
Automated Custom Glass Ordering and Integrated Payment Gateway System Using Rapid Application Development

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Keywords

Custom Glass Ordering; Payment Gateway; Rapid Application Development; E-Commerce; Information System

Abstract

Digital transformation has increased the need for ordering systems that are efficient, structured, and customer-oriented. In the glass industry, custom orders present specific challenges because each customer may request different glass types, dimensions, thicknesses, processing services, and delivery methods. CV Family Kaca provides glass distribution and custom glass processing services, but its ordering and payment confirmation activities were previously handled through messaging applications, telephone communication, and direct visits. This condition caused repeated recording, delayed confirmation, difficulty tracing order history, and a higher risk of specification errors. This study aims to develop a web-based custom glass ordering system integrated with payment gateway services using the Rapid Application Development method. The development process includes requirements analysis, prototyping and design, system development, and testing and refinement. The system provides customer features such as registration, login, product catalog access, product detail, cart management, checkout, delivery or pickup selection, payment processing, order history, and order detail. The admin features include product management, order management, payment management, user management, shipping and warehouse settings, dashboard reporting, and revenue monitoring. Blackbox testing was conducted using use-case-based scenarios to evaluate the suitability of system input and output. The test results show that the tested customer and admin features produced valid outputs according to the expected scenarios. Therefore, the system can support more structured custom glass ordering, reduce manual recording errors, accelerate transaction processing, and improve customer access to order information.

1. Introduction

The development of information technology has encouraged companies to digitize business processes, especially in services that require fast access to product information and transaction data. Web-based sales systems can help companies present product information, manage orders, and provide more accurate transaction records for customers and business owners [1]. Customer behavior has also shifted toward online access because digital systems allow product information, ordering, and payment activities to be performed without direct visits. Research on web-based sales at Bucks Corner shows that sales automation can improve customer accessibility, speed up services, and increase sales data accuracy [2]. Similar findings are found in the development of a web-based sales system at Toko Parfum Rika Utami Bangil, where customers previously had to visit the store to obtain product information and make orders. The implemented website made product information and ordering more accessible while helping store owners process data more easily [3].

CV Family Kaca is a company engaged in glass distribution and custom glass processing services. The company provides various glass types, thickness options, and additional services such as tempered glass, bevel, engraving, aluminium partition installation, and UPVC-related work. This product diversity creates a more complex order management process than standard product sales because each customer can determine different specifications. Based on initial observation, the ordering process at CV Family Kaca was still conducted through WhatsApp, telephone communication, and direct customer visits. Admin had to manually rewrite order details, including glass type, size, thickness, additional service, fulfillment method, and payment confirmation. Manual recording in sales activities can reduce data accuracy and slow down report preparation when transaction volume increases [4]. Previous research on CV Family Kaca developed a web-based distribution and online sales system using RAD, UML, and SEO to improve transaction flow and digital promotion [5]. However, the previous system did not specifically focus on custom glass ordering with structured dimension input, dynamic order variables, and integrated digital payment flow.

Several studies on web-based material and product sales also show that online systems can improve product catalog access and transaction efficiency [6]. Web-based sales applications for small and medium enterprises also support online product presentation and transaction management [7]. Nevertheless, most of these systems focus on standard products rather than custom products with specification-based ordering. In contrast, the custom glass ordering process requires structured dimension input, dynamic order details, fulfillment selection, and transaction status monitoring.

Based on these problems and research gaps, this study aims to design and develop a web-based custom glass ordering system at CV Family Kaca using Rapid Application Development. The contribution of this research is the integration of product catalog access, custom order flow, cart and checkout, delivery or pickup selection, payment gateway processing, order tracking, admin order management, and dashboard reporting in one platform.

2. Research Methods

This study uses the Rapid Application Development (RAD) method. RAD was chosen because it supports rapid prototyping, active user involvement, and iterative refinement based on feedback. This approach is relevant for the custom glass ordering system because the workflow, interface, specification fields, checkout flow, and admin monitoring features must be adjusted to the operational needs of CV Family Kaca.

