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Web-Based E-Commerce Application Development with Real-Time Notifications via Telegram Bot

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Abstract This research aims to develop a web-based e-commerce system equipped with real-time notifications through a Telegram bot. The background of the study originates from issues in sales transactions that are still conducted through chat messages, which often lead to delayed confirmations and irregular order recording. The system being developed is expected to simplify the transaction process, improve data organization, and enhance the efficiency of communication among system users. The research employs an Agile approach with development stages that adapt to user needs. The system is designed to support three types of users with different access rights: customers, employees, and owners. The main features implemented include product management with ready-stock and pre-order categories, order management, payment confirmation, transaction history, sales reports, and automated notifications via a Telegram bot. Testing was conducted using Black Box Testing to evaluate system functionality, along with external testing to obtain feedback from users. The test results indicate that the system operates according to its functions and provides a good level of user satisfaction. Based on these findings, it can be concluded that the system is capable of improving the effectiveness and efficiency of business processes while supporting the digitalization of small and medium enterprises, particularly in the integrated management of ready-stock and pre-order product models.

Keywords *Agile; Bot Telegram; Django; E-Commerce;*

1. INTRODUCTION

The development of information and communication technology has changed the transaction patterns of modern society, especially with the advent of e-commerce as a practical solution for buying and selling activities. E-commerce allows consumers to make purchases without having to be physically present in a store, making it more efficient and in line with the needs of the digital age. (Hapan & Usman, 2024; Rezkia, 2024). This creates opportunities for Micro, Small, and Medium Enterprises (MSMEs) to expand their market

reach and increase competitiveness amid changing consumer behavior. (Anam & Yosepha, 2024).

However, in reality, many MSME players still face obstacles in optimally adopting digital technology. Naura Collection, one of the Muslim fashion MSMEs, still does not have an adequate e-commerce system. Transactions are still conducted through direct visits or chats with administrators, which often results in delays in order confirmation and the absence of an automatic reminder system, making it easy for orders to be overlooked. This difference illustrates a **gap analysis,** namely between das sollen (MSMEs should be able to utilize modern e-commerce systems) and das sein (in reality, they still rely on inefficient manual methods).

Previous studies have discussed the development of web-based e-commerce applications with additional features such as payment gateways, inventory management, and automatic notifications. Cahyani & Yaqin (2024) Developing a fashion sales system with a payment gateway and Telegram bot for real-time notifications. Gunawan & Kosasi (2022) designing Django-based inventory software for recording stock items. Other research by Fatman, Nafisah, & Pambudi (2023) implementing the Midtrans payment gateway to facilitate digital transactions. Iqbal, Djamaludin, & Anam (2023) building a web-based cashier application using the Agile method, while Andipradana & Hartono (2021) using the Scrum model for MSME online sales applications.

Although these studies show a significant contribution to the digitization of MSMEs, there are still research gaps that can be developed. Most studies focus on the integration of payment systems and inventory management, while the integration of real-time transaction notifications based on Telegram bots for MSMEs with ready stock and pre-order products has rarely been studied in depth. This demonstrates the novelty (state of the art) of this research, which presents a web-based e-commerce application with Telegram bot integration that is not only intended for customers but also provides notifications for employees.

Thus, this study offers a new solution in supporting the digitization of MSMEs, particularly Naura Collection, through a web-based e-commerce application using the Django framework equipped with real-time notification features via Telegram bot. This integration is expected to improve communication efficiency, accelerate transaction flows, and minimize the risk of missed orders.

Based on the above description, the purpose of this research is to design and develop a web-based e-commerce application with real-time notifications via Telegram bot, in order to improve the effectiveness and efficiency of business operations and provide a better transaction experience for customers and employees.

2. RESEARCH METHOD

This research uses the Agile software development method with the Scrum approach. Scrum was chosen because it is iterative and flexible, allowing for gradual Sytem development and adaptation to user needs.

Gambar 1. Scrum stages

The development process is divided into several stages as follows:

2.1. Product Backlog

The product backlog is a list of prioritized system requirements compiled based on observations, interviews, and needs analysis at Naura Collection. These requirements include key features such as ready stock and pre-order product management, product catalog, product search, ordering, payment, Telegram bot integration for real-time notifications, and administrative features.

