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Information System Requirements Analysis for MSME Digitalization Using the SDLC Waterfall Approach

Alvan Dhan[1], Angelina Apriyani Pandiangan[2], Nadita[3], Ratih Echa Kurnia[4]✉, Rafi Akmal Rizqullah[5]
alvandhan126@gmail.com[1], angelinaapriyani284@gmail.com[2], dnaditaaa@gmail.com[3], ratihecha010@gmail.com[4], rafiiiakmall@gmail.com[5]
[12345] Sistem informasi, Institut Digital Ekonomi LPKIA, Indonesia

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Abstract

Micro, Small, and Medium Enterprises (MSMEs) play a strategic role in the economy; however, they still face various challenges in adopting digital technology. This study aims to examine the requirements of an information system to support the digitalization of MSMEs using the Software Development Life Cycle (SDLC) Waterfall model. The research focuses on the analysis and design stages, which include identifying user requirements, analyzing business processes, and designing the system using Unified Modeling Language (UML). The results indicate that the proposed system should be capable of supporting integrated product management, transactions, ordering processes, and sales reporting, involving key actors such as buyers, sellers, and administrators. This study produces a system requirements model that can serve as a foundation for developing digital applications for MSMEs, thereby improving operational efficiency and enhancing business competitiveness.

Corresponding Author:
Ratih Echa Kurnia
Sistem informasi, Institut Digital Ekonomi LPKIA
Bandung, Indonesia
Email: ratihecha010@gmail.com

INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play an important role in the economy, particularly in developing countries, due to their significant contribution to economic growth and job creation (Sagala & Őri, 2024). In addition, MSMEs dominate the business structure and serve as the main drivers of the national economy; however, they still face various limitations in developing technology-based businesses (Aripin et al., 2024). In the current digital era, digital transformation has become a key necessity for MSMEs to enhance competitiveness and business sustainability, yet the level of technology adoption remains relatively low (Indiani et al., 2025).

Previous studies indicate that many MSMEs are not yet ready to adopt digital technologies due to limited resources, low levels of digital literacy, and a lack of

organizational readiness to cope with technological changes (Kawung et al., 2022). Furthermore, most MSMEs are still at an early stage in utilizing digital technologies, particularly in the use of e-commerce and information systems to support business operations (Rahayu & Day, 2017).

On the other hand, changes in consumer behavior, which are increasingly dependent on digital technology, require MSMEs to adapt quickly to these developments (Kurniawati et al., 2021). However, the development of information systems in MSMEs is often not optimal because it is not based on a comprehensive analysis of user needs, resulting in systems that do not align with actual field requirements (Rahmawati et al., 2024). Therefore, requirements analysis becomes a crucial stage in information system development to ensure that the resulting solutions are appropriate and aligned with user characteristics (Sagala & Őri, 2024).

One method that can be applied in system development is the Software Development Life Cycle (SDLC) with the Waterfall model, which offers a structured sequence of stages from requirements analysis to system implementation (Sagala & Őri, 2024). Based on this background, this study aims to analyze the requirements of an information system to support MSME digitalization using the SDLC Waterfall approach. Thus, it is expected to produce a system that aligns with user needs and is capable of improving operational efficiency and enhancing the competitiveness of MSMEs.

RESEARCH METHODS

The system development in this study adopts the Software Development Life Cycle (SDLC) using the Waterfall model. This model is chosen due to its structured, systematic, and sequential workflow, where each phase must be completed before proceeding to the next. This approach enables a more controlled development process, minimizing errors, reducing the potential for significant changes in later stages, and ensuring that the developed system aligns with user requirements (Hartolo et al., 2023; Setiawan et al., 2024).

The Waterfall model consists of six main stages: analysis, design, implementation, testing, deployment, and maintenance. However, in this study, the development process is limited to the design stage. These stages include user requirements analysis and system design, such as business process modeling, data structure design, and user interface design. Meanwhile, the implementation, testing, deployment, and maintenance stages are planned for future development.

