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SmartKasir Pro Edition: Design of a Web Based Omnichannel Platform for Point of Sale (POS) and E-Commerce Integration for Micro, Small, and Medium Enterprises (MSMEs)

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ABSTRACT

Micro, Small, and Medium Enterprises (MSMEs) play a strategic role in supporting national economic growth. However, many MSMEs continue to face challenges in managing sales transactions, inventory, and business operations, as these processes are often performed manually or through separate, non-integrated systems. This condition frequently leads to data duplication, information inconsistency, and reduced operational efficiency. This study aims to develop the design of SmartKasir Pro Edition, a web-based information system that integrates Point of Sale (POS) and E-Commerce services into a single omnichannel platform. The study employs the Research and Development (R&D) method, focusing specifically on the system design stage. The research process includes requirements analysis, system flow design, database structure design, user interface design, system architecture design, and the preparation of a testing framework using the Black Box Testing method. The proposed system adopts a client-server architecture by separating the frontend and backend components through RESTful API communication. The proposed technologies include React.js and TypeScript for frontend development, PHP Native for backend development, and MySQL as the database management system. The research results in a comprehensive system design consisting of an administrator dashboard, product management, Point of Sale (POS) transactions, E-Commerce services, customer management, order management, inventory control, product search functionality, and sales reporting integrated within a centralized database. The proposed design of SmartKasir Pro Edition is expected to serve as a reference for future system implementation and further development, while also providing an alternative solution to support business process digitalization and improve the operational efficiency of MSMEs.

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ABSTRAK

Usaha Mikro, Kecil, dan Menengah (UMKM) memiliki peran strategis dalam mendukung pertumbuhan ekonomi nasional, namun masih menghadapi berbagai kendala dalam pengelolaan transaksi, persediaan barang, dan penjualan yang sebagian besar masih dilakukan secara manual atau menggunakan sistem yang terpisah. Kondisi tersebut menyebabkan terjadinya duplikasi data, ketidaksinkronan informasi, serta rendahnya efisiensi operasional. Penelitian ini bertujuan menghasilkan rancangan SmartKasir Pro

Edition berbasis web sebagai sistem informasi yang mengintegrasikan layanan Point of Sale (POS) dan E-Commerce dalam satu platform berbasis omnichannel. Penelitian menggunakan metode Research and Development (R&D) yang difokuskan pada tahap perancangan sistem. Tahapan penelitian meliputi analisis kebutuhan, perancangan alur sistem, perancangan struktur basis data, perancangan antarmuka pengguna, perancangan arsitektur sistem, serta penyusunan rancangan pengujian menggunakan metode Black Box Testing. Arsitektur sistem dirancang menggunakan pendekatan client-server dengan pemisahan antara *frontend* dan *backend* melalui komunikasi berbasis RESTful API. Teknologi yang diusulkan meliputi React.js dan TypeScript pada sisi *frontend*, PHP Native pada sisi *backend*, serta MySQL sebagai sistem manajemen basis data. Hasil penelitian berupa rancangan sistem yang mencakup dashboard administrator, manajemen produk, transaksi Point of Sale (POS), layanan E-Commerce, pengelolaan pelanggan, pengelolaan pesanan, pengendalian stok barang, pencarian produk, dan laporan penjualan yang terintegrasi dalam satu basis data. Rancangan SmartKasir Pro Edition diharapkan dapat menjadi acuan dalam tahap implementasi sistem pada penelitian selanjutnya serta memberikan alternatif solusi dalam mendukung digitalisasi proses bisnis dan peningkatan efisiensi operasional UMKM.

Kata kunci:
Point of Sale (POS); E-Commerce; Omnichannel; Sistem Informasi; UMKM; React.js; RESTful API; Perancangan Sistem.

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INTRODUCTION

Digital transformation has become one of the primary drivers of change across various economic sectors, including Micro, Small, and Medium Enterprises (MSMEs). The utilization of information technology enables business owners to improve operational efficiency, accelerate business processes, expand market reach, and enhance customer service quality. In Indonesia, MSMEs play a significant role in national economic growth by generating employment opportunities, increasing household income, and strengthening the national economic structure. Therefore, improving the digital capabilities of MSMEs has become one of the key strategies for enhancing business competitiveness in the digital economy era (Irianto et al., 2023; OECD, 2023).

The rapid advancement of digital technology has transformed business management practices from conventional approaches into integrated, data-driven systems. Today, sales transactions are no longer conducted exclusively through physical stores but are increasingly performed via online platforms. This transformation requires businesses to adopt information systems capable of managing various operational activities efficiently, accurately, and in an integrated manner. A well-designed information system serves not only as a transaction recording tool but also as a platform for data management, inventory control, report generation, and decision support for business management (Laudon & Laudon, 2022).

Despite the rapid growth of information technology, many MSMEs still manage their business operations manually. Sales transactions, inventory records, customer information, and financial reports

are often maintained using handwritten records or simple spreadsheet applications. Such practices frequently result in recording errors, delayed data updates, duplicated information, difficulties in retrieving business data, and reduced reporting accuracy. These issues not only decrease operational efficiency but also hinder managerial decision-making due to the lack of integrated and up-to-date information (Hermawan & Fauzi, 2021; Ismail et al., 2024).

One of the most widely adopted technologies for supporting sales digitalization is the Point of Sale (POS) system. A POS system is designed to automate sales transactions, product management, customer records, inventory control, and sales reporting. The implementation of POS systems improves service speed, minimizes recording errors, and provides real-time business information, enabling business owners to monitor and evaluate operational performance more effectively. Consequently, POS technology has become an essential solution for improving business management efficiency (Yuliana & Ronal, 2025; Prasetyo et al., 2024).

