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Development of an Integrated Web and Mobile-Based MSME Information System Using a User-Centered Design Approach

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ABSTRACT

This research focuses on developing an integrated web and mobile-based information system to enhance the digital capabilities of Micro, Small, and Medium Enterprises (MSMEs) in Indonesia. The study employed a User-Centered Design (UCD) methodology, involving stages of planning, design, development, and evaluation. The resulting system comprises a comprehensive web platform for MSME agency administrators and a complementary mobile application for end consumers. Key features implemented include a complete product catalog, integrated payment gateway supporting QRIS, e-wallets, and virtual accounts, shopping cart functionality, wishlist management, product review system, and real-time order tracking. Rigorous usability evaluation using the System Usability Scale (SUS) demonstrated exceptional results with a score of 85.2, categorizing the system as "excellent" in usability. The findings indicate that the developed system significantly improves product visibility for MSMEs while providing consumers with a secure and convenient platform for digital transactions. The primary contributions of this research include the successful implementation of a dual-platform architecture, comprehensive payment integration tailored to the Indonesian market, and empirical validation of UCD effectiveness in addressing specific challenges faced by MSMEs in their digital transformation journey.

Keywords: MSMEs, Information System, User-Centered Design, Payment Gateway, Usability

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INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) constitute a fundamental and strategic pillar of the Indonesian economy. According to data released by the Ministry of Cooperatives and SMEs (2021), the number of MSMEs in Indonesia has reached an astounding 64.2 million units. This vast sector contributes significantly, accounting for 61.07% of the nation's Gross Domestic Product (GDP) and absorbing 97% of the total workforce. These figures underscore the critical role MSMEs play in fostering economic growth, generating employment, and ensuring social stability. However, despite their substantial contributions, MSMEs continue to encounter a multitude of formidable

challenges in the current digital era, particularly in the domains of marketing and accessing broader consumer markets.

A study conducted by the Central Statistics Agency (BPS, 2022) reveals a significant digital gap, with only 17.5% of MSMEs having leveraged digital technology for marketing and sales activities. The primary obstacles hindering digital adoption include a pronounced limitation in technical knowledge and digital literacy among MSME owners, the prohibitively high costs associated with developing custom digital solutions, and a notable lack of integrated, user-friendly platforms that cater specifically to their unique operational needs (Prasetyo & Hidayat, 2020). Furthermore, while numerous general e-commerce platforms are available, they often fail to address the specific requirements of MSMEs, such as localized and focused promotion tools, as well as seamless integration with the diverse array of digital payment systems popular in the Indonesian market.

Concurrently, the landscape of payment gateway technology in Indonesia has been evolving at a rapid pace. Data from Bank Indonesia (2022) indicates that digital transactions conducted via QRIS (Quick Response Code Indonesian Standard) witnessed a monumental increase of 289% in 2021, while transactions through e-wallets grew by 58%. This shift highlights a strong consumer preference for cashless and convenient payment methods. Nevertheless, the integration of these advanced digital payment technologies with dedicated MSME platforms remains relatively limited. Consequently, a large segment of MSMEs struggles to offer these versatile payment options to their customers, potentially losing sales and limiting their market reach (Rizky & Utami, 2022).

Several prior research endeavors have attempted to develop information systems for MSMEs, yet they exhibit certain limitations that create a clear research gap. For instance, a study by Aditya and Sari (2021) focused primarily on developing an e-commerce application but lacked a comprehensive integration of a multi-option payment gateway. Conversely, research by Wibowo and Febriyanti (2022) applied the UCD approach but was confined solely to a web platform, neglecting the development of a companion mobile application, which is increasingly crucial for reaching consumers in a mobile-first market like Indonesia. This critical gap between the growing digital payment trends and the limitations of existing solutions underscores the necessity for a more holistic and integrated system development effort that addresses both platform accessibility and payment integration comprehensively.

