

Original Research

Analysis and Design of a Fitness Equipment Sales Website at MBB Mart Fitness Using User-Centered Design (UCD)

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ABSTRACT

Digital commerce requires retail businesses to provide product information and transaction services through accessible, structured channels aligned with customer needs. MBB Mart Fitness, a fitness-equipment retailer in Medan, has utilized social media and third-party marketplaces, but these channels provide limited control over product presentation, transaction management, and customer data. This study aimed to analyze user requirements and design a dedicated web-based fitness-equipment sales system for MBB Mart Fitness using User-Centered Design (UCD). Data were collected through an interview with the business owner and questionnaires involving 20 respondents. The UCD process comprised understanding the context of use, specifying user requirements, producing design solutions, and evaluating the resulting system. The system was implemented using Laravel 12 and MySQL and provides customer functions including product catalogs, keyword search, category and usage-type filtering, product details, shopping cart, checkout, payment information, order confirmation, and rating. Administrator functions include authentication, category management, product management, order monitoring, and order-detail processing. Functional verification used black-box testing across ten principal scenarios. All scenarios produced the expected outputs, resulting in a functional success rate of 100%. The study demonstrates that UCD can be adapted to a specialized fitness-equipment retail context by integrating customer purchasing activities and administrator sales management within an independent digital sales channel. The system remains limited by semi-manual payment verification, automated shipment tracking, and standardized usability evaluation. Future development should address these aspects through payment integration, delivery tracking, security testing, and broader usability evaluation under real conditions.

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How to Cite:

P. Hapsari and A. M. Elhanafi, "Analysis and Design of a Fitness Equipment Sales Website at MBB Mart Fitness Using User-Centered Design (UCD)," *J. Kecerdasan Buatan dan Teknol. Inf.*, vol. 5, no. 3, pp. 862–874, 2026.

Doi: <https://doi.org/10.69916/jkbt.v5i3.426>

KEYWORDS

User-Centered Design
Fitness Equipment
E-Commerce
Laravel
Web Application

ARTICLE INFO

Received: January 24, 2026

Accepted: September 27, 2026

Available Online: September 30, 2026

1 INTRODUCTION

The growth of internet-based commerce has changed how customers search for product information, compare alternatives, and complete purchases. For retail businesses, a dedicated website can function as a direct information and transaction channel that is not limited by the layout, competition, and business rules of third-party marketplaces. Web-based sales systems can also improve the organization of product information and provide customers with access to product and transaction services without being restricted by business hours or physical location [1,16]. In this context, an independently managed sales website can provide greater control over product presentation, transaction workflows, and customer-facing information than relying solely on external marketplace platforms.

MBB Mart Fitness is a fitness-equipment retailer in Medan that has used social media and marketplaces such as Shopee and Tokopedia as digital sales channels. Although these platforms provide access to online customers, the source study identifies several operational limitations. The product catalog must follow the structure of the marketplace, products compete directly with other sellers within the same platform, and customer and transaction information cannot be managed entirely through the store's own system. In addition, product, order, and stock management require a more integrated workflow to ensure that information can be maintained consistently. Similar web-based sales studies have demonstrated the importance of organizing product data, transaction processes, and customer access within an integrated information system [1, 16]. However, these studies generally address web-based sales implementation at a general retail level and do not specifically address the user requirements and operational characteristics of a fitness-equipment retailer.

A sales website should not be designed only from a technical perspective because navigation, information structure, transaction flow, and interface clarity directly affect how efficiently customers and administrators can interact with the system. User-Centered Design (UCD) places users at the center of the design process by identifying their context, requirements, tasks, and responses to proposed design solutions. The approach emphasizes user involvement and evaluation throughout the design process so that interface decisions are based on actual user needs rather than solely on developer assumptions [2, 5, 6]. UCD has also been applied to e-commerce interfaces, marketplace applications, and web-based sales systems, demonstrating its relevance for translating user requirements into product catalogs, navigation structures, and transaction functions [3–5].

Previous research has shown that UCD can support the development of web-based sales applications by incorporating user requirements into the design of product information, navigation, and transaction processes [1, 4]. Natsir and Sihombing [5], for example, applied UCD to the design of a marketplace interface, while Alja et al. [3] applied UCD to an e-commerce user interface. Hidayat et al. [4] also applied UCD to a website-based sales application. These studies establish that UCD is applicable to sales and e-commerce systems; however, the existing research identified in the literature does not specifically combine UCD-based requirement analysis with the design of an independent fitness-equipment sales website that accommodates both customer purchasing activities and store-side operational management.

This condition indicates a research gap in the application of UCD to a specialized retail context in which product characteristics, catalog organization, purchasing activities, and administrative management must be considered simultaneously. Fitness equipment differs from many general retail products because customers may require detailed information such as product category, usage type, specifications, price, stock availability, weight, and product description before making a purchase. Therefore, a sales website for fitness equipment requires an information structure that supports product discovery as well as a transaction flow that is understandable to customers and manageable by administrators. The present study addresses this gap by applying UCD specifically to the analysis and design of a fitness-equipment sales website for MBB Mart Fitness, rather than merely implementing a generic online sales system.