In addition to POS systems, the rapid expansion of internet technology has accelerated the adoption of electronic commerce (e-commerce) as a medium for digital marketing and online transactions. E-commerce enables customers to browse products, place orders, and complete payments regardless of geographical location or time constraints. For business owners, e-commerce expands market opportunities, increases product accessibility, and strengthens digital marketing strategies. The integration of online sales channels also enables MSMEs to improve their competitiveness by providing more flexible and customer-oriented services (Ghani et al., 2022; UNCTAD, 2024).

Although POS systems and e-commerce platforms are widely utilized, they are commonly operated as separate applications. This separation often leads to transaction inconsistencies, inventory discrepancies, duplicate data entry, and increased administrative workload because information must be updated across multiple systems. Such fragmentation negatively affects operational efficiency and reduces the reliability of business information used for decision-making. Therefore, an integrated platform capable of managing both offline and online transactions through a centralized database is required to ensure consistency, accuracy, and efficiency in business operations.

Previous studies have proposed various web-based POS systems and e-commerce applications to support MSME digitalization. However, most existing research focuses on developing these systems independently, while the integration of offline and online business processes remains limited. Furthermore, many studies emphasize transaction processing without fully integrating customer management, inventory control, sales reporting, and synchronized business data within a single platform. This limitation highlights a research gap regarding the design of an integrated information system capable of managing comprehensive business processes within a unified digital ecosystem.

To address these challenges, this study proposes the design of SmartKasir Pro Edition, a web-based integrated information system that combines Point of Sale (POS) and e-commerce services within a single omnichannel platform. The proposed system adopts a RESTful API-based architecture with a clear separation between the frontend and backend components, enabling a modular, flexible, and scalable system architecture for future implementation. The proposed platform is designed to integrate product management, product categories, customer management, sales transactions, inventory control, online ordering, and sales reporting through a centralized database.

The novelty of this study lies in the design of an integrated system architecture that combines Point of Sale and e-commerce services using an omnichannel approach, allowing all business activities to operate on a unified data source. This approach is expected to minimize data duplication, improve information consistency, simplify business management processes, and provide a solid foundation for developing adaptive information systems that support the digital transformation of MSMEs.

This study aims to produce the design of SmartKasir Pro Edition, a web-based platform integrating Point of Sale (POS) and e-commerce services into a unified omnichannel ecosystem. The proposed design is expected to serve as a reference for future system implementation and contribute to the development of integrated information systems that support MSME digital transformation.

Furthermore, this project was developed as part of the Capstone Project requirements, providing students with an opportunity to apply software engineering principles and information system design methodologies to address real-world business challenges through an integrated digital solution.

METHOD

This study employed a Research and Development (R&D) approach with a primary focus on the software design stage. The research was not intended to implement or comprehensively evaluate the proposed system; instead, it aimed to produce a web-based information system design that could serve as a reference for subsequent software development phases. The proposed system, named SmartKasir Pro Edition, is designed as an integrated information system that combines Point of Sale (POS) and E-Commerce services into a single omnichannel platform to support the digital transformation of business operations.

The initial stage of the study involved a requirements analysis to identify both the functional and non-functional requirements of the proposed system. The analysis was conducted by examining common business processes adopted by Micro, Small, and Medium Enterprises (MSMEs), particularly those related to product management, sales transactions, customer management, inventory control, order management, and sales reporting. The findings from this analysis served as the foundation for defining the system specifications, ensuring that the proposed design addressed user requirements in a comprehensive manner.

Following the requirements analysis, a system flow design was developed to illustrate the sequence of activities involved in business operations. This stage aimed to model the relationships among business processes, data flows, and interactions between users and the system. By representing business workflows through a structured system model, manual operational procedures could be transformed into an organized information system framework, thereby facilitating future software implementation and development.

In addition to designing the business workflow, this study also proposed a User Interface (UI) based on the principles of User-Centered Design (UCD). This approach was selected because it emphasizes user needs and user experience, ensuring that the proposed interface achieves a high level of usability. The interface was designed using a modern, simple, and responsive design concept, allowing the system to adapt seamlessly to various devices, including desktop computers, tablets, and smartphones. Furthermore, the interface design considered navigation consistency, accessibility to essential features, and interaction efficiency to provide a more intuitive user experience during business operations and transaction processing.

The proposed system involves three primary user roles: Administrator, Cashier, and Customer. The Administrator is responsible for managing all system resources, including user accounts, products, product categories, customer information, sales reports, and system configurations. The Cashier manages in-store (offline) sales transactions through the Point of Sale (POS) module, while the Customer interacts with the system through the E-Commerce platform to browse products, place orders, and complete online purchases. This role-based access control mechanism is designed to enhance data security while ensuring that each user can access only the functionalities relevant to their assigned responsibilities.

The proposed system architecture is expected to provide a solid foundation for developing an integrated business management platform in which both online and offline transactions are managed through a centralized database. Such an architecture is intended to improve business process efficiency, maintain data consistency, and simplify operational management within a unified digital ecosystem. The overall workflow of the proposed system is illustrated in Figure 1.

Furthermore, this study was conducted as part of the requirements for the Capstone Project, aiming to apply software engineering principles, system analysis, and information system design

methodologies in developing an integrated digital solution for modern business management. Although the study is limited to the system design stage, the proposed architecture is expected to provide a strong foundation for future implementation, testing, and evaluation.

