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Designing of Web-based E-Commerce Platform at Jaya Studio

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Abstrak

Jaya Studio merupakan toko alat musik yang sistem penjualannya masih dilakukan secara konvensional, sehingga pelanggan harus datang langsung ke lokasi untuk melakukan transaksi. Merancang dan membangun platform e-commerce berbasis website yang terintegrasi dengan layanan payment gateway, dan RajaOngkir membantu Jaya Studio memberikan pengalaman berbelanja yang optimal bagi pelanggan serta menjangkau pasar dengan lebih luas. Pengembangan sistem dengan metode Agile membuat pengerjaan menjadi sistematis secara bertahap sehingga mampu mencapai kebutuhan dari sisi pelanggan ataupun toko. Pelanggan dapat melihat detail produk termasuk video demonstrasi alat musik dari YouTube yang durasinya tidak dibatasi seperti e-commerce Shopee atau TokoPedia, sehingga tidak hanya pengalaman berbelanja yang didapat, tetapi pengetahuan akan alat musik tersebut. Pengujian menggunakan black box dan stress test. 100 VUs yang berkelanjutan pada pengujian stress test, menunjukkan kinerja website dapat menahan performa dengan normal rata-rata 982 milidetik dalam 52 menit 30 detik yang hanya 5% waktu response lebih dari 1,663 detik.

Kata kunci: *E-Commerce, Payment Gateway, Toko Alat Musik, Agile, Laravel.*

Abstract

Jaya Studio is a music equipment store that still operates using a conventional sales system, requiring customers to visit the location directly for transactions. Designing and building a website-based e-commerce platform integrated with payment gateway services and RajaOngkir helps Jaya Studio provide optimal shopping experiences for customers and reach a wider market. System development using the Agile method makes the work systematic and gradual, meeting both customer and store needs. Customers can view product details including YouTube music equipment demonstration videos without duration limits like on Shopee or Tokopedia e-commerce platforms, providing not just shopping experiences but knowledge about the musical instruments. Testing was conducted using black box and stress test methods. With 100 continuous VUs in the stress test, website performance maintained normal operations with an average of 982 milliseconds over 52 minutes and 30 seconds, with only 5% of response times exceeding 1,663 seconds.

Keywords : *E-Commerce, Payment gateway, Musical Instruments Store, Agile, Laravel.*

1. Introduction

Jaya Studio is a musical instrument store located in Bangli, Bali. Having its own factory or place to manufacture musical instruments allows Jaya Studio to sell several instruments with greater profit. Like other musical instrument manufacturers, Jaya Studio still only focuses on making musical instruments, while the sales process is still carried out conventionally. Product purchases still rely solely on people who go directly to the store location. Product purchases still rely solely on customers visiting the store location to shop. Conventional purchasing results in relatively stagnant business growth, which means the optimization of Jaya Studio's selling process has not yet been achieved.

Customer confidence can be obtained by presenting something that makes customers understand the product they are going to buy [1]. Technological developments can be utilized by Jaya Studio for management and optimization in terms of integrated business processes, especially from the sales side [2]. E-Commerce can become a platform for buying and selling

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interactions between Jaya Studio and customers [3]. The existence of an e-commerce platform will become a bridge that allows customers to make transactions without limits of space and time.

Jaya Studio's E-Commerce will direct customers to focus only on shopping for products from Jaya Studio, thereby reducing distractions from other store products [4]. A standalone e-commerce platform enables management tailored to Jaya Studio's needs, including flexible video display durations, considering the video duration limitations of other platforms such as Shopee [5] and Tokopedia [6]. Customers will gain an understanding of Jaya Studio's products through video displays to convey information properly [7]. Videos about playing musical instruments play a significant role in providing customers with experience while shopping; with videos, customers can visually and audibly understand the products or musical instruments they might choose [8]. Customer trust in buying tools or products can be assisted using technology [9].

The YouTube platform will also function as a marketing medium that will certainly make customers more interested in product selection. The system integrates payment gateway to automate the payment process using services from Midtrans. Customers can choose payment methods according to their needs and provide ease of checking status from the store side [10]. RajaOngkir is also integrated to obtain the shipping costs needed for an order. This application is also expected to help Jaya Studio music store overcome the challenges in the conventional sales system, so that the sales process can run more efficiently to encourage business progress.

2. Research Method / Proposed Method

The agile software development method was chosen for system development. The Agile model was introduced by the Agile Manifesto in 2001, having an iterative approach and flexibility in each stage [11]. The stages include Requirements, Design, Development, Testing, Deployment, and Review, which certainly align with the system development that focuses on the owner's needs.

