JOURNAL TEKNOLOGI DAN OPEN SOURCE
Vol. 8, no. 2, December 2025, pp. 569~581
e-ISSN: 2622-1659, accredited Four Grade by Kemenristekdikti, Decree No: 152/E/KPT/2023
DOI: https://doi.org/10.36378/jtos.v8i2.4675

Designing An E-Commerce System For Local Products With Web-Based Map Integration Using The Laravel Framework

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Article Info

Article history:

Received 07 12, 2025
Revised 08 29, 2025
Accepted 11 23, 2025

Keywords:

E-commerce
Local Products
Map Integration
MSMEs
Payment system
MVC

ABSTRACT

The development of information and communication technology has opened up new opportunities in promoting and marketing local products and tourist destinations. However, there are still many obstacles faced by local businesses, such as limited market access, lack of promotion, and the absence of marketing system integration. This research aims to design and implement a Harau local product e-commerce system with map integration on a Laravel-based web application. This platform is designed to facilitate the sale of local products while providing navigation of store locations through interactive maps. The system development method uses Agile methodology with Laravel framework and MVC architecture. The system successfully integrates role-based authentication features, product management, conventional payment systems, and digital mapping using Google Maps API and Leaflet Maps through the Laraflet plugin. The test results show a system validity rate of 75% based on expert assessment and an effectiveness rate of 80.33% based on user surveys. The system has met good quality standards with all main features functioning according to the black-box testing results. This platform makes a significant contribution to the empowerment of local MSMEs by providing innovative solutions to overcome location problems that have been the main obstacles for local businesses.

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1. Introduction

The digitalization era has brought fundamental changes to the tourism and creative economy landscape. Today's travelers not only seek memorable experiences but also desire authentic products that reflect the richness of local culture. Items such as traditional foods, handicrafts, and souvenirs are no longer mere accessories to tourism but have become integral components of a meaningful travel experience and contribute significantly to the local economy. However, access to information and affordability of these local products remain relatively limited [1]. Harau Geopark, as one of the premier tourist destinations in West Sumatra, holds significant potential for local product development. Unfortunately, the connection between tourists and local businesses remains constrained due to the lack of digital platforms capable of effectively

bridging the two. Limited digital promotion and the absence of an integrated information system hinder tourists from locating authentic product vendors, while Small and Medium Enterprises (SMEs) face challenges in expanding their market reach. A digital transformation through the development of an e-commerce platform integrated with geographic maps offers an innovative solution to close this gap.

Previous studies [2] have shown that web- and mobile-based marketplaces integrated with Maps Application Programming Interfaces (APIs) can effectively help tourists find local products quickly and accurately. Another study [3] confirmed that digitalizing commerce plays a key role in accelerating economic transformation, especially by facilitating inclusive, direct connections between businesses and consumers. More recently, research [4] has emphasized that service quality is a critical factor in enhancing customer satisfaction on digital marketplace platforms. Despite the considerable potential of information technology, its implementation in tourism areas such as Harau Geopark still faces significant challenges. Many high-quality local products with strong cultural value struggle to gain visibility due to limited distribution through digital channels [5]. One major obstacle to optimizing the creative economy's potential in this region is the lack of a unified platform that integrates local product sales with tourist destination information.

This research aims to develop a web-based e-commerce system using the Laravel framework, enhanced with interactive map features, to streamline the sales process of local products within the Harau Geopark area. The platform is designed for two main user groups: buyers (tourists and the general public) and sellers (local businesses). Core features of the system include searching for nearby local products, displaying detailed product information, and enabling an ordering system supported by geo-navigation to help users locate partner stores easily. The contribution of this research lies not only in enriching the theoretical discourse on the application of information technology in tourism and the creative economy but also in offering practical solutions. These solutions aim to improve accessibility to local products, broaden the market reach of SMEs, and enhance the overall tourist experience. The developed web-based platform is expected to transform the way tourists interact with local businesses by providing a user-centered interface that simplifies the processes of discovering, ordering, and receiving local products at travel destinations [6]. Therefore, the outcomes of this study are envisioned to act as a catalyst for digital transformation that supports local economic sustainability and fosters community-based tourism development in the Harau Geopark area.

