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Catalog Web Design as a Product Information Medium Using the User Centered Design (UCD) and Waterfall Methods at PT. Sigma Sejuk Indonesia Jakarta

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ABSTRACT

Manual dissemination of product information through printed brochures and direct messaging can delay updates and limit customers' access to accurate, consistent, and comprehensive product specifications. This study aimed to develop a centralized web-based product catalog for PT Sigma Sejuk Indonesia in Jakarta by integrating User-Centered Design (UCD) principles with the Waterfall software development model. Data were collected through observations, stakeholder interviews, and user requirements assessments. Five participants, comprising two administrators and three customers, were purposively selected to identify system requirements and evaluate usability. The system was developed using the Laravel framework and MySQL database management system, incorporating role-based access control, product and category management, keyword-based search, category filtering, detailed product information, and WhatsApp-based customer inquiries. System evaluation involved eight black-box functional testing scenarios, task-based usability assessments, and follow-up interviews. All eight functional testing scenarios passed, indicating that the evaluated authentication, product management, search, and filtering functions operated as expected. Regarding perceived usability, three participants rated the interface as very easy to use, while the remaining two rated it as easy to use. These findings suggested that incorporating UCD activities into the Waterfall development stages supported alignment between system functionality, user requirements, and interface usability within the evaluated setting. The developed web catalog fulfilled the principal functional requirements and provided a centralized platform for managing and disseminating product information. Nevertheless, further evaluation involving a larger and more diverse user population, along with performance and scalability testing, was necessary to establish the system's broader usability, technical robustness, and long-term operational benefits.

INTRODUCTION

The rapid advancement of information technology has encouraged companies to transform how they communicate product information to customers (Behera et al., 2024; Taherdoost, 2023). Digital platforms, particularly websites, offer opportunities to deliver information efficiently, maintain consistent product specifications, and provide access regardless of time or geographical location. Web-based information platforms can expand promotional reach and facilitate the flexible dissemination of product information across

different regions (Sokibi et al., 2024). Similarly, the implementation of web-based digital information systems can improve operational efficiency by enabling companies to present their product portfolios interactively to a broader audience (Putri, 2023). These developments highlight the growing importance of centralized digital platforms in supporting product information management and customer communication (Felicia et al., 2024; Haniyah & Samsudin, 2025; Nasrullah et al., 2024).

PT Sigma Sejuk Indonesia had not yet implemented a centralized digital platform for managing and disseminating product information. Based on observations and evaluations conducted during a previous internship (Praktik Kerja Lapangan, PKL), product specifications were primarily communicated to prospective customers through direct messaging or printed brochures. This manual approach often delayed customers' access to updated product information and limited management's ability to revise and distribute product details efficiently. Consequently, customers could encounter difficulties obtaining timely and consistent information, while administrative staff faced additional challenges in maintaining accurate product records (Saroinsong et al., 2025).

Reliance on printed catalogs also presented operational challenges for the company. The sales team needed to reproduce brochures whenever product specifications, prices, or availability changed, resulting in recurring printing costs and increasing the possibility that outdated information would continue circulating among customers. Furthermore, prospective customers who wished to compare multiple products encountered difficulties because the company lacked a centralized information source that could be accessed independently. These limitations demonstrated the need to transition from fragmented manual communication methods to a centralized, accessible, and regularly updated web-based product information system (Manulang, 2025; Zulkahfi et al., 2026).

To address these challenges, this study proposed the development of a web-based product catalog by integrating User-Centered Design (UCD) principles with the Waterfall software development model. UCD was selected to ensure that user needs, characteristics, and expectations informed interface design decisions, while the Waterfall model provided a structured and sequential framework for requirements analysis, system design, implementation, testing, and maintenance. Integrating these approaches was expected to support the development of a technically organized system that addressed identified user requirements while maintaining an accessible and intuitive interface. This combination also enabled user-centered activities to be incorporated into defined development stages without compromising the systematic documentation and control associated with the Waterfall model (Mentari & Haris, 2026; Safira et al., 2023; Valensyah & Irnawati, 2024).