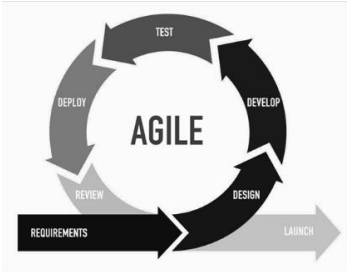

Figure 1 Agile Method

Figure 1 shows the stages of the agile method for the website-based e-commerce platform at Jaya Studio. The system development starts from the requirements stage which identifies the needs for the platform, second is the design stage which creates the general platform design, third is the development stage where system features are worked on in sprints or small processes over certain time periods using Laravel, fourth is the testing stage to test the development results, fifth is the deployment stage where development is implemented in the production environment, and sixth is the review stage where feedback from stakeholders regarding features is received, followed by adjustments, further development, and system improvements [12].

2.1. System Overview

The system overview provides a depiction of how the system on the website-based e-commerce platform at Jaya Studio works. The provision of information from the system in this research will be described generally and comprehensively in the following diagram.

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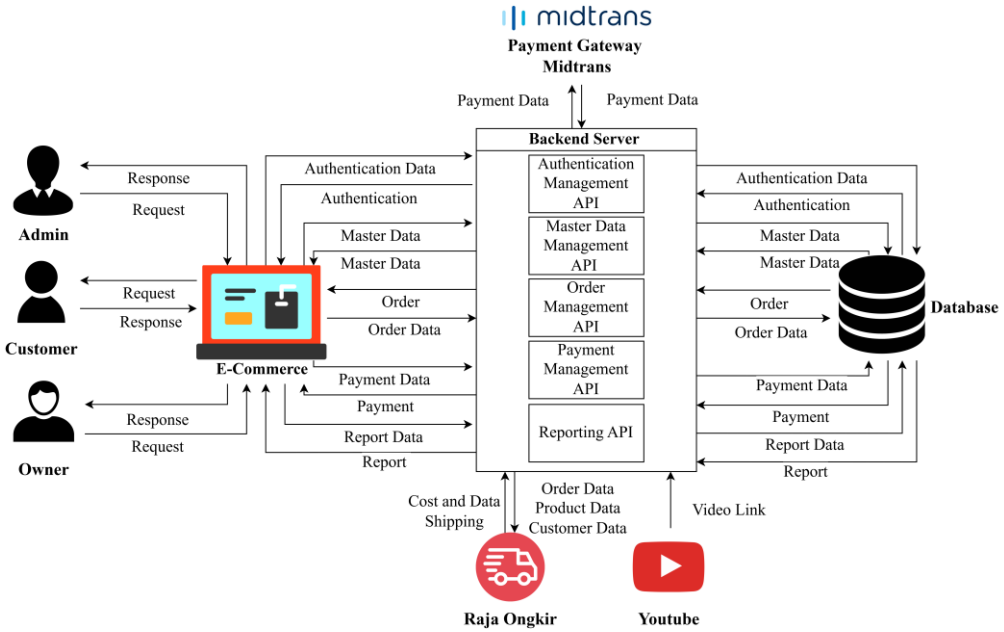

Figure 2 System Overview

Figure 2 represents the general overview of the e-commerce system at Jaya Studio. This system involves several main entities, namely Admin, Owner, and Customer. All entities use the system and interact with the database through an API. The API in the system handles processes from various third-party services. Entities in the system use the system according to requests, whether regarding authentication, master data, ordering, payment, and reporting.

2.2. Context Diagram

A context diagram is an information system modeling that shows the system's data flow, depicting the entities involved, the flow of data in the system from entities, and the processes that occur in the system[13]. The following is the context diagram of the e-commerce system at Jaya Studio.