The novelty of this study lies in the integration of user-centered requirement analysis, fitness-equipment-specific product information, customer purchasing functions, and administrator-oriented sales management within a dedicated web-based sales channel. The study does not propose UCD as a new design method; instead, its contribution is the application and adaptation of UCD to the specific operational context of MBB Mart Fitness. The resulting design connects customer-side activities—including product search, category filtering, product-detail examination, shopping-cart management, checkout, payment information, order confirmation, and rating—with administrator-side activities involving category, product, and order management. This integrated scope distinguishes the study from previous works that primarily focus on general e-commerce interface design, marketplace interfaces, or generic web-based sales applications [3–5].

Furthermore, the study extends the design process beyond interface prototyping by evaluating whether the implemented functions conform to the requirements identified during the UCD process. The use of black-box testing provides functional verification of the principal customer and administrator workflows, including authentication, product and category management, product browsing, shopping-cart operations, checkout, and order confirmation. Thus, the contribution of this study is not only the development of a website, but also the establishment of a user-oriented sales workflow that connects business administration and customer purchasing activities within an independent digital channel.

Based on these conditions, this study aims to analyze user requirements and design a fitness-equipment sales website for MBB Mart Fitness using the User-Centered Design (UCD) method. The proposed system provides a dedicated product catalog, search and category filtering, product details, shopping cart, checkout, payment

information, order confirmation, store information, rating, and administrative functions for managing categories, products, and orders. The research also evaluates the implemented functions through black-box testing to verify whether the developed system performs according to the specified requirements.

2 RESEARCH METHODS

2.1 Research Object and Data Collection

The research object was MBB Mart Fitness, a retailer of fitness equipment located in Medan. Research materials included the store profile, product information such as product name, price, description, stock, weight, and image, the existing ordering process, payment practices, and requirements identified by the store owner and prospective users. Data collection used a quantitative-oriented questionnaire distributed to 20 respondents together with an interview with the owner of MBB Mart Fitness. The interview covered required website features, product information, ordering flow, payment flow, interface expectations, administrative functions, search, and product categorization.

2.2 User-Centered Design Procedure

The system-development process followed the User-Centered Design method. UCD is an interface and interaction design approach that emphasizes usability goals and user needs throughout the design process. User participation and empirical evaluation are central characteristics because the design is refined according to actual tasks, goals, and user feedback [5,6].

a. Context of Use

The first stage, understand and specify the context of use, identified the actors, their responsibilities, the sales workflow, product information, order handling, payment practices, and the environment in which the website would be used.

b. User Requirements

The second stage, specify user requirements, translated interview and questionnaire findings into functional and nonfunctional requirements, including catalog management, product search, ordering, transaction processing, ease of use, comprehensible navigation, and data security [7].

c. Design Solutions

The third stage, produce design solutions, transformed the requirements into UML models and interface prototypes. Use case, activity, sequence, and class diagrams were used to describe functional behaviour and interactions, while Figma was used to prepare the interface design.

d. Design Evaluation

The fourth stage, evaluate the design against requirements, allowed users to review the developed design and functions. Identified deficiencies were used as a basis for design improvement so that the resulting system remained aligned with user expectations.

2.3 Development Environment and System Scope

The website was implemented using Laravel 12 version 12.62.0 and MySQL, with Visual Studio Code as the development environment and Google Chrome as the browser. Laravel was selected as the principal PHP framework because its structured application components support the development of maintainable web applications and common functions such as routing, database interaction, and interface rendering [8].

The customer-facing website provides product browsing, category filtering, product details, shopping cart, check-out, payment information, order confirmation, store information, and rating functions. The administrator interface provides authentication, dashboard information, category management, product management, order monitoring, and order-detail processing. MySQL stores the operational data used by the application [9].

2.4 Functional Testing

Functional verification was conducted using black-box testing to determine whether the implemented system functions according to the specified functional requirements. Black-box testing evaluates system behaviour from the user's perspective by providing predefined inputs and observing the resulting outputs without examining the internal source code or implementation logic. In this study, each test case was executed through the application interface using a predefined test procedure, and the actual output was compared with the expected output specified for the corresponding function.

The testing covered the principal administrator and customer workflows, including administrator login, category management, product management, order-list access, order-detail access, product catalog, product details, shop-

ping cart, checkout, and order confirmation. For each test case, the input condition, test procedure, expected output, observed result, and test status were recorded. A test case was classified as Passed when the observed output was consistent with the expected output; otherwise, it was classified as Failed.

The functional test success rate was calculated using the following equation:

$$SR = \frac{P}{N} \times 100\% \quad (1)$$

where SR represents the functional test success rate, P represents the number of test cases that passed, and N represents the total number of test cases executed.