Based on the identified problems and research scope, this study addressed four research questions: (1) How could user needs and existing challenges in product information delivery at PT Sigma Sejuk Indonesia be translated into web catalog system requirements? (2) How could a centralized web-based product catalog be developed using the Laravel framework and MySQL database management system? (3) How could UCD principles be applied to develop a usable and visually accessible interface that met user expectations? (4) How could information architecture and product categorization be structured to facilitate efficient product searches and information retrieval? These questions guided the development of a system that combined functional requirements with user-centered interface considerations (Dangkua et al., 2026; Kusuma et al., 2021; Mulyana et al., 2022; Nawawi & Suhendri, 2021; Nurfaqih et al., 2026; Surya, 2026).

Consistent with these research questions, the study aimed to identify and translate user requirements into an appropriate system design, develop a centralized web-based product catalog using Laravel and MySQL, design an intuitive interface through UCD principles, and establish a structured information architecture with clearly organized product categories.

These objectives provided a systematic basis for developing and evaluating the proposed system according to the company's operational needs and the characteristics of its intended users.

From an academic perspective, this study was expected to contribute to the literature on integrating user-centered design practices with sequential software development models, particularly in the development of web-based product information systems. The findings could provide a practical reference for future research in information systems and computer engineering concerning the incorporation of usability considerations into structured development processes. From a practical perspective, the developed system was intended to assist PT Sigma Sejuk Indonesia in centralizing product information, simplifying updates without repeated brochure printing, and improving communication between the company and prospective customers. By providing a consistent and accessible source of product information, the web catalog could support more efficient information management and facilitate customer access to updated product specifications.

METHOD

Research Framework

This study followed a structured software development process that began with field observations and problem identification at PT Sigma Sejuk Indonesia, followed by user requirements analysis using the User-Centered Design (UCD) approach. Database and user interface design activities were integrated into the sequential stages of the Waterfall model, and the system was subsequently implemented using the Laravel framework and MySQL database management system. System evaluation was conducted through black-box functional testing and usability testing. The integration of UCD and Waterfall supported systematic development documentation while incorporating user requirements into design and implementation decisions to improve functional suitability and interface usability.

Institutional/Organizational Overview

PT. Sigma Sejuk Indonesia is a company engaged in the distribution and sale of spare parts for electronic devices, especially air conditioning (AC) and washing machine (MC) components. The research was carried out at this company during Field Work Practice (PKL) activities for the period of September 29, 2025 to December 29, 2025, with data collection methods in the form of direct observation of the business process of delivering product information as well as guidance and interviews with company leaders as key stakeholders. Based on the results of direct observation with the guidance of company leaders, the process of delivering product information currently still uses physical catalogs/brochures, so product information is difficult to access, the update process is inefficient, and distribution costs are high.

The organizational structure of PT. Sigma Sejuk Indonesia consists of the president director, sales manager, and sales team. The president director acts as a strategic decision-maker as well as a direction giver regarding system needs, the sales manager is responsible for coordinating the delivery of product information to potential customers, while the sales team is the party who deals directly with customers in the field. The main users of the catalog web system are the sales team (acting as an Admin who manages product and category data) and prospective customers (acting as the User who accesses the catalog), with the company leader acting as a decision-making stakeholder for the functional and non-functional needs of the system. The certificate of having conducted research with the company's letterhead, signature, and official stamp attached to the thesis attachment as proof of the research implementation.

Software Needs Analysis

Problem analysis was carried out through direct observation during street vendors, which showed three main problems: (1) delayed data updates – physical catalogs are difficult to update so that customers receive information that is not up to date, in line with Putri's (2023) findings that delays in manual catalog updates can reduce customer confidence; (2) limited accessibility – customers cannot view product catalogs directly and in a structured manner; and (3) low efficiency – admin/marketing workflows are hampered because they have to distribute manual catalogs repeatedly. The solution offered is to design a catalog web system with the integration of User Centered Design (UCD) and Waterfall methods, where UCD ensures the system is according to user needs, while Waterfall provides a systematic and documented development framework (Sokibi et al., 2024).

This study uses the UCD approach with 5 respondents selected through purposive sampling techniques, namely two Admins as operational users and three Customers as technical and non-technical users. The five respondents were used to obtain information about user needs and evaluate the system interface design. Based on the results of the identification of needs, the system has two user roles: Admin who is in charge of managing product and category data, and User (Customer) who has access rights to view, search, filter, and view product details.