Analysis

The analysis stage aims to identify and formulate system requirements by considering the characteristics and needs of MSME actors. This process ensures that the developed system can fulfill functional requirements, such as transaction management, business data recording, and ease of use for users with varying levels of digital literacy (Mahayati & Rahayu, 2022; Suviani et al., 2023).

Design

The design stage involves the development of system architecture, database structure, and user interface design. This process emphasizes usability and user experience to ensure that the resulting system can be operated intuitively by MSME users (Hartolo et al., 2023; Ramadhan & Syarif, 2022).

Implementation

The implementation stage is the process of translating the system design into a functional program or application. At this stage, key system features are developed based on previously identified requirements, such as business data management, transaction recording, and the integration of various digital technology-based features (Safitri et al., 2023; Setiawan et al., 2024).

Testing

The testing stage aims to ensure that all system functions operate according to the defined requirements. This process includes evaluating system functionality, process accuracy, and application stability during operation. This stage is crucial for identifying and correcting errors before the system is widely deployed.

Deployment

The deployment stage involves implementing the system in a real environment so that it can be used by end users. At this stage, the system becomes operational and accessible, allowing for evaluation of its performance and its suitability for operational needs.

Maintenance

The maintenance stage is conducted after system implementation and includes activities such as bug fixing, performance improvement, and adjustments to evolving user requirements. This stage plays an important role in ensuring the sustainability and optimal performance of the system in supporting MSME activities (Hamizar, 2023).

