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Development of an AI-Based Customer Service Information System for MSME XYZ

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ABSTRACT

This research aims to develop an Artificial Intelligence (AI)-based customer service information system for MSME XYZ. The study addresses problems in manual customer service processes, including slow response times, repetitive customer inquiries, and unstructured order management that affect operational efficiency and customer satisfaction. The study applies the Research and Development (R&D) method using the Rapid Application Development (RAD) approach. The developed system is a WhatsApp-based AI chatbot integrated with the n8n automation platform, supported by a PostgreSQL database and a web-based dashboard using Budibase. The system provides automated real-time responses, manages product information requests, processes customer orders, and handles customer complaints. System testing was conducted using the Black-Box Testing method to evaluate system functionality. The results indicate that all systems feature operate according to the specified requirements. The implementation of the AI-based chatbot system improves customer service efficiency, reduces manual workload, accelerates response time, and supports digital transformation for MSMEs.

Keyword: AI Chatbot, Customer Service Information System, MSMEs, n8n, WhatsApp, Automation

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1. INTRODUCTION

The rapid development of information technology has significantly transformed business activities, particularly in customer service management. In the digital era, customers expect fast and responsive services that are accessible at any time. One technology increasingly used to improve customer service efficiency is the Artificial Intelligence (AI)-based chatbot. AI chatbots are capable of providing automated real-time responses, reducing repetitive manual tasks, and improving communication efficiency between businesses and customers [1], [2].

MSMEs play an important role in Indonesia's economy, contributing 61,07% to the national Gross Domestic Product (GDP) and absorbing around 97% of the national workforce [3]. However, many MSMEs still rely on conventional customer service processes such as manual messaging and unstructured order recording, resulting in slow response time and inefficient customer interaction management. MSME XYZ is one of the businesses that still manages customer service manually through WhatsApp personal messages. Based on

observations and interviews with the business owner, customer inquiries are dominated by repetitive questions related to product information, prices, stock availability, and ordering processes, which may reduce customer satisfaction and operational efficiency.

Several previous studies have discussed the use of AI chatbots in customer service systems. Research by Lubis et al. showed that AI chatbots can improve service effectiveness through real-time responses [4]. Other studies also explained that low-code and no-code platforms simplify chatbot development for users with limited technical knowledge [5]. However, research related to AI chatbot automation integrated with workflow automation platforms for MSMEs in Indonesia is still limited.

Therefore, this research proposes the development of an AI-based customer service information system integrated with the n8n automation platform. The developed system utilizes WhatsApp as the primary communication platform and is supported by a PostgreSQL database and a web-based dashboard using Budibase. This research applies the Research and Development (R&D) method using the Rapid Application Development (RAD) approach. The system is expected to improve customer service efficiency, reduce manual workload, accelerate response time, and support digital transformation for MSMEs [6].

2. METHODS

This research applied the Research and Development (R&D) method using the Rapid Application Development (RAD) approach. The RAD approach was selected because it supports iterative and rapid system development according to user requirements. The development process consists of several stages, including requirement planning, system design, implementation, testing, and evaluation [7]. This approach also allows system development to be conducted more flexibly through continuous user feedback and iterative improvements.

2.1 Requirement Planning

The requirement planning stage was conducted through observation and interviews with the owner of MSME XYZ to identify existing customer service problems. The analysis showed that customer service activities were still handled manually through WhatsApp personal messages, resulting in slow response times, repetitive customer inquiries, and unstructured order management. Based on these findings, the identified requirements were categorized into functional and non-functional requirements, including automated customer responses, product information management, order processing, customer complaint handling, data synchronization, and dashboard-based monitoring features as the basis for system development [8], [9].

2.2 System Design

The system design stage was carried out using Unified Modelling Language (UML) diagrams to describe system workflows and user interactions [10]. The developed system integrates WhatsApp, n8n, PostgreSQL, and Budibase into a connected customer service management system. WhatsApp was used as the primary communication platform, while n8n was implemented to automate chatbot workflows and customer interaction processes. PostgreSQL was used as the database management system for storing customer, product, order, and complaint data, whereas Budibase was utilized to develop the web-based dashboard interface for admin and super admin users.