2.2. Sprint Planning

Sprint planning is the initial planning stage before the sprint begins. At this stage, the team determines which backlog items to work on, sets sprint goals, and details the estimated time required for completion. This stage ensures that each sprint has clear and measurable targets.

2.3. Sprint Backlog

The sprint backlog contains a list of tasks selected from the product backlog to be completed in a single sprint. This list focuses on priority needs, such as implementing the home page, integrating the product catalog, or developing Telegram bot notifications.

2.4. Daily Scrum

A daily scrum is a brief daily meeting that serves to monitor development progress, discuss obstacles, and plan the next activities. Although this research was conducted within an individual context, the principle of daily scrum was still adapted by recording daily progress as a form of monitoring.

2.5. Sprint Review

Sprint reviews are conducted at the end of each sprint to review the results that have been achieved. Interim products (increments) are tested and evaluated by owners and users. The feedback obtained will be used as a basis for improvement in the next sprint. Through the Scrum stages, this research produced a web-based e-commerce application using the Django framework and integrated real-time Telegram bot

notifications, which is expected to improve transaction and communication efficiency at Naura Collection MSMEs.

3. RESEARCH RESULTS

The results of this study were obtained through the application of the Agile method with the Scrum approach. Each stage of Scrum produced an increment in the form of feature development in accordance with system requirements.

3.1. Product Backlog

The product backlog contains the main system requirements based on analysis at Naura Collection, including ready stock and pre-order product management, catalog, product details, search, ordering, and real-time notifications via Telegram bot. This list forms the basis for sprint planning so that requirements can be realized gradually according to priority.

Tabel 1. Product Backlog

User	Features	Description
Customer	Home	View products without logging in
	Products by Category	Searching for products by brand
	Product details	Description, variants, colors, sizes, stock, and prices
	Login	Log in
	Registration	Create a new account
	User profile	Can access personal data
	Shipping address	Save shipping address
	Shopping cart	Selecting products before checkout
	Payment form	Making a transaction
	Payment details	Transaction information
	Transaction history	List of all orders
Employees and Owners	Login	Access to internal systems
	Dashboard	Monitoring data summaries
	Product categories	Product grouping
	Product size	Managing product size variants
	Product color	Managing product color variants
	Banner	Managing banners
	Account number	Managing account numbers
	Customer level	Assigning levels to customers

	User data	Managing customer data
	Product	Managing products
	Product variants	Managing variants per product
	Color variants	Managing colors per variant
	Size color variations	Managing size per color
	Payment list	Displaying transaction data
	Payment details	Managing payment details
	Payment details	Displaying sales data
	Stock report	Displaying stock availability
	Payment report	Displaying the payment list

3.2. Sprint Planning

Sprint planning is done to divide the product backlog into smaller, measurable sprints that can be completed within a certain period of time. In this study, sprint planning was divided into seven sprints with time estimates adjusted according to the complexity of each feature.

Tabel 2. Sprint List

Sprint	Duration	Sprint Phases	Features being worked on	What is expected
Sprint 1	2 weeks	- Literature review - Data colections - Sytem Requirements Analysis	No technical features were worked on during this phase.	Understanding user needs (owners and employees), documenting literature study results to design applications.
Sprint 2	4 weeks	- Needs Analysis - System design	User interface (UI) design and application structure.	Obtaining a clear design for further development, including system architecture.
Sprint 3	4 weeks	Application development (coding and initial feature implementation).	Home page, product catalog, and product search.	Complete the initial appearance of the application with a product catalog feature that is easy for users to navigate.

Sprint 4	4 weeks	Advanced application development (focus on pre-order and checkout features)	Fitur pre-order, checkout dan sistem notifikasi.	Implementation of a product ordering system with pre-order features, notification reminders, and checkout process.
Sprint 5	3 weeks	Pengujian sistem (Blackbox dan external testing).	Testing all developed features.	Identify and fix bugs and ensure that all features work properly according to user expectations.
Sprint 6	2 weeks	Evaluation and improvement based on test results and user feedback.	Improvements to features found to be problematic during testing	Improve application performance based on test results and feedback from users and stakeholders.
Sprint 7	3 weeks	Preparation of reports and documentation, preparation of presentations.	No technical features were worked on during this phase.	Preparation of clear documentation on research development and results, as well as structured presentation preparation.