Supporting research further underscores the importance of technological integration in advancing tourism and local economic sectors. For example, developed a web and mobile marketplace application using the Maps API to help tourists find destinations, accommodations, and local products [2]. Meanwhile, highlighted the role of e-commerce platforms in accelerating economic transformation by fostering inclusive and direct connections between businesses and consumers [3]. Additionally, pointed out that the success of marketplace platforms is significantly influenced by the implementation of Customer Relationship Management (CRM) and the quality of delivery services in increasing customer satisfaction [4]. Collectively, these studies provide a strong foundation for designing a Laravel-based marketplace application that integrates mapping and delivery services to enhance the shopping experience and promote local products in the tourism sector.

2. Research Method

2.1 Research procedures

This research adopts an Agile-based software development approach, characterized by its iterative nature and adaptability to change. Agile methodology was selected due to its effectiveness in supporting incremental system development through multiple development cycles (sprints), where each cycle emphasizes feature enhancements based on user feedback. This approach encourages close collaboration with stakeholders and allows for swift adjustments to evolving project requirements [7]. The Harau tourism area possesses significant potential in both tourism and local product sectors, which remains underutilized in the digital domain. The Agile approach was particularly suitable for this context, as its iterative structure facilitates gradual, organized system development while remaining highly responsive to changing user needs [8]. Each phase of the development process was executed in an iterative manner and reviewed at the

conclusion of every sprint, ensuring that the final system aligns with the needs of its target users—tourists and local businesses alike.

Figure 1. Agile method stages[9].

The research procedure was implemented systematically by adopting a software engineering approach based on the Agile methodology—a paradigm recognized for its iterative process and adaptability to change [10]. This method enables system development to be conducted over multiple development cycles, or sprints, with each cycle focusing on incremental feature improvements based on user feedback. The entire process was structured into six main stages following the Agile framework, as outlined below:

1. Initiation and Planning (Sprint 0): This initial stage focused on identifying field issues, such as the difficulty tourists face in accessing local products and the low level of digital adoption among local businesses. The primary output of this stage was a product backlog—a comprehensive list of key application features to be developed.
2. Requirements Gathering and Analysis: System requirements were collected through direct observation at the Harau tourist site, interviews with local MSMEs, and a review of relevant literature. These findings were formulated into user stories, for example: “As a tourist, I want to see local products near my location so I can purchase them directly.”
3. System Design and Sprint Planning: At this stage, the development team created the initial system design, including UI wireframes, the database schema, and integration points for tourist location mapping. Sprint planning sessions were held to determine which features would be implemented in each sprint cycle.
4. Development (Implementation): The application was developed through several sprints, with core features including a local product catalog, integrated tourist and vendor maps, and ordering and checkout functionalities. Each sprint lasted one to two weeks and concluded with a demonstration of the results to stakeholders for review and feedback.
5. Testing and Review: At the end of every sprint, black-box testing was conducted to validate the functionality of newly implemented features. Stakeholder evaluations were used to assess whether the features met expectations, and the product backlog was updated accordingly based on feedback.
6. Final Evaluation and Documentation: After all iterations were completed and the system met the specified requirements, a final performance evaluation was carried out. The research concluded with the preparation of documentation detailing the system's strengths, weaknesses, and recommendations for further development.

2.2 Data analysis techniques

In this study, data analysis techniques were employed to evaluate the success of the developed system in terms of both effectiveness and validity. The analysis aimed to ensure that the Laravel-based marketplace

application integrated with tourist mapping features effectively met user needs and functioned as intended in real-world scenarios.

a. Questionnaire validity test

The validity of the questionnaire was assessed using a content validity approach, with two experts evaluating each item. Items were rated using a 5-point Likert scale, where scores of 3 to 5 were considered relevant. To determine item validity, the Content Validity Ratio (CVR) was calculated using the following formula [11]:

$$CVR = \left(\frac{N_e - \frac{N}{2}}{\frac{N}{2}}\right) \quad (1)$$

Where Ne is the number of experts who give a score ≥ 3, and N is the number of all experts involved in the assessment. The CVR value is then used to determine the validity of the item, with the following criteria:

- CVR ≥ 1.0 : item is valid
- CVR = 0.0 : item requires revision
- CVR < 0.0 : item is invalid

