use the system in daily operations. The 100% functionality test success rate further validates that the system operates reliably and meets all specified requirements, providing a solid foundation for business operations.

Despite the successful implementation and positive results, several challenges and limitations were encountered during the development and testing phases. The development process required careful requirements analysis to ensure that the system addressed all operational needs while maintaining usability and simplicity. User training was essential to ensure that staff could effectively use the system, requiring time investment and change management efforts. The testing period was relatively short (four weeks), which may not capture long-term system performance and user satisfaction trends. Additionally, the study was conducted at a single store, which limits the generalizability of findings to other retail contexts. The system's effectiveness in other business environments may vary depending on specific operational requirements, business processes, and user characteristics.

Based on the research findings, several practical recommendations are provided for store management and similar businesses. Store management should prioritize user training and change management to ensure successful system adoption and utilization. Ongoing system maintenance and support are essential to address any technical issues and ensure system reliability. Management should regularly monitor system performance and user feedback to identify areas for improvement and system enhancement. The system can be expanded with additional features such as mobile access for sales staff, integration with accounting software, or advanced analytics capabilities to further enhance operational efficiency and business insights. Other small retail businesses considering similar system implementation should conduct thorough requirements analysis, select appropriate technologies, and ensure adequate user training and support.

For future research, several directions are suggested to expand understanding of web-based systems in small retail businesses. Longitudinal studies tracking system performance and user satisfaction over extended periods (6-12 months) would provide insights into long-term system effectiveness and identify any emerging challenges or performance trends. Research exploring mobile integration capabilities would address the growing importance of mobile access in business operations, enabling sales staff to access inventory information and process transactions from mobile devices. Studies investigating the integration of advanced features such as artificial intelligence-based sales prediction, inventory forecasting, and customer relationship management capabilities would demonstrate the potential for further system enhancement and business value creation. Research on cloud-based scalability would address how web-based systems can support business growth and accommodate increasing transaction volumes. Comparative studies evaluating system effectiveness across different retail contexts and business sizes would

enhance generalizability and provide insights into factors influencing system success. Additionally, research exploring financial impacts and return on investment would provide quantitative evidence of financial benefits to support business decision-making.

In conclusion, this research successfully demonstrates that web-based information systems can significantly improve operational efficiency, data accuracy, and business management capabilities in small specialized retail businesses. The substantial improvements in transaction processing speed, inventory accuracy, and reporting efficiency validate the system's effectiveness in addressing operational challenges and supporting business growth. The positive user acceptance and high functionality test success rate indicate that the system provides a practical and viable solution for small retail businesses seeking to improve their operations through digital transformation. The research contributes to the existing body of knowledge by demonstrating the practical application of web-based systems in specialized retail contexts and providing a reference model that can be adapted for similar businesses. Overall, the successful implementation and positive results suggest that web-based information systems represent a valuable investment for small retail businesses, offering substantial operational benefits while remaining accessible and practical for businesses with limited IT resources. The continuous digital transformation of retail businesses is essential for maintaining competitiveness and operational efficiency, and web-based systems provide practical solutions that enable small businesses to achieve these goals while supporting sustainable business growth and development.

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