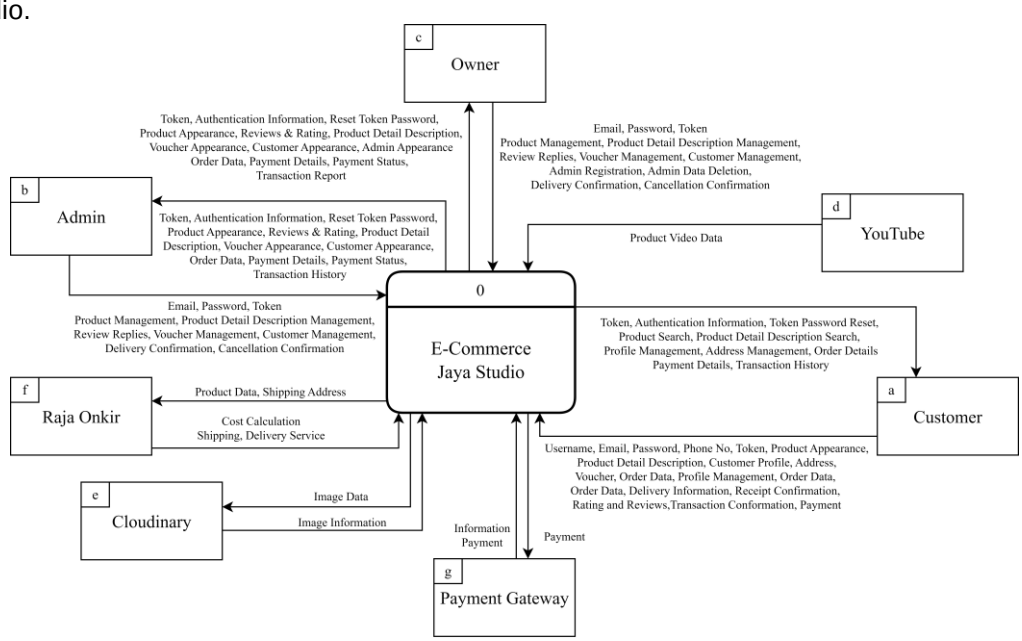

Figure 3 Context Diagram

Figure 3 is a Context Diagram depicting the interaction flow between the Jaya Studio e-commerce system [14]. This system is connected to several entities including Customers, Admin, Store Owner, YouTube, RajaOngkir, payment gateway, and Cloudinary. Each entity has its own

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flow in every process, where each flow will work on each module in the system such as authentication, product management, ordering, payment, and reporting.

3. Literature Study

The development of e-commerce for Pandawa Music Shop implements API (Application Programming Interface). APIs are used with third-party entities: Midtrans as a payment gateway to enable online transactions and RajaOngkir to check shipping costs [15]. This online sales website can be expected to help Pandawa Music Shop improve efficiency and effectiveness in sales data management.

Local bag producers showcase products to the wider community through web-based application development as a solution for effective product marketing. The Waterfall method was used for system development, with the system integrated with RajaOngkir for shipping, and Black Box testing was also applied in the research [16]. The research results showed that this application made it easier for buyers to order products anytime and from anywhere, and simplified management data handling for owners.

Research on the design of an e-commerce platform for Atlanta Sport store captured the challenges of manually managing marketing data, product sales, and reporting faced by Atlanta Sport store. The e-commerce platform was designed using the Waterfall method and UML modeling, using PHP and MySQL technology. The e-commerce system development results successfully increased data management efficiency, expanded market reach through online sales, and accelerated reporting and decision-making processes for store owners [17].

The Agile method is the approach used in the E-commerce Application for Minang Creative Cake and Food Business. The Agile method enables adaptive web-based application development using PHP, CodeIgniter, and MySQL, involving stages of design, implementation, black box testing, through to maintenance, thereby increasing operational efficiency, product visibility, and market reach. As a result, this application successfully increased sales and reduced operational costs, allowing it to contribute to the local economy [12].

Referring to these studies, a difference can be drawn that there is not yet an e-commerce platform that provides customers with an understanding of the products being sold [18]. Videos and explanations about products will be present to provide product understanding to customers, with videos about products that will be directly displayed on the e-commerce platform.

3.1. E-Commerce

E-Commerce is a trading system conducted online, offering either services or goods [19]. E-Commerce will benefit the store in terms of customer management, products, ordering, and also payments. E-Commerce serves as a solution for transactions that are still conducted conventionally in a store, which poses a limitation for the store itself [20]. All these variables will be more efficient if the information can be well integrated by the system, making store management effective and efficient, thus aligning with the services provided to customers [21].

3.2. Payment Gateway

Midtrans is one of the payment gateway service providers. Midtrans itself can verify payments automatically according to the actions taken by the payer, so the payment status will be updated according to its status [22]. Midtrans is a payment gateway service that offers easy integration through supported APIs to conduct transactions through various payment methods, such as bank transfers, e-wallets, and others [23].