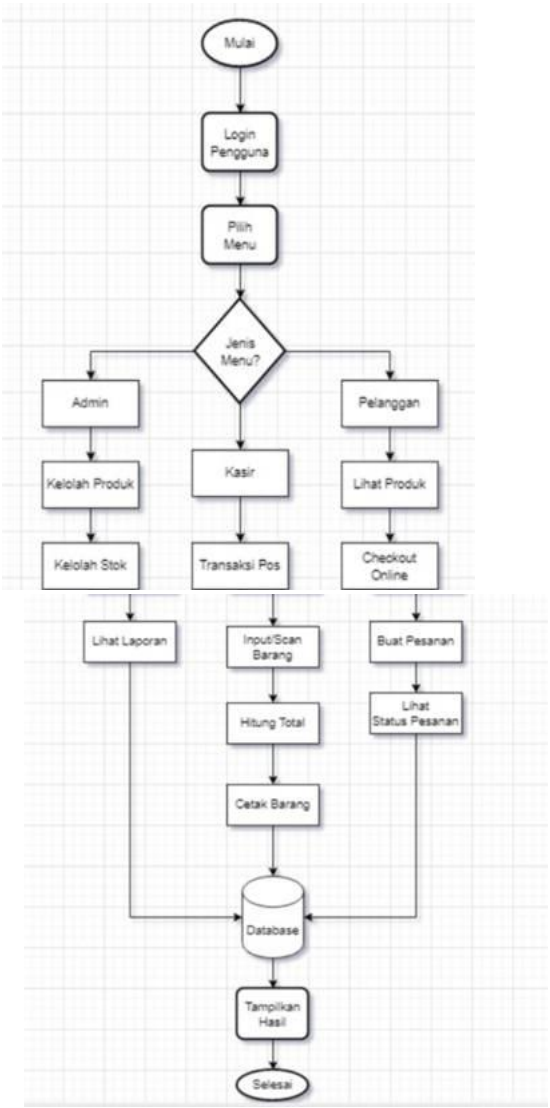

Figure 1. Proposed System Flowchart of SmartKasir Pro Edition

Data Structure and System Component Design

Data structure design represents one of the fundamental stages in information system development, as it provides the foundation for organizing data storage, management, and exchange among the system's modules. A well-designed data structure should accurately represent the information requirements identified during the requirements analysis phase, enabling business processes to operate in an integrated, consistent, and efficient manner. In this study, the data structure design focuses on developing a database model capable of supporting the integration of Point of Sale (POS) and E-Commerce services within a unified web-based platform.

The database is designed using MySQL as the Database Management System (DBMS) due to its capability to efficiently manage relational data, support Structured Query Language (SQL) operations, and provide a stable, secure, and scalable environment for data management. Furthermore, MySQL was selected because of its strong compatibility with web application development technologies and its widespread adoption in information systems ranging from small-scale to enterprise-level applications.

The proposed database structure follows the Entity-Relationship (ER) modeling approach, allowing relationships among entities to be defined systematically. The primary entities proposed in this study include users (administrators and cashiers), product categories, products, customers, sales transactions, transaction details, online orders, inventory records, and several supporting entities required to facilitate business operations. Each entity is designed with appropriate attributes and relationships to establish an integrated database capable of supporting all major functionalities of the proposed system.

Relationships among entities are designed following the principles of database normalization to minimize data redundancy, maintain data consistency, and improve storage and retrieval efficiency. Through this structured database design, any modification to business data—such as inventory updates following sales transactions or product information changes—can be automatically synchronized across all modules utilizing the same data source. This approach is expected to enhance data integrity while minimizing inconsistencies throughout business operations.

All business data are designed to reside within a centralized database, allowing both Point of Sale (POS) and E-Commerce transactions to operate using a single source of truth. The centralized database architecture is intended to improve data synchronization, eliminate duplicate records, and ensure that inventory levels, customer information, and transaction histories remain consistent and continuously updated. Consequently, the proposed system is expected to provide accurate and reliable business information to support managerial decision-making.

In addition to the database design, this study also develops a Use Case Diagram as part of the system modeling process. The Use Case Diagram illustrates the interactions between system actors and the primary functionalities provided by SmartKasir Pro Edition. The proposed model defines the access rights of three primary actors—Administrator, Cashier, and Customer—together with the business activities each actor is authorized to perform according to their respective roles. This modeling process provides a systematic representation of the system's functional requirements and serves as a valuable reference for subsequent software implementation and development.

The proposed system architecture adopts a client-server architecture based on the separation of concerns principle, which separates the frontend (presentation layer) from the backend (application logic layer). This architectural approach is intended to improve development flexibility, simplify system maintenance, and facilitate future feature enhancements or integration with external services.

On the frontend, the proposed system is designed using React.js with TypeScript to deliver an interactive, responsive, and maintainable user interface. Meanwhile, the backend is designed using PHP Native, which is responsible for managing business logic, user authentication, transaction processing, and database communication. Data exchange between the frontend and backend is designed through RESTful APIs, enabling structured, efficient, and modular communication among system components. The proposed technology stack employed in this study is presented in Table 1, while the interactions between system actors and functional modules are illustrated in Figure 2.