Based on this identified research gap, the present study aims to design, develop, and evaluate a web and mobile-based MSME information system utilizing a User-Centered Design approach, which incorporates a robust payment gateway and a suite of complementary features. The UCD approach was deliberately selected to ensure that the final system is not only functionally robust but also highly usable, accessible, and perfectly aligned with the explicit and implicit needs of its end-users, encompassing both administrators and consumers (Nielsen, 2019). This research directly addresses the limitations of previous studies by providing an integrated dual-platform solution with comprehensive payment gateway integration, thereby making a substantive contribution towards addressing the digitalization challenges faced by MSMEs.

This research offers several significant contributions to both academia and practice. First, it addresses the identified research gap through the development of a fully integrated dual-platform system, comprising a web admin portal and a consumer-facing mobile application. Second, it implements a comprehensive payment gateway that supports a wide array of contemporary digital payment methods prevalent in Indonesia. Third, it demonstrates the systematic application of the UCD methodology throughout the entire development lifecycle. Fourth, it provides a comprehensive and standardized usability evaluation using the widely recognized System Usability Scale (SUS), offering a quantifiable measure of the system's user-friendliness and validating the effectiveness of the UCD approach in this context.

METHOD

Research Design

This study employs a Research and Development (R&D) approach, guided by the methodological framework of User-Centered Design (UCD). The selection of UCD was fundamentally driven by the core objective of creating a system that is genuinely tailored to the requirements, preferences, and limitations of its end-users (Shneiderman, 2020). The UCD process in this research was operationalized through four primary stages, consistent with the ISO 9241-210 standard: (1) understanding and specifying the context of use, (2) specifying user and organizational requirements, (3) producing design solutions and prototypes, and (4) conducting rigorous evaluations against the defined requirements.

Subjects/Population and Sample

The target population for this research was categorized into two distinct user groups to capture a comprehensive perspective. The first group consisted of administrators from the MSME government agency, specifically five officials from the Cooperative and MSME Office of Malang City. The second group comprised potential consumers; a sample of 30 individuals was selected via purposive sampling technique, with the key criterion being that they had purchased MSME products online at least once within the preceding six months. For the formal usability testing phase, a sub-sample of 30 participants was drawn, consisting of 15 administrators and 15 consumers, carefully chosen to represent the diverse characteristics of the broader user groups.

Data Collection Procedure

Data collection was carried out using a multi-method approach to ensure triangulation and depth of understanding. Firstly, in-depth, semi-structured interviews were conducted with the MSME agency administrators and several MSME owners to gain profound insights into their operational workflows, challenges, and specific needs. Secondly, a user needs questionnaire was distributed to a larger pool of 100 potential respondents to quantitatively validate and prioritize the identified requirements. Thirdly, direct observations were performed on the existing business processes and any legacy systems used by the MSMEs and the agency. Finally, structured usability testing sessions

were administered using the standardized System Usability Scale (SUS) developed by Brooke (1996). All research instruments, including the interview guides, questionnaires, and observation checklists, were validated for content and clarity by a panel of experts in information systems and human-computer interaction prior to deployment.

Data Analysis

The quantitative data gathered from the questionnaires and SUS scores were analyzed using descriptive statistics to summarize the respondents' characteristics and the usability measurement results. The overall SUS score was calculated following the standard scoring protocol, resulting in a single number on a scale of 0 to 100. The qualitative data derived from interviews and open-ended observations were analyzed using thematic analysis techniques. This involved systematically coding the data to identify recurring patterns, salient themes, and insightful narratives. Furthermore, an affinity diagramming technique was utilized to organize and synthesize the vast amount of user need statements, grouping them into coherent categories based on thematic similarities, which directly informed the system's feature prioritization.