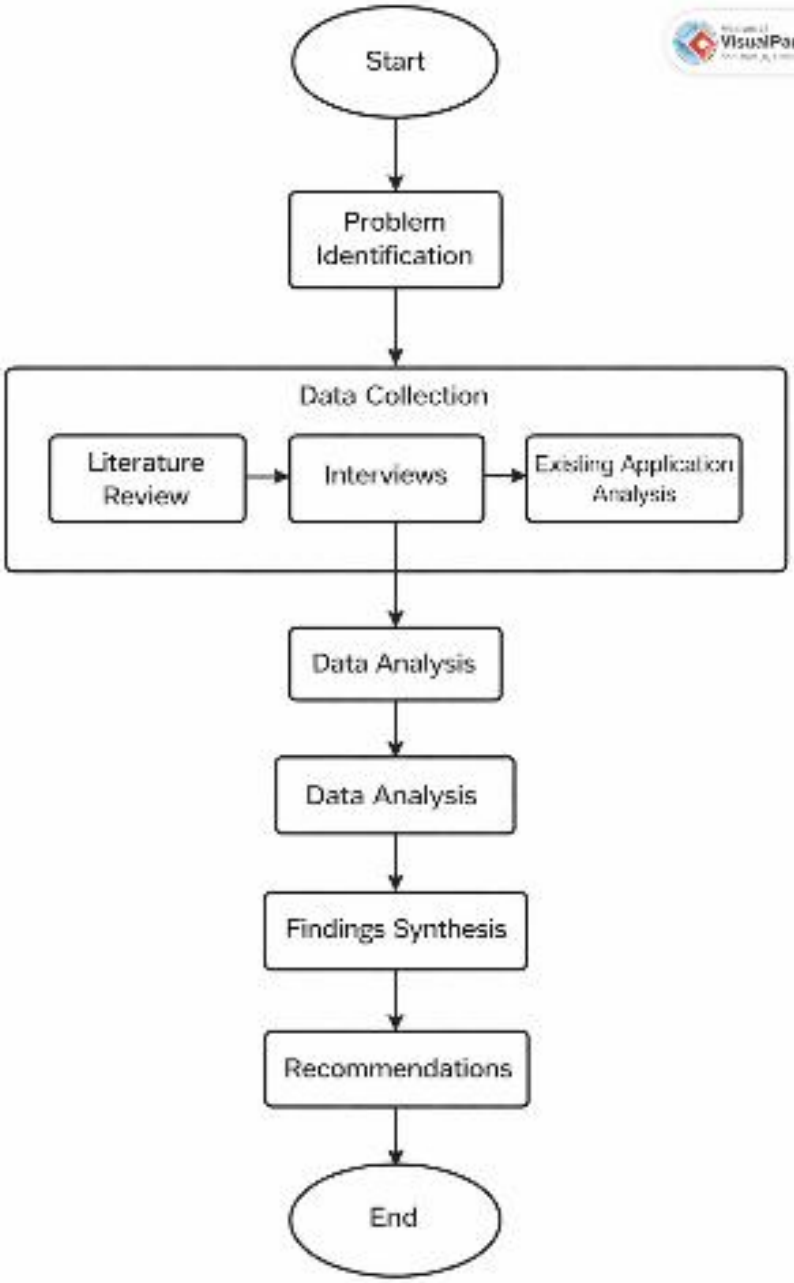

Figure 1. Research Method

The figure above illustrates the research methodology flowchart. It shows that the research follows a structured sequence of steps. The process begins with identifying the problem to determine the research focus, followed by data collection through literature review, interviews, and analysis of relevant applications. The collected data are then analyzed to generate a synthesis of findings, which serves as the foundation for system design. In the final stage, recommendations are presented as proposed solutions based on the results of the analysis conducted.

RESULTS AND DISCUSSION

Functional requirements describe the main features or functions that must be available in the information system to support the digitalization of MSMEs. These requirements are formulated based on the analysis of user needs, the challenges faced by MSME actors, and the objectives of system development. Functional requirements focus on the services provided by the system to each actor involved, ensuring that the system can be used effectively and aligns with operational needs.

Table 1. System Functional Requirements

No	Actor	Actor Description	System Functionalities
1	Buyer	Users who utilize the system to search, view, and conduct transactions for MSME products digitally.	1. The system provides buyer account registration features 2. The system provides buyer login features 3. The system displays MSME product catalogs 4. The system provides product search and filtering features 5. The system facilitates product ordering processes 6. The system displays order status and history
2	MSME Seller	Micro, small, and medium enterprise actors who use the system to market products and manage business activities.	1. The system provides seller registration and login features 2. The system facilitates product data management (add, update, delete) 3. The system displays a list of orders from buyers 4. The system facilitates order management (confirm, process, complete) 5. The system provides sales transaction recording features 6. The system provides simple sales reports
3	Admin	System administrators responsible for managing, monitoring, and ensuring the system operates properly.	1. The system provides admin login features 2. The system facilitates user data management (buyers & sellers) 3. The system facilitates product data management 4. The system provides system activity monitoring features 5. The system facilitates report and transaction data management

Use Case Diagram

A Use Case Diagram is one of the diagram types in Unified Modeling Language (UML) used to represent the interaction between actors and the system, as well as to illustrate the main functions provided. This diagram shows the services that can be accessed by each actor without detailing the internal processes of the system.

The use of a Use Case Diagram in this study aims to visualize the identified functional requirements, thereby facilitating developers and stakeholders in understanding the scope of the system to be developed. Through this diagram, the relationships between actors (buyers, MSME sellers, and admins) and the system can be clearly and systematically illustrated (Hartolo et al., 2023; Setiawan et al., 2024).

