JURNAL TEKNOLOGI DAN OPEN SOURCE
Vol. 8, No. 2, December 2025, pp. 1243~1256
e-ISSN: 2622-1659, accredited Four Grade by Kemenristekdikti, Decree No: 152/E/KPT/2023
DOI: https://doi.org/10.36378/jtos.v8i2.5199

Applying the Waterfall method to build applications *E-Commerce* at Palembang City Computer Embroidery Partners

Revina Pravita Sari[1], Karnadi[2],Jimmie[3]
[1,3]Department of Information Technology, University of Muhammadiyah Palembang, South Sumatra
[2]Information Technology Study Program, Faculty of Engineering

Article Info

Article history:

Received 12 07, 2025
Revised 12 16, 2025
Accepted 12 27, 2025

Keywords:

Waterfall Method
Application
Website
E-Commerce

ABSTRACT

The role of public media such as websites is needed to disseminate products or goods, especially for small businesses that have the potential to face competition with other businesses. Websites are an alternative solution to the limitations of the business area and provide the speed of bidding and provide the opportunity to become the best seller. *E-Commerce* makes consumers more time-saving, and differentiates cheaper prices, it provides various things to sell and minimizes crowding in stores, *E-Commerce* Websites support our trade business by providing products and services online to users in various regions. Websites are an alternative solution to the limitations of the business area and provide the speed of bidding and provide the opportunity to become the best seller. The researcher found a problem that the border computer partner figure in data processing is still done manually with paper media. Therefore, the author took the initiative to design *an E-Commerce* information system for Computer Embroidery Partners in Palembang City with a waterfall method design. This waterfall method has a fairly clear workflow, measurable work time and clear documentation. This research was tested with the Blackbox test, with this website it is hoped that it can facilitate the sales system for Computer Embroidery Partners in making sales reports automatically and with this website it is hoped that it can be a promotional medium for Computer Embroidery Partners

Corresponding authors:

Revina Pravita Sari
Department of Information Technology
University of Muhammadiyah Palembang
South Sumatra, Indonesia
Email: revinapravita@gmail.com

1. Introduction

The advancement of the system is now in line with the improvement of computer technology which motivates changes in understanding, both in review and implementation in the field[1]. Today's system plays an important role, almost all aspects of life bring about significant transformations in various sectors, including communication, education, health, and business [2]. In the world of technology, Information

Technology (IT) has become the main pillar in managing, storing, and transferring data. Information Technology has a great impact on improving business. Various ways are done to market their business, including using online sales platforms [3]. The use of the internet by companies in Indonesia has been proven to be able to increase the volume of online buying and selling or E-Commerce. There is high competition among companies competing to provide the best service in an effort to achieve a market leader position in Indonesia. This company takes part in the field of sales in optimizing business processes, sales information systems are very much needed for the Company to operate effectively. This situation encourages better and more efficient service improvements, as well as the ability to manage data quickly, easily, and accurately.

The role of public media such as websites is needed to disseminate products or goods, especially for small businesses that have the potential to face competition with other businesses. In addition to marketing media, the internet is also used for transaction systems, marketing products, services and information that are published using online sales platforms, by using the role of this platform the products, services and information that we have can be seen by all people from various regions. Actually, not only business actors can use websites for marketing, education, learning, product introduction, and many more. Because of its flexible capabilities, websites can be used for a variety of purposes. Various activities that used to be done manually, are now starting to be facilitated by technology that is all fast-paced. A website is a means used to store a variety of information such as text, sound, images, and animations that can be accessed by a computer through the internet. Websites are a means of information based on a computer network that can be accessed anytime and anywhere at a low cost. This platform arose due to the increasing market needs. In this day and age, many people have used websites and the internet as a means of supporting them in doing business and delivering their information, especially in big cities. Websites are often used as an information medium. In addition, websites are also used as social media, which increases speed and facilitates the delivery of communication between individuals. [4] [5] *E-Commerce* is a buying and selling activity that is carried out online through a platform or website. E-Commerce ventures have become a trend in the business world now. *E-Commerce* websites support our trading business by providing online products and services to users in various regions. Websites are an alternative solution to the limitations of the business area and provide the speed of bidding and provide the opportunity to become the best seller. *E-Commerce* allows consumers to save more time, and distinguish cheaper prices, which provides a variety of things to sell and minimizes crowding in stores. [6]

Mitra Bordir Computer is a store that sells a variety of embroidery products, in the form of slings that people usually use at graduation, gordons, logos and names on school children's clothes or work uniforms. This Computer Embroidery Partner is located in Bukit Kecil, Palembang City. In addition, this Computer Embroidery Partner has a branch in one of the shophouses located in Tegal Binangun. The current marketing system uses the process of buyers visiting the location directly or buyers placing orders through WhatsApp chat. In Computer Embroidery Partners, the problem that occurs is promotional media. Marketing is still within the scope of offline stores, data processing is still done manually with paper media. Therefore, the author took the initiative to design an *E-Commerce information system* for Computer Embroidery Partners in the city of Palembang. With the existence of this website, it is hoped that it can facilitate the sales system for Computer Embroidery Partners in making sales reports automatically and with this website, it is hoped that it can be a promotional medium for Computer Embroidery Partners.