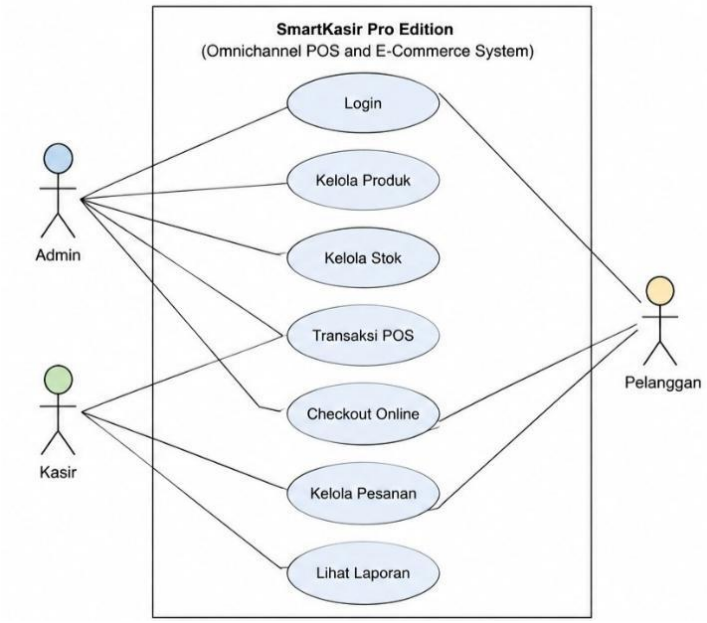

Figure 2. Use Case Diagram of the Proposed Web-Based SmartKasir Pro Edition System

The system components proposed in this study are designed using a client-server architecture that adopts the separation of concerns principle by separating the presentation layer (frontend), application layer (backend), and database layer. This architectural approach is selected to enhance development flexibility, simplify system maintenance, and facilitate future feature enhancements during subsequent implementation stages. Furthermore, separating the system into independent components is expected to improve source code organization, simplify system integration, and produce a modular architecture that can be more easily extended to accommodate future user requirements.

The frontend of the proposed system is designed using React.js, a JavaScript library for developing dynamic, interactive, and responsive User Interfaces (UI). React.js is chosen because of its component-based architecture, which enables user interface elements to be developed as reusable and modular components across multiple application pages. To further improve software quality, React.js is combined with TypeScript, a statically typed programming language built upon JavaScript. The adoption of TypeScript is expected to improve code readability, reduce development errors, and simplify long-term application maintenance.

The backend is designed using PHP Native, which is responsible for managing business logic, user authentication, transaction processing, data validation, and communication with the database. PHP Native is selected because of its strong compatibility with web application development environments, ease of implementation, and capability to support the development of efficient application services that meet the proposed system requirements.

All system data are designed to be managed using MySQL as the Database Management System (DBMS). MySQL is selected because it provides reliable relational database management, efficient data processing mechanisms, and strong support for maintaining data consistency and integrity through relational database structures. The proposed database serves as a centralized repository for storing information related to users, products, product categories, customers, sales transactions, online orders, and sales reports, allowing all system modules to access a unified and integrated data source.

Communication between the frontend and backend is designed using the Representational State Transfer Application Programming Interface (RESTful API) architecture. This approach enables structured data exchange through the HTTP protocol using lightweight data formats such as JavaScript Object Notation (JSON). The adoption of RESTful APIs provides flexibility for integrating different system components, enhances interoperability, and supports the development of modular application

services. Moreover, this architectural approach facilitates future system expansion to additional platforms, including mobile applications and third-party services, without requiring modifications to the core application architecture.

By integrating React.js, TypeScript, PHP Native, MySQL, and RESTful APIs, the proposed SmartKasir Pro Edition is expected to provide a modular, maintainable, and scalable system architecture capable of supporting the development of an integrated business information system. The proposed architecture establishes a strong foundation for building a responsive, scalable, and adaptive platform that can support the digital transformation of business processes for Micro, Small, and Medium Enterprises (MSMEs).

Tabel 1.1 Komponen Sistem SmartKasir Pro Edition

No.	Component	Technology	Function
1	Frontend	React.js	Develops the interactive and responsive user interface.
2	Frontend Programming Language	TypeScript	Implements frontend application logic with static typing and improved code maintainability.
3	Backend	PHP Native	Manages business logic, transaction processing, user authentication, and system operations.
4	Database	MySQL	Stores, manages, and maintains centralized system data.
5	API	RESTful API	Facilitates communication and data exchange between the frontend and backend services.

Core Feature Design

The design of the system's core features represents a critical phase in information system development, as it translates user requirements into functional capabilities that will be provided by the proposed platform. This phase is carried out based on the results of the requirements analysis, ensuring that each designed feature effectively supports business processes in an efficient, integrated, and user-oriented manner. According to Pressman and Maxim (2022), identifying functional requirements is a fundamental step in developing software that exhibits high quality, reliability, and maintainability. Therefore, all features of SmartKasir Pro Edition are designed by considering the operational requirements of business owners, particularly those related to sales transactions, inventory management, and customer services (Pressman & Maxim, 2022).

Based on the requirements analysis, this study proposes several core features that serve as the foundation for developing the SmartKasir Pro Edition web-based platform. These features are designed to operate through a centralized database, enabling seamless synchronization between offline transactions processed through the Point of Sale (POS) module and online transactions conducted through the E-Commerce module. This integrated approach is expected to reduce data duplication, improve information consistency, and simplify overall business operations (Laudon & Laudon, 2022).

The proposed core functionalities include product management, product category management, customer management, Point of Sale (POS) transactions, E-Commerce services, customer order management, inventory management, and sales reporting. Each module is designed based on the identified functional requirements to support business activities ranging from master data management

to decision-support information. According to Sommerville (2021), an effective software design should emphasize strong relationships among system modules to improve maintainability, scalability, and future extensibility (Sommerville, 2021).

The Product Management module is designed to support product creation, modification, deletion, searching, and categorization. Administrators can manage product information, including pricing, inventory levels, product images, and descriptions through a structured interface. The Point of Sale (POS) module is designed to facilitate in-store sales transactions while automatically synchronizing inventory updates and transaction histories. Meanwhile, the E-Commerce module enables customers to browse product catalogs, search for products, add items to the shopping cart, and place online orders through a web-based interface. The integration of these two services represents an omnichannel approach that has become increasingly important for improving operational efficiency in digital business environments (Verhoef et al., 2023).