Based on the division of roles, the system needs are formulated as follows:

a) Functional Needs

Admins can login, add, view, change, and delete product data and manage category data; (b) Customers can view product catalogs, perform product searches, filter products by category, and view product details.

b) Non-Functional Needs

Usability – the system interface is designed to be simple and easy to use based on the UCD approach; (b) Performance – the system is capable of displaying product listings and search results with a good response time; (c) Security – the system implements user authentication and CSRF protection available on the Laravel framework (Sinlae et al., 2024); (d) Compatibility – the system can be accessed via a web browser on devices that support web applications.

The selection of five respondents using the purposive sampling technique was based on the consideration that these two groups of users represent two different but complementary needs perspectives. The Admin group provides input related to the efficiency of data management (addition, change, and removal of products/categories) because they are the ones who will use the system regularly every day, while the Customer group provides input related to the ease of search and clarity of product information because they are the end users who will assess the success of the system as an information medium. The inputs from these two groups are then aligned into a list of functional and non-functional needs that are used as a reference in the next stage of design (System Design).

Program Design: UCD and Waterfall Integration

The program design is prepared based on the integration of the UCD and Waterfall flows, as mapped in Table 1. The activity of understanding the context of use and determining the needs of the user is applied at the Requirement Analysis stage; the activity of producing design solutions is applied at the System Design stage; the implementation is carried out based on the results of the UCD at the Implementation stage; the evaluation of the design and system is carried out at the Testing stage; and the evaluation results become the basis for improvement at the Maintenance stage.

Table 1. UCD and Waterfall Integration Mapping

Waterfall	Applied UCD	Integration Results
Requirement Analysis	Understand Context of Use + Specify User Requirements	System needs by user
System Design	Produce Design Solutions	UI/UX prototype and system design
Implementation	Implementation based on UCD results	Catalog web system
Testing	Evaluate Design	Usability evaluation and test results
Maintenance	Improvements based on evaluation	System enhancements

Product Search Mechanism Using SQL LIKE

The mechanism used in this catalog web system is a text-based search using the LIKE operator in MySQL to find data that matches the keywords entered by the user. The mechanism of operation is as follows: the user enters the search keyword through the catalog page; the system receives the keyword and retrieves the product data along with the category relationship through the category_id; if the keyword is filled, the system performs a search using the LIKE operator on the product name and the category name through the Category relationship, by comparing the keyword to the stored data using the search pattern (%keyword%); if the matching data is found, the product data is displayed to the user, and if not, the system displays empty search results.

The implementation of search logic utilizes Laravel's Eloquent ORM and the relationship between the Product and Category models, which can conceptually be represented as a query: SELECT products FROM products JOIN categories ON products.category_id = categories.id WHERE products.name LIKE '%keyword%' OR categories.name LIKE '%keyword%'. This mechanism is used because the database structure separates product and category data into different tables, with the category_id field in the products table as a foreign key that connects the product to the categories table, so that searches can be performed based on product name or category name through relationships between tables.

System Modeling with UML

System modeling is carried out using Unified Modeling Language (UML) to describe functional needs, activity flows, interactions between objects, and class structures in the catalog web system, including Use Case Diagram, Activity Diagram, Sequence Diagram, and Class Diagram (Kurniawan et al., 2024; Setiaji et al., 2024).

The Use Case Diagram illustrates the interaction between two actors – Admin and Customer (User) – with the system. Admins have access rights to login, view, add, change, and delete product data as well as manage category data. Customers can log in, register for new users, view catalogs, search for products, filter by category, view product details, and send questions to admins through the product details page.

Activity Diagram models the system's workflow through two swimlanes, namely the Admin Activity Diagram and the Customer Activity Diagram. In the Admin flow, the process starts from login, validation of login data, to access the Admin Dashboard to manage product data (add, change, delete after confirmation) and category data (add and delete). In the Customer flow, the process starts from login/registration, followed by product search by keyword, product appearance by AC/MC category, and the "ask Admin" feature that sends automatic messages to Admins via WhatsApp.

The Sequence Diagram illustrates the sequence of interactions between objects in the product search process: the user's request from the interface (View) is forwarded to the

Controller, which calls the Eloquent Model to retrieve data from the MySQL database, then the search results are returned to View and displayed to the user; for failed flows, the system returns an empty collection.