2. Research Methods

2.1 Place and Time of Research

The research was conducted over a period of four months, starting from October 2024 and concluding in January 2025. This time frame was deliberately selected to ensure that all stages of the research process could be carried out systematically and comprehensively. The four-month duration allowed the researcher to perform preliminary observations, identify existing problems, collect relevant data, and implement the proposed solutions in a structured manner. During the initial phase, observations and informal interviews were conducted to gain an in-depth understanding of the operational conditions and business processes at the research location. The subsequent stages focused on data collection, analysis, system design, and evaluation to ensure that the research objectives were achieved optimally.

The research location was Mitra Bordir Computer, a business entity engaged in computer-based embroidery services, located in Plaju Darat, Palembang City, South Sumatra. This location was chosen because Mitra Bordir Computer represents a small-to-medium enterprise that actively utilizes digital tools in its daily operations, making it relevant to the scope of this research. Additionally, the business faces practical challenges related to data management and operational efficiency, which align with the focus of the study. Conducting the research at this site provided real-world conditions that enriched the analysis and ensured the applicability of the findings. By situating the research in an actual business environment, the study was able to generate results that are not only academically sound but also practically valuable for similar enterprises..

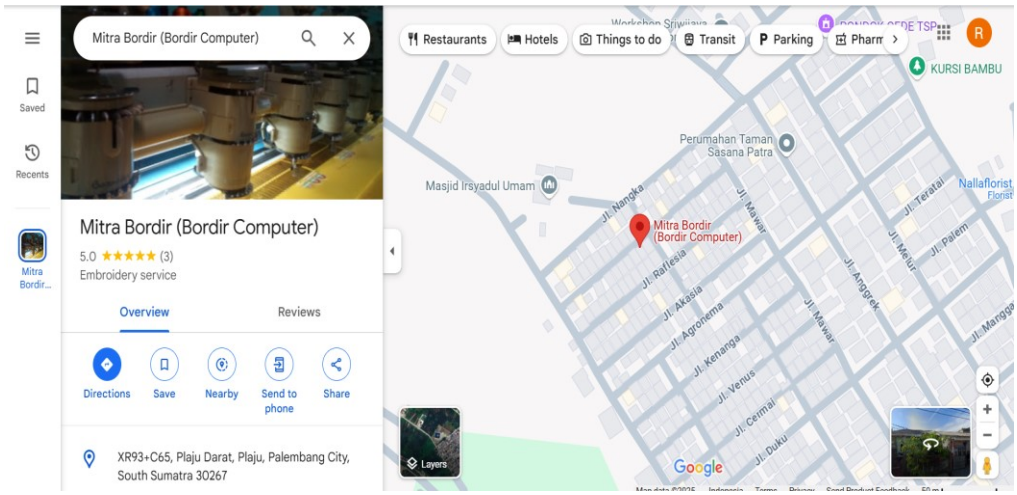

Figure 1. Research Place

2.2 Data Collection Methods

In the discussion of this research methodology, there are several data collection techniques that will be discussed, namely:

a. Observation is a technique carried out by researchers by directly observing the research area to take a close look at the activities that are taking place. Direct observation was carried out at the Palembang City Computer Embroidery Partner to identify existing problems.
b. Literature Studies is a technique that involves collecting data through learning and gathering information from sources such as books, journals, and other references relevant to the topic of this research.

2.3 System Development Methods

Information system development is often referred to as the process of developing a system. The definition of system development includes the drafting of a new system to replace the old system in its entirety or improve an existing system. There are various methods available for system development. System development involves processing or replacing old systems to function better and old systems need to be repaired or replaced to undergo changes towards better and more useful. The need for repair or replacement is caused by various problems that arise [26].

The most well-known method in information system development is the Development Life Cycle (SDLC) system. SDLC is a common methodology used to develop information systems and has several models in the application of process stages, including: Sequential Model (Waterfall), Parallel Model, Iterative Model, Prototyping Model, RAD (Rapid Application Development) Model, Spiral Model, V-Shaped Model, and Agile Development.

The system development model used by the author in this study is the waterfall model. The waterfall method is a systematic approach and follows the order of the existing stages. The Waterfall SDLC model is often referred to as a sequential linear model or a classic life cycle. [2 7]

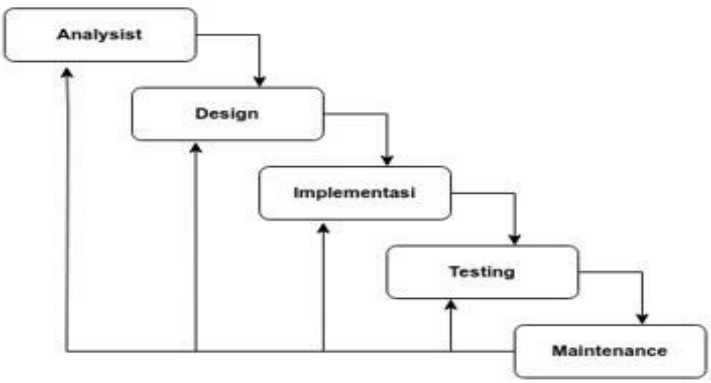

Figure 2. Waterfall Method

a. Analysis
The requirements gathering process is carried out intensively to specify the needs of the software to match the expectations of the user. Needs analysis aims to identify the needs needed in design, both in the form of documents and other sources that can help in determining solutions to existing problems.

b. Design
Software design is a process that involves several steps and focuses on creating a software program, including data structures, interface architecture, and coding procedures. In addition, the design also serves as a guide in the course of the software and includes detailed algorithms.