Based on the ten functional test scenarios, the success rate was calculated as:

$$SR = \frac{10}{10} \times 100\% = 100\% \quad (2)$$

Thus, all tested functions produced the expected outputs. The result indicates that the implemented system achieved 100% functional conformity for the tested scenarios. However, this result represents functional correctness within the defined test cases and does not imply that the system has been fully evaluated in terms of usability, performance, security, scalability, or reliability under real-world conditions.

3 RESULTS AND DISCUSSION

3.1 System Implementation

The research produced a Laravel-based sales website with separate operational views for administrators and customers. The administrator interface supports store-management activities, whereas the customer interface supports product exploration and ordering. Each interface is explained according to its role in the implemented sales workflow.

a. Order List

The order list consolidates customer transactions in a single administrative view. The administrator can review incoming orders, customer information, payment totals, and transaction status. This interface provides a structured replacement for order monitoring that would otherwise be dispersed across messaging or marketplace channels.

b. Order Details Interface

The order management interface was designed to provide administrators with a centralized view of customer transactions. Through this interface, the administrator can monitor incoming orders and review essential transaction information, including customer identity, delivery address, order total, payment status, and available actions. The interface is intended to simplify order monitoring by presenting transaction information in a structured table, as shown in Figure 1.

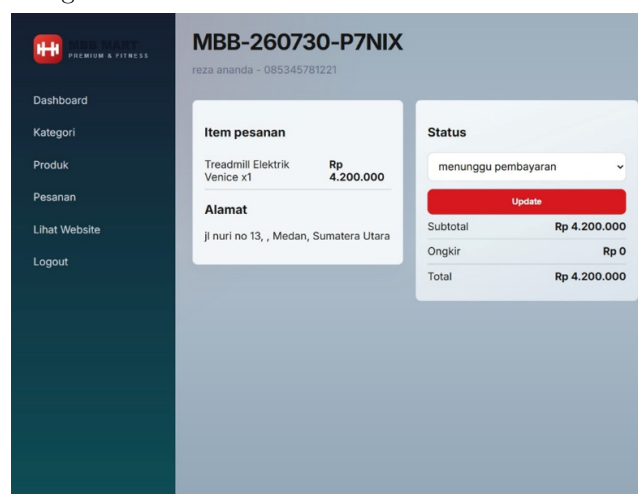


Figure 1. Order Detail Page Showing Transaction Information

Figure 1 shows the order management page accessed by the administrator after successful authentication. The interface displays a list of customer orders together with the customer name, delivery address, transaction total, and current order status. The status column allows the administrator to distinguish orders that are still waiting

for payment from transactions that have been completed. Each transaction also provides a Detail action that can be selected to examine more comprehensive order information.

The centralized presentation of orders enables the administrator to monitor multiple transactions from a single interface rather than relying on separate communication channels. This structure supports the administrative requirements identified during the User-Centered Design process, particularly the need to organize customer orders and transaction status in a clear and accessible manner. The interface therefore connects the customer ordering process with the administrative workflow for subsequent order processing and verification.

c. Product Catalog Interface

The customer-facing product catalog was designed as the primary interface for product discovery and selection. The interface organizes fitness equipment according to product categories, usage types, prices, stock availability, and product images. To support different customer search preferences, the catalog provides keyword search, category filtering, and product sorting options. The resulting interface is presented in Figure 2.