2.3 Technologies Used

The developed system utilized several technologies to support chatbot automation and customer service management. WhatsApp API was used to support automated customer communication services, while the n8n automation platform was implemented to manage chatbot workflows, system integration, and data processing activities. PostgreSQL was used as the database management system to store customer interaction data, orders, products, and complaints. In addition, Budibase was utilized to develop the dashboard management interface, and JavaScript with Node.js technologies were implemented to support system integration and workflow execution [11]. The technologies used in the developed system are summarized in **Table 1**.

Table 1. Technologies Used

Technology	Function
WhatsApp API	Customer communication platform
n8n	Workflow automation and chatbot integration
PostgreSQL	Database management system
Budibase	Web-based dashboard development
JavaScript	System integration scripting
Node.js	Backend workflow execution

2.4 Implementation

The implementation stage involved developing an AI-based chatbot integrated with n8n workflow automation. The chatbot system was designed to provide automated real-time responses, display product information, process customer orders, and handle customer complaints automatically. In addition, the dashboard system was developed to support product management, order monitoring, customer interaction management, and report visualization. The integration between the chatbot system, PostgreSQL database, and dashboard enable automatic synchronization of customer and transaction data in real-time. The implemented system architecture of customer and transaction data in real-time [12].

2.5 Testing

System testing was conducted using the Black-Box Testing method to evaluate system functionality based on input and output results. The testing process focused on validating chatbot features, dashboard functions, login authentication, order processing, customer complaint handling, and database synchronization. Each feature was tested to ensure that the expected outputs matched the actual system behaviour. The testing results were used to ensure that all system components operated according to the specified requirements and that all the chatbot system was capable of responding to customer requests automatically while synchronizing data correctly with the dashboard management system [13].

3. RESULTS AND DISCUSSION

This section presents the implementation and evaluation results of the AI-based customer service information system developed for MSME XYZ. The system integrates WhatsApp chatbot automation using n8n with a PostgreSQL database and a web-based dashboard using

Budibase. The developed system supports customer service activities, including product information request, order processing, customer complaint handling, and customer interaction management.

3.1 System Implementation

The developed system consists of several integrated components, including WhatsApp, n8n workflow automation, PostgreSQL database, and Budibase dashboard. WhatsApp functions as the primary communication platform between customers and the chatbot system, while n8n is used to automate chatbot workflows and customer interaction processes. PostgreSQL stores customer, product, order, and complaint data, whereas Budibase is used to manage operational data through a web-based dashboard interface.

The chatbot workflow begins when customers send messages through WhatsApp. The messages are processed automatically through the n8n workflow to identify customer requests and retrieve information from the PostgreSQL database. The system then generates automated responses based on the customer's request category. In addition, all customer interaction data are recorded automatically to support monitoring and reporting activities. The integration between WhatsApp, n8n, PostgreSQL, and Budibase enables automatic synchronization of customer and transaction data in real-time. The implemented workflow architecture is shown in **Figure 1**.

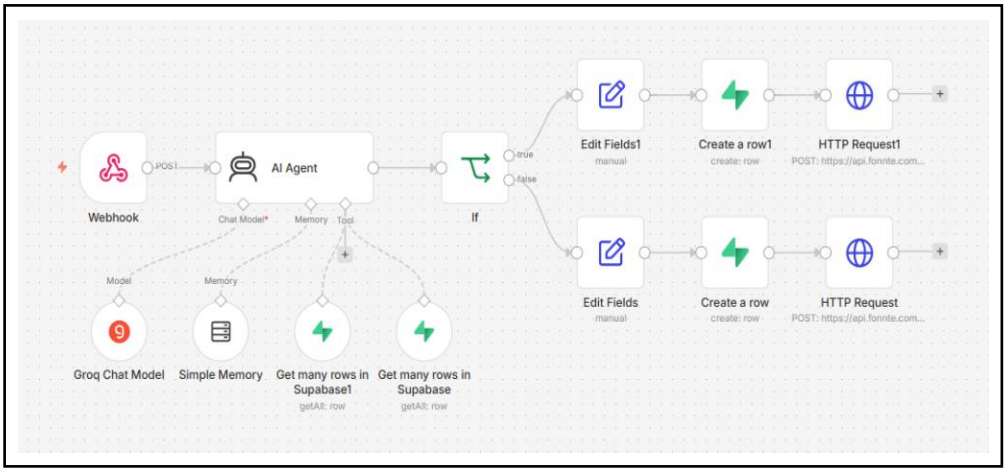

Figure 1. System Architecture and n8n Workflow

The implemented workflow consists of several automated processes connected through the n8n platform. The workflow starts when customer messages are received through the WhatsApp webhook service. The system then processes customer requests using AI-based automation and retrieves related information from the PostgreSQL database. Based on the customer request category, the chatbot automatically generates responses related to product information, order processing, or customer complaints.