Figure 1 illustrates the Software Development Life Cycle (SDLC) model used in this study. The RAD model consists of requirements analysis, prototype and design, system development, and testing and refinement. These stages were applied iteratively so that the prototype could be evaluated and improved before the system was finalized.

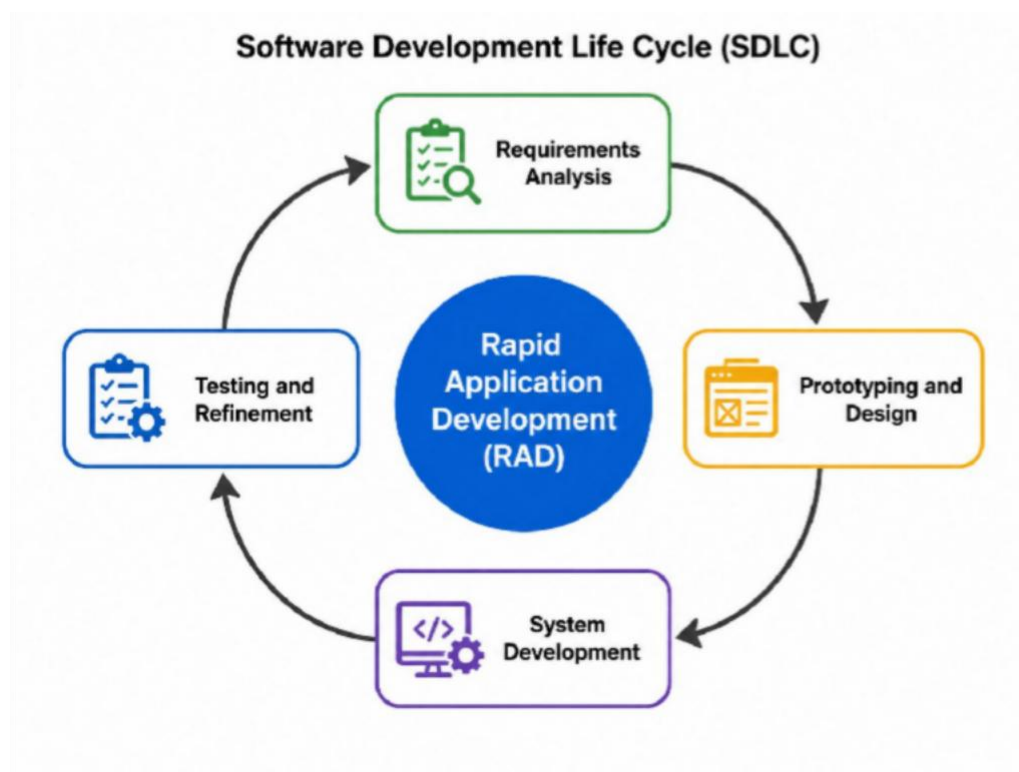


Fig. 1 Software Development Life Cycle with Rapid Application Development Model (Author's illustration)

The research was conducted at CV Family Kaca, located in Kp. Baru, Godog, Polokarto, Sukoharjo, Central Java. The research subjects include customer registration, product catalog access, product detail viewing, custom order input, cart management, checkout, delivery or pickup selection, payment, customer order history, admin order processing, payment monitoring, and report generation.

Data collection was carried out through observation, interviews, and literature study. Observation was used to identify the current ordering process, manual recording activities, and problems in payment confirmation. Interviews with the owner and admin were used to determine feature needs, product variations, pricing considerations, delivery or pickup flow, and payment gateway requirements. Literature

study was used to strengthen the theoretical basis related to web-based sales systems, e-commerce, UML modeling, database design, RAD, and black-box testing.

2.1 Requirements Analysis

The requirements analysis phase identified several problems in the existing process, including manual order recording, possible specification input errors, delayed payment confirmation, scattered order history, and limited monitoring of transaction status. Similar problems are also reported in web-based sales research, where manual processes cause slow information access, data duplication, and lower service efficiency [1], [2], [3].