In addition to transaction processing, the proposed system incorporates a Customer Management module that stores customer profiles together with their transaction histories. This functionality is intended to assist business owners in improving customer service quality while fostering long-term customer relationships. The system also includes inventory management, product search, and an interactive business dashboard designed to present operational information through visual summaries, thereby supporting business monitoring and data-driven decision-making. According to Ismail et al. (2024), interactive dashboards significantly enhance operational monitoring and improve the speed and accuracy of business information delivery (Ismail et al., 2024).

System Testing Plan

As part of the software development process, this study proposes a system testing plan using the Black Box Testing method. This testing approach is selected because it evaluates software functionality by verifying the correspondence between input and output without considering the internal implementation of the source code. Black Box Testing is widely adopted in software engineering because it effectively determines whether system functionalities conform to the specifications established during the requirements analysis phase (Pressman & Maxim, 2022).

The proposed testing plan is designed to evaluate all major system modules, including user authentication (login), product management, product category management, Point of Sale (POS) transactions, E-Commerce services, checkout processing, customer management, order management, inventory updates, product search, and sales reporting. Each module will be assessed using a series of test scenarios developed according to the identified functional requirements, allowing every feature to be systematically validated prior to system implementation.

The results of the testing process, which will be conducted during the future implementation phase, are expected to provide an assessment of how well the developed system satisfies user requirements. If functional inconsistencies or logical errors are identified during implementation, the evaluation results will serve as the basis for system refinement and continuous improvement. Consequently, the proposed application is expected to achieve higher levels of reliability, software quality, and usability. Therefore, the Black Box Testing plan proposed in this study is intended to serve as a guideline for future system validation and evaluation in subsequent research (Sommerville, 2021).

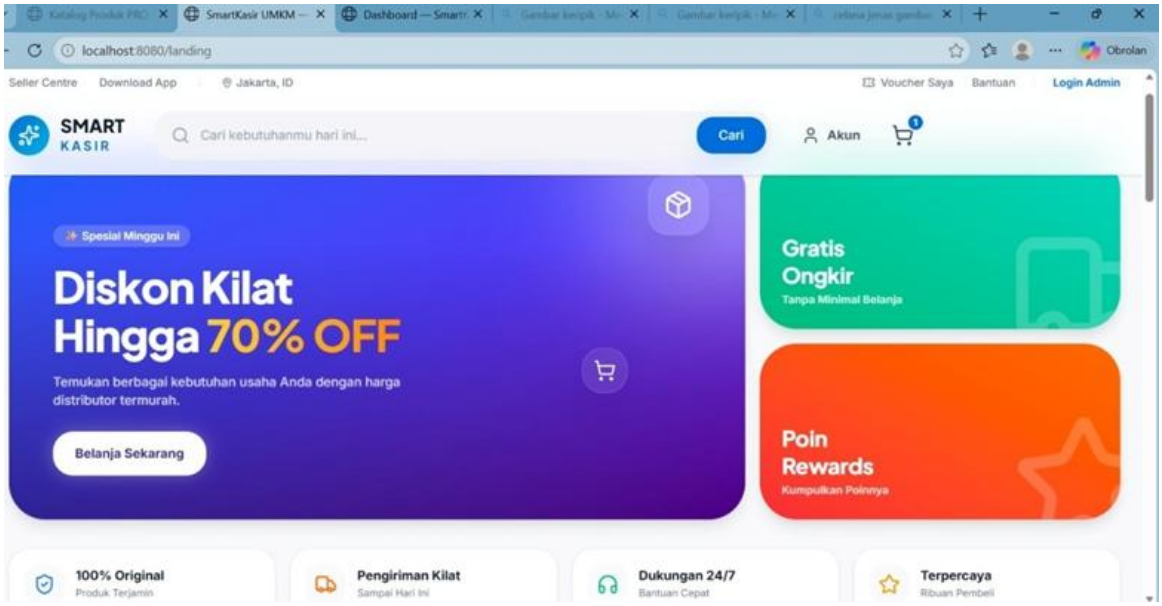

Figure 3. Proposed Landing Page of the SmartKasir Pro Edition System

Proposed Administrator Dashboard

The Administrator Dashboard is designed as the primary control center for managing all operational activities within the proposed SmartKasir Pro Edition system. This interface serves as a centralized platform that provides integrated access to essential operational information, enabling administrators to monitor and manage business activities efficiently. The dashboard is designed to support administrators in obtaining timely, accurate, and easily interpretable information, thereby facilitating data-driven decision-making (Laudon & Laudon, 2022).

Conceptually, the proposed dashboard presents a comprehensive business summary, including the total number of products, product categories, registered customers, completed sales transactions, inventory status, and sales performance over a specified period. Information is organized using a combination of information cards, data tables, and data visualizations, allowing administrators to obtain an overview of business performance without navigating through multiple system modules. This design approach follows the principles of dashboard analytics, which emphasize concise, interactive, and user-friendly presentation of business information (Few, 2023).

The dashboard interface is also designed following the principles of User-Centered Design (UCD) by positioning frequently accessed information and functionalities in easily accessible locations. In addition, consistent use of icons, typography, color schemes, and layout structures is incorporated to improve usability and simplify system navigation. According to ISO 9241-210, user-centered interface design enhances effectiveness, efficiency, and user satisfaction during system interaction (ISO, 2019).

Furthermore, the proposed administrator dashboard adopts the principles of responsive web design, allowing all interface components to adapt seamlessly to different screen sizes, including desktop computers, laptops, tablets, and smartphones. This responsive approach enables administrators to monitor business activities anytime and anywhere without compromising interface quality or system functionality (Marcotte, 2021).