c. Implementation
At this stage, the design should be translated into the software program code. The result of this stage is a computer program that corresponds to the design that has been designed in the previous stage.

d. Testing
Testing focuses on evaluating the logical flow and functional performance of the software to ensure that every feature operates according to the specified requirements. This stage aims to identify potential errors, inconsistencies, or system failures before the software is fully implemented. By conducting thorough testing, developers can ensure that the outputs generated by the system match the expected results and meet user needs. In this study, the testing process employs the Blackbox Testing method, which emphasizes testing system functionality without examining the internal code structure. This approach allows the tester to assess the system from the user's perspective by providing various input scenarios and observing the resulting outputs. Through Blackbox Testing, each function is verified to confirm that it responds correctly to valid inputs and handles invalid inputs appropriately. The application of this method is expected to ensure that the software design that has been developed can run smoothly, reliably, and in accordance with the initial specifications, thereby increasing system quality and user satisfaction.

e. Maintenance
The last stage, i.e. the maintenance stage, can repeat the development process starting from the analysis of specifications to changes to existing software, but not to create new software.

2.4 System Planning

System design is a process that aims to design or improve an existing system to be better and able to carry out work effectively and efficiently. In the design of this website, Unified Modelling Language (UML) was used, which is a visual language for modeling and communicating about systems through diagrams and supporting text. Here's an explanation of the system design:

2.4.1 Running system

Figure 3 illustrates the manual purchasing process carried out at Mitra Bordir Computer in Palembang City. The process begins when the buyer comes directly to the Computer Embroidery Partner outlet located in Cinde Market. At this stage, the buyer observes the available embroidery products, including the types, designs, and prices offered by the seller. After selecting the desired product, the buyer engages in a price negotiation process with the seller until an agreement is reached that is acceptable to both parties. Once the price has been agreed upon, the buyer is asked to provide a phone number, which serves as an important communication medium for confirming order details, production progress, and completion notifications. This communication is especially necessary because the embroidery process requires time before the product is ready to be collected. After providing contact information, the buyer proceeds to make the payment according to the agreed price. This manual process relies heavily on direct interaction and verbal communication, which can potentially lead to inefficiencies and data recording limitations.

An overview of the running system is:

1. Overview of the running system
2. There are 2 actors who carry out activities in the system, including sellers and buyers.
3. Data processing is still done manually
4. Transactions can only be made in person.

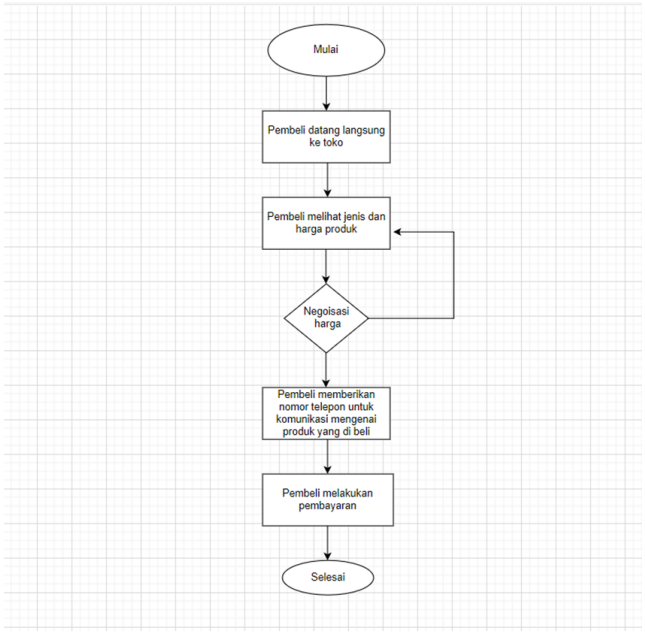

Figure 3. Running systems

2.4.2 Follow-up system

This proposed system overview is a description of a system where buyers can access online purchase websites. Buyers can see the products available on the Computer Embroidery Partners website, besides that buyers can also see the details of each product, then if the buyer wants to buy the product it will be directed to the cart page, if the buyer wants to make a payment then the buyer must log in first, if you already have an account the buyer can directly log in, if you don't have an account the buyer must register or register first.

After successfully accessing the payment page, the buyer is redirected to the payment confirmation page. On the payment confirmation page, buyers are required to fill out a form containing the payment number, payment amount, payment method, and payment date. If you have made the payment, the status on the order will change to already paid. The following is an overview of the system running on the Embroidery Partner application which describes the system workflow as follows:

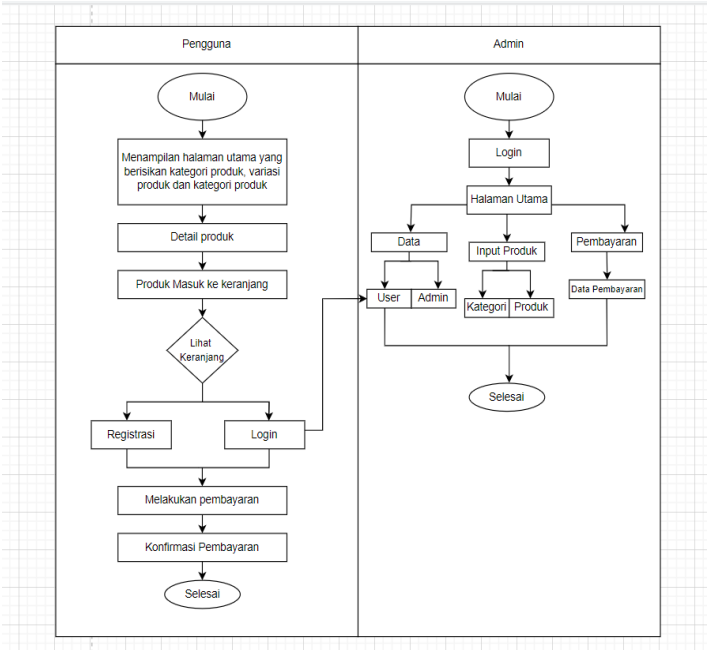

Figure 4. Proposed system

2.4.3 UseCase Diagram

Figure 5 below explains the use case diagram in the design of the system that the author made, there are 2 actors who can access the system determined by the account level, including:

1. Users
   Users have access to register, login, view products, select products, purchase products, put products in carts, and make payments.
2. Admin
   Admins have access to login, process products, process user data, process order data, and transactions.

Figure 5. Usecase

2.4.4 Diagram Activity

In figure 6 below, it explains the flow of the purchase Activity Diagram which is designed when the buyer opens the website, the main page will appear, the main page displaying the product and product category. When the buyer wants to see the product details then the system will display the product details page based on the selected product. After viewing the product details and entering the product into the cart, the buyer wants to proceed to the checkout page, but the buyer is required to register or log in first. Log in using your email and password. After logging in, the buyer can proceed to the payment page and fill out the payment confirmation form.

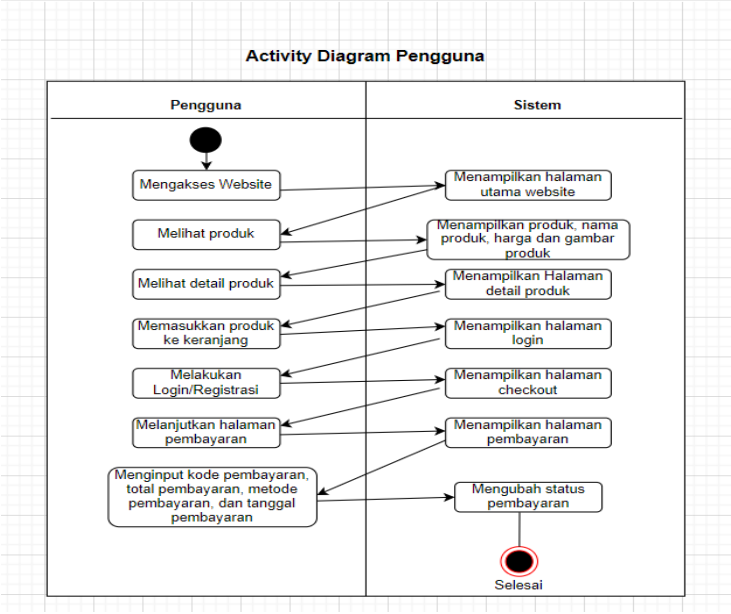

Figure 6. User Activity Diagram

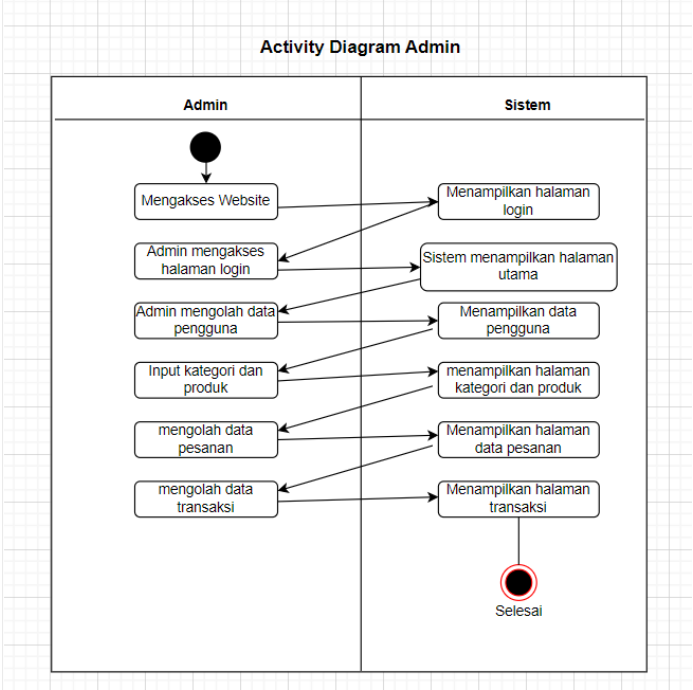

Figure 7. Activity Diagram Admin

In Figure 7. Above is explained the flow of the Activity Diagram for admins that is designed when the admin wants to access the website page. Admins will be redirected to the login page, where they will need to enter their email and password to enter the main admin page. After successfully accessing the login page, the system displays the main page that has 7 menus, namely products, product categories, sliders, customer data, order data, payment data, and admin profiles. Admins can choose one of these menus.

2.4.5 Class Diagram

The image below explains the class diagram about the relationship between entities used on the Computer Embroidery Partner website.