The system requirements were divided into customer-side and admin-side requirements. Customer features are needed to make ordering more independent, while admin features are needed to manage product data, verify transactions, and monitor order progress. Web-based sales research on Batik Widi Nugraha shows that online sales systems can help customers access products and help the business manage transaction data more efficiently [8].

Table 1. Functional Requirements

No	Functional Requirement	Description
1	Customer registration and login	Customers create accounts and access ordering features securely.
2	Product catalog and detail	Customers view glass product information, service descriptions, and available options.
3	Cart management	Customers add, update, and remove products before checkout.
4	Custom order checkout	Customers confirm order data, quantity, selected specification, and total payment.
5	Delivery or pickup selection	Customers select shipment or self-pickup according to their needs.
6	Payment gateway processing	Customers complete digital payment and the system records the payment status.
7	Order history and detail	Customers monitor previous orders and view the status of each order.
8	Product management	Admin adds, edits, deletes, and views product data.
9	Order and payment management	Admin verifies order data, updates status, and monitors payment records.
10	User and shipping settings	Admin manages users, shipping costs, warehouse locations, and pickup settings.
11	Dashboard and report	Admin monitors total orders, paid orders, pending payments, revenue, and recent transactions.

2.2 Prototyping and System Design

The prototyping and design phase produced the system workflow and interaction model. UML was used because it helps visualize system behavior and interactions between actors and features. The use of UML in web system development supports clearer analysis and communication of functional requirements [9].

Database design was prepared to support centralized storage of customer, product, cart, order, payment, and report data. A structured entity relationship design is important because it describes how data entities and relationships are organized before implementation [10].

The use case diagram consists of two main actors, namely Admin and Customer. Admin can log in, manage products, manage orders, manage payments, manage users, configure shipping and warehouse locations, and view dashboard reports. Customer can register, log in, manage profile, view product catalog, view product detail, manage cart, checkout, choose delivery or pickup, make payment, view order history, and view order detail.

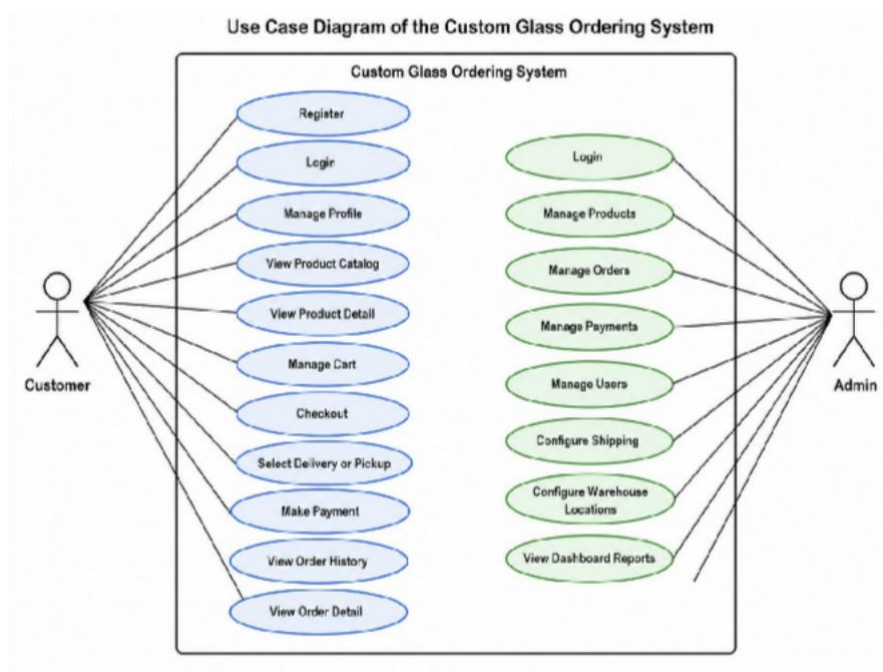


Fig. 2 Use Case Diagram of the Custom Glass Ordering System

Figure 2 shows that cart management includes adding items, updating items, and deleting items, while the checkout process includes delivery or pickup selection and payment. This design supports the main objective of enabling customers to submit custom glass orders through a web platform without visiting the store directly.