To assess the overall validity of the instrument, the Content Validity Index (CVI) was used:

$$CVI = \left(\frac{Number\ of\ valid\ items}{\text{total number of items}}\right) \quad (2)$$

b. System effectiveness test

The effectiveness of an information system is determined by its ability to perform functions accurately and meet user expectations, which are key factors in overall user satisfaction [12]. To measure the effectiveness of the MyHarau system from the user's perspective, a survey was conducted involving a set of statements reflecting core system features. Responses were collected using a 5-point Likert scale:

- 5 = Strongly agree
- 4 = Agree
- 3 = Neutral
- 2 = Disagree
- 1 = Strongly disagree

System effectiveness is calculated using the following formula:

$$\text{Effectiveness}(\%) = \left(\frac{\sum x}{n \times m \times s_{maks}}\right) \times 100\% \quad (1)$$

information:

- $\sum x$ = Total score from all respondents
- n = Number of items/statements assessd
- m = Number of respondents
- s_{maks} = Maximum score on the likert scale

This calculation provides a quantitative measure of how effectively the system meets user needs based on their perception of the implemented features.

c. System validity test

The validity of an essential component of effective information system performance—relates to the system's ability to execute its defined functions in alignment with user requirements [13]. This was tested using the black-box testing method under real-world usage scenarios, simulating actual user interactions with the system. The system's validity was calculated using the following formula:

$$Validity\ (\%) = \left(\frac{Number\ of\ successfully\ executed\ test\ scenarios}{Total\ number\ of\ test\ scenarios}\right) \times 100\% \quad (3)$$

Validity criteria:

- 90–100% = Very Valid
- 75–89% = Valid
- 60–74% = Quite Valid
- < 60% = Invalid

Validity testing is carried out by testing each main function of the system to ensure that the system can run according to the established specifications and can provide the correct output according to the input provided.

To complement the quantitative analysis, a qualitative approach was also employed, involving direct interviews and field observations. Feedback from MSMEs and tourists served as valuable indicators of the system's usability and impact in real-world contexts. This qualitative perspective provided deeper insights into user experiences and potential barriers to adoption.

By combining quantitative and qualitative methods, the analysis delivers a comprehensive assessment of the application's performance and readiness for broader implementation. This mixed-methods approach ensures a robust validation of the system from both technical and user-centric viewpoints.

3. Results and Discussion

At the planning stage of developing an e-commerce system for local Harau products integrated with map features using the Laravel framework, a comprehensive analysis was conducted through direct observations and interviews with local business owners. The analysis identified five key issues in the conventional sales system: (1) limited market reach due to dependence on physical stores and local exhibitions, (2) difficulty navigating store locations because of the absence of integrated map functionality, (3) manual transaction processes that complicate payment verification, (4) error-prone manual stock management, and (5) lack of an organized reporting system to monitor business performance.

To address these issues, a web-based e-commerce platform was developed using the Laravel framework. Key features include expanding market reach through a digital platform that supports efficient online transactions, interactive map integration using Google Maps API and Laravel OpenStreetMap to assist consumers in accurately locating nearby stores, COD payment support and payment upon product pickup, real-time and fully integrated stock management modules, and a seller dashboard equipped with automatic data visualization to monitor sales statistics and product performance. Through these features, the system is expected to optimally support, strengthen, and accelerate the digital transformation of local businesses in Harau.

3.1 Design

The system was designed using the Model-View-Controller (MVC) architecture within the Laravel framework, allowing for a clear separation of business logic, user interface, and data management. It supports three primary user roles: Admin as the overall platform manager, Seller representing local businesses offering products, and Buyer consisting of general users or visiting tourists. Google Maps API and Leaflet (Laraflet Maps) are integrated to provide accurate, interactive map displays that assist users in locating nearby stores or service points. For financial transactions, the Midtrans API enables secure, fast, and reliable online payments. Additionally, real-time order tracking improves transparency and ensures that users can monitor each stage of their transaction without delay. The system's user interface is designed to be fully responsive, accessible across various devices, and optimized to ensure ease of use for all user roles, enhancing overall platform effectiveness.