The integration between WhatsApp, n8n, PostgreSQL, and Budibase enables data synchronization between the chatbot system and the dashboard. Product data updated through the dashboard are automatically synchronized with chatbot responses, allowing customers to receive updated product information in real-time. In addition, the implementation of workflow automation simplifies customer service management processes by reducing repetitive manual activities and improving response consistency during customer interactions.

3.2 Dashboard Management System

The dashboard system was developed using Budibase to support customer service management for MSME XYZ. The dashboard can be accessed by admin and super admin users through a web-based interface developed using Budibase. Role-based control was implemented to ensure that users only access features according to their responsibilities and authorization levels.

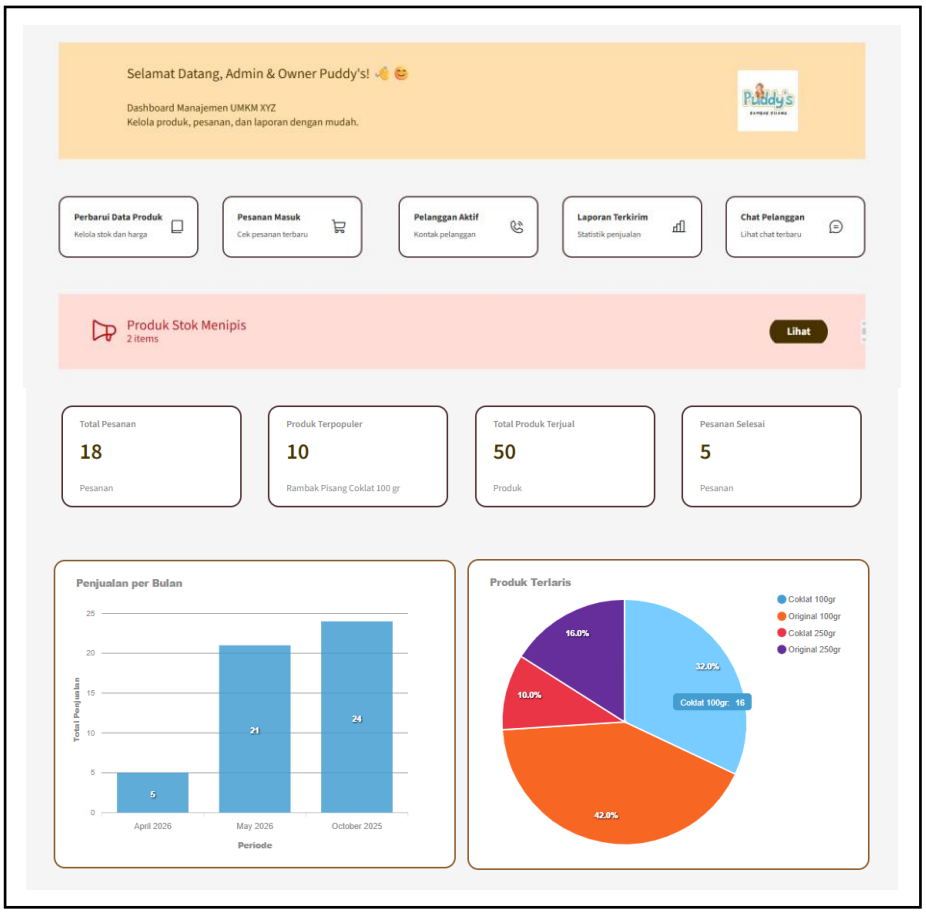

Figure 2. Dashboard Management Interface

The dashboard provides several management features, including product management, order management, customer management, customer interaction monitoring, and report visualization, as shown in **Figure 2**. The product management feature allows admin users to add, edit, and delete product information such as product names, prices, stock availability, and product descriptions. Product data updated through the dashboard are synchronized automatically with the chatbot system to ensure customers receive updated information in real-time.