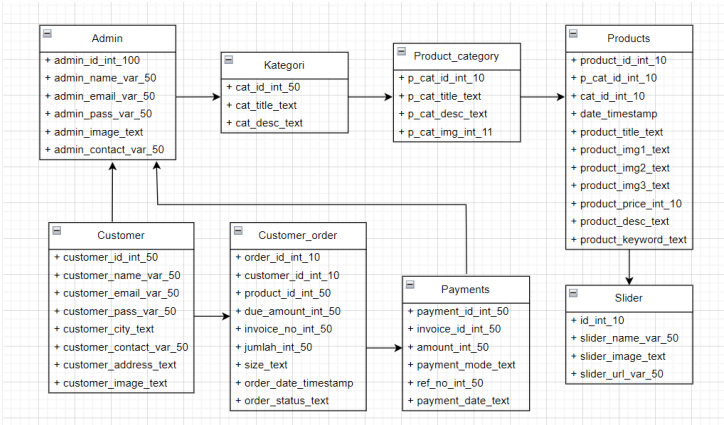

Figure 8. Calss Diagram

Figure 3.9 is a design of the Class Diagram from the Computer Embroidery Partners website. Where, programmers can understand database design when building the Palembang City Computer Embroidery Partner website.

3. Results and Discussion

3.1 Website Interface Design

3.1.1 Home

This page has 6 menus that have uses, namely home, shop, about, cart, register, My Account, and Login pages.

Figure 9. Website Home Page

3.1.2 Product Page

The product page functions to display the products sold on the Mitra Bordir Computer website.

Figure 10. Product Page

3.1.3 Product Detail Page

The product details page serves to display the details of each product sold such as the number of products to be ordered, the variety of products, and the price of the product.

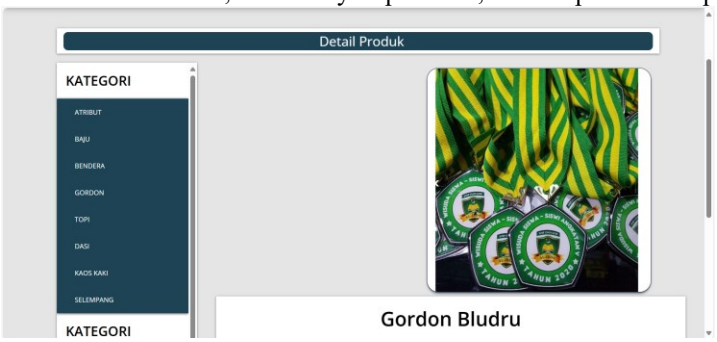

Figure 11. Product Detail Page

3.1.4 User Login Page

The user login page functions so that users can make orders and payments on this website. Because if they do not log in, customers cannot make orders and payments. The email and password that are filled in are the data that the customer fills in when registering.

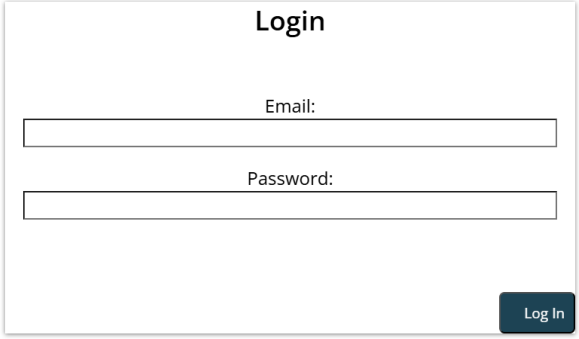

Figure 12. User Login Page

3.1.5 User Registration Page

The user registration page functions so that customers can log in. Because if the customer does not have an account, then the customer cannot log in, cannot make orders and payments.

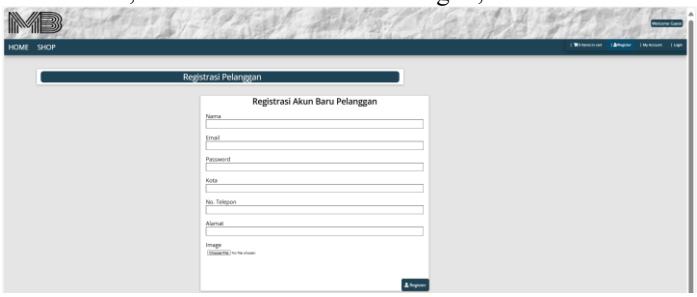

Figure 13. User Registration Page

3.1.6 Cart Pages

The cart page serves to enter the products to be purchased before making a payment.

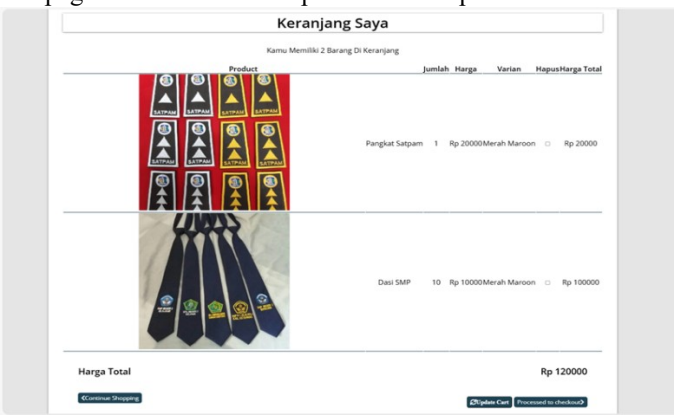

Figure 14. Cart Pages

3.1.7 Checkout Page

After placing the product in the basket. Users can make payments by clicking confirm now and will display a form to make a payment.