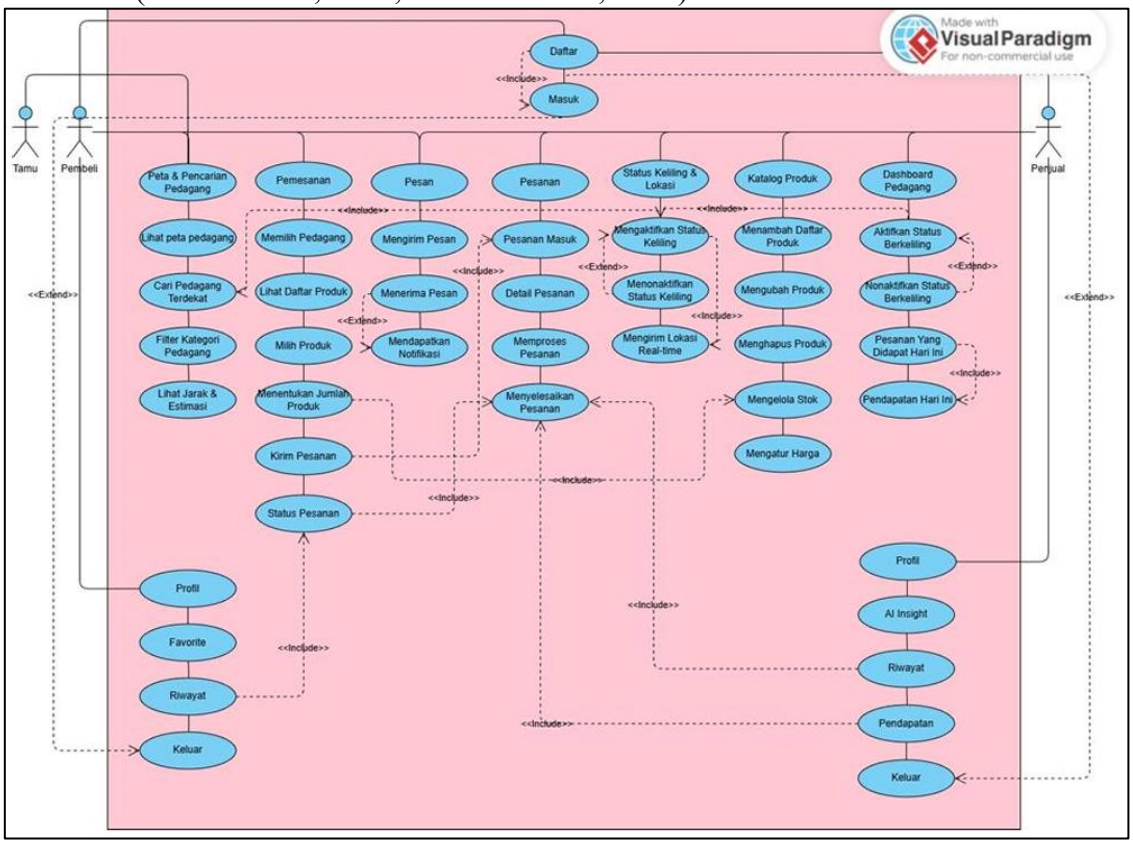

Figure 2. ***Use Case Diagram***

The Use Case Diagram illustrates the relationships between guest users, buyers, and sellers with the main functions provided by the system. Guests can access search features and view product information without authentication, while buyers can select products, view details, place orders, monitor order status, and manage their profiles and transaction history. Sellers are responsible for managing product catalogs, setting stock and prices, updating location or availability in real time, processing orders, and monitoring revenue through a dashboard. This diagram demonstrates how the system supports transaction processes and interactions between buyers and sellers in an integrated manner.

Based on the Use Case Diagram, the system has several functional requirements that must be fulfilled. The system should be able to provide product search and information access for unauthenticated users, as well as registration and login features for buyers. In addition, the system must support the ordering process, product quantity selection, and display order status and notifications. For sellers, the system must facilitate product management, stock and price settings, business information updates, order processing, and revenue visualization through a dashboard. The system also provides profile management and activity history features for each actor.

Activity Diagram

An Activity Diagram is one of the diagram types in Unified Modeling Language (UML) used to represent the flow of activities or workflows within a system in a

sequential manner, from the initial state to the final state. This diagram illustrates a series of activities, control flows, decision points, and possible branching processes that occur within the system. The purpose of an Activity Diagram is to help understand how a process operates in a systematic, structured, and logical way, thereby facilitating analysis and information system design (Hartolo et al., 2023; Ramadhan & Syarif, 2022).