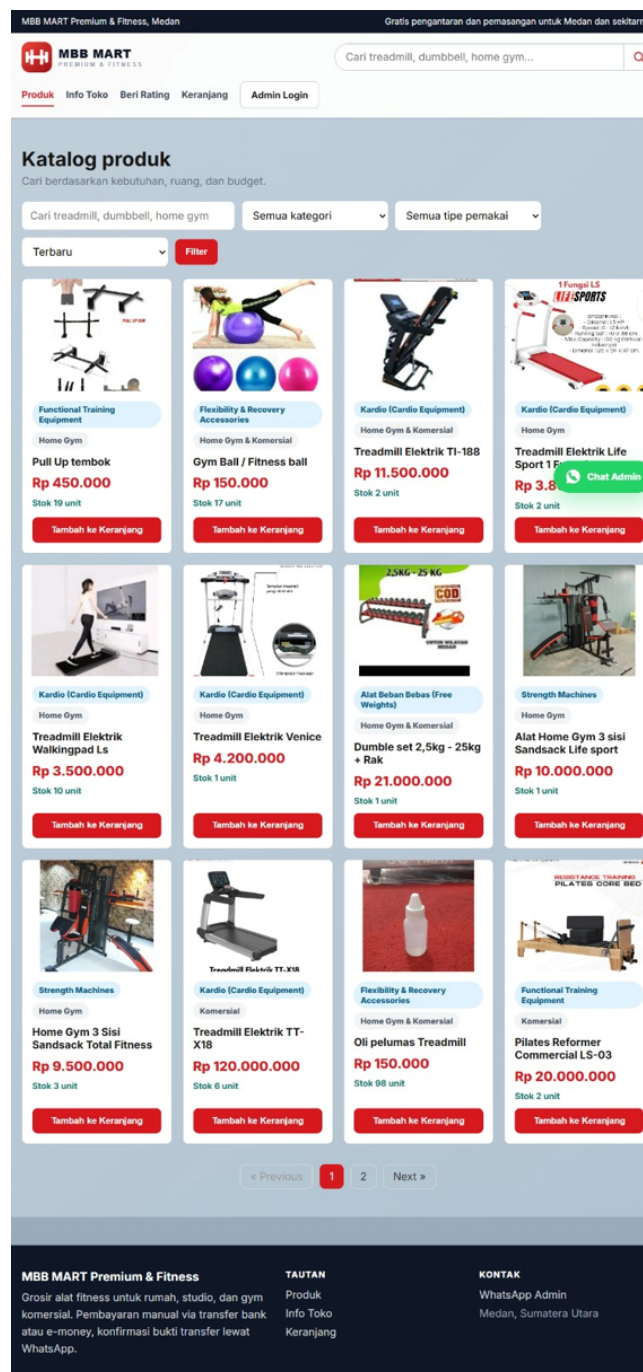


Figure 2. Product Catalog Page for Item Discovery and Filtering

Figure 2 presents the product catalog interface developed for MBB Mart Fitness. The interface displays fitness

equipment in a structured grid containing product images, category information, usage type, product name, price, stock availability, and an Add to Cart button. Customers can search for products using keywords and narrow the displayed products through category and usage-type filters. A sorting option is also provided to organize the displayed products according to the selected criterion.

The catalog is designed to reduce the effort required to identify relevant products by presenting essential product information directly within each product card. Customers can therefore compare available products before opening the purchasing process. The Add to Cart function provides a direct transition from product discovery to transaction preparation.

From the User-Centered Design perspective, the interface addresses the requirement for clear product discovery and straightforward navigation. The combination of search, filtering, sorting, product information, stock information, and cart access creates a continuous interaction flow from product exploration to product selection. This supports the user requirements identified during the requirement-analysis stage and complements the subsequent shopping-cart and checkout processes [3].

d. Shopping Cart Interface

After selecting a product from the catalog, the customer is directed to the shopping cart to review the selected item before proceeding to checkout. The shopping cart provides an intermediate step in the transaction process, allowing customers to verify the selected product, adjust the quantity, remove an item, and review the estimated transaction value. The implemented shopping-cart interface is shown in Figure 3.

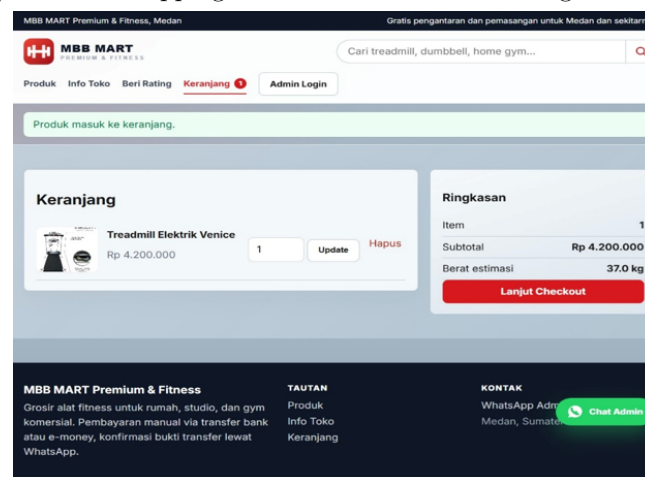


Figure 3. Shopping Cart Page Displaying Selected Items

Figure 3 shows the shopping cart interface containing the product selected by the customer. The interface presents the product name, product image, unit price, selected quantity, subtotal, and estimated shipping weight. Customers can modify the quantity using the quantity field and Update button or remove the selected product using the Delete option.

The summary panel on the right provides the number of items, subtotal, and estimated shipping weight. A Continue Checkout button is provided to allow the customer to proceed to the next stage of the transaction. A notification is also displayed to confirm that the selected product has been successfully added to the cart.

This interface establishes a clear transition between product selection and checkout. From the User-Centered Design perspective, the separation of product selection, cart verification, and checkout helps users review their transaction before submitting the order. The functions shown in Figure 3 therefore support the requirement for a simple and understandable purchasing flow, while giving customers an opportunity to correct product quantities before continuing to checkout [3].

e. Order Confirmation Interface

After reviewing the selected products in the shopping cart, the customer proceeds to the checkout process to submit the transaction. Once the required ordering information has been completed and the order is successfully recorded, the system displays an order confirmation page containing the transaction number, payment details, order total, and instructions for submitting payment evidence. The implemented order-confirmation interface is shown in Figure 4.