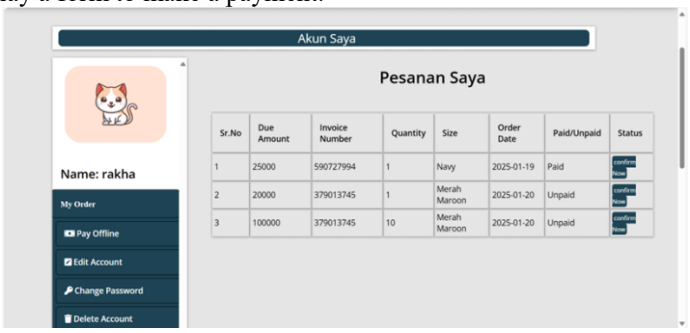

Figure 15. Checkout Page

3.1.8 Checkout Page

The payment page displays several forms that customers must fill out when they want to make a payment, such as entering the payment number, the amount of the price to be paid, the payment method, the reference code and the date of payment.

Figure 16. Checkout Page

3.1.9 User Account Page

The user account page displays a user page where on the side there are several menus such as orders, payments, edit accounts, change passwords, and delete accounts.

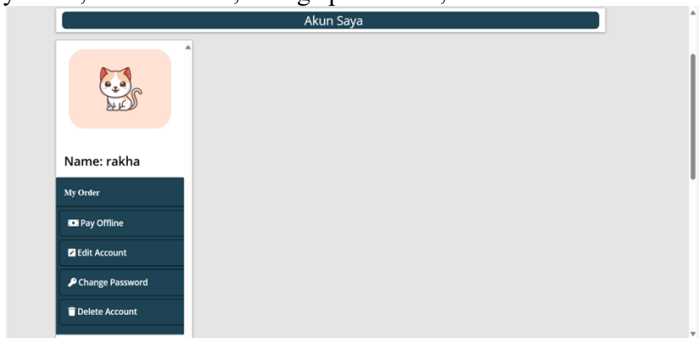

Figure 17. User Account Page

3.1.10 Admin Login Page

The admin login page functions to access the main page of the admin by filling in the email form and password, if the admin does not log in. As a result, admins can't access the main page.

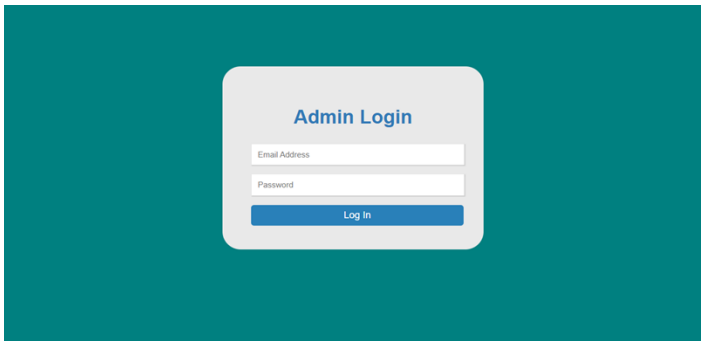

Figure 17. Admin Login Page

3.1.11 Product Page

The product page serves to display the products sold on this website. On this page displays the product name, product image, product price, product addition date, remove and edit product.

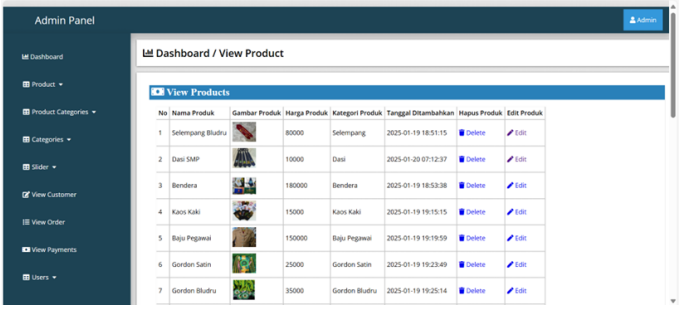

Figure 17. Product Page

3.1.12 Banner Page

The banner page displays several banner photos displayed on the user's main page. On this page, admins can delete and edit banner photos.

Figure 18. Banner Page

3.1.13 User Data Page

The user data page displays data from the users of this website. On this page, you can display the user's name, email, user photo, user's city of origin, user's phone number, user address, and on this page the admin can also delete the user's data.

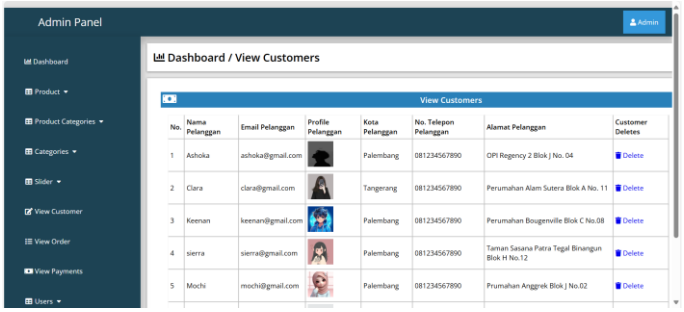

Figure 19. User Data Page

3.1.14 Order Data Page

The order data page displays orders from customers. On this page you can view the email, payment number, product name, number of products ordered, product variation, order date, total price, order status and on this page admin can delete the order data.