The order management feature supports customer order monitoring and customer order management. Orders submitted through the WhatsApp chatbot are automatically stored in the PostgreSQL database and displayed on the dashboard interface. Admin users can monitor order status, customer information, and transaction details through the dashboard. In addition, the dashboard also provides graphical report visualization to display transaction summaries and customer interaction statistics in real-time.

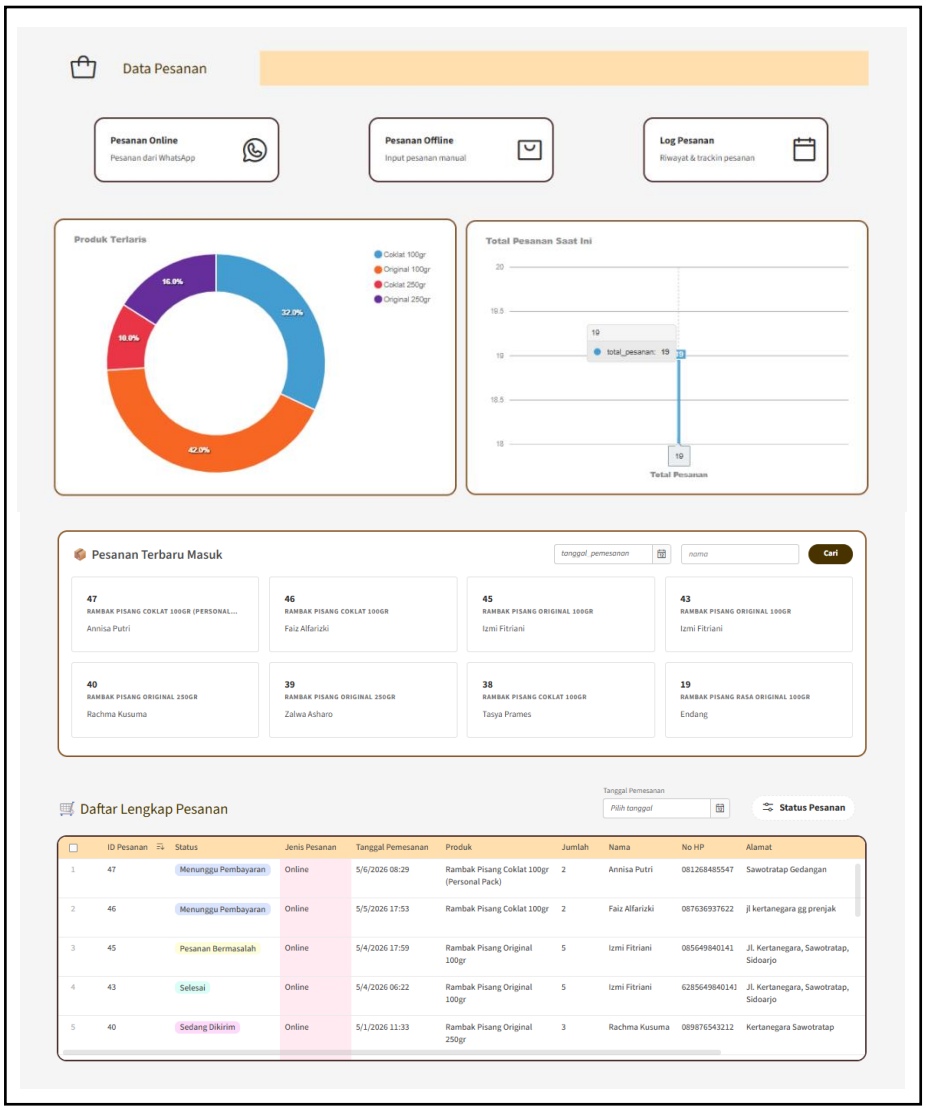

Figure 3. Order Management Interface

The system also provides customer interaction monitoring features that display customer management, customer chat history and interaction records. This feature helps admin users monitor customer communication activities and evaluate customer service performance. In addition, the dashboard includes graphical report visualization to present transaction summaries and customer interaction statistics in real-time.