3.3. RajaOngkir

RajaOngkir is used as a third-party service for shipping management. RajaOngkir is integrated through the provided API, and covers location data as well as shipping services or couriers in Indonesia. The calculation of shipping costs is obtained from determining the location of the store and customer, then calculated according to the product, so that data regarding shipping services with those shipping costs will be provided [24].

3.4. Laravel Framework

Laravel is a framework for building websites using the PHP programming language. The Laravel framework allows users to manage both the back-end and front-end of a website within a single framework. Additionally, the tools needed to develop a website are provided by Laravel

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through the execution of Artisan commands, which serve as a tool for downloading packages in a structured and organized manner [25].

4. Result and Discussion

Result and discussion section explain about discusses result of the process from e-commerce platform web based in Jaya Studio. Implementation of the system describe from the e-commerce interface. Testing stage of the system involves the of black box testing and Stress Testing.

4.1. System Interface

The website-based e-commerce platform at Jaya Studio designs an easy-to-use and informative interface. The features on the platform are tailored to the website's users, whether customers, admins, or store owners, covering aspects such as login, product display, ordering, and sales reporting.

1) Login Interface

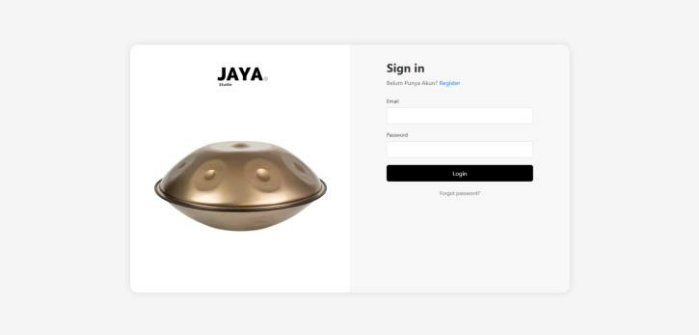

Figure 4 Login Interface

Figure 4 shows the login page of the system. This login page serves as the authentication process for registered users to access the platform further by filling out the login form. Upon successful login, the user will be redirected to the homepage.

2) Homepage Interface

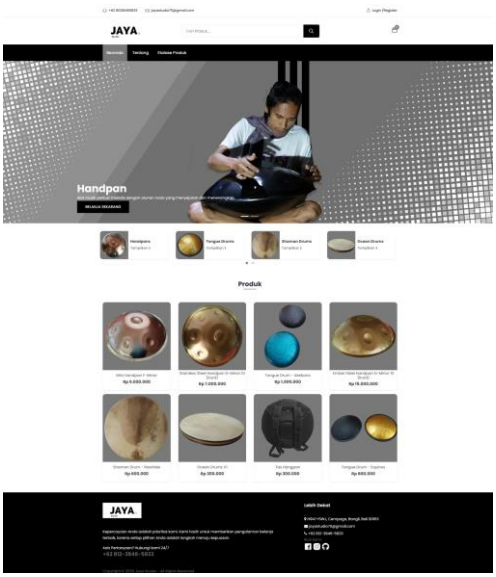

Figure 5 Homepage Interface

Figure 5 shows the homepage of the system. This homepage displays a banner, product categories available on the e-commerce platform, and several products that can be purchased.

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The categories and products are accompanied by information to assist customers and can be clicked for more detailed information.