2.3 System Development

The development phase translated the approved prototype into a web-based application. The system was developed using PHP with the Laravel framework and MySQL database. Laravel and MySQL are widely used in web-based sales systems because they support structured application development, data management, and transaction processing [11], [4].

The customer side focuses on product browsing, product detail viewing, cart management, checkout, delivery or pickup selection, payment gateway processing, and order history. The admin side focuses on

dashboard monitoring, product management, order management, payment monitoring, user management, shipping settings, warehouse location settings, and report viewing. The integration between customer and admin features allows order data to be stored centrally and monitored from the beginning of ordering until payment and order status updates.

The system interface was designed to be simple and responsive so that customers and admin can access the required features easily. Research on e-commerce and service systems emphasizes that web interfaces should support clear navigation, transaction transparency, and accessible service information [12].

2.4 System Testing

System testing was carried out using the black-box testing method. This method was used to ensure that each feature in the system produced outputs that matched the expected results based on the defined functional requirements. The testing focused on the interaction between user input and system response, without analyzing the internal structure of the program code.

The testing scenarios were arranged based on the main functions used by customers and admins. On the customer side, the tested features included registration, login, product catalog access, product detail viewing, cart management, checkout, delivery or pickup selection, payment gateway processing, order history, and order detail. On the admin side, the tested features included admin login, product management, order management, payment management, user and shipping settings, and dashboard report monitoring. Each scenario was considered valid when the system response was in accordance with the expected output.

The results of black-box testing showed that all tested features ran properly and produced valid outputs. These results indicate that the web-based custom glass ordering system was able to support the ordering process, payment flow, order tracking, and admin management activities according to the system requirements. White-box testing was not used in this study because the testing process was limited to functional evaluation from the user perspective, rather than analyzing the internal logic or source code of the application.

3. Result and Discussion

This section presents the development results based on the RAD stages. The discussion covers the results of requirements analysis, system implementation, functional testing, and the contribution of the developed system to the ordering process at CV Family Kaca.

3.1 Results of the Requirements Analysis

The analysis results show that CV Family Kaca needed a system that could centralize customer orders, reduce repeated recording, and make payment confirmation easier to monitor. The system also needed to provide different access rights for Customer and Admin. This access separation is important because customer features focus on ordering and order tracking, while admin features focus on product data, order verification, and report monitoring.

3.2 System Implementation Results

The implementation produced a web-based custom glass ordering system consisting of a customer interface and an admin interface. The customer interface provides access to the homepage, product catalog,

product details, cart, checkout, payment, and order history. The admin interface provides access to dashboard summaries, order data, order details, payment data, product data, shipping settings, and report information.