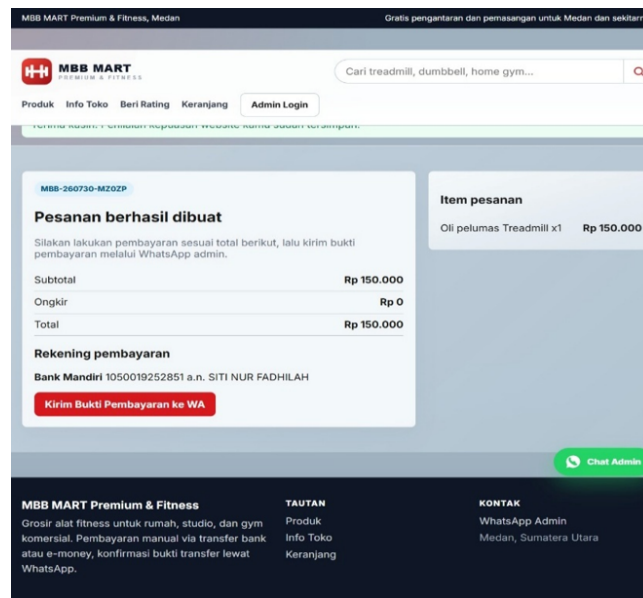


Figure 4. Successful Order Confirmation Page

Figure 4 shows the order confirmation interface displayed after the customer's order has been successfully created. The page provides a unique order number as a transaction reference and displays the message "Pesanan berhasil dibuat", indicating that the order has been recorded by the system.

The interface presents the transaction summary, including the subtotal, shipping cost, and total payment. It also provides the bank account information required for payment. In addition, the Send Payment Proof to WhatsApp button provides a direct mechanism for the customer to submit payment evidence to the store administrator through WhatsApp. The right-side panel summarizes the item included in the order and its corresponding price.

This interface completes the main transaction flow from product selection and shopping-cart management to order creation and payment instructions. From the User-Centered Design perspective, presenting the order number, payment amount, bank information, and payment-confirmation option on the same page reduces ambiguity regarding the actions that customers need to perform after submitting an order. The interface therefore connects the automated order-recording process within the website with the subsequent manual payment-verification process performed by the administrator.

3.2 Black-Box Testing Results

Black-box testing was conducted to verify the functional behaviour of the main administrator and customer features implemented in the MBB Mart Fitness sales website. The test cases were selected to represent the principal interaction flow of the system, beginning with administrator authentication and store-data management and continuing to the customer-side product browsing and purchasing process. This approach allows the testing to cover both back-office operations and the customer transaction workflow.

For each test case, four aspects were defined: the feature being tested, the test procedure, the expected output, and the resulting status. The test procedure describes the input or user action performed during testing, while the expected output specifies the system response that should occur when the function operates correctly. A test case was classified as Passed when the observed system response corresponded to the expected output. Conversely, a test would be classified as Failed if the system did not produce the specified output.

The ten test cases were organized to cover administrator authentication and management functions, including Admin Login, Category Management, Product Management, Order List, and Order Details. Customer-facing functions were represented by Product Catalog, Product Details, Shopping Cart, Checkout, and Order Confirmation. Therefore, the test set covers the major functional sequence from managing store information on the administrator side to browsing products and completing an order on the customer side. The detailed results are presented in Table 1.

Table 1 shows that all ten tested scenarios produced the expected system outputs and were therefore classified as Passed. The results cover two major functional areas of the application: administrator operations and customer transactions.

For the administrator side, the Admin Login test confirms that valid authentication credentials successfully

Table 1. Black-Box Testing Results

No.	Feature	Test Procedure	Expected Output	Status
1	Admin Login	Valid administrator email and password	Administrator dashboard is displayed.	Passed
2	Category Management	Add, edit, and delete category data	Category data are stored, updated, or deleted according to the selected action.	Passed
3	Product Management	Enter complete product information and save	The product is stored and displayed in the product list.	Passed
4	Order List	Open the order-list menu	All customer orders are displayed.	Passed
5	Order Details	Select an order from the order list	Complete information for the selected order is displayed.	Passed
6	Product Catalog	Open the product-catalog menu	Available fitness-equipment products are displayed.	Passed
7	Product Details	Select a product from the catalog	Image, price, stock, description, and other product information are displayed.	Passed
8	Shopping Cart	Select Add to Cart for a product	The product is added to the shopping cart and displayed correctly.	Passed
9	Checkout	Complete ordering data and submit checkout	The order is processed and transaction data are stored.	Passed
10	Order Confirmation	Complete the checkout process	The system displays confirmation that the order has been created successfully.	Passed

provide access to the administrative dashboard. The Category Management and Product Management tests verify that the principal master-data operations can be performed and that the resulting data are stored and displayed appropriately. The Order List and Order Details tests further demonstrate that administrators can access customer transactions and inspect the information associated with individual orders. These functions represent the primary operational workflow required to maintain product information and monitor customer transactions.