The Class Diagram depicts three main classes: Users, Products, and Categories. The Users class has the attributes id, name, email, password, role, hp, status, and method login(), logout(), showMessageError(), registration(), with the role attribute distinguishing Admin and Customer access rights. The Users class is one-to-many related to Products and Categories (a single User can manage zero or many Products/Categories). The Products class has the attributes id, category_id, name, image, description, created_by, price_range, stock, and method inputDataProduct(), changeDataProduct(), deleteDataProduct(), with a many-to-one relationship to Categories (each Product is connected to one Category, while one Category can be used by zero or many Products). This Class Diagram is the basis for the preparation of the Entity Relationship Diagram (ERD) and Logical Record Structure (LRS) at the implementation stage, because each class, attribute, and relationship that has been modeled will be translated directly into entities, fields, and foreign keys in the database.

The four UML diagrams are used in complementarity: the Use Case Diagram sets the boundaries of the functions that can be accessed by each actor, the Activity Diagram describes the sequence of steps that the user must take to execute the function, the Sequence Diagram shows how the software objects (View, Controller, Model) communicate with each other to realize a single function, and the Class Diagram establishes the data structure that underlies the entire process. This layered modeling approach ensures that the interface designs generated through UCD can be consistently translated into the database structure and programming logic at the implementation stage, thus reducing the risk of mismatches between user needs and the end result of the system.

RESULTS AND DISCUSSION

Database Design and Implementation

The database design is carried out to implement the data storage structure that has been modeled in the Class Diagram, through the creation of an Entity Relationship Diagram (ERD) which is then transformed into a Logical Record Structure (LRS). The ERD catalog web system consists of three main entities: Users (stores user data – id, name, email, email_verified_at, password, hp, status, role, remember_token), Products (stores catalog data – id, name, image, category_id, description, created_by, price_range, stock, created_at, updated_at), and Categories (stores category data – id, name, slug, created_by, created_at, updated_at).

Based on the results of an interview with PT. Sigma Sejuk Indonesia, the main need of the system is to display and manage the product catalog online, so that the ordering entity is not needed because the ordering process is still done manually through WhatsApp. The relationships formed are: one User can manage zero or many Products, one User can manage zero or many Categories, and one Category can have zero or many Products.

LRS maps the ERD into a relational table structure, generating three tables: Users table with id (bigint unsigned, Primary Key), name, email (UNIQUE), email_verified_at, password, hp, status, role (admin / customer access differentiator), and remember_token; Categories table with id (Primary Key), created_by (Foreign Key to Users), name, slug, created_at, updated_at, is dynamic so that it can be added/removed by Admins; and Products table with id (Primary Key), created_by and category_id (Foreign Key to Users and Categories), name, image, description, price_range (price range in text format), stock, created_at, updated_at.

The design of the ERD and LRS directly addresses the problem of how the information architecture and product category grouping are structured to be easily accessible to users: by separating the Products and Categories entities and linking them via a foreign key category_id,

the system allows one product to be connected to only one category, while a single category can house many products, so that the catalog grouping remains consistent even as the number of products grows.

The database implementation was done according to LRS using MySQL via Laragon, resulting in three main tables (products, users, categories) that can be verified via phpMyAdmin. Example data in the products table – such as WATER LEVEL MU-3 (category_id = 2) and Bracket AC Indoor HC6382A (category_id = 1) – proves that the table contains data and is ready to be used by the system, with fields created_by = 1 indicating the product was created by the user admin. In the users table, the password field is stored in the form of a hash for security, and the field role (VARCHAR) differentiates the admin/user access so that the system only uses a single login page that directs the user to the role. In the categories table, the field slug (varchar) is used for SEO-friendly URLs; the example data shows two categories, "AC" (slug: ac) and "MC" (slug: mc), both of which are created by admins with ID = 1. With separate categories tables, admins can add and remove categories at any time without changing the table structure, making catalog management more flexible.