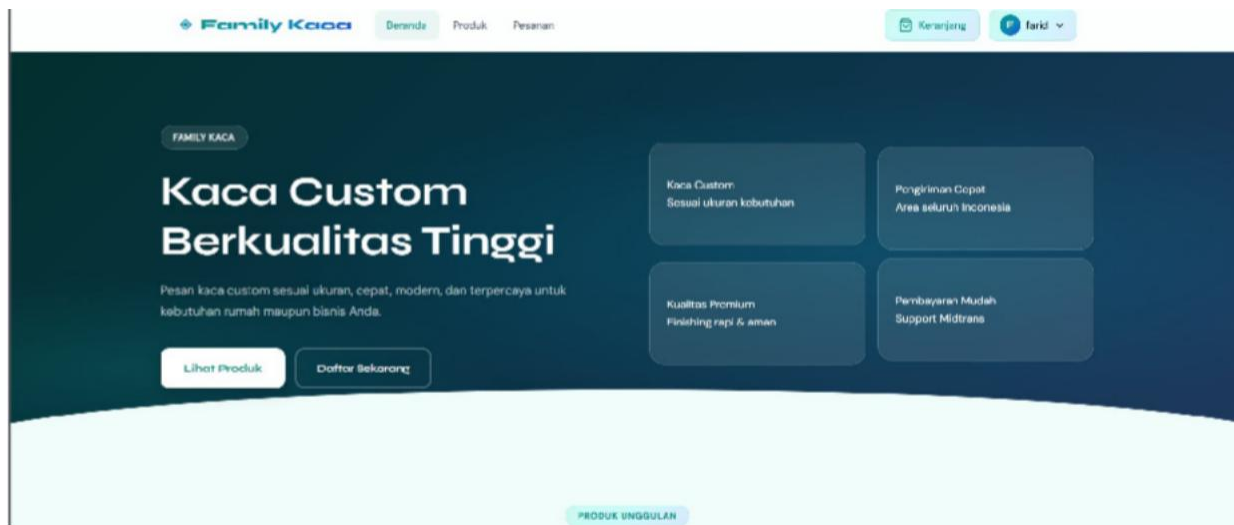


Fig. 3 Customer Homepage

Figure 3 shows the customer homepage. This page introduces the Family Kaca brand, highlights custom glass services, delivery support, premium quality, and digital payment support, and provides navigation to product and cart features. The display is intended to guide customers toward product selection and ordering activities.

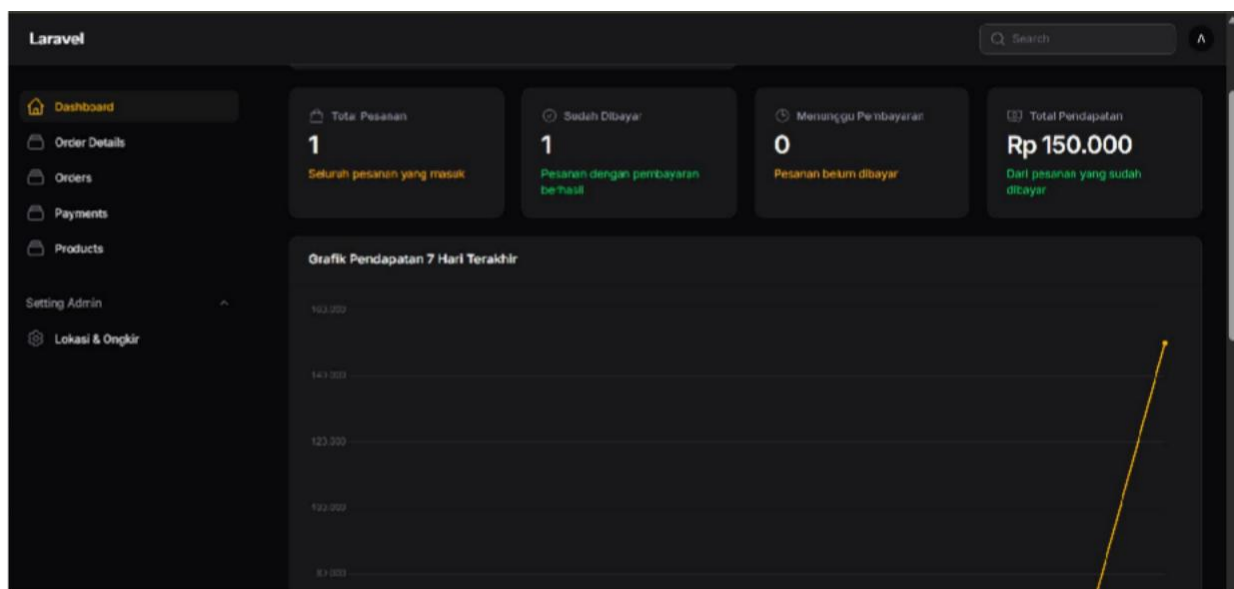


Fig. 4 Admin Dashboard Summary

Figure 4 shows the admin dashboard summary. The dashboard presents total orders, paid orders, pending payments, total revenue, and a seven-day revenue chart. The dashboard helps admin obtain a quick overview of transaction conditions and payment status in one page.