3.3. Sprint Blacklog

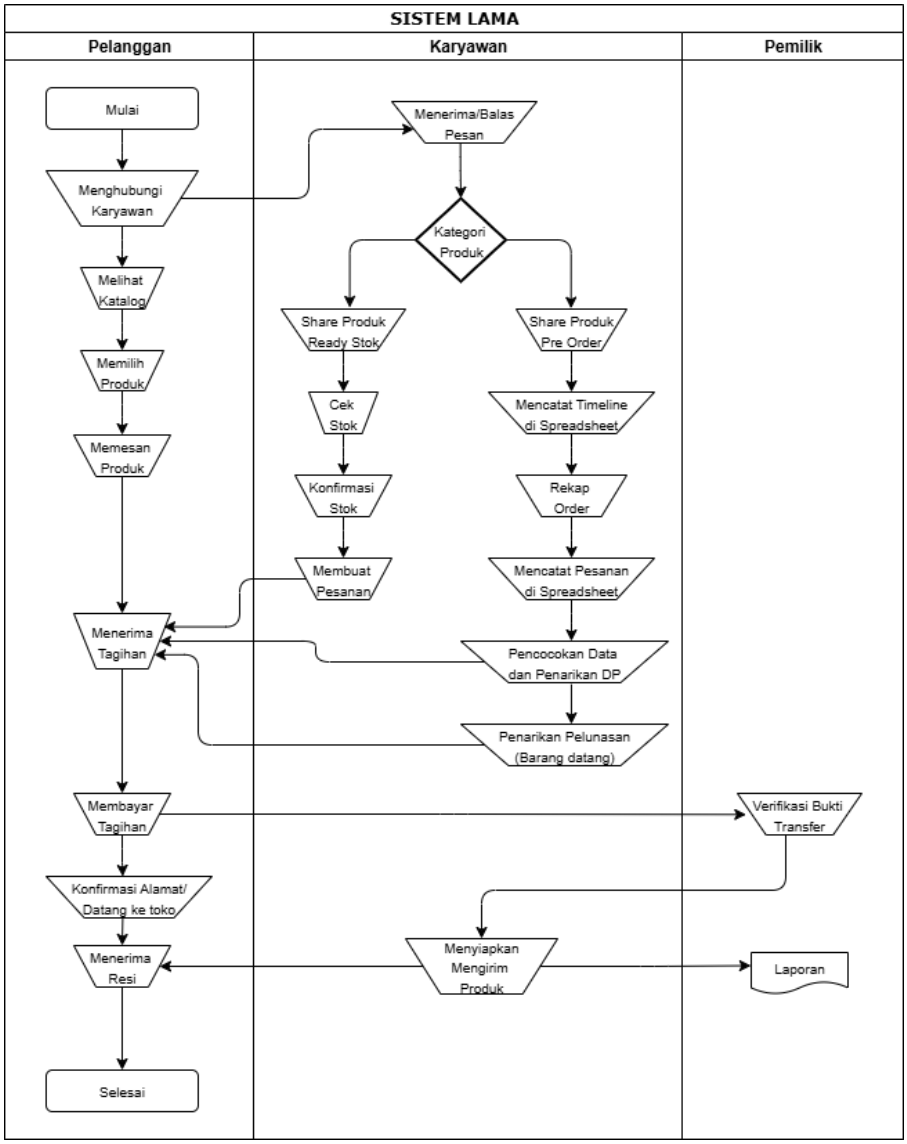
The sprint backlog is a list of tasks selected from the product backlog to be worked on during each sprint. This list contains the technical activities required to implement the features in the system according to priority.