3) Detail Product Interface

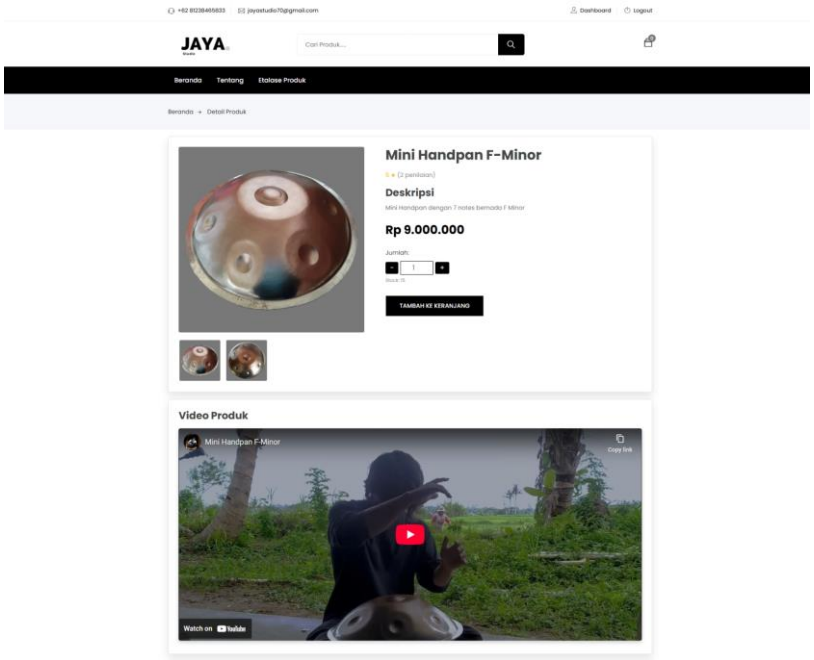

Figure 6 Detail Product Interface

Figure 6 shows the product detail page of the e-commerce platform. This product detail page displays data for the product previously clicked by the customer. The information provided includes product details, a product demonstration video, product price, and product reviews. The product can be added to the cart by clicking the "Add to Cart" button.

4) Cart Interface

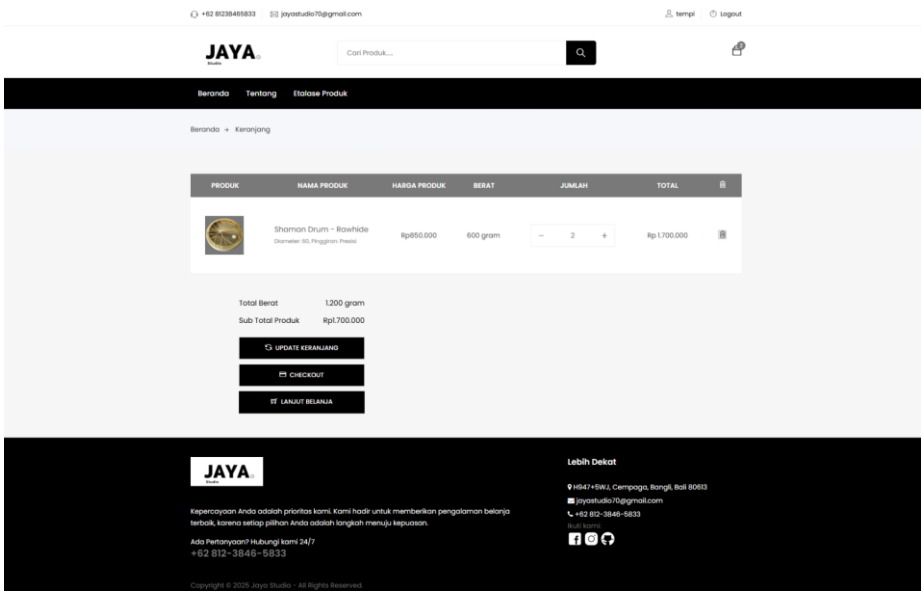

Figure 7 Cart Interface

Figure 7 shows the cart page of the e-commerce platform. This cart page displays the data of products in the cart. The product data in the cart can be adjusted according to the customer's needs, including removing products or changing the order quantity. The "Continue

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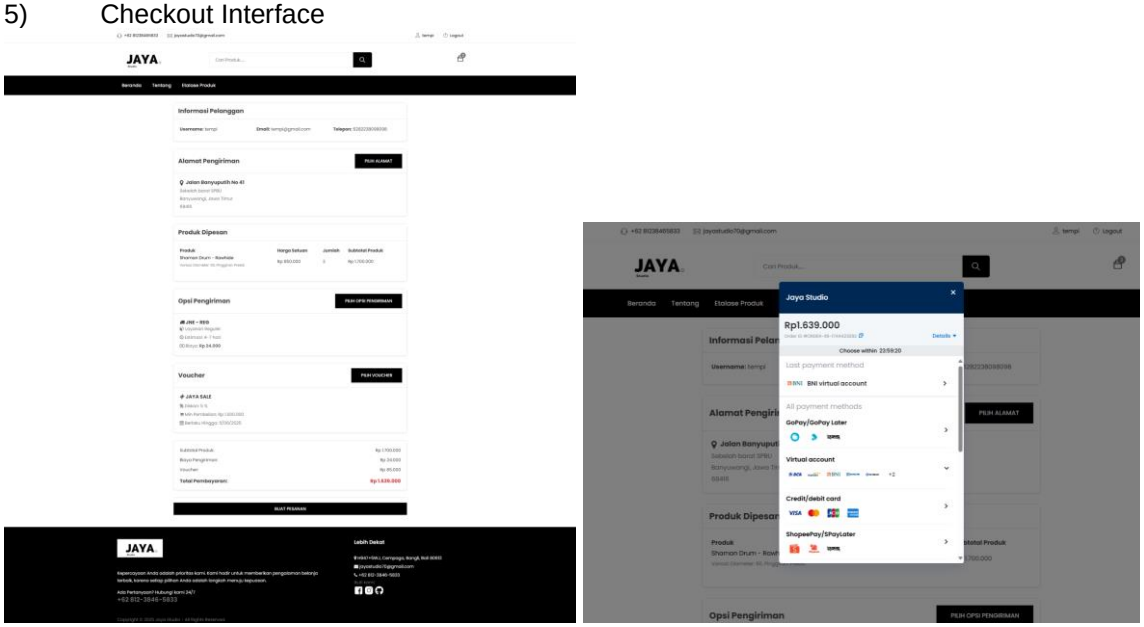
Shopping" button can be used to search for other products, and the "Checkout" button is for placing the order.