Beyond presenting business information, the dashboard is designed to function as the central navigation hub for accessing all major modules of SmartKasir Pro Edition, including Product Management, Point of Sale (POS), Customer Management, Order Management, Sales Reporting, and System Configuration. Through this integrated interface, administrators are expected to manage overall business operations more efficiently using a single unified platform. The proposed administrator dashboard is illustrated in Figure 4.

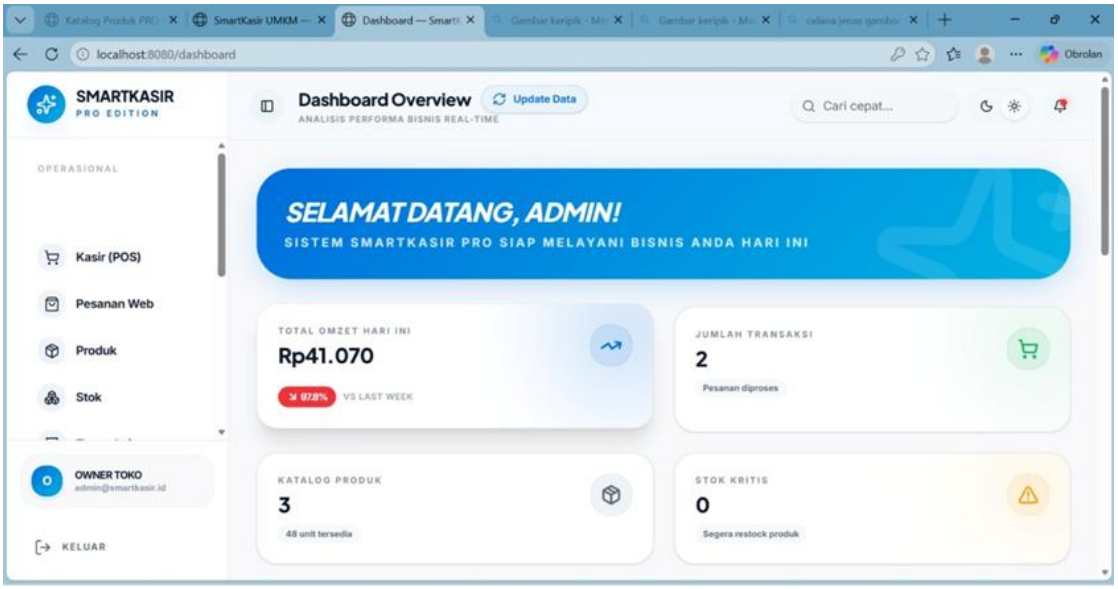

Figure 4. Proposed Administrator Dashboard of the SmartKasir Pro Edition System

Proposed Product Catalog Interface

The Proposed Product Catalog Interface is designed as the primary medium for presenting product information to customers through the E-Commerce module of the proposed SmartKasir Pro Edition system. This interface is intended to provide customers with comprehensive and well-structured product information, enabling them to make informed purchasing decisions before initiating online transactions. According to Kotler et al. (2022), the presentation of clear, accurate, and easily understandable product information plays a significant role in enhancing customer experience and influencing purchasing decisions in digital commerce.

In the proposed design, each product is displayed using a product card containing essential information, including the product name, product category, selling price, product image, and stock availability. The information is organized using a clean and consistent layout, allowing customers to compare multiple products efficiently. Furthermore, high-quality product images are incorporated to improve visual attractiveness, facilitate product recognition, and increase customer engagement during the product selection process.

The proposed product catalog also incorporates search and category-based filtering functionalities, enabling customers to quickly locate desired products based on keywords or product categories. These navigation features are designed to improve usability by reducing the time required to search for products, particularly when the system manages a large inventory. This design approach follows established web usability principles that emphasize efficient navigation and rapid information retrieval (Nielsen, 2020).

Beyond serving as a product showcase, the proposed catalog interface functions as the entry point to the online purchasing workflow. Through this interface, customers can browse detailed product information, select desired products, add items to the shopping cart, and continue to the checkout process. Consequently, the product catalog is designed not only as an information presentation module but also as a critical component of the overall E-Commerce transaction process, supporting a seamless and user-friendly online shopping experience.

In addition, the proposed interface is developed following responsive web design principles to ensure consistent usability across various devices, including desktop computers, laptops, tablets, and smartphones. This responsive design enables customers to access product information and perform online shopping activities conveniently regardless of the device being used. The proposed product catalog interface is illustrated in Figure 5.

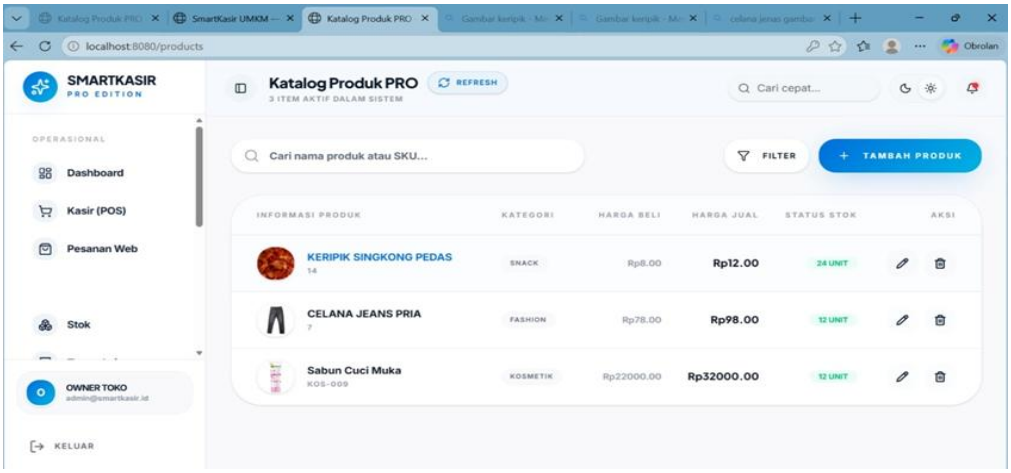

Figure 5. Proposed Product Catalog Interface of the SmartKasir Pro Edition System

Proposed Product Catalog Interface

The Product Catalog Interface is designed as the primary medium for presenting product information to customers through the E-Commerce platform. This interface serves as a structured information portal that enables customers to access comprehensive product details before making purchasing decisions. According to Kotler et al. (2022), presenting clear, complete, and easily understandable product information is one of the key factors influencing customer experience in digital commerce.