3.1.1 Use case diagram

The use case diagram (Figure 2) illustrates the communication flow and core processes of the Laravel-based e-commerce platform, highlighting the interactions between users and key system components. It provides a clear overview of how each actor—such as administrators, sellers, and buyers—engages with

essential features, including product management, transaction processing, and order monitoring. This diagram serves as a foundational reference for understanding the system's functional structure..

Figure 2. Marketplace use case diagram

3.1.2 Sequence diagram

Figures 3 and 4 present sequence diagrams for the purchase and payment processes. The diagrams illustrate the user journey from product search, cart addition, and checkout to payment confirmation. The system supports multiple payment methods, including manual transfer (with proof upload), COD, and pickup. Notifications are sent to sellers and admins to ensure timely processing, demonstrating the platform's flexibility in accommodating various transaction flows.

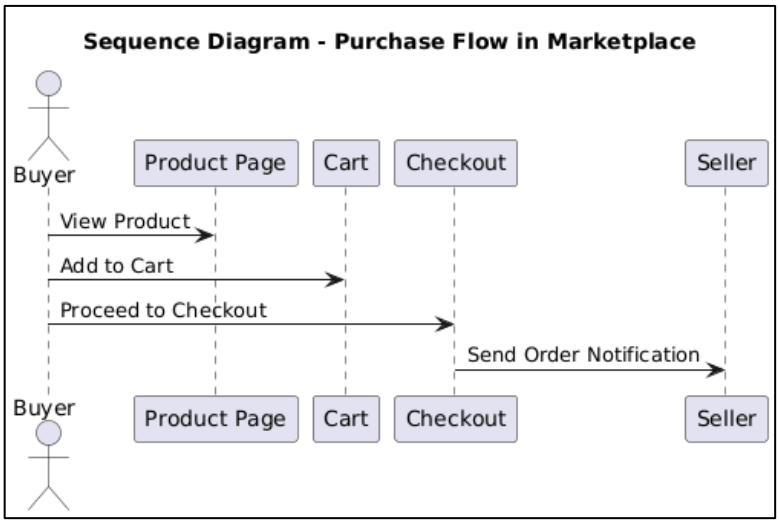

Figure 3. Sequence diagram of the purchasing process

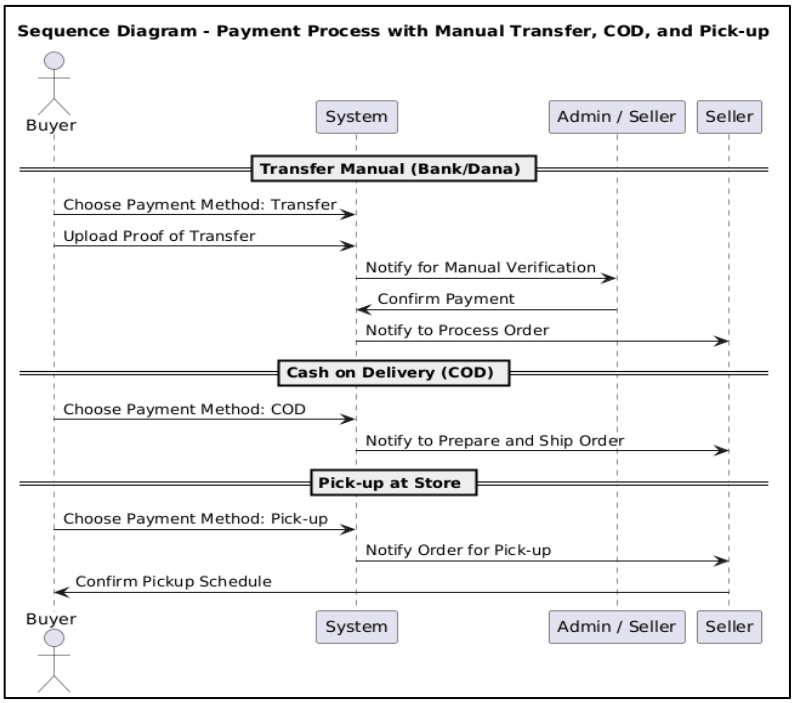

Figure 4. Sequence Diagram of the Payment Process

3.1.3 Class diagram

Figure 5 shows the main class diagram of the marketplace system, consisting of the following core classes: Product (id, name, price, stock, category_id) is linked to Category, Order (customer_id, total_price, status) contains OrderItem, and is linked to Payment. ShippingAddress is linked to Customer. Store and StoreLocation represent stores and their locations. User is the parent inherited by Customer, Seller, and Admin. Cart represents the user's shopping cart. This diagram visualizes the data structures and relationships that support marketplace functionality in an organized manner.