Figure 3 shows the order management interface developed to support customer order monitoring and transaction management activities. The interface provides several features, including online order management, offline order input, order tracking, recent order monitoring, and complete order data management. Admin and super admin users can monitor order status, customer information, product details, and transaction history through the dashboard interface in real-time.

The order management dashboard also provides graphical visualization and order summaries to support operational monitoring activities. Through this interface, business owners can identify product sales trends, monitor order activities, and manage customer transactions more efficiently. In addition, the integration between the dashboard and the

WhatsApp chatbot system enables automatic synchronization of order data, reducing manual administrative activities and improving transaction management efficiency.

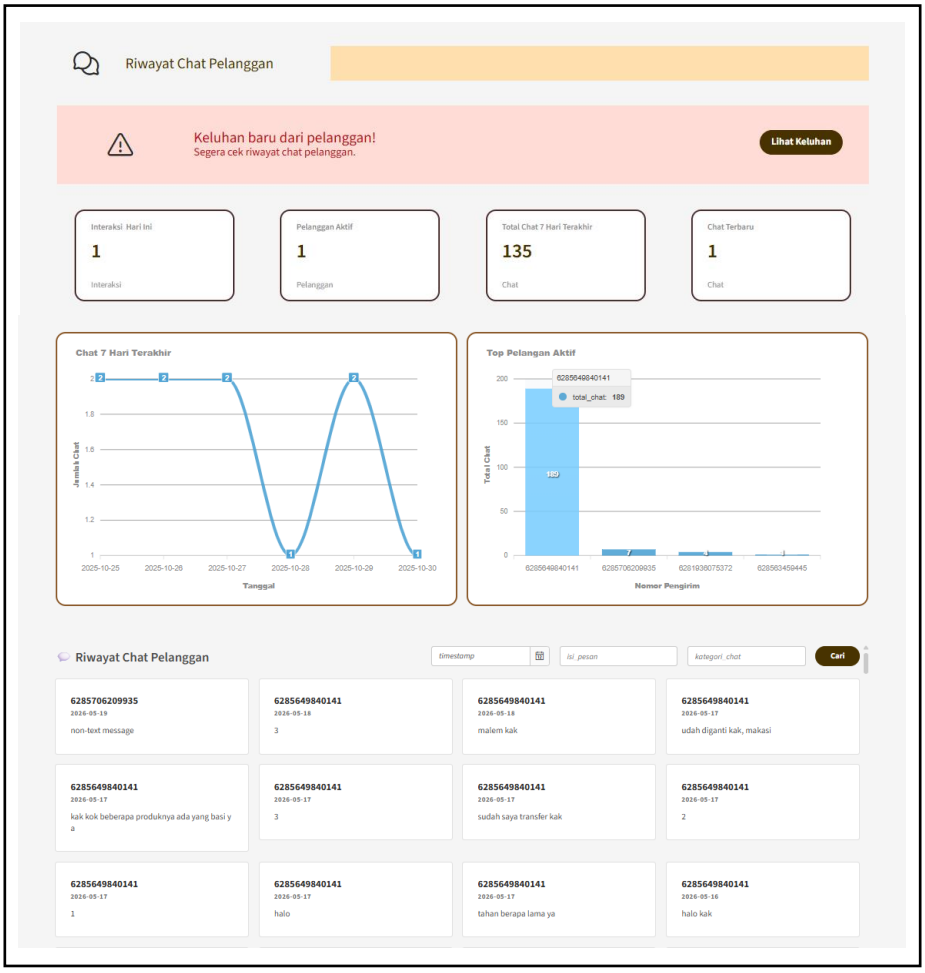

Figure 4. Customer Interaction Monitoring

The dashboard management system improves operational monitoring by providing centralized access to customer interaction data, transaction records, and report visualization, as shown in **Figure 4**. The implementation of graphical reports and monitoring features also assists business owners in evaluating customer service performance and monitoring operational activities in real-time. In addition, the dashboard interface simplifies customer data management and supports more organized business operations.

3.3 Chatbot Features

The WhatsApp-based chatbot system provides several automated customer service features to support MSME XYZ operations. One of the main features is automated product information services. Customers can request product information and prices through WhatsApp messages. The chatbot automatically retrieves the requested information from the database and sends responses to customers in real-time.