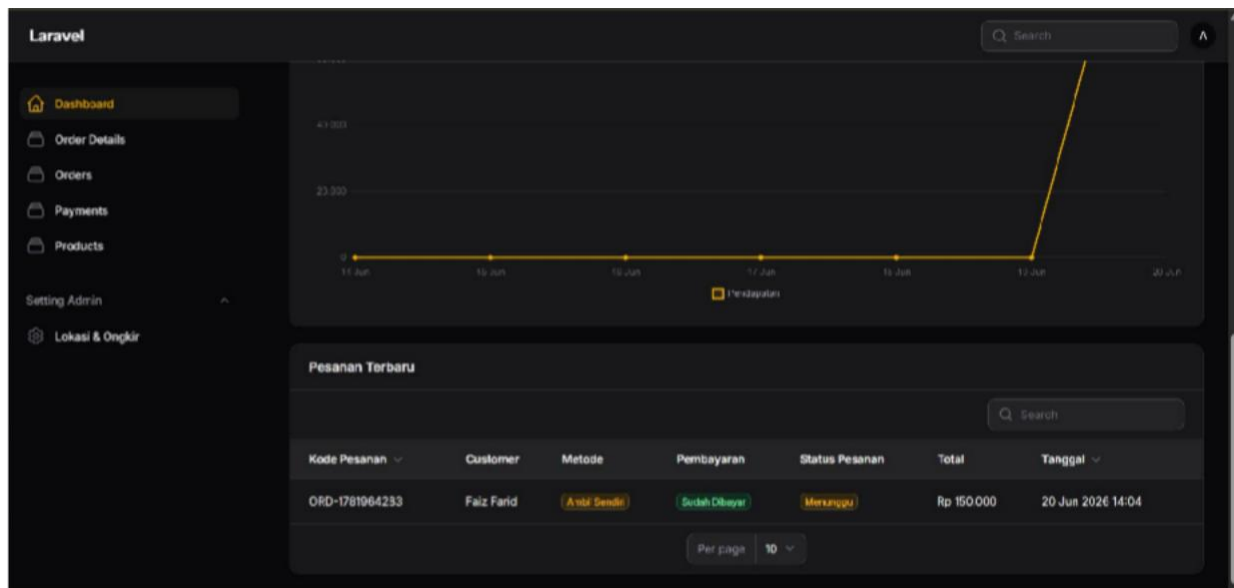


Fig. 5 Order and Revenue Monitoring

Figure 5 shows the recent order and revenue monitoring section. The table displays order code, customer name, fulfillment method, payment status, order status, total payment, and transaction date. This feature helps admin monitor incoming orders and verify the progress of each transaction more efficiently.

3.3 System Testing Results

Black-box testing was performed to ensure that each feature worked according to user requirements. The test scenarios were derived from the main use cases of the system and focused on the correspondence between user input, system process, and expected output.

Table 2. Black-Box Testing Results

No	Feature Tested	Test Scenario	Expected Result	Result
1	Registration	Customer enters valid account data and submits the registration form	Account data is saved and customer can log in	Valid
2	Login	User enters correct email and password	System displays page according to user role	Valid
3	Product catalog	Customer opens the product page	System displays available glass products and product information	Valid