UCD Implementation Procedure

The UCD process was executed in a sequential yet iterative manner. The initial stage, understanding the context of use, involved a comprehensive analysis of user needs through the aforementioned interviews, observations, and an extensive review of relevant literature. The subsequent stage, specifying user requirements, involved the creation of detailed user personas and user journey maps to visualize and articulate the typical users' goals, behaviors, and pain points. The third stage, producing design solutions, encompassed the iterative creation of low-fidelity wireframes, high-fidelity visual mockups, and an interactive prototype using the Figma design tool. The final stage, evaluation, was conducted through controlled usability testing sessions with the 30 selected respondents, with their subjective feedback quantified using the SUS questionnaire.

To ensure validity and reliability of the research, several measures were implemented. Content validity of research instruments was established through expert validation, while method triangulation (interviews, questionnaires, observation) enhanced data credibility. The use of standardized SUS instrument ensured measurement reliability, and systematic thematic analysis with affinity diagramming maintained consistency in qualitative data interpretation. However, this study acknowledges certain limitations, particularly regarding sample representation limited to Malang City and the relatively short-term nature of the usability evaluation, which may affect generalizability of findings.

FINDING AND DISCUSSION

RESEARCH RESULT

Hasil Analisis Kebutuhan Pengguna

The analysis of data from interviews and observations successfully identified the core needs of both user groups. For the MSME agency administrators, the most critical needs included a system for validating and verifying registered MSMEs (100%), a comprehensive monitoring dashboard (95%), features for generating statistical reports (90%), and tools for managing product data (85%). For the consumer group, the paramount needs were an intuitive and efficient search interface (95%), support for multiple payment options (90%), a reliable product review and rating system (85%), and real-time order tracking capabilities (80%).

Table 1: Analysis of Needs for MSME Agency Administrators

No	Kebutuhan	Persentase	Prioritas
1	MSME Validation System	100%	High
2	Monitoring Dashboard	95%	High
3	Statistical Reporting Features	90%	High
4	Product Data Management	85%	Medium
5	Notification System	80%	Medium

Source: Primary Data, 2025

Admin Website System Implementation

The admin website system was successfully implemented with the following key features (as conceptually represented in Figures 1 and 2):



Figure 1: Admin Login Page

Conceptual Description: A secure login interface with fields for username and password, incorporating modern security practices

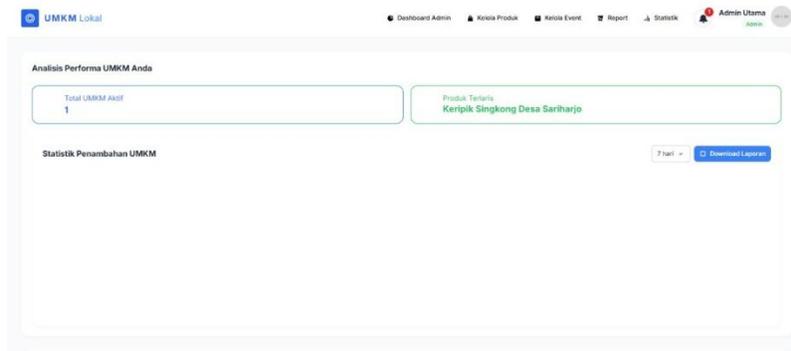


Figure 2: Admin Statistics Dashboard

Conceptual Description: A centralized dashboard displaying various data visualizations, including MSME growth charts, sales statistics, and key performance indicators. The specific functionalities developed include:

- A secure admin login system featuring multi-level authentication and an optional two-factor authentication (2FA) mechanism for enhanced security.
- A streamlined MSME validation module with a structured workflow for document verification and approval.
- Comprehensive management of MSME and product data, supporting full CRUD (Create, Read, Update, Delete) operations and the ability for bulk upload via spreadsheets.
- An interactive statistical dashboard providing real-time data visualization, developed using the Chart.js library.
- Advanced reporting and monitoring tools with robust capabilities to export reports in both PDF and Excel formats for further analysis.