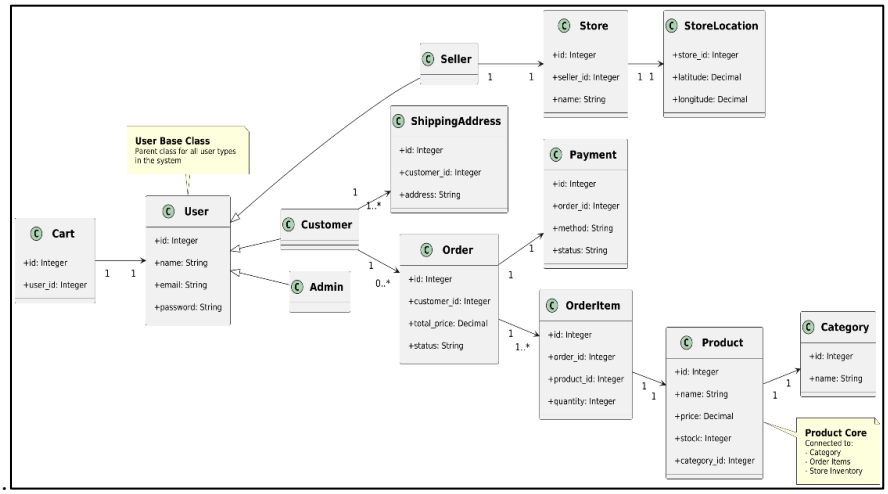

Figure 5. Class diagram of the main structure of the marketplace

3.1.4 Activity diagram

Figure 6 outlines the user's purchasing activity, beginning with product browsing, selection, cart management, address entry, and payment method selection.

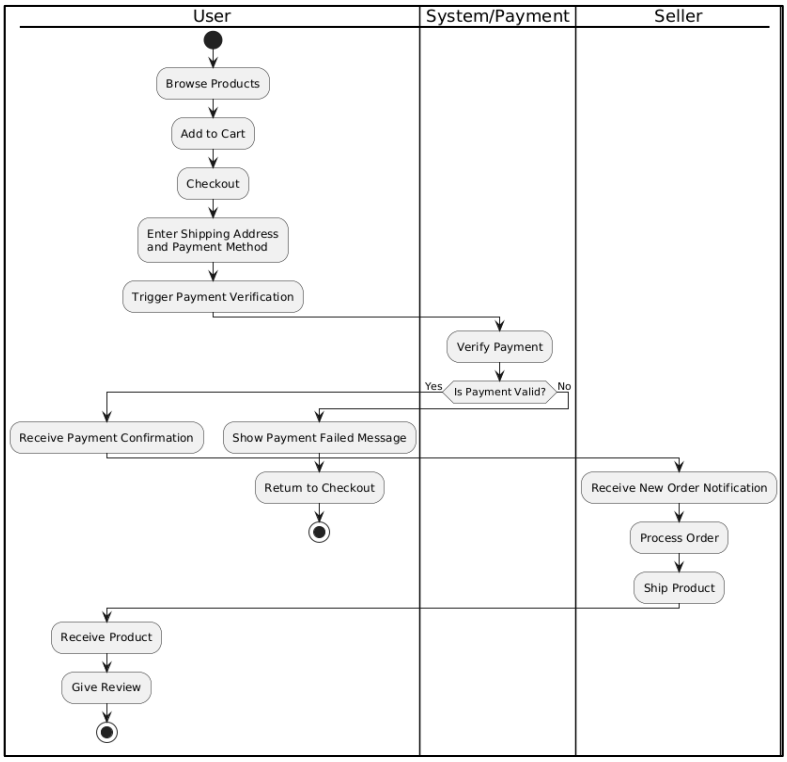

Figure 6. Purchasing process activity by the user

3.2 Develop

The development stage is the process of implementing the previously created system design into program code using the Laravel framework. At this stage, each functional component outlined during the design phase is translated into structured, reusable, and maintainable code, ensuring that the system operates according to its intended specifications. This phase includes configuring the database, developing controllers and models, building responsive user interfaces, and integrating necessary APIs or third-party services. Validation, debugging, and iterative adjustments are also performed to refine system performance. Overall, the development stage transforms conceptual designs into a fully functioning application.