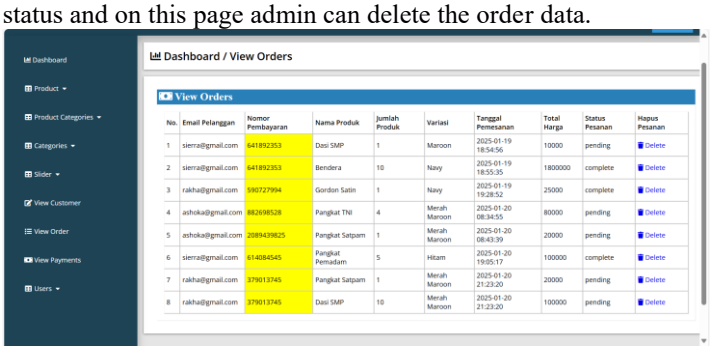

Figure 20. Order Data Page

3.1.15 Payment Data Page

The payment data page displays payments made by subscribers. On this page you can view the payment number, payment amount, payment method, reference code, payment date, and on this page the admin can delete the payment data.

3.2 Black Box Test Results

The following are the results of Black Box Testing testing for various pages, including main page, root page, product detail page, user login page, user registration page, cart page, checkout page, payment page, user account page, order page, edit account page, change password page, delete account page, admin login page, admin main page, product page, add product page, product category page, Product Category Add Page, Banner Page, Add Banner Page, User Data Page, Order Data Page, Payment Data Page, and Admin Account Page, which can be seen in the table below:

Table 1. Black Box Test Results

No.	Features	Expected results	Test Results	Conclusion
1	Home	The website is capable of displaying the main page of the website	A website can display the main page of the website	Successful
2	Product Page	The website is capable of displaying the product pages sold	The website can display the product page of the website	Successful
3	Product Detail Page	The website is capable of displaying pages of product details	The website can display a page of the details of the products sold	Successful
4	User Login Page	The website is able to log in to the user section	The website can log in on the user's login page	Successful
5	User Registration	The website is able to	The website can	Successful

	Page	register on the user page	register on the user page	
6	Cart Pages	The website is able to put the product in the cart	Websites can put products in carts	Successful
7	Checkout Page	The website is able to checkout when the product has been added to the cart	The website can checkout when the product has been added to the cart	Successful
8	Checkout Page	The website is capable of making payments	The website can make payments	Successful
9	User Account Page	The website is able to access the user account page	The website can access the user account page	Successful
10	Order Page	The website is able to access the order page in the user's account	The website can access the order page in the user account section	Successful
11	Account Edit Page	The website is able to edit accounts consisting of name, email, city, phone number, address and photo of the customer	The website can edit the account consisting of name, email, city, phone number, address and photo of the customer	Successful
12	Change Password Page	The website is able to change the password on the user's page	The website can change the password on the user's page	Successful
13	Delete Account Page	The website is able to delete the account	Websites can delete accounts	Successful
14	Admin Login Page	Admin is able to log in to the website on the admin page	Admins can log in to the website on the admin section page	Successful
15	Admin Home Page	Admin is able to access the main page of the admin	Admins can access the main admin page	Successful
16	Product Page	Admins can access product pages	Admins can access the product page	Successful
17	Add Products Page	Admins can add products	Admins can add products	Successful
18	Product Categories Page	Admins can access the product category page	Admins can access the product category page	Successful
19	Add Product Categories Page	Admins can add product categories	Admins can add product categories	Successful
20	Banner Page	Admins can access banner pages	Admins can access the banner page	Successful
21	Add Banner Page	Admins can add banners	Admins can add banners	Successful
22	User Data Page	Admins can access user data pages	Admins can access user data pages	Successful
23	Order Data Page	Admins can access the order data page	Admins can access the order data page	Successful
24	Payment Data Page	Admins can access payment data	Admins can access payment data	Successful
25	Admin Account Page	Admins can access the admin account page	Admins can access the admin account page	Successful

4. Conclusion

Based on the discussion and description of the results of the research in the previous chapter, the following conclusions can be drawn:

a. With the existence of *an E-Commerce* system built using the waterfall method, the purchasing process at Mitra Bordir Computer becomes more efficient and structured.

b. The system allows customers to place orders online, which were previously done manually, thus saving time and effort.
c. The use of websites as a promotional and transaction medium can increase market reach and make it easier to manage sales data.

Acknowledgments

From the above conclusion, the author gives suggestions, including:

a. Prepare Hardware and Software that have adequate specifications to support the performance of this E-Commerce system so that it can run optimally.
b. Perform periodic data backups to anticipate unwanted data loss.
c. Develop the system by adding new features that can improve the user experience, such as product recommendations and more diverse payment methods.
d. Conduct regular system testing to ensure that all functions are running properly and according to the needs of the user.