The automated chatbot interaction feature enables customers to access customer service information more efficiently without requiring direct manual responses from business owners. Through WhatsApp integration, customers can obtain product information, stock availability, prices, and ordering procedures automatically at any time. The implementation

of automated chatbot responses also helps reduce repetitive customer inquiries and improves communication consistency during customer interactions.

Figure 5. Automated WhatsApp Chatbot Interaction

Figure 5 shows the automated chatbot interaction implemented through WhatsApp integration. The chatbot provides several automated menu options to help customers access services such as product information, ordering services, and customer complaint handling. The implementation of automated chatbot responses helps reduce repetitive customer inquiries and improves communication consistency during customer interactions.

The chatbot system also provides automated product list and product information services integrated with the PostgreSQL database. Customers can request product lists, prices, stock availability, and product descriptions directly through WhatsApp interactions. Product information displayed by the chatbot is synchronized automatically with the dashboard management system to ensure the customers receive updated information in real-time.

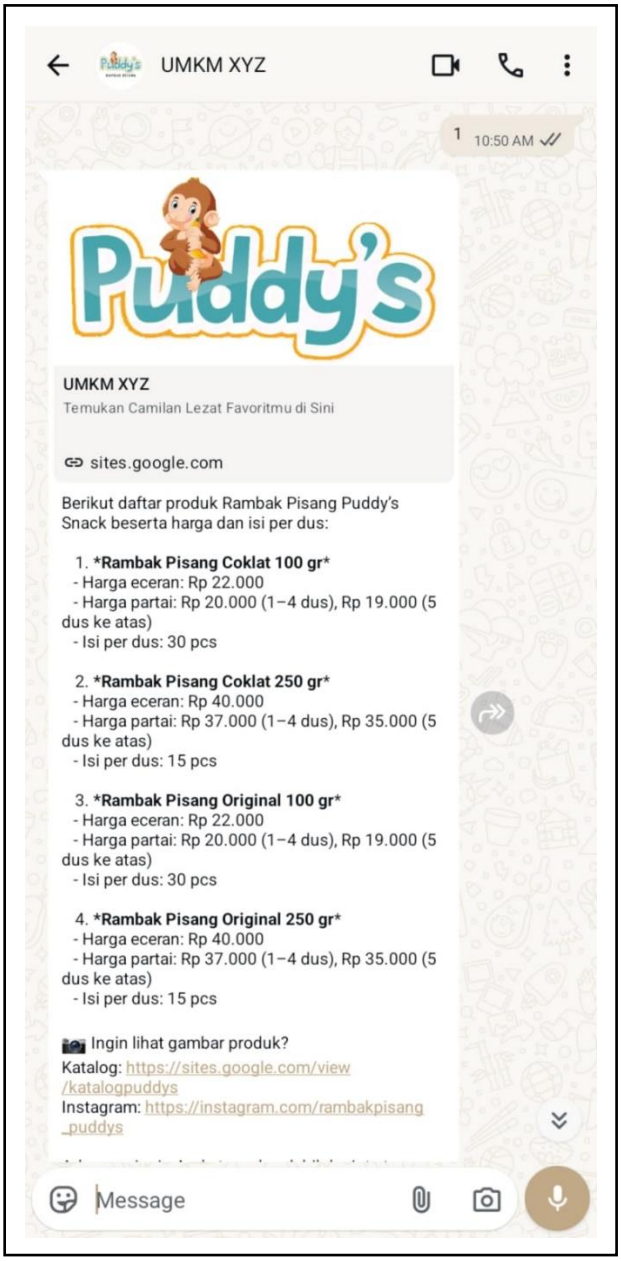

Figure 6. Product Information and Product List Services

Figure 6 presents the automated product information feature provided by the chatbot system. Customers can view available products, prices, and product details directly through WhatsApp messages without requiring manual responses from admin users. This feature improves information accessibility and supports more efficient customer service activities.

The chatbot also supports automated order processing features that allow customers to place orders directly through WhatsApp interactions. The system records customer order data automatically and stores them into the PostgreSQL database. Automated order recording helps reduce manual administrative activities and improves transaction management efficiency during operational processes.