(1) Home page

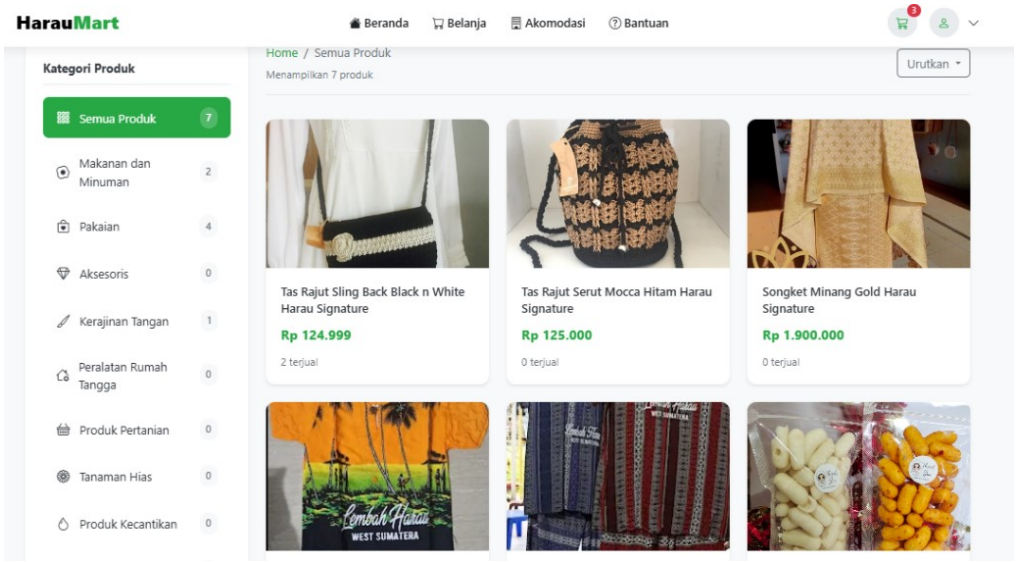

Figure 7. Marketplace main page

(2) Seller dashboard

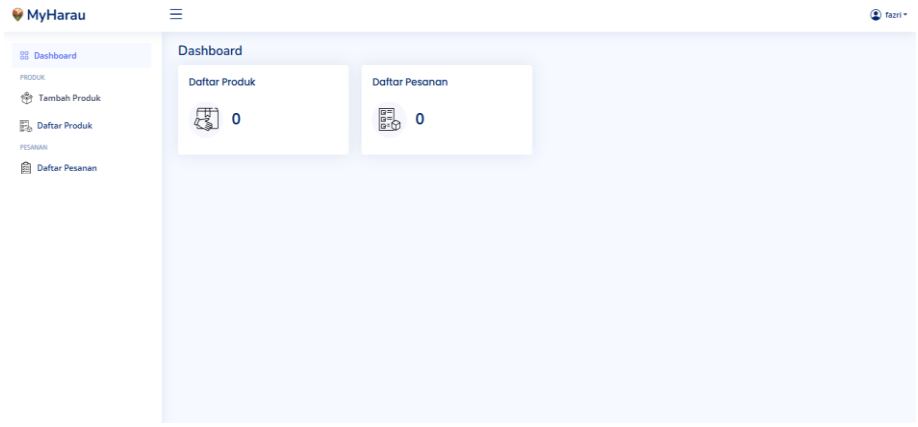

Figure 8. Seller dashboard page

Figure 8 depicts a dashboard page specifically designed for sellers as the main control center for managing their business activities on the platform. On this page, sellers can view a real-time summary of important information, such as the number of incoming orders, best-selling products, daily sales statistics, and stock availability status. The dashboard also provides quick access to product management features, order management, price updates, and sales performance monitoring through automatically updating visual graphs. With a simple, informative, and easy-to-understand interface, the seller dashboard page aims to help MSMEs monitor their businesses more efficiently and make more informed decisions based on available data.