5) Checkout Interface



(a) (b)

Figure 8 (a) Checkout Interface (b) Payment Interface

Figure 8 (a) shows the checkout page of the e-commerce platform, while (b) shows the payment page of the e-commerce platform. The checkout page contains a form for filling in customer details to place an order, including entering the address, selecting shipping options sourced from RajaOngkir, and applying a voucher (if available). Payment can be made by clicking the "Place Order" button once all required data is complete, which will display the payment page. On the payment page, customers can choose their preferred payment method and will be given a specific time limit to complete the payment.

6) Order Log Interface

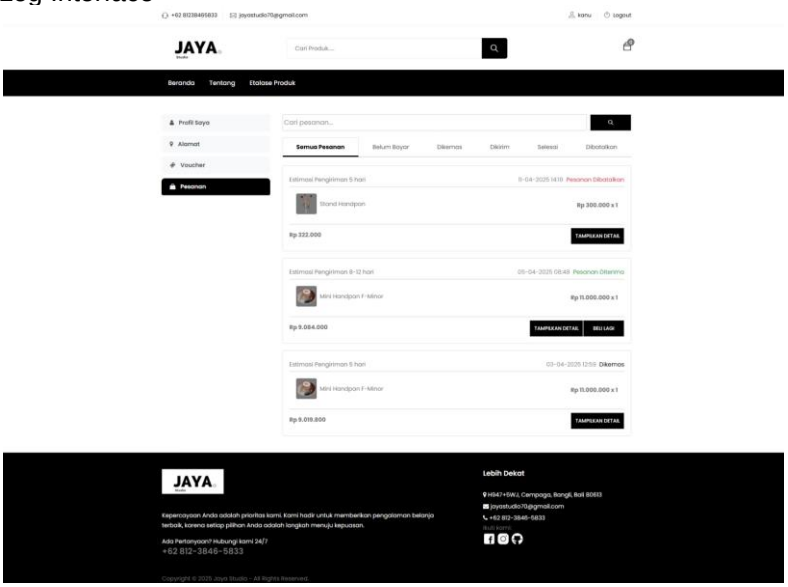


Figure 9 Order Log Interface

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Figure 9 shows the customer's order log page of the e-commerce platform. This order log page displays data on orders placed by the customer based on the status of those orders. Orders can be managed according to their status, and details can be viewed by clicking the "Show Details" button.