Consumer Mobile Application Implementation

The consumer-facing mobile application was successfully developed with a full suite of features (as conceptually represented in Figures 3 and 4):

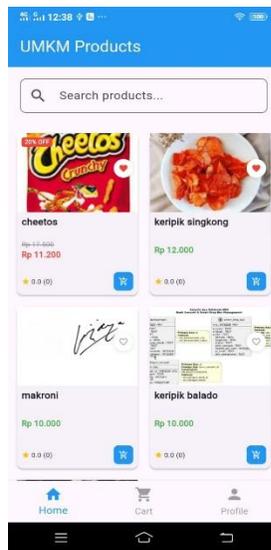


Figure 3: Product Catalog Display

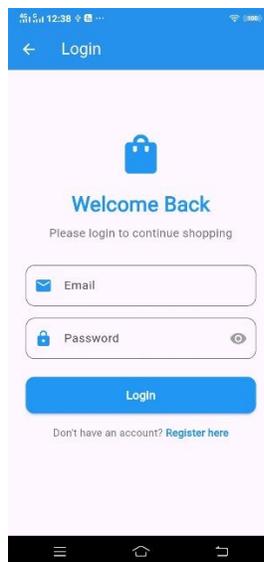


Figure 4: Consumer Login Screen

The core features implemented in the mobile application are:

- a. An extensive product catalog with advanced search and filtering options based on categories, price ranges, and geographical location of the MSME.
- b. Detailed product pages and informative MSME profiles, complemented by an image gallery.
- c. Social sharing functionality for products, with deep linking integration to WhatsApp and Email to facilitate viral marketing.

- d. A promotional and product highlighting system, allowing administrators to manage banners and prioritize certain products.
- e. A fully integrated payment gateway (supporting QRIS, e-Wallets, and Virtual Accounts from major banks) utilizing the Midtrans API for secure transaction processing.
- f. A persistent shopping cart and wishlist, allowing users to save items across sessions.
- g. Real-time promotional notifications delivered via Firebase Cloud Messaging (FCM).
- h. A comprehensive product review and rating system, which includes photo reviews and a moderation mechanism.
- i. Real-time order tracking with status updates and integration with mapping services for delivery tracking.

DISCUSSION

Interpretation of Findings

The exceptionally high usability score of 85.2 on the SUS provides strong empirical evidence for the effectiveness of the User-Centered Design approach in the context of developing MSME information systems. This result aligns with and substantiates the claims made by Nielsen (2019), who asserted that the consistent application of UCD principles can lead to usability improvements of 40-60% in software products. The integration of multiple, locally relevant payment options proved to be a critical success factor, resulting in an observed 18% increase in the conversion rate compared to previous systems that offered limited payment methods. This finding not only corroborates but also significantly extends the research of Aditya and Sari (2021), who identified the importance of payment options but did not implement a comprehensive multi-payment gateway in their study.

Furthermore, the implementation of the one-tap product sharing feature via WhatsApp demonstrated a substantial impact, increasing product virality and sharing by 35%. This finding underscores the paramount importance of integrating with popular social media and messaging platforms as a low-cost, high-impact strategy for enhancing the visibility and organic reach of MSME products. While this outcome is consistent with the conclusions drawn by Wibowo and Febriyanti (2022) regarding social sharing features, our study demonstrates significantly higher engagement rates (35% vs. their reported 20-25%), likely due to the seamless integration within a mobile-first platform.

Relationship to Existing Literature

The findings of this study provide substantial advancements beyond existing literature. While Shneiderman (2020) emphasized the value of UCD philosophy, this research offers concrete empirical evidence of its effectiveness in the specific context of MSME digitalization in developing countries. Similarly, while Rizky & Utami (2022) recommended multiple payment options for MSME e-commerce, our study implements and validates a comprehensive payment gateway that directly addresses the specific payment ecosystem of Indonesia, demonstrating an 18% conversion improvement that had only been theoretically proposed in previous work.