(3) Checkout page

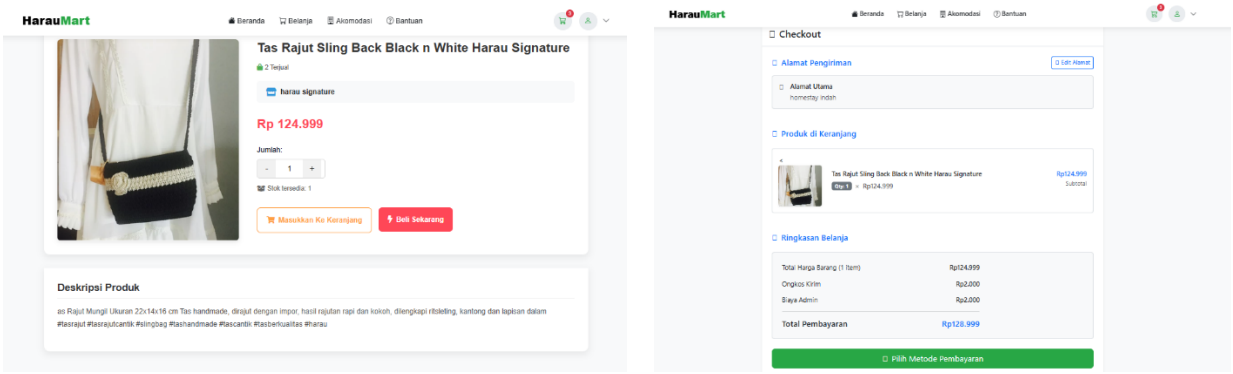

Figure 9. Purchase checkout page

3.3 *Testing*

The testing phase was conducted to ensure that the MyHarau application developed was running properly and meeting user needs. Testing was conducted using two main approaches: black-box testing to verify system functionality, and effectiveness and validity testing through user questionnaires, as shown in Table 1.

Table 1. Black box testing results

No	Tested Features	Status
1	User and Seller Login	Succeed
2	User and Seller Registration	Succeed
3	Add Product to Cart	Succeed
4	Checkout and Payment Process	Succeed
5	Product Search	Succeed
6	Nearest Product Features with Map	Succeed

7	Purchase Notifications and Order Status	Succeed
8	Menu and Dashboard Navigation	Succeed
9	Responsive Display (Mobile & Desktop)	Succeed
10	Data Synchronization	Succeed

A user survey involving 10 respondents was conducted using a questionnaire comprising 12 key feature statements. Effectiveness was calculated as:

$$\text{Effectiveness } (\%) = \left(\frac{482}{12\times10\times5}\right) \times 100\% = \left(\frac{482}{600}\right) \times 100\% = 80{,}33\% \quad (5)$$

Table 2. Analysis of scores per feature through the questionnaire

No	Feature	Average Score
1	The website is easy to use and the menu navigation is clear.	4.33
2	The website is quickly accessed without any significant problems.	4.22
3	Easy and accurate product search process	4.22
4	The ordering and confirmation process went smoothly.	4.22
5	I feel satisfied using this website to buy local products.	4.22
6	Adding and managing products on the website is very easy.	4.12
7	The process of receiving orders and confirming payments is clear and easy.	4.12
8	Website helps increase sales of my local products	4.12
9	I am satisfied using this website to sell my products.	4.12
10	The product information displayed is complete and easy to understand.	4.11
11	I feel satisfied using this website to buy local products.	4.11
12	The available payment methods are adequate and easy to use.	4.00

3.3.1 Questionnaire validity test

Validity testing was conducted using a content validity approach through assessments of 20 questionnaire items by two supervisors. Each item was scored using a Likert scale of 1–5, with scores of 3 to 5 considered relevant. To measure content validity, the Content Validity Ratio (CVR) formula was used:

$$CVR = \left(\frac{N_e - \frac{N}{2}}{\frac{N}{2}}\right) \quad (4)$$

where Ne is the number of experts who gave a score ≥ 3, and N is the total number of experts (2 people). The CVR value is then used to determine the validity of the item, with the following criteria: CVR ≥ 1.0 is declared valid, CVR = 0.0 requires revision, and CVR < 0.0 is invalid. Next, to measure overall validity, the Content Validity Index (CVI) formula is used:

$$CVI = \left(\frac{\text{Number of valid items}}{\text{total items}}\right) \quad (5)$$