Implementation of Search Architecture and User Interface

The product search algorithm is implemented according to the Product Search pseudocode (keyword, category_id): the system takes Products data and the Category relationship, filters by category_id if selected, searches for keywords in the product name or category name when filled, sorts the results by product name ascending, and then displays the product list. The implementation of the code in ProductsController.php uses Eloquent ORM Laravel with category_id filter conditions and LIKE search for the product name and category name through the category relationship, the results of which are sent to the dashboard.index view. This approach is consistent with the SQL LIKE search mechanism that has been designed at the research method stage, so that there is no deviation between the algorithm design and the actual implementation results in the program code.

The user interface is implemented using Laravel and Bootstrap according to the design design at the research method stage, covering three groups of views. The User view presents a product catalog page with keyword-based search fields, category filter (AC/MC) dropdowns, product lists in the form of cards displaying product images, names, and price ranges, and product details pages that display full descriptions along with a "ask Admin" button to send queries directly via WhatsApp. The Admin view presents a management dashboard that contains a list of all products and categories along with add, change, and delete action buttons, so that Admins can update the catalog without the need to involve developers. The common view includes a single login page and a registration page, which after a successful authentication process will automatically redirect users to the Admin Dashboard or Customer catalog page according to the field role values in the users table.

The three display groups are designed with the principle of visual consistency – using a uniform color palette, typography, and button layout – so that users don't experience confusion when moving between pages. This principle is a direct application of the Produce Design Solutions stage to the UCD method, which emphasizes that design solutions must be evaluated and refined iteratively based on user input before being fully implemented into the program code.

As a continuation of the implementation of the interface, testing the search function with the keyword "Bracket" via URL 127.0.0.1:8000/dashboard?query=Bracket returned the product INDOOR AC BRACKET HC6382A with the AC category, proving that the implementation of the LIKE algorithm '%keyword%' worked according to the pseudocode designed. The system only displayed products relevant to the keyword and did not display a data management button when the logged-in account had a user role, indicating that role-based access control was working as intended.

System Test Results

Testing is carried out to ensure that the system runs according to the functional needs and user needs in terms of interface, through two methods: Black Box Testing and Usability Testing.

Functionality testing is carried out using the Black Box Testing method, which tests the functions of the system without looking at the internal structure of the program code. The results of the tests on eight test scenarios – admin login (true and false data), product search, add product, add category, delete product, edit product, and filter category – are presented in Table 2.

Table 2. Black Box Test Results

Yes	Test Scenarios	Input	Expected Output	Results	Status
1	Login Admin	Username and Password are correct	Successfully logged in to the Dashboard	As expected	Pass
2	Login Admin	Incorrect username and password	Failed login + error message	As expected	Pass
3	Product Search	Keyword: "bracket"	Displaying bracket products	As expected	Pass
4	Add Products	Fill out the full form	Data stored in the database	As expected	Pass
5	Add Categories	Fill in the name Category	Categories stored in the database	As expected	Pass
6	Remove Products	Click the delete button	Data was successfully deleted in the database	As expected	Pass
7	Edit Products	Change name, category, price, stock, description, image	Data successfully changed in the database	As expected	Pass
8	Filter Categories	Select category: Air conditioning	Display AC products	As expected	Pass

All eight Black Box test scenarios were declared "Passed" with a result of "As expected", indicating that the main functions of the system – authentication, product and category data management, search, and filters – were running according to the designed functional requirements. The login scenario with true or false credentials proved that the authentication mechanism was able to distinguish between legitimate and unauthorized access and display informative error messages. The search and category filter scenarios proved that the LIKE mechanism and category_id relationships designed at the research method stage were functioning according to pseudocode. Meanwhile, the add, change, and delete scenarios of product and category data proved that the basic create, read, update, and delete (CRUD) operations of the Products and Categories entities were well implemented through Eloquent

ORM Laravel, allowing Admins to manage catalog data independently without relying on the brochure reprinting process.

In addition to functionality testing, UCD-based Usability Testing was conducted to evaluate the ease of use of the system on five respondents representing user characteristics: two Admins (Sales and Inventory Section) and three Customers. The test was carried out through the provision of task scenarios and post-test interviews to explore user responses, with the results in Table 3.