4	Product detail	Customer selects one product from the catalog	System displays detailed product information and available ordering action	Valid
5	Add item to cart	Customer adds a selected product to the cart	System stores the selected item in the cart	Valid
6	Update cart item	Customer changes item quantity or selected order data in the cart	System updates cart content and total correctly	Valid
7	Delete cart item	Customer removes an item from the cart	System deletes the item and recalculates the cart total	Valid
8	Checkout	Customer confirms order data from the cart	System creates an order and directs customer to the payment process	Valid
9	Delivery or pickup selection	Customer selects shipment or self-pickup as fulfillment method	System stores the selected fulfillment method correctly	Valid
10	Payment gateway processing	Customer completes the digital payment process	System records the payment result and displays payment status	Valid
11	Order history	Customer opens order history page	System displays customer order list with status information	Valid
12	Order detail	Customer opens detail of one order	System displays order detail, payment status, fulfillment method, and total payment	Valid

13	Admin login	Admin enters valid account credentials	System displays admin dashboard	Valid
14	Product management	Admin adds, edits, or deletes product data	System updates product data in the database	Valid
15	Order management	Admin opens and updates order data	System displays order details and saves updated order status	Valid
16	Payment management	Admin monitors payment data from customer transactions	System displays payment information and transaction status correctly	Valid
17	User and shipping settings	Admin updates user, shipping cost, warehouse, or pickup configuration	System stores updated configuration data	Valid
18	Dashboard report	Admin opens dashboard page	System displays order totals, payment status, revenue, and chart	Valid

Table 2 shows that all tested scenarios produced valid results. These findings indicate that the system features have met the functional requirements identified during the analysis phase. The testing approach follows previous studies that used black-box testing to confirm the functional suitability of web-based sales and e-commerce applications [13], [14], [15].

3.4 Discussion

The developed system supports the custom glass ordering process at CV Family Kaca by providing a more structured digital workflow. Customers can view product information, submit orders, manage cart contents, choose delivery or pickup, complete payment through the payment gateway flow, and monitor order history. Admin can manage products, verify orders, monitor payment status, update order progress, configure shipping and warehouse settings, and view dashboard reports.

The system reduces dependence on scattered communication channels because order data can be stored in a centralized database. This condition helps minimize repeated recording and makes order history easier to trace. Research on web-based sales systems also states that digital transaction systems can improve product information access, transaction recording, report preparation, and customer service efficiency [1], [2], [3].

The use of payment gateway support strengthens the ordering workflow because customers can complete transactions electronically and admin can monitor payment status more systematically. Online sales research with product, transaction, and payment management features shows that integrated transaction workflows can help admin manage orders and reduce manual checking activities [2], [3], [11].

Compared with previous studies that generally focused on standard product sales, this study focuses on the specific needs of custom glass ordering. Previous systems for clothing, perfume products, digital assets, and musical instruments mainly handle product selection, cart, transaction, and report features [1], [3], [11], [4]. The novelty of this study lies in combining product catalog access, custom order checkout, delivery or pickup selection, payment gateway processing, customer order tracking, and admin order monitoring in the context of custom glass products. Compared with previous research at CV Family Kaca, this study gives more emphasis to structured ordering based on customer-side interaction and transaction monitoring rather than only distribution and online promotion [5].

The implementation also indicates that RAD is suitable for this research because the system requirements require user feedback and iterative improvement. Through prototyping, the ordering flow and admin dashboard can be adjusted to the needs of the owner and admin before finalization. This process helps ensure that the developed system is not only technically functional but also aligned with the actual business process at CV Family Kaca.

4. Conclusions

This study successfully designed and developed a web-based custom glass ordering system at CV Family Kaca using the Rapid Application Development method. The system provides customer features such as registration, login, product catalog, product detail, cart management, checkout, delivery or pickup selection, payment gateway processing, order history, and order detail.

The system also provides admin features such as product management, order management, payment management, user management, shipping and warehouse settings, dashboard reports, and revenue monitoring. The results of black-box testing show that all tested scenarios produced valid outputs according to the expected results, indicating that the main customer and admin functions work according to the defined requirements.

The implementation of this system helps reduce manual recording activities, minimize the risk of order data errors, accelerate transaction processing, centralize order information, and improve customer access to order status. Further development is recommended by adding automatic custom price calculation based on glass dimensions and processing services, improving production scheduling, and expanding report features to support managerial decision-making.

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