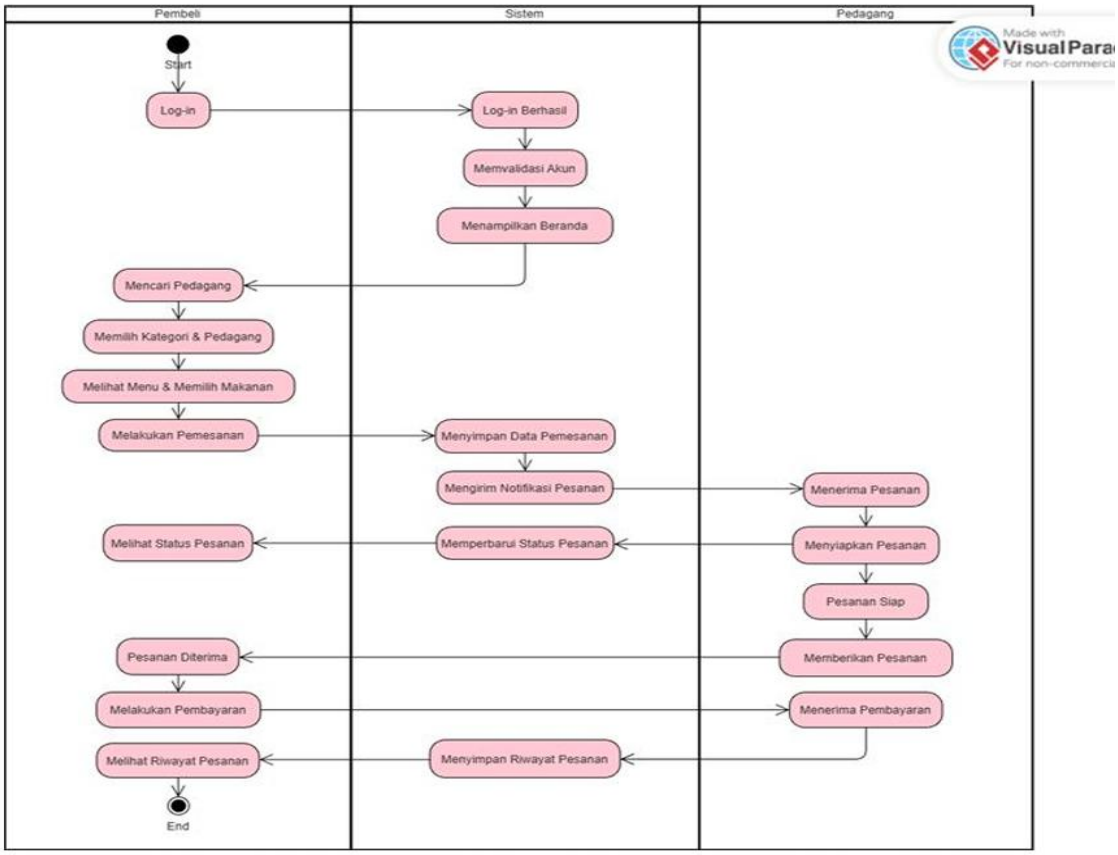

Figure 3. ***Activity Diagram***

For MSME sellers, the process begins when the buyer logs in, searches for and selects products, and then places an order. The system then validates the data, stores the order, and sends a notification to the seller. The seller processes the order until it is ready, while the system updates the order status and stores the transaction history. This diagram illustrates a structured workflow of the ordering process until the transaction is completed.

Based on this Activity Diagram, the system must support user authentication before accessing the main services. The system should also provide product search and selection features, record order data, and send notifications to sellers. In addition, the system needs to update order status periodically so that it can be monitored by buyers, provide payment options, and store transaction history that can be accessed by both buyers and sellers.