1. Sprint 1 – Literature Study, Data Collection, Needs Analysis

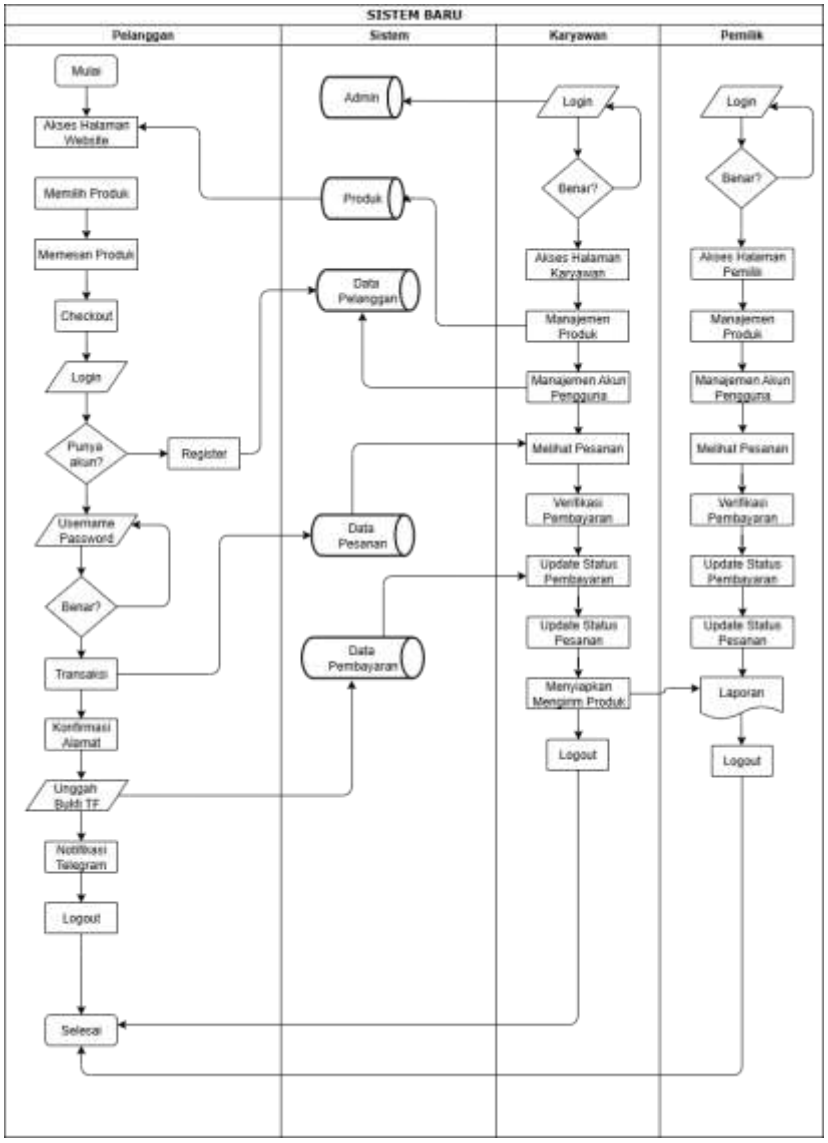
   Sprint 1 is the initial stage of developing the Naura Collection e-commerce system using the Agile Scrum method. The main focus of this sprint is data collection, which will form the basis for system design and development in the next sprint. This stage focuses on needs analysis and documentation, so it does not yet cover the implementation of technical features.