References

[1] Anharudin, A, & Nurdin, A. (2018). Design and Build Course Registration Administration Information System (Case Study: Ghibrant English Course-Pandeglang). *PROSISKO: Journal of Research Development and Observation of Computer Systems, 5(2).*
[2] Arini, D, & Rahman, A. (2023). Design and build a school website using the CodeIgniter 3 framework (Case study: SDN 12 OKU). *Journal of Infotama Media, 19(1)*, 162-167.
[3] Cahyodi, S. C, & Arifin, R. W. (2017). Web-based Point of Sales Information System in Amaranta Colony Bekasi. *Information System For Educators And Professionals Journal of Information Systems, 1(2), 189-204.*
[4] Effendy, E, et al. (2023). Da'wah Management Information System Decision Making. *Journal of Education and Counseling (JPDK), 5(2)*, 4314-4320.
[5] Fadillah, A. R, & Fajarita, L. (2020). Design and development of a web-based e-commerce application to increase sales at the Naufal Leather Jacket Shop. *IDEALIS: InDonEsiA journaL Information System, 3(1)*, 85-91.
[6] Fernandes, A. L. (2019). E-commerce Design to Expand Communication Products at PT. Golden Communication is Web-Based Mobile. *urnal Teknik Ibnu Sina (JT-IBSI), 4(01)*, 95-100.
[7] Firmansyah, M. D, & Herman, H. (2023). Website-based e-commerce web design at Toko Ida Shoes. *Journal of Information Systems and Technology (JOINT), 4(1)*, 361-372.
[8] Frisdayanti, A. (2019). The role of brainware in management information systems. *Journal of Information Systems Management Economics, 1(1)*, 60-69.
[9] Handayani, S. (2018). Design of an e-commerce-based sales information system case study of the Jakarta kun shop. *ILKOM Scientific Journal, 10(2)*, 182-189.
[10] Iqbal, M., Sutarman, S, & Irmansyah, D. (2019). Design of a Web-Based Project Management Information System at PT Visionet Data International. *Academic Journal of Computer Science Research, 1(1).*
[11] Karnadi, K, et al. (2021). Design and build a web-based payroll information system for lecturers and employees at the Faculty of Engineering UM-Palembang. *Digital Journal of Information Technology, 4(1)*, 32-38.
[12] Kartika, D., & T.B., D. R. Y. (2024). Project Monitoring Information System of the Public Works and Spatial Planning Office of Aceh Province. *Journal Of Informatics And Computer Science, 10(1)*, 48-54.
[13] Murdiani, D, & Hermawan, H. (2022). Comparison of waterfall and RAD (Rapid Application Development) methods in information system development. *Journal of Information Technology, 6(1)*, 14-23.
[14] Novianto, D. (2016). The implementation of a web-based employee information system (Simpeg) uses the Codeigniter and Bootstrap frameworks. *Global Informatics Scientific Journal, 7(2).*
[15] Podungge, E. S, et al. (2020). Implementation of the Salary Information System for Employees of the Kasimbar District Office, Parigi Moutong Regency. *Journal of Electronic Information Systems and Computers, 4(1)*, 63-74.
[16] Pramesti, A, et al. (2023). The application of operational management in the digital era and the development of e-commerce. *Economics, Business Finance and Entrepreneurship*, 88-97.

[17] Purnama, M. J., et al. (2023). E-Commerce Transactions: A Business Process Modelling. *In SENADA (National Seminar on Management, Design and Application of Technology Business) (Vol. 6, pp. 266-271).*
[18] Romadhon, M. H, et al. (2021). The car rental information system with Android chassis and website uses the Codeigniter framework 3 Case Study: CV Kopja Mandiri: Array. *Journal of Information Systems and Civilization Technology, 2(1)*, 30-36.
[19] Rosaly, R, & Prasetyo, A. (2019). Definition of Flowchart and Functions and Most Commonly Used Flowchart Symbols.
[20] Saputri, R. D, & Setyadi, R. (2023). IFSTORE e-commerce website design with the Waterfall method. *Infoman's: Journal of Informatics and Management Sciences, 17(2).*
[21] Seran, K. J. T, & Naiheli, V. N. (2021). Development of media to promote the potential of Oepuah Village using the waterfall method. *Journal of Information and Technology, 1(1), 31-36.*
[22] Sukamdani, N. B., & Wahyu Istuningsih, W. (2018). DESIGNING A WEBSITE-BASED E-COMMERCE STRATEGY TO INCREASE SALES. *(CASE STUDY OF "SONGKETKITO" TYPICAL FABRIC OF PALEMBANG).*
[23] Widiana, S. A, & et al. (2023). Web-Based Clothing Sales Application (E-Commerce) with Code Formulation. *Journal of Information Technology Software Engineering and Computer Science (ITSECS), 1(1),*.
[24] Wijaya, Y. D, & Astuti, M. W. (2019). A web-based tour ticket sales information system uses the waterfall method. *In Proceedings of the National Seminar on Information and Communication Technology (SENATIK) (Vol. 2, No. 1, pp. 273-276).*
[25] Wijoyo, A, & et al. (2023). Design and build a web-based e-commerce application using the waterfall model (Case Study: Mandapal Indonesia). *LOGIC: Journal of Computer Science and Education, 1(6),* 1399-1405.
[26] Wirayuda, M, & Sutabri, T. (2024). Design of a Sales Information System for Manggleng Chips Based on E-Commerce Website with the Waterfall Method. *IJM: Indonesian Journal of Multidisciplinary, 2(3)*, 57-67.
[27] Yudin Wahyudin, D. N. R. (2020). Analysis of Website-Based Information System Development Methods: A Literature Review. STMIK Rosma). *Intercom Journal: Journal of Scientific Publications in the Field of Information and Communication Technology, 15(3).*