Figure 7. Automated Product Ordering

Figure 7 shows the automated product ordering feature implemented in the chatbot system. Customers can submit orders directly through WhatsApp interactions, while the chatbot records transaction data automatically and synchronizes them with the dashboard management system. This feature improves transaction efficiency and supports more organized order management activities.

In addition, the chatbot provides customer complaint handling features that allow customers to submit complaints or service issues automatically. Customer complaints submitted through WhatsApp are recorded into the database and displayed on the dashboard management system for further processing by admin users. This feature improves communication efficiency between customers and business owners while reducing delays in handling customer complaints.

Figure 8. Customer Complaint Handling

Figure 8 presents the customer complaint handling feature implemented through the WhatsApp chatbot system. Customers can submit complaints automatically through chatbot interactions, while complaint data are synchronized directly with the dashboard management system. The implementation of automated complaint handling helps business owners monitor customer issues more effectively and improves customer service responsiveness.

To improve workflow efficiency, the chatbot system also implements session management and workflow automation to ensure stable system performance. If customers do not respond within a certain period, the conversation workflow is terminated automatically to reduce unnecessary resource usage and maintain system stability.

The implementation of chatbot automation successfully reduced repetitive customer service tasks and accelerated response time during customer interactions. The integration between chatbot automation and database management also improved the efficiency of customer interaction recording and order processing activities.

3.4 System Testing

System testing was conducted using the Black-Box Testing method to evaluate whether all system functions operated according to the specified requirements. The testing process focused on validating chatbot functionality, dashboard management features, login authentication, order processing, customer interaction management, and database synchronization.

The login testing process showed that users could access the dashboard successfully using valid authentication data. Product management testing also demonstrated that product data could be added, updated, and deleted successfully through the dashboard interface. In addition, order processing testing confirmed that customer orders submitted through WhatsApp were recorded automatically and synchronized with the dashboard system.

Chatbot testing demonstrated that the system was capable of responding to customer inquiries automatically according to the requested service category. The chatbot successfully displayed product information, processed customer orders, and handled customer complaints without significant system errors. Customer interaction data were also stored correctly in the PostgreSQL database.

Table 2 presents a summary of the Black-Box Testing results.

Table 2. Summary of Black-Box Testing Results

No	Test Scenario	Expected Result	Status
1	Login validation	User successfully accesses dashboard	Valid
2	Product data management	Product data successfully added and updated	Valid
3	Order processing	Customer orders recorded successfully	Valid
4	Chatbot response	Chatbot provides automated responses correctly	Valid
5	Customer complaint handling	Complaint data stored successfully	Valid
6	Dashboard synchronization	Data synchronized successfully	Valid

Based on the testing and implementation results, the developed system successfully improved customer service efficiency for MSME XYZ. The implementation of workflow automation using n8n reduced repetitive manual tasks during customer service operations, in addition, the integration between WhatsApp chatbot automation and dashboard management improved the efficiency of order monitoring and customer interaction management. These findings are consistent with previous studies stating that chatbot automation can improve operational efficiency and customer service effectiveness [4], [5].

CONCLUSION

This research successfully developed an AI-based customer service information system for MSME XYZ using WhatsApp chatbot integration with the n8n automation platform. The developed system integrates WhatsApp, PostgreSQL, and Budibase to support automated customer service activities, including product information services, order processing, complaint handling, and customer interaction monitoring. Based on the Black-Box Testing results, all system features operated according to the specified requirements. The implementation of chatbot automation successfully improved customer service efficiency, reduced manual workload, accelerated response time, and supported digital transformation processes for MSMEs.

The implementation results indicate that the integration of workflow automation and AI-based chatbot technology can assist MSMEs in managing customer service activities more efficiently and systematically. In addition, the developed dashboard management system supports real-time monitoring of customer interactions and transaction data, enabling business

owners to manage operational activities more effectively. Future research may focus on improving chatbot intelligence, implementing Natural Language Processing (NLP) capabilities, and integrating additional payment or customer relationship management features to further enhance system functionality and user experience.

The developed system also demonstrates that low-code and no-code platforms can support MSME digital transformation processes effectively with lower development complexity and implementation costs. The integration between automation platforms and AI-based chatbot systems provide opportunities for MSMEs to improve customer service quality, operational efficiency, and business scalability in the digital era.