2. Sprint 2 – System Design

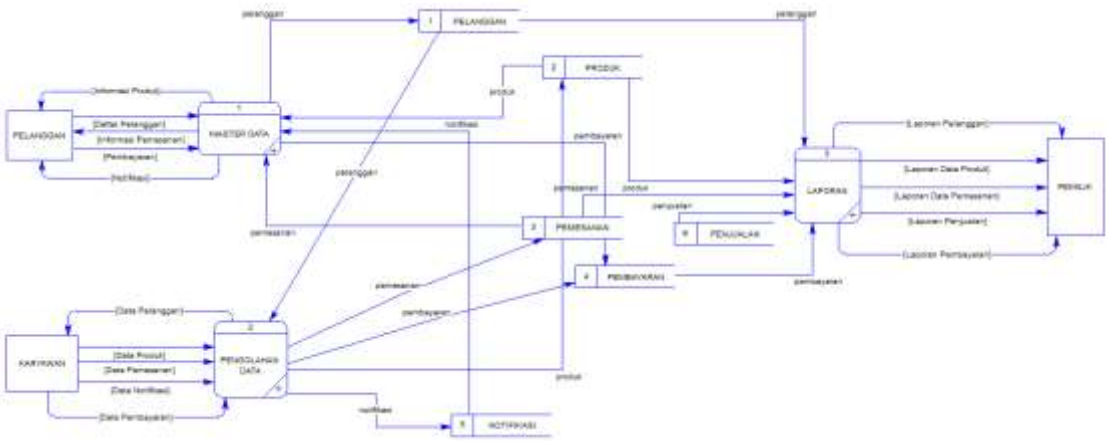
   After Sprint 1 produced a list of requirements, Sprint 2 focused on system design, including process flow modeling, data structure, and user interface. This stage aims to develop a system framework as the basis for implementation in the next sprint and provide a comprehensive overview of the Naura Collection e-commerce system.