In the proposed design, each product is displayed using a product card that contains essential information, including the product name, category, price, product image, and stock availability. This information is organized using a clean and consistent layout, allowing customers to compare multiple products efficiently. Furthermore, the use of high-resolution product images is intended to enhance visual appeal and assist customers in recognizing products more easily.

The proposed product catalog also supports product search and category-based filtering, enabling customers to locate desired products quickly and efficiently. This functionality is designed to improve navigation usability while reducing the time required to retrieve product information, particularly when managing large product inventories (Nielsen, 2020).

Beyond functioning as a product showcase, the proposed catalog interface also serves as the gateway to the online purchasing process. From this interface, customers can browse product details, select items of interest, add products to the shopping cart, and proceed to the purchasing workflow. Consequently, the product catalog is designed not only as an information display but also as a fundamental component of the overall E-Commerce transaction process. The proposed product catalog interface is illustrated in Figure 5.

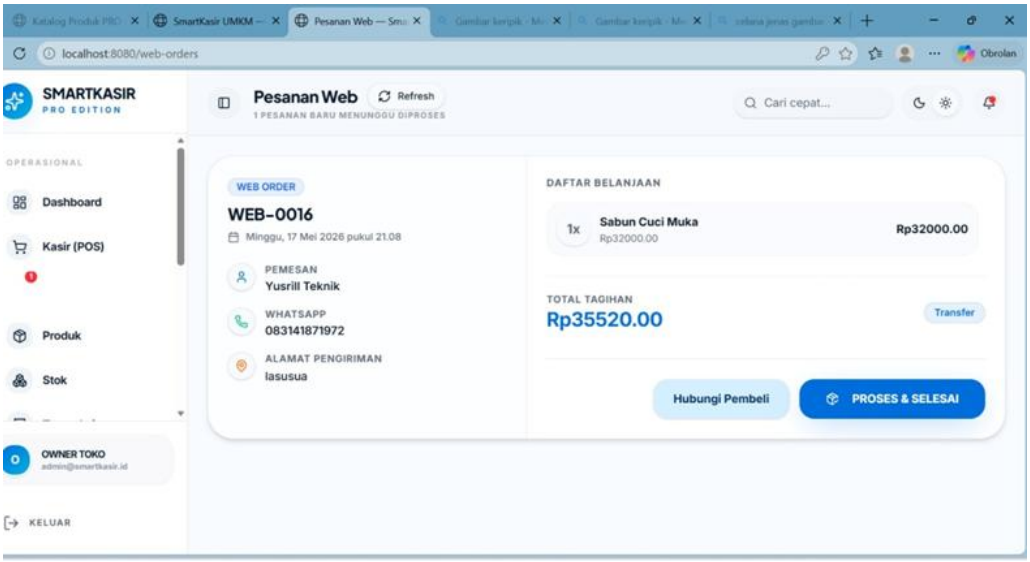

Figure 6. Proposed Web Orders Interface of the SmartKasir Pro Edition System

Proposed Product Search Feature

The Product Search feature is designed as a supporting component to enhance user interaction and improve operational efficiency within the proposed SmartKasir Pro Edition system. This feature enables users to quickly locate products based on product names, categories, or specific keywords without manually browsing the entire product catalog. According to Nielsen (2020), an effective search function is a fundamental element of web usability, as it significantly improves navigation efficiency and facilitates faster access to information.

In the proposed system, the Product Search feature adopts a real-time searching mechanism, allowing search results to be displayed dynamically as users enter search keywords. This approach is intended to reduce the time required to locate products, particularly when the system manages a large number of product records. By providing immediate search feedback, the feature is expected to improve user experience while increasing the overall efficiency of business operations.

In addition to supporting customers through the E-Commerce module, the proposed search functionality is also designed to assist administrators and cashiers during Point of Sale (POS) transactions. The availability of an efficient search mechanism enables users to identify products more quickly during sales transactions, thereby reducing customer waiting time and improving service quality. Consequently, the proposed search feature contributes not only to system usability but also to operational productivity within the business environment.

The Product Search feature is fully integrated with the centralized database, ensuring that search results are always generated from the most up-to-date product information. This integration maintains data consistency across all system modules while ensuring that users access accurate and synchronized information. As a result, the proposed search functionality supports reliable business operations and enhances the effectiveness of the integrated POS and E-Commerce platform. The proposed Product Search feature is illustrated in Figure 7.