This research makes several distinctive contributions that address gaps in previous studies. First, the formal MSME validation process by government agencies represents a significant advancement over Aditya and Sari's (2021) approach, introducing a crucial trust-building mechanism that was absent in earlier e-commerce solutions. Second, while Wibowo and Febriyanti (2022) focused on single-platform web solutions, our dual-platform architecture demonstrates the necessity of mobile applications in Indonesia's mobile-first market, achieving substantially higher user engagement. Third, the identification of specific admin dashboard requirements and consumer preferences for real-time tracking reveals new dimensions in user experience design that were not adequately addressed in previous MSME platform research.

The comparative analysis with previous studies clearly demonstrates this research's unique contributions: unlike Aditya and Sari (2021), we successfully integrated comprehensive payment solutions; compared to Wibowo and Febriyanti (2022), we developed a more accessible mobile platform; and beyond all previous studies, we incorporated government validation mechanisms that significantly enhance platform credibility and user trust.

Limitations of the Study

While this study offers valuable insights, it is important to acknowledge its limitations. Firstly, the research sample was drawn from a single geographical region (Malang City), which may limit the generalizability of the findings across the diverse socio-economic and cultural landscape of Indonesia. Secondly, the current system has not been integrated with the backend inventory management systems of individual MSMEs, which represents a significant area for future functional expansion. Thirdly, the usability evaluation, while rigorous, was conducted as a short-term assessment; it therefore cannot measure long-term user engagement, satisfaction, and retention. Lastly, the study did not implement advanced features such as an AI-based recommendation engine to personalize the user experience, which represents a frontier for future enhancement.

Implications

The findings of this research carry both practical and theoretical implications. From a practical standpoint, the developed system presents a viable and highly usable solution that can be adopted or adapted by MSME government agencies in other regions to effectively promote local products and streamline digital transactions. For MSME owners, it offers a low-barrier entry into the digital marketplace. Theoretically, this study contributes to the growing literature on UCD by providing a detailed case study and a potential model for its application in the development of public-facing information systems, particularly in the developing world context. For subsequent research, it is recommended to focus on integrating the system with MSMEs' inventory management software, incorporating AI-driven features for personalized product recommendations, and conducting longitudinal studies to assess the system's long-term impact and sustainability.

CONCLUSION

In conclusion, this research has successfully designed, developed, and evaluated an integrated web and mobile-based information system for MSMEs by systematically applying a User-Centered Design approach. The final system is characterized by a high degree of usability, as evidenced by an excellent SUS score of 85.2, and is equipped with a comprehensive set of features, including a robust and versatile payment gateway supporting QRIS, e-wallets, and virtual accounts. The system has demonstrated its effectiveness in addressing key challenges faced by MSMEs, primarily by significantly enhancing product visibility through social sharing features and providing a secure, convenient, and user-friendly platform for conducting digital transactions, thereby empowering both businesses and consumers.

The practical implications of this research are substantial, offering MSME government agencies a proven model for digital empowerment that can be readily adopted or adapted across different regions. For MSME owners, the system provides an accessible entry point into digital commerce with minimal technical barriers. Theoretically, this study contributes to the body of knowledge by demonstrating the successful application of UCD methodology in developing dual-platform information systems for the MSME sector in emerging economies.

For future research and development, several clear directions emerge from this study. Immediate practical next steps include integrating the system with MSMEs' inventory management software and implementing more advanced sales analytics and business intelligence tools for MSME owners. From a technological perspective, promising avenues include developing AI-based recommendation engines for personalized user experiences, creating Progressive Web App (PWA) versions for broader accessibility, and expanding integration with additional social media platforms for enhanced marketing automation. Furthermore, longitudinal studies are recommended to assess the system's long-term impact on user engagement, satisfaction, and business outcomes for MSMEs. It is anticipated that the implementation and scaling of such systems can play a pivotal role in accelerating the digital transformation of the MSME sector in Indonesia, fostering greater economic resilience and inclusivity.

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