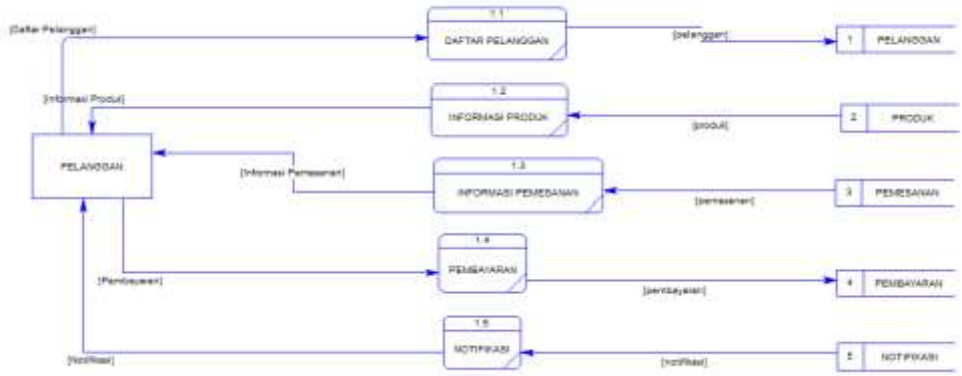
Gambar 2. Old System



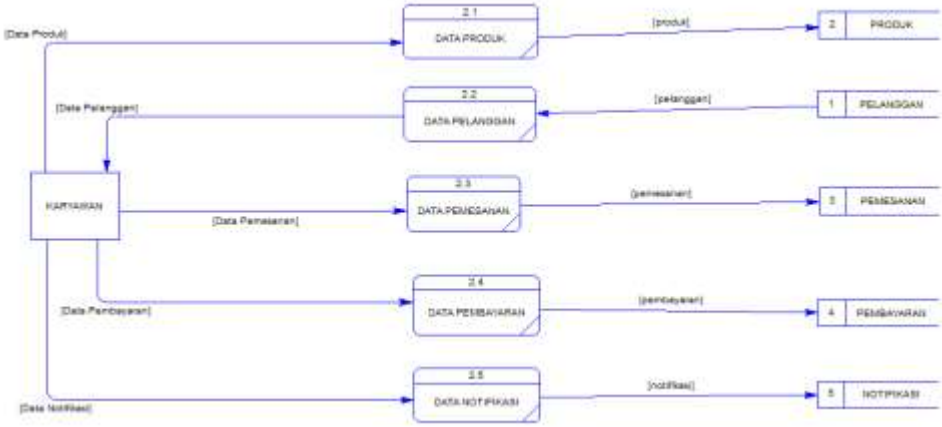
Gambar 3. New System



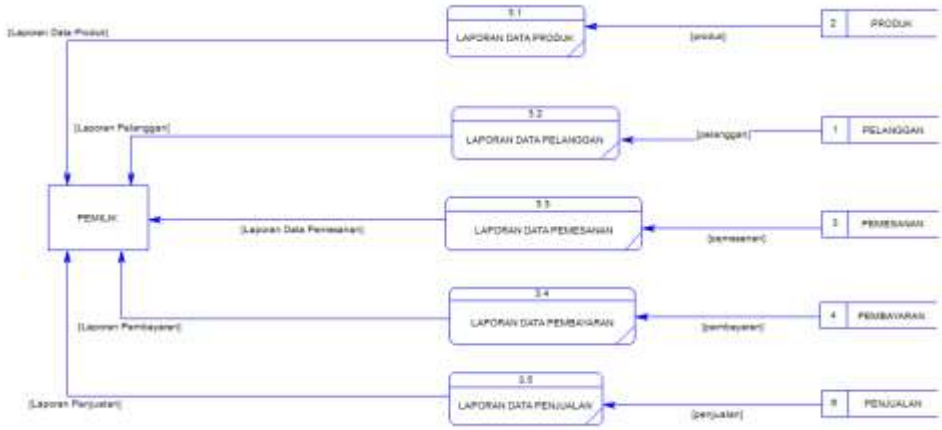
Gambar 4. DFD Level 1



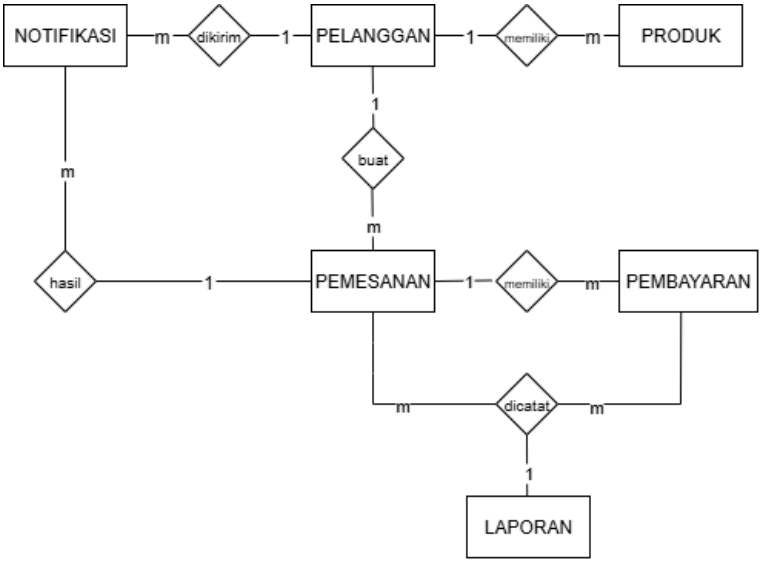
Gambar 5. DFD Level 2 Costomer



Gambar 6. DFD Level 2 Employee



Gambar 7. DFD Level 2 Owner

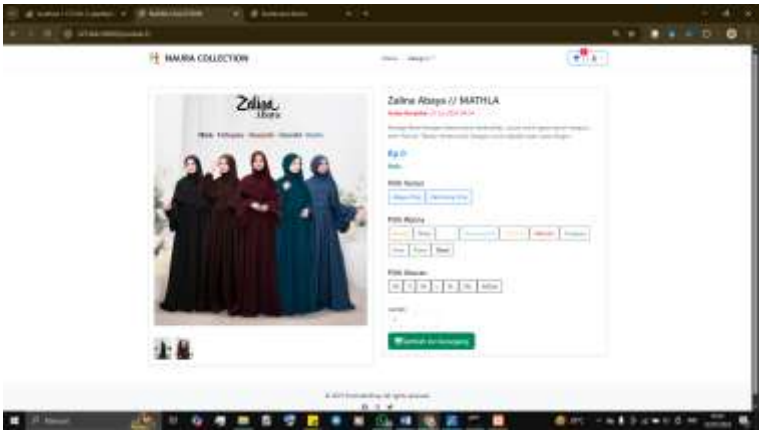


Gambar 8. ERD

3. Sprint 3 – Implementasi Fitur Dasar

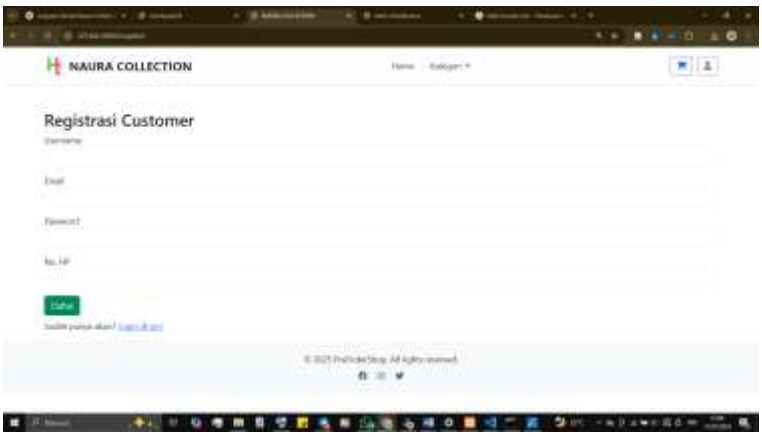
Sprint 3 is the stage of implementing the system design into a Django-based web application with reference to the database and interface design. At this stage, core features