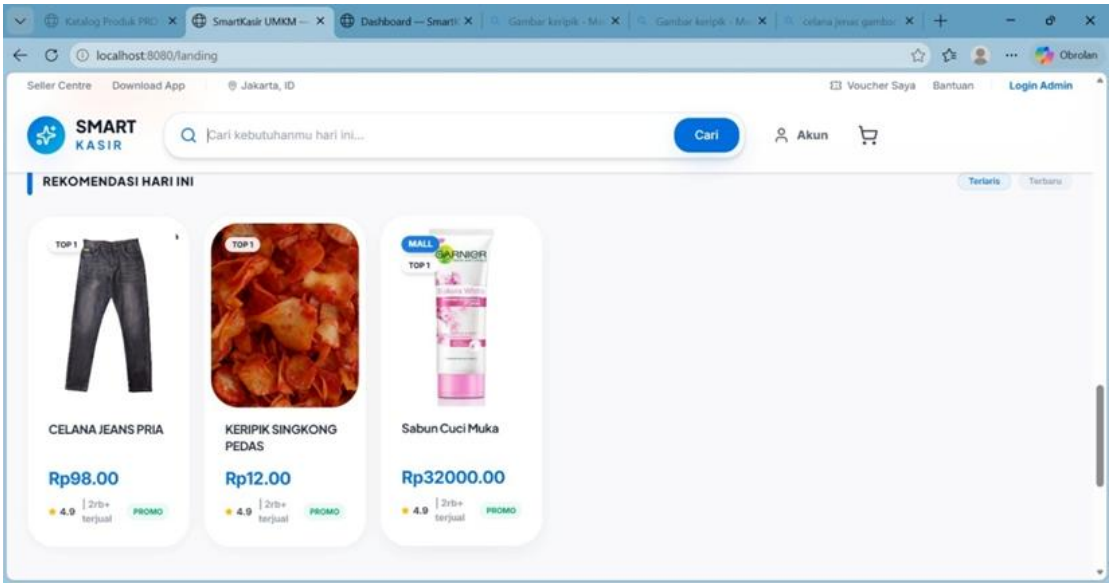

Figure 7. Proposed Product Search Interface of the SmartKasir Pro Edition System

Proposed System Testing Plan

As part of the software development process, this study proposes a system testing plan based on the Black Box Testing method. This testing approach is selected because it focuses on evaluating the functional behavior of software by examining the correspondence between input and output without considering the internal structure of the source code (Pressman & Maxim, 2022).

The proposed testing plan is intended to evaluate all major functionalities of the SmartKasir Pro Edition system, including user authentication, product management, category management, Point of Sale (POS) transactions, E-Commerce ordering, checkout processing, customer management, order management, product search, inventory updates, and sales reporting. Each functional module is planned to be evaluated using a series of test scenarios derived from the identified functional requirements, ensuring that every system feature can be systematically validated during the implementation phase.

The proposed testing activities are expected to provide a comprehensive evaluation of the extent to which the implemented system satisfies the predefined functional specifications. If functional inconsistencies, logical errors, or processing failures are identified during implementation, the evaluation results can serve as the basis for system refinement and continuous improvement before large-scale deployment. Therefore, the testing process is expected to function not only as a verification mechanism but also as an essential component of software quality assurance and continuous software improvement (Sommerville, 2021).

Table 2. Proposed Black Box Testing Scenarios

No.	Module / Feature	Test Scenario	Expected Result	Expected Status
1	User Authentication (Login)	Enter valid username and password.	The user is successfully authenticated and redirected to the appropriate dashboard.	Pass
2	Product Management	Add, edit, delete, and view product information.	Product data are successfully created, updated, deleted, and displayed correctly.	Pass
3	Product Category Management	Create, update, and delete product categories.	Category data are managed successfully and reflected throughout the system.	Pass

4	Point of Sale (POS)	Process an offline sales transaction.	The transaction is completed successfully, inventory is updated, and the transaction record is stored in the database.	Pass
5	E-Commerce Checkout	Place an online order through the checkout process.	Customer orders are processed successfully and recorded in the order management module.	Pass
6	Customer Management	Add, edit, delete, and search customer information.	Customer data are successfully stored, updated, and retrieved from the database.	Pass
7	Order Management	Update the status of customer orders.	Order status changes are successfully saved and reflected in the system.	Pass
8	Product Search	Search products using product names or keywords.	Relevant products are displayed accurately based on the search query.	Pass
9	Inventory Management	Update product inventory after a sales transaction.	Inventory quantities are synchronized automatically and updated correctly.	Pass
10	Sales Reporting	Generate sales reports based on transaction records.	Sales reports are generated accurately according to the recorded transaction data.	Pass

CONCLUSION

This study proposes the design of SmartKasir Pro Edition, a web-based information system concept that integrates Point of Sale (POS) and E-Commerce services into a unified omnichannel platform. The proposed system is developed based on the results of the requirements analysis, enabling it to accommodate essential business processes, including product management, product category management, customer management, sales transactions, order processing, inventory control, and sales reporting within a single integrated platform.

The proposed architecture adopts a client-server model with a clear separation between the frontend and backend through RESTful API communication. This architectural design is intended to provide a modular, flexible, and maintainable foundation that supports future software implementation and enhancement. Furthermore, the proposed use of React.js, TypeScript, PHP Native, and MySQL establishes a robust technological framework for developing a responsive, well-structured, and maintainable web-based information system.

The research also produces comprehensive design artifacts, including the user interface design, database structure, and the proposed core functional modules required to support business digitalization. These modules include the administrator dashboard, product catalog, Point of Sale (POS), E-Commerce services, customer order management, product search, inventory management, and integrated sales reporting. All modules are designed to operate using a centralized database, enabling synchronized data management for both offline and online business transactions.

Overall, the proposed SmartKasir Pro Edition provides a conceptual foundation for future system implementation and development. The proposed design is expected to serve as an alternative

solution for supporting business process digitalization, improving operational efficiency, enhancing data management, and facilitating the digital transformation of Micro, Small, and Medium Enterprises (MSMEs). Future research is recommended to continue with the implementation, functional testing, and comprehensive system evaluation in real-world environments to validate the effectiveness, usability, and performance of the proposed platform.

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