7) Dashboard Interface

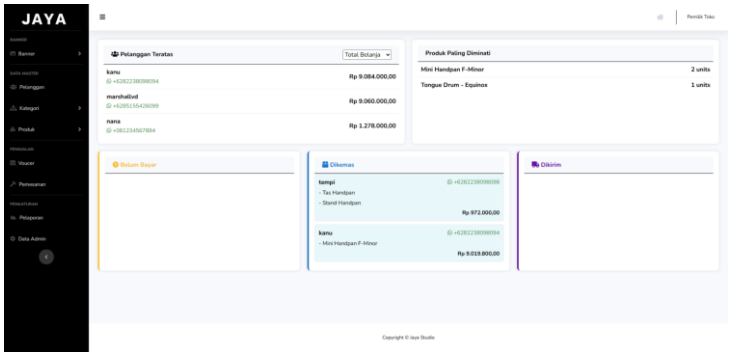
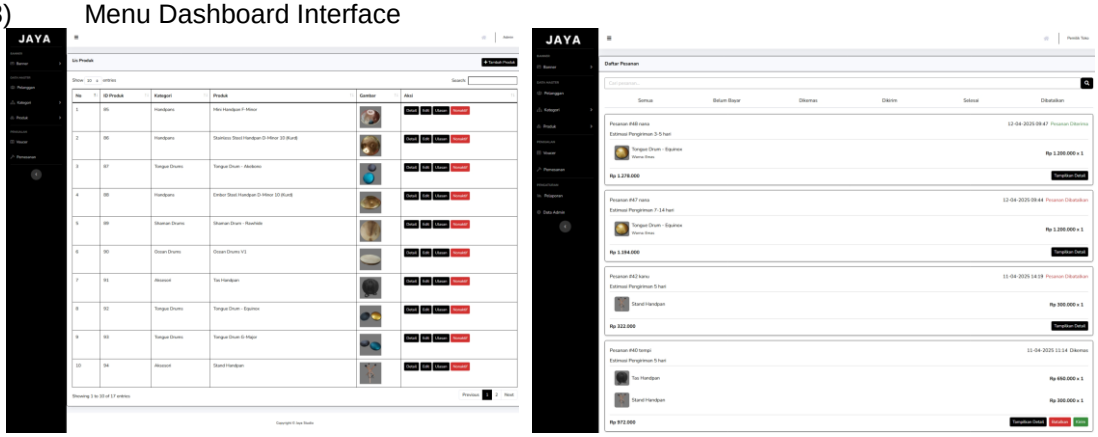


Figure 10 Dashboard Interface

Figure 10 shows the dashboard page for the store owner or admin on the e-commerce platform. This dashboard page displays data on orders from all recent orders. Additionally, there are menus displayed on the dashboard sidebar for managing other data.

8) Menu Dashboard Interface



(a) (b)

Figure 11 (a) List Product Interface (b) Master Order Log Interface

Figure 11 (a) shows the product list page on the e-commerce platform, and (b) shows the order log page for all customers. The product list page displays products with indicated actions that can be performed on them through buttons, such as edit, view details to see product information, product reviews, and deactivate product. The order log page displays data on orders placed by all customers based on the status of those orders. Customer orders can be managed according to their status, and details can be viewed by clicking the "Show Details" button.

9) Report Interface

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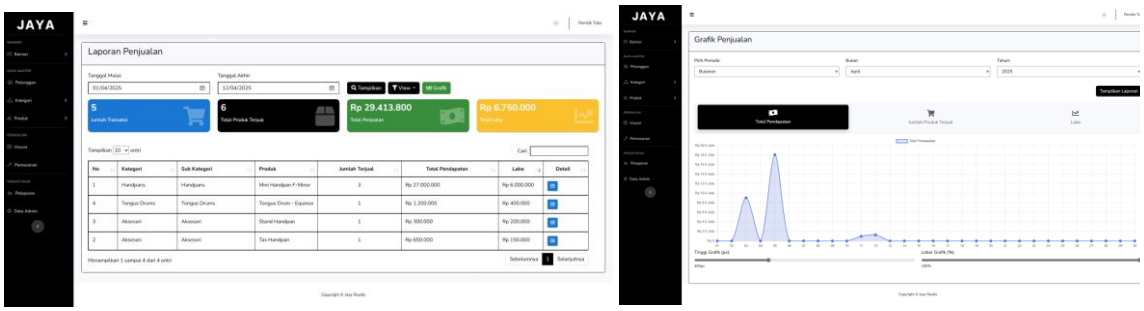

(a) (b)

Figure 12 (a) Report Interface (b) Chart Report Interface

Figure 12 (a) shows the report page and (b) shows the report graph page of the e-commerce platform. The report page displays sales data on the e-commerce platform based on a specified time range, providing information about sales reports. The report graph page is displayed after clicking the graph button on the report page. The report graph page shows graphs of sales, either by year or month, as determined.

4.2. Testing Result

The Jaya Studio e-commerce platform underwent black box testing to test system functionality and also stress testing to evaluate system resilience. Testing was conducted to determine system performance, which is explained as follows.

1) Black Box Testing

Black box testing on the Jaya Studio e-commerce platform involved all modules and features contained in the system. Features in the modules were thoroughly tested including both positive and negative responses. The following table is the black box testing on the Jaya Studio e-commerce platform.