On the customer side, the Product Catalog test confirms that available fitness-equipment products can be accessed through the customer interface. The Product Details test verifies that selecting a product provides the information required for product examination, including image, price, stock, and description. The Shopping Cart test then confirms that a selected product can be transferred from product browsing into the purchasing workflow. Subsequently, the Checkout test verifies that completed ordering information can be submitted and stored as a transaction, while the Order Confirmation test confirms that the system provides a successful-order response after the transaction has been created.

The testing results can also be summarized quantitatively using the functional success rate equation:

$$SR = \frac{P}{N} \times 100\% \quad (3)$$

where SR is the success rate, P is the number of passed test cases, and N is the total number of executed test cases. Based on Table 1, all ten test cases were passed:

$$SR = \frac{10}{10} \times 100\% = 100\% \quad (4)$$

Thus, the functional success rate of the tested scenarios was 100%. This result indicates that every tested function produced an output consistent with its predefined expected behaviour under the specified test conditions. The results also demonstrate that the implemented system supports the principal interaction sequence required by the proposed sales website, namely administrator authentication → product and category management → order monitoring on the administrative side and product browsing → product examination → shopping cart → checkout → order confirmation on the customer side. The consistency between the test procedures and expected outputs provides functional evidence that the implemented features conform to the requirements defined for the system.

However, the 100% success rate should be interpreted specifically as functional conformity within the ten tested scenarios. It does not constitute evidence of usability, performance under high traffic, security against attacks, scalability, or reliability under prolonged real-world operation. These aspects require separate evaluation methods and were outside the scope of the black-box functional testing reported in this study. This interpretation is also consistent with the scope of the source study, which did not report load testing, penetration testing, or a standardized quantitative usability measurement.

3.3 Discussion

The results demonstrate that the developed system addresses the principal operational requirements of MBB Mart Fitness by establishing a dedicated web-based sales channel for product presentation, customer order-

ing, and administrative transaction management. The implementation provides an alternative to the store's previous dependence on social media and third-party marketplace platforms. Instead of presenting products within a standardized marketplace structure, the developed website allows the business to organize product categories, product information, navigation, ordering procedures, and transaction information according to its own operational requirements. This finding is consistent with previous research on web-based sales systems, which emphasizes the role of dedicated information systems in organizing product information and supporting sales activities through an integrated website [1,16]. The present implementation extends this concept to the specific context of fitness-equipment retail.

One important contribution of the system is the integration of customer-facing and administrator-facing activities within a single sales workflow. On the customer side, the website provides product browsing, keyword search, category filtering, usage-type filtering, product details, shopping-cart management, checkout, payment information, order confirmation, and rating functions. On the administrator side, the system provides authentication, category management, product management, order monitoring, and order-detail processing. This separation allows each user group to interact with functions that correspond to its respective tasks. The implementation therefore does not treat the website merely as an online product catalog, but as an operational sales system connecting product management with customer transactions. The same principle of organizing web-based information and operational functions can be observed in other information-system implementations within the reference literature, although the present study applies it specifically to the sales process of a fitness-equipment retailer [10,16].

The product catalog is particularly important because fitness equipment requires customers to examine several product attributes before making a purchasing decision. The developed catalog presents product images, categories, usage types, prices, stock availability, and product names, while search and filtering functions assist customers in narrowing the available products. This arrangement reduces the need for customers to examine products sequentially and provides a structured mechanism for product discovery. Previous research on web-based sales and e-commerce interfaces has similarly emphasized the importance of organizing product information and navigation around user requirements [1,3,4]. The present study applies this principle to fitness equipment by incorporating product characteristics that are relevant to the store's inventory, including product category, intended usage, price, stock, and descriptive information.

The implementation of the shopping cart, checkout, and order-confirmation functions further establishes a continuous transaction path. Customers can select products from the catalog, adjust quantities in the shopping cart, review the transaction summary, provide the required ordering information, and submit the order. After successful order creation, the system generates an order reference and provides payment information. This sequential interaction reduces fragmentation between product exploration and transaction processing. Previous studies on website-based sales applications have demonstrated the importance of integrating product and transaction functions into a coherent sales interface [4]. Similarly, research applying UCD to e-commerce and marketplace interfaces has emphasized the importance of organizing navigation and interaction according to user activities rather than treating interface components as independent elements [3,5].

The findings also demonstrate the practical application of the User-Centered Design (UCD) approach. In this study, UCD was not limited to the visual design of the interface but was used to translate the context of use and identified user requirements into functional and interface decisions. The requirement analysis involved an interview with the store owner and a questionnaire involving 20 respondents. The resulting requirements were translated into functions such as product search, categorization, product information, ordering, checkout, and administrative management. This process is consistent with the UCD principle that system design should be based on user context, requirements, and evaluation rather than being determined exclusively by developer assumptions [2,5,6].