Table 3. Usability Testing Results

Yes	Person Responds	Testing Scenarios	Feedback	Status
1	Admin	Log in to the system as an admin	Simple login interface for easy use	It's Very Easy
2	Admin	Product and Category Management	The action buttons are easy to recognize and the process of changing data is quite clear	Easy
3	Customers	Register and log in	The login process is not confusing and can be done quickly	It's Very Easy
4	Customers	View and search for products using keywords	Text and buttons are clearly visible, search features are easy to use, results by keyword	It's Very Easy
5	Customers	Filter by category and view product details	Category filters are easy to find, product detail information is easy to understand	Easy

Based on the results of the interface evaluation of the five purposively selected respondents, three respondents gave a "Very Easy" rating and the other two gave an "Easy" rating on the given scenario. Thus, all five respondents gave a positive rating on the ease of use of the system interface, indicating that the UCD-based interface design met the usage needs identified in the study. Admin respondents rated the login and data management process as easy as the action buttons (add, change, delete) were easy to recognize and placed in a consistent position on each page. Customer respondents rated the registration and login process as not confusing, the keyword-based search feature provided expected results, and the category filter feature helped narrow down the product selection so that product detail information was easier to understand. This feedback showed that the application of the Understand Context of Use, Specify User Requirements, and Produce Design Solutions stages in the UCD method was successfully translated into an interface that matched the characteristics and expectations of actual users in the field.

In terms of testing scope, the eight Black Box Testing scenarios represent all the functional needs that have been formulated at the research method stage, both for the Admin role (login, add/change/delete products, add categories) and Customer roles (product search, category filters). The absence of scenarios with a status of "Failed" indicates that the code implementation on ProductsController.php and CategoriesController.php has been in accordance with the logic designed in the pseudocode and Activity Diagram, so there is no need for re-iteration at the Implementation stage before the system is declared ready for the interface testing stage.

Supporting Device Specifications

The system is developed and run in a local environment with software and hardware specifications as presented in Table 4.

Table 4. Specifications of System Support Devices

Categories	Components	Specification
Software	Operating System	Windows 11 64-bit
	Web Server	Apache via Laragon v6.0
	Framework	Laravel 10.x
	Database	MySQL 8.0
	Browser	Google Chrome
Hardware	Processor	Intel Core i3 Gen 11
	RAM	8 GB
	Storage	256 GB SSD

General Discussion

Overall, the integration of the User Centered Design (UCD) and Waterfall methods proved to be effective in the web design process of PT. Sigma Sejuk Indonesia. The UCD approach ensures that the needs of users – both Admin and Customer – are the basis of every design decision, while the Waterfall framework provides a systematic development structure starting from needs analysis, design (ERD, LRS, UML), implementation (Laravel, MySQL), to testing. The integration mapping in Table 1 proved to be consistent with findings in the field: the Requirement Analysis stage enriched by UCD activities succeeded in identifying three main problems (update delays, limited accessibility, low efficiency), the System Design stage produced interface prototypes and database designs that were then implemented consistently, and the Testing phase which included Black Box Testing and Usability Testing proved that the implementation results were in line with the initial design.

The results of the Black Box test, which were all "Passed", showed that the system functions were running according to the specifications, while the results of the Usability Testing, which were all positive ("Very Easy"/"Easy") showed that the interface design had met the aspects of ease of use according to the UCD principle. These two test results complemented each other: Black Box Testing ensured technical correctness in terms of system functionality, while Usability Testing ensured user acceptance in terms of user experience, so that the feasibility of the system could be accounted for both technically and from the end user's point of view.

Thus, the built catalog web system is considered feasible to be used as a centralized product information medium that replaces physical catalogs/manual brochures, as well as answers the problems of data update delays, limited accessibility, and admin work efficiency identified in the early stages of the research. The application of field roles to the Users entity allows one system to serve two different user needs (Admin and Customer) without duplicating the login page, while the dynamic design of the Categories entity provides flexibility for Admins to adjust the structure of product categories at any time according to the development of the company's product line. In terms of limitations, this system does not include sales transaction features or payment gateways according to the problem limits set from the beginning, so the ordering process is still carried out manually through WhatsApp;

further development can be directed to the integration of these features as well as the addition of the most sought-after product statistical reports as management evaluation material.