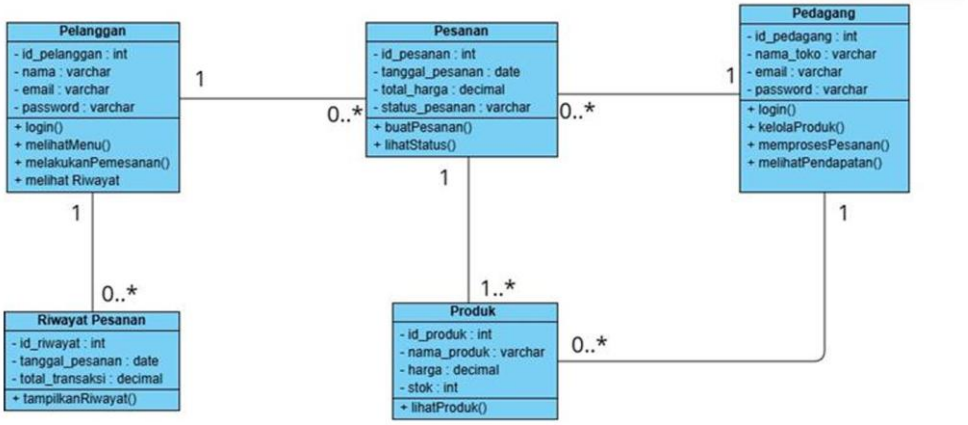

Figure 4. *Class Diagram*

A Class Diagram is one of the diagram types in the Unified Modeling Language (UML) used to represent the static structure of a system, including classes, attributes, methods, and relationships between classes such as associations and other types of relationships. This diagram serves as a foundation for system design before implementation into software or databases, helping developers understand the relationships between components in a structured way (Setiawan et al., 2024; Safitri et al., 2023).

The class diagram in this system consists of several main entities, namely Customer, Order, MSME Seller, Product, and Order History. A customer can place orders and view transaction history, an order consists of one or more products, products are managed by sellers, and sellers are responsible for processing orders. The relationships between classes show that both a customer and a seller can handle multiple orders.

Based on this diagram, the system must be able to manage customer data, product data, and order data in an integrated manner. The system must also support detailed order recording, including date, status, and total transaction value. In addition, it should provide seller data management as well as order processing activities and sales monitoring. All transactions must be stored in the order history so that they can be accessed again by users as a reference.

CONCLUSIONS AND SUGGESTIONS

Conclusion

The developed application provides a digital solution for MSMEs to improve market access and business management. Through product information features, business profiles, and location-based search, MSME actors can reach customers more effectively without relying on conventional methods. In addition, the system helps enhance business image, making it more professional and easily accessible to the public.

From an operational perspective, the system provides transaction recording and sales reporting features that assist MSME actors in understanding sales patterns and business performance. The integration of digital payment systems also supports transaction efficiency while encouraging improvements in technological and financial literacy. For customers, the system offers convenience in searching for products, accessing information, and placing orders in a practical manner. Additional features such as reviews and ratings support more transparent decision-making.

Overall, the system contributes to supporting MSME digitalization, improving operational efficiency, and strengthening the connection between business actors and customers within a digital ecosystem.

Suggestion

Based on the research findings up to the design stage, the system development can be continued to the next phases of the Waterfall model, namely implementation, testing, deployment, and maintenance. The implementation stage focuses on translating system designs and UML diagrams into a web-based or mobile application, with attention to usability for MSME actors. Next, the testing phase is conducted to ensure that all system functions operate according to user requirements. This research can also serve as a foundation for further development until a fully deployable system is produced.

Future development may include additional features such as notifications, sales analytics, and digital payment integration. Thus, the system is expected to evolve into an applicable and sustainable solution that provides real benefits in supporting MSME digitalization.

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