The separation between customer and administrator interfaces also reflects the task-oriented nature of UCD. Administrators require functions for maintaining product and category data and monitoring orders, whereas customers require a simpler sequence for finding products and completing purchases. This distinction is important because combining all operational functions into a single interface could increase unnecessary interaction complexity for customers. The design therefore applies UCD not only to individual interface components but also to the organization of system functions according to user roles. Similar user-oriented considerations have been reported in previous UCD studies involving marketplace, e-commerce, and web-based application interfaces [3–6].

The results further indicate that the developed system is consistent with previous research applying UCD to

sales-oriented applications. Hidayat et al. [4] applied UCD to a website-based sales application, while Alja et al. [3] investigated UCD for e-commerce user-interface design. Natsir and Sihombing [5] applied UCD to a marketplace interface for marketing processed fishery products. These studies establish the applicability of UCD for systems involving product presentation, navigation, and sales-related interactions. The present study differs in its specific combination of a fitness-equipment retail context, user-centered requirement analysis, customer transaction workflow, and administrator-side sales management. Therefore, the contribution should not be interpreted as proposing a new UCD method, but rather as demonstrating how UCD can be adapted to a specialized retail context with particular product-information and operational requirements.

The study also demonstrates that UCD can be combined with conventional system-development and modeling techniques. The requirements were translated into UML models, including use-case, activity, sequence, and class diagrams, before being implemented as a Laravel-based web application. UML provides a structured representation of system behaviour and relationships, while the UCD process provides the user-oriented basis for determining what functions and interactions need to be represented. This combination is useful because system modeling and user-centered analysis address complementary aspects of development: UML helps formalize system structure and behaviour, whereas UCD ensures that the resulting functions correspond to actual user tasks and requirements. The use of UML in web-based information-system design is also represented in the existing literature, including studies applying UML to website-based system planning [25].

From the implementation perspective, Laravel 12 and MySQL provided the technical foundation for the developed system. Laravel was used to structure the web application, while MySQL was used to store operational data such as categories, products, and transactions. The selection of a structured web framework is consistent with previous research that has employed Laravel for web-based information-system development [8]. However, the technical framework itself is not considered the primary contribution of this study. Rather, Laravel functions as the implementation platform through which the user requirements identified using UCD are transformed into operational system functions. This distinction is important because the research contribution is centered on the analysis and design of the user-oriented sales workflow, rather than on the use of a particular programming framework.

The black-box testing results provide additional evidence regarding the functional conformity of the implementation. Ten principal scenarios were tested, covering both administrator and customer activities, and all ten scenarios produced the expected outputs. The resulting functional success rate was therefore 100%. The tested functions include authentication, category and product management, order monitoring, product browsing, product-detail access, shopping-cart operations, checkout, and order confirmation. These results indicate that the principal functional workflow designed from the identified requirements was successfully implemented. However, the result should be interpreted as evidence of functional conformity under the defined test conditions rather than as evidence that the system is completely error-free under all possible operating conditions.

The functional result is particularly relevant when considered alongside the UCD process. A UCD process is meaningful only when identified user requirements are translated into usable system functions. In this study, requirements related to product discovery were implemented through catalog, search, and filtering functions; requirements related to purchasing were implemented through the cart and checkout functions; and administrative requirements were implemented through category, product, and order management. The black-box results consequently provide a functional verification layer demonstrating that these requirements were implemented according to the specified behaviour. This relationship between requirements, implementation, and evaluation strengthens the methodological coherence of the study.

Nevertheless, the findings reveal several areas in which the current implementation remains dependent on semi-manual procedures. The payment process is not fully automated. After an order is created, the customer receives bank-transfer information and is directed to submit payment evidence through WhatsApp, after which the administrator verifies the payment. Therefore, although order creation and transaction recording are handled by the website, payment verification remains partly outside the system. This represents an important limitation because a fully integrated e-commerce workflow would ideally connect order creation, payment processing, payment confirmation, and order-status updates within a unified system.

A similar limitation exists in the area of delivery management. The current system records the customer and transaction information required for the order, but it does not provide real-time courier tracking. Consequently, customers cannot use the website to obtain automated shipment-status updates after the transaction. This limitation is particularly relevant for a retail system involving fitness equipment because some products may be relatively large or heavy and therefore require more detailed delivery coordination. Future system development

could integrate payment gateways and shipping services so that payment status and delivery status can be updated automatically.

Security is another aspect requiring further development. The present functional testing confirms that the administrator login and principal application functions operate according to their expected outputs, but black-box functional testing alone does not establish resistance against security threats. Security-oriented mechanisms such as stronger authentication controls, authorization checks, secure session management, input validation, and protection of sensitive transaction information require dedicated testing. The existing reference list includes research on RSA-based database confidentiality [27], which indicates the relevance of cryptographic approaches to protecting information systems; however, such mechanisms were not implemented or evaluated as part of the present study and therefore should be considered as potential future work rather than as a current system capability.