The Relationship of Research Results with Problem Formulation

The results of this study directly answer the four problem formulations submitted in the preliminary stage. First, user needs and obstacles in information delivery at PT. Sigma Sejuk Indonesia has been successfully mapped through the Problem Analysis and Needs Analysis stages in the research method, which resulted in two user roles (Admin and Customer) along with a list of functional and non-functional needs that became a reference for the design. Second, an effective web catalog as a centralized product information medium has been successfully built using the Laravel framework and MySQL database, as evidenced by the implementation of ERD, LRS, and the results of the Black Box test which were all declared passed. Third, the web catalog interface has been designed using the UCD approach and proven to be user-friendly based on the results of the Usability Testing, where all five respondents gave a positive rating ("Very Easy" or "Easy"). Fourth, the information architecture and product category grouping have been designed in a structured manner through the relationship between the Products and Categories entities, so that product information is easily accessible to users both through category search and keyword-based searches.

This achievement is also in line with the research objectives that have been formulated, namely mapping user needs into an appropriate system design, building Laravel and MySQL-based web catalogs, designing a user-friendly UCD-based interface, and structuring information architecture and product category grouping. With the achievement of all these objectives and the fulfillment of the expected academic and practical benefits, this study shows that the integration of User Centered Design and Waterfall methods is a relevant and replicable approach for the development of similar digital information media in spare parts distribution companies and other trading companies with comparable needs characteristics.

From the perspective of practical benefits, the implementation of this system concretely replaces the three manual activities that were previously identified as sources of inefficiency, namely printing repeated physical brochures, delivering product specifications one by one through personal messages, and manual coordination between the sales team and management whenever there is a change in product data. With the availability of a valid catalog database that can be accessed online, the risk of misalignment of information between customers as described in the problem identification can be reduced, because all users access the same data source in real-time through queries on the products and categories tables. This also confirms that the five formulations of the problems, objectives, and benefits of the research prepared in the preliminary stage have been consistently answered through the stages of the research method to the results and discussions that have been presented.

In summary, the series of research stages – starting from problem identification at PT. Sigma Sejuk Indonesia, UCD-based needs analysis, database and interface design, implementation using Laravel and MySQL, to Black Box and Usability testing – form a complete development cycle that verifies each other. The consistency between the design of the research method (Table 1, pseudocode, and UML diagram) with the results of implementation and testing in the results and discussion sections (Table 2, Table 3, and Table 4) is an indicator that the system development process has been carried out in a controlled and accountable manner, both from the academic side and from the operational needs of PT. Sigma Sejuk Indonesia as the object of the research.

CONCLUSION

Based on the implementation and testing results, the web-based product catalog for PT Sigma Sejuk Indonesia was successfully developed using the Laravel 10.x framework and the MySQL 8.0 database management system. The database consisted of three primary tables:

products, users, and categories. A role attribute in the users table supported role-based access control by distinguishing administrator and customer permissions. A unified login interface was implemented using Laravel's Auth::attempt() authentication method, followed by role-based redirection to /admin/dashboard for administrators and /products for customers. These results indicated that the authentication and authorization mechanisms operated according to the specified system requirements. The keyword search and product filtering functions also performed as intended, in line with the designed algorithm. Black-box testing confirmed that all eight functional test scenarios produced the expected results. Customers were permitted to view product information, while administrators were authorized to perform create, read, update, and delete (CRUD) operations on product records. Furthermore, a usability evaluation involving five purposively selected participants indicated positive perceptions of the system's ease of use. Overall, the developed web catalog fulfilled the principal functional requirements and received favorable usability assessments within the evaluated setting. However, these findings were limited to the tested functions and participants, and they did not establish the system's performance under higher workloads or its usability across a broader user population.

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CONFLICT OF INTEREST

The authors state that there is no conflict of interest in this study. The authors have no commercial or financial relationships that could potentially be considered a conflict of interest with this research and manuscript.

AUTHOR CONTRIBUTIONS

All authors contribute in a balanced way to the preparation of this manuscript, including the development of ideas, analysis, and drafting of the manuscript. All authors have read and approved the final version of the manuscript.

GENERATIVE AI STATEMENT

The author uses artificial intelligence (AI) tools only for grammar improvement and language checking. The use of AI does not include the creation of ideas, data analysis, or drawing conclusions. The entire content and substance of the manuscript is the sole responsibility of the author.

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