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REFERENCES

[1] A. S. Lubis, Y. Yulinda, A. Qaedi Hutagalung, A. Dilham, F. R. Sofiyah, and J. L. Marpaung, "The chatbot artificial intelligence as the alternative customer services strategic to improve the customer relationship management in real-time responses," *Int. J. Econ. Bus. Res.*, vol. 27, no. 5, 2024, doi: 10.1504/ijebr.2024.10064925.

[2] A. N. Aini, R. Rinofah, and A. Maulida, "Efektifitas Pengembangan Artificial Intelligence (AI) pada Chatbot MbakPia," vol. 6, pp. 8224–8228, 2023.

[3] KemenkopUKM, "Panduan Penggunaan Website Sidt Kumkm," *Penambahan Natrium Benzoat Dan Kalium Sorbat Dan Kecepatan Pengadukan Sebagai Upaya Penghambatan Reaksi Inversi Pada Nira Tebu*, 2024.

[4] S. Hamideh Kerdar, B. M. Kirchhoff, L. Adolph, and L. Bächler, "A Study on Chatbot Development Using No-Code Platforms by People with Disabilities for Their Peers at a Sheltered Workshop," *Technologies*, vol. 13, no. 4, pp. 1–23, 2025, doi: 10.3390/technologies13040146.

[5] I. Weber, "Low-code from frontend to backend: Connecting conversational user interfaces to backend services via a low-code IoT platform," *ACM Int. Conf. Proceeding Ser.*, pp. 1–10, 2021, doi: 10.1145/3469595.3469632.

[6] Vederico Pitsalitz Sabandar, "Rancang Bangun Sistem E-Book," *J. Penelit. Rumpun Ilmu Tek.*, vol. 1, no. 4, pp. 160–172, 2022, doi: 10.55606/juprit.v1i4.4283.

[7] W. Suryn, *Software Quality Engineering: A Practitioner's Approach*, vol. 9781118592. 2014. doi: 10.1002/9781118830208.

[8] Aditia Ramadhani, Maulana Dwi Yantoro, Muhammad Farhan Akmal, Muhammad Mahfud, and Fauzi, "Chatbot Otomatis Dengan N8N Dan Ai Untuk Analisis Data Dan Pelaporan Hasil," *J. Ris. Tek. Komput.*, vol. 2, no. 2, pp. 18–23, 2025, doi: 10.69714/x1p94182.

[9] R. G. Damara, A. S. Fitrani, and A. Eviyanti, "Perancangan Aplikasi Chatbot Melalui Media Whatsapp pada Toko Sembako," *Indones. J. Appl. Technol.*, vol. 1, no. 2, p. 15, 2024, doi: 10.47134/ijat.v1i2.3050.

[10] J. E. Putra and B. Prabowo, “The Effect of Utilizing AI Chatbot and Recommendation System on Customer Satisfaction and Retention in Local Marketplace in Bandung,” *West Sci. Soc. Humanit. Stud.*, vol. 3, no. 01, pp. 20–32, 2025, doi: 10.58812/wsshs.v3i01.1651.

[11] S. Nasution and M. Irwan Padli Nasution, “Analyzing the Impact of Using Artificial Intelligence (Ai) Customer Service on Service,” *JHSS (Journal Humanit. Soc. Stud.*, vol. 08, no. 02, pp. 429–435, 2024, [Online]. Available: https://doi.org/10.33751/jhss.v8i2.10791

[12] M. S. Pawar, “A Practical Evaluation of Self-Hosted n8n for Secure and Scalable Workflow Automation,” *Int. J. Sci. Res. Eng. Manag.*, vol. 09, no. 06, pp. 1–9, 2025, doi: 10.55041/ijsrem50302.

[13] Dinar Nur Safitri and Muhammad Imron Rosadi, “Rancang Bangun Penyedia Layanan Informasi Pelayanan Masyarakat Kantor Kecamatan Pandaan Menggunakan Chatbot,” *J. Comput. Sci. Vis. Commun. Des.*, vol. 6, no. 2, pp. 74–83, 2021, doi: 10.55732/jikdiskomvis.v6i2.427.