The system also has limitations in terms of usability evaluation. Although the UCD process involved user requirements collected through interviews and questionnaires, the implemented website was not evaluated using a standardized usability instrument such as the System Usability Scale (SUS). Consequently, the present study can demonstrate that the system functions according to the defined requirements, but it cannot quantitatively establish the level of perceived usability, satisfaction, learnability, or efficiency among users. This distinction is important because functional correctness and usability are different dimensions of system quality. Future research should therefore involve a larger sample of actual customers and employ standardized usability measurements to determine whether the implemented interface provides a satisfactory user experience after actual use.

The study also has methodological limitations concerning the scale of user involvement. The requirement-analysis stage involved 20 respondents and one store-owner interview. This sample was sufficient for identifying the functional requirements addressed in the present implementation, but it limits the extent to which the findings can be generalized to other fitness-equipment retailers or broader e-commerce populations. Customer preferences may differ according to demographic characteristics, purchasing frequency, product type, and digital experience. Therefore, future studies could involve a larger and more diverse sample and compare requirements between first-time buyers, returning customers, and administrators.

Overall, the findings suggest that the principal value of the developed system lies in the integration of user-centered analysis with a specialized fitness-equipment sales workflow. Previous studies have demonstrated the use of UCD for e-commerce, marketplace, and sales applications [3–5], while other studies have demonstrated the development of web-based information systems for different operational domains [10, 16, 21]. The present study builds on this body of work by applying the UCD process to a fitness-equipment retailer and integrating product discovery, product information, cart management, checkout, order confirmation, and administrative order management within one dedicated sales channel. Thus, the contribution is contextual and integrative rather than methodological: the study demonstrates how established UCD principles can be translated into a complete sales workflow tailored to the operational characteristics of a fitness-equipment business.

4 CONCLUSION

This study analyzed the user requirements and designed a web-based fitness-equipment sales system for MBB Mart Fitness using the User-Centered Design (UCD) approach. The UCD process enabled the requirements of administrators and customers to be translated into a structured sales workflow that integrates product management, product discovery, purchasing, and order management within a dedicated digital sales channel. The resulting system provides customer-facing functions for product catalog browsing, keyword search, category and usage-type filtering, product details, shopping-cart management, checkout, payment information, order confirmation, and rating, while the administrator interface supports authentication, category management, product management, order monitoring, and order-detail processing.

The implementation demonstrates that the UCD approach can be adapted to the specific operational context of a fitness-equipment retailer. In particular, the integration of fitness-equipment-specific product information with customer and administrator workflows provides a more context-oriented design than a generic product catalog. The system also provides an independent sales channel through which MBB Mart Fitness can organize product information and transactions under its own website rather than relying exclusively on third-party marketplace structures. This represents the main contribution of the study, while UCD itself is treated as an established design approach rather than a newly proposed method.

Functional verification using black-box testing covered ten principal scenarios involving administrator authen-

tication, category management, product management, order monitoring, product browsing, product details, shopping-cart operations, checkout, and order confirmation. All ten test cases produced the expected outputs, resulting in a functional success rate of 100% for the evaluated scenarios. This result demonstrates functional conformity between the implemented features and the predefined requirements under the specified test conditions. However, the result should not be interpreted as evidence of complete system quality because usability, performance, security, scalability, and long-term reliability were not quantitatively evaluated.

Several limitations remain in the current implementation. Payment verification is still semi-manual because customers submit payment evidence through WhatsApp, while automated payment-gateway integration and real-time shipment tracking have not been implemented. In addition, the study has not conducted standardized usability evaluation using a larger sample of actual customers. Future research should therefore evaluate the system using standardized usability instruments, expand user participation, integrate automated payment and shipping services, and conduct dedicated security and performance testing. These extensions would provide a more comprehensive evaluation of the system beyond its current functional conformity.

Overall, the study establishes a user-oriented web-based sales workflow for MBB Mart Fitness that connects product management, customer product discovery, transaction processing, and order administration within a single dedicated platform. The findings demonstrate the practical applicability of UCD for designing a specialized fitness-equipment sales system while providing a foundation for further development toward a more automated, measurable, and fully integrated e-commerce platform.

DECLARATIONS

Author Contributions:

Puspa Hapsari: Conceptualization, Data curation, Formal analysis, Software, Writing—original draft.

Andi Marwan Elhanafi: Methodology, Supervision, Validation, Writing—review & editing.

Funding:

The authors received no financial support for the research, authorship, and/or publication of this article.

Conflicts of Interest:

The authors declare that there are no competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability:

The data that support the findings of this study are available from the corresponding author upon reasonable request.

AI Use Statement:

During the preparation of this manuscript, the authors used ChatGPT to assist with manuscript structuring and language editing. The authors reviewed and edited the generated content and take full responsibility for the final manuscript.

Additional Information:

No additional information is available for this paper.

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