were developed, namely account registration, user data management, and access to product details prior to transactions.

Gambar 9. Home Costumer service



Gambar 10. Product Details

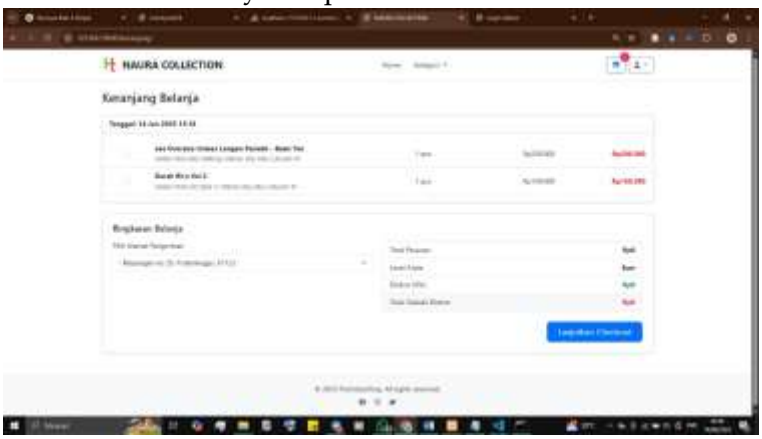
Gambar 11. Login



Gambar 12. Registration

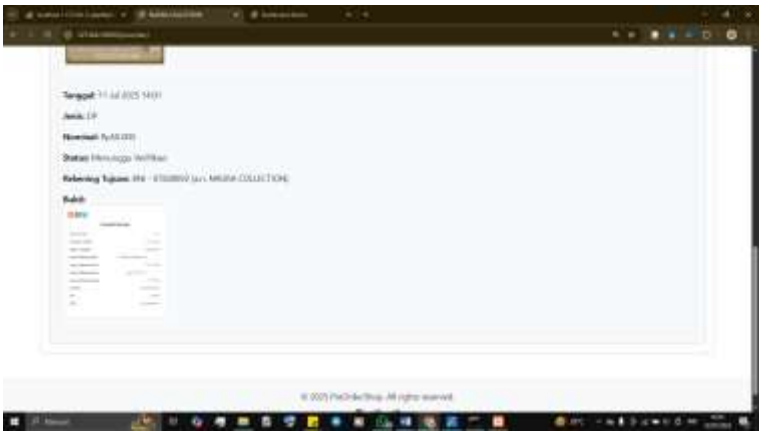
4. Sprint 4 – Implementasi Fitur

Sprint 4 focuses on implementing transaction features that enable customers to make purchases, as well as developing modules for employees and owners to manage products, orders, payments, and reports. This stage is key to ensuring that the system can function fully as a platform. *e-commerce.*