Based on the results of the analysis that has been carried out, the following is a summary of the assessment results contained in table 3:

.Table 3. Validity test assessment

No	Statement	R1	R2	Average	CVR	Status
1	Easy to use application	3	4	3.5	1.0	Valid
2	Easy to understand navigation	4	4	4.0	1.0	Valid
3	Accurate product search	3	5	4.0	1.0	Valid
4	Checkout is easy to do	3	4	3.5	1.0	Valid
5	Attractive appearance	3	4	3.5	1.0	Valid
6	Text/button size is easily accessible	4	3	3.5	1.0	Valid
7	The colors and design are pleasing to the eyes	4	4	4.0	1.0	Valid
8	Product information is displayed clearly	2	4	3.0	0.0	Needs Revision
9	Fast loading pages	3	3	3.0	1.0	Valid
10	Rarely error/crash	3	3	3.0	1.0	Valid
11	Notifications are working fine	2	2	2.0	-1.0	Invalid
12	Smooth synchronization between platforms	2	2	2.0	-1.0	Invalid
13	Nearest product features are working well	3	3	3.0	1.0	Valid
14	Easy to use payment system	3	3	3.0	1.0	Valid
15	Login and register are working fine	4	4	4.0	1.0	Valid
16	Responsive desktop view	4	4	4.0	1.0	Valid
17	Applications meet shopping needs	2	3	25	0.0	Needs Revision
18	Responsive mobile view	2	2	2.0	-1.0	Invalid
19	Help find local products	3	4	3.5	1.0	Valid
20	Supporting local MSMEs	3	5	4.0	1.0	Valid

The results showed a system validity rate of 75% and an effectiveness rate of 80.33%, with all features passing black-box testing. These outcomes indicate that the system meets general quality standards. Although some areas still require improvement, the system significantly contributes to the empowerment of local MSMEs by offering a user-friendly digital platform that enhances product visibility and accessibility.

4. Conclusion

Based on the results of this research, the development of the MyHarau e-commerce system—integrated with map functionality on a Laravel-based web platform—has been successfully implemented using the Agile methodology and MVC architecture. The system incorporates key features such as role-based authentication, product management, a conventional payment system, and interactive digital mapping using the Google Maps API and Leaflet Maps via the Laravel plugin. The testing phase produced a system validity rate of 75% (based on expert evaluation) and an effectiveness rate of 80.33% (based on user surveys),

indicating that the system meets acceptable quality standards. Furthermore, the integration of map-based features provides a novel solution to the long-standing challenge of store location accessibility, thereby supporting the empowerment of local MSMEs. All core features functioned as intended, with black-box testing confirming reliability and user feedback reflecting high satisfaction.

Based on the research and evaluation results, several future developments are recommended to achieve more comprehensive e-commerce standards. These include the implementation of digital payment gateways such as Midtrans, Xendit, or Doku to support a variety of payment methods—including QRIS, Dana, OVO, GoPay, and bank transfers—to enhance payment flexibility. Additionally, the development of a shipping management module integrated with courier services such as JNE, J&T, SiCepat, and Pos Indonesia is crucial, offering features like automated shipping cost calculations, shipment tracking, and real-time delivery notifications. To improve performance, the system should incorporate caching techniques, database query optimization, and media compression, ensuring faster page loads and better responsiveness across devices. Further enhancements should include real-time notification features, deployment to a secure and stable production server, and the addition of advanced functionalities such as live chat, multi-seller ordering, and AI-based product recommendation systems. Once the system proves stable in the Harau region, it can be expanded to other areas with localized content and features. To ensure successful adoption, training and mentoring programs for MSMEs are necessary to strengthen digital literacy. Finally, continued research is needed to assess the long-term impact of system implementation on increasing MSME revenues. With ongoing improvements, MyHarau has the potential to serve as a scalable model for digital MSME empowerment, fostering inclusive and sustainable economic growth throughout Indonesia.

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