Table 1 Black Box Testing the Report Feature

Activity	Test Scenario	Expected Result	Test Result	Outcome
Store owner views report with input date range.	- Login as store owner - Click the "Dashboard" text on the website header - Select the reporting menu from the dashboard sidebar - Enter start date and end date - Click the "Show" button - Click "Detail" to display product variations - Click "View" to filter by category or all	Report is successfully displayed based on payment data, regarding orders made along with other detailed data within the selected date range, and presented in a table format.	Report is successfully displayed based on payment data, regarding orders made along with other detailed data within the selected date range, and presented in a table format.	Fulfilled
Store owner generates report with start date later than end date or no sales during that period.	- Login as store owner - Click the "Dashboard" text on the website header - Select the reporting menu from the dashboard sidebar - Enter start and end dates - Enter an invalid date range	Report fails to display and an error message appears.	Report fails to display and an error message appears.	Fulfilled

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	- Click the "Show" button			
Store owner generates report with empty date range.	- Login as store owner - Click the "Dashboard" text on the website header - Select the reporting menu from the dashboard sidebar - Click the "Show" button	Fails to generate report, system displays an error message.	Fails to generate report, system displays an error message.	Fulfilled

Table 1 shows the black box testing on one of the e-commerce platform features, which is the sales report display feature. Testing was conducted on user inputs that were both successful and failed in displaying sales reports.

2) Stress Testing

Stress Testing was also conducted through four scenarios first warm-up test simulation (0-25 VUs/5 minutes), load test (25-45 VUs/10 minutes), stress test (45-90 VUs/25 minutes), and spike test (0-100 VUs/12 minutes) to identify the system's capacity limits and areas for optimization. The test results ensured the system's reliability in terms of both functionality and performance under high user pressure [26].

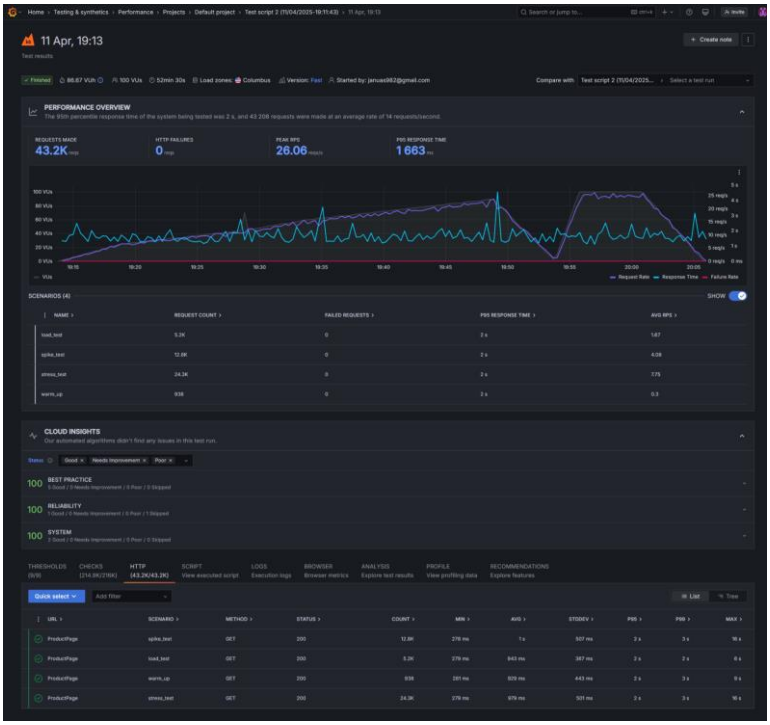

Figure 13 Stress Testing Result

The test results from the graph and description above indicate that during 52 minutes and 30 seconds of testing, the system successfully handled a total of 43.200 requests with an average response time of 982 milliseconds and a 95th percentile response time of 1,663 seconds. The maximum response time test occurred at 100 VUs, with the highest response time reaching 16,3 seconds in the spike_test scenario. A failure rate of 2.9% in the spike_test scenario indicates that some responses exceeded the 2 second time limit during periods of significant peak load. Overall, a total of 1,167 failures were recorded from the entire evaluation.

5. Conclusion

The Jaya Studio e-commerce platform, developed using the Agile methodology with the Laravel framework, offers various features including authentication, product data management,

ordering, payment, and reporting. Third-party services were implemented to streamline shipping cost calculations and payments using RajaOngkir and Midtrans. Black Box Testing confirmed that functionality was met, while Stress Testing with 100 VUs showed stable performance with an average response time of 982 milliseconds over 52,5 minutes of testing, despite a decline during the spike test phase or user surge, which indicated a 2.9% response failure rate with some responses exceeding 2 seconds. The system successfully transformed conventional sales into a digital format through the e-commerce platform.

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