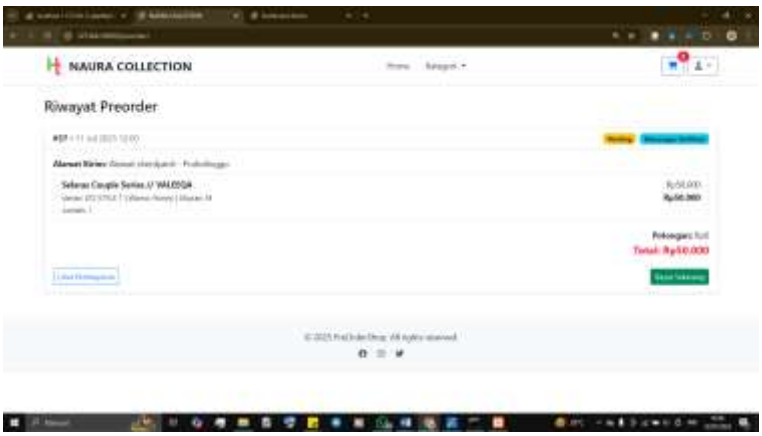


Gambar 13. Basket

Gambar 14. Payment Form



Gambar 15. Payment Details



Gambar 16. Transaction History

5. Sprint 5 – Hasil Pengujian

System testing was conducted to ensure that the Naura Collection e-commerce application functions properly and meets user needs. Internal testing was conducted using the black box testing method, which resulted in a score of 0.905, indicating that all major features of the system are functioning properly. In addition, external testing involved seven respondents consisting of owners, administrators, and customers. User evaluation results show a satisfaction level of

88.93%, indicating that the system is well accepted and capable of improving transaction efficiency at Naura Collection.

6. Sprint 6 – System Evaluation, Improvement, and Maintenance

   Sprint 6 focuses on evaluating test results and system maintenance. The improvements made include consistency in the interface display, validation of registration and payment data, report presentation, and transaction recording logic related to installment payments. In addition, the limitation of Telegram notifications, which can only be sent to employees, was noted as an area for further development. Maintenance is performed periodically, including bug fixes, feature updates, and technical and functional adjustments to ensure the system remains optimal for use.

7. Sprint 7 – Dokumentasi dan Persiapan Presentasi

   Sprint 7 is the final stage of developing the Naura Collection e-commerce system, focusing on compiling research documentation and preparing presentations. The documentation contains the entire process, starting from literature studies, needs analysis, system design (DFD, ERD), interface implementation, to test results, accompanied by application screenshots. In addition, presentation materials were prepared to present a coherent summary of the research to the examiners. Although this is the final stage, the system still has potential for further development, especially in Sprint 6 evaluation, such as automatic reduction of down payment/installment amounts and Telegram notifications to customers, in accordance with the Agile principle that emphasizes continuous improvement.

3.4. Daily Scrum

A daily scrum is a brief meeting held every day during a sprint to ensure progress remains on track. The main focus includes activities that have been carried out, plans to be implemented, and obstacles encountered. Dalam penelitian ini, daily scrum In this study, daily scrums were conducted flexibly between researchers and supervisors, adjusting to the context of individual research.

3.5. Sprint Review

In this study, daily scrums were conducted flexibly between researchers and supervisors, tailored to the context of each study. The evaluation was conducted through feature demonstrations, user feedback collection, and improvement identification. The results of the sprint review form the basis for improvements in the next sprint so that the system develops continuously according to user needs.

4. CONCLUSION

This research successfully developed a web-based e-commerce system equipped with real-time notifications via Telegram bot to support the operations of Naura Collection in Probolinggo. The system includes key features such as ready stock and pre-order product management, ordering, payment, sales reports, and transaction status notifications. The results of implementation and testing show that the system is capable of speeding up the ordering process, simplifying inventory management, and improving the regularity of transaction recording. Based on Black Box testing, the system achieved a success rate of 90.5%, while external testing with seven respondents showed an average

satisfaction rate of 88.93%. This proves that the system has fulfilled the research objectives by providing effective digital solutions to improve store operational efficiency.

Further research is recommended to integrate the system with a payment gateway so that payments can be made automatically, add a delivery tracking feature to improve the customer experience, and develop an analytics dashboard to support store owner decision-making. With this development, the system is expected to be more adaptive to user needs and contribute to supporting digital transformation in the MSME sector.

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