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# Implementation of a Chatbot Using the Waterfall Method to Improve Helpdesk Service Efficiency at IT Consulting Companies

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**Abstract**: PT XYZ is a company engaged in information and communication technology services, supporting customers' digital transformation. The effectiveness of helpdesk services plays a crucial role in maintaining operations and fostering customer relationships. However, the issue reporting process is still handled manually through platforms such as WhatsApp and email, causing several problems, including inefficient ticket management, delays in ticket number assignment, and limited historical data. This study developed a chatbot based on Microsoft Copilot Studio to automate ticket creation, supported by Power Apps to address the lack of two-way communication features, aiming to support Customer Relationship Management (CRM) efforts. The system was developed using Waterfall methodology. The results showed significant improvements in service efficiency: the previous average initial response time of 2 days, 19 hours, and 13 minutes was eliminated due to automatic ticket number assignment; the average issue resolution time decreased from 5 days, 6 hours, and 20 minutes to 42 minutes; and ticket history search time improved from 14 minutes to 2 seconds. The chatbot successfully accelerated the reporting process, enhanced data recording, and reduced the workload of the helpdesk team. This solution significantly improved helpdesk efficiency and strengthened customer engagement.

**Keywords**: Chatbot; Helpdesk; Microsoft Copilot Studio; Waterfall Method; Customer Relationship Management.

# 1. Introduction

The fast development of information technology has changed the way companies provide services to their customers. Businesses are under more pressure than ever to innovate and improve service quality in every aspect of their operations, especially helpdesk services. Helpdesk operations are key to how an organization runs since they deal with technical problems and user questions. The department is the first point of contact when there are technical issues, so its performance is very important for overall company success. The speed and accuracy with which problems are fixed affect work efficiency and satisfaction among users of IT services [1]. Good helpdesk service means that workers do not lose their productivity trying to solve technical problems; instead, they can focus on their jobs.

PT XYZ is a company that deals with information and communication technology services. It has a lot of issues in running its helpdesk operations. According to internal data for Q1 2025, there were 696 incoming tickets reported through traditional communication channels like WhatsApp and email. A study of this data revealed alarming performance metrics: average ticket response time reached 4,012 minutes (or 2 days, 19 hours, and 13 minutes), while the average ticket resolution time reached 7,580 minutes (approximately 5 days, 6 hours, and 20 minutes). In addition to the challenges of initial response and resolution, finding ticket history in a manual system took an average of 14 minutes per ticket! These numbers show that there is a large opportunity for improvement in efficiency related to service delivery. These prolonged times for responses and resolutions are rooted in several interlinked factors. First, the process of reporting still relies on conventional media that necessitate manual intervention at all stages. Second, ticket data is dispersed through various channels without any integrated storage structure making information retrieval not only difficult but also time-consuming. Thirdly, there exists no systematically documented recording system that can effectively track ticket progress as well as maintain historical records. These conditions create a chain reaction of negative impacts: reduced productivity of the helpdesk team, impeded daily operational processes, and lowered levels of user satisfaction. Helpdesk staff spend so much time managing communications over different platforms that they do not have time to actually solve problems.

WhatsApp, even though it is widely used for business communication, has many drawbacks when it comes to professional helpdesk operations. The platform does not have sufficient support and audit capabilities that are necessary in a professional business environment [2]. Organizations cannot easily track conversation histories or produce performance reports or even remain compliant with data retention policies. In addition, WhatsApp does not provide enterprise-grade data protection needed for organizational operations [3], which raises concerns over the security of sensitive information. Email support systems are more formal but they show slower response capabilities than real-time communication solutions [4]. Users typically wait for hours or sometimes even days to get responses and this leads to frustration and reduced productivity. In light of these issues, we developed a supplementary module chatbot based on Microsoft Copilot Studio integrated with Microsoft Power Apps. This solution overcomes the limitations associated with standalone chatbot systems regarding bidirectional communication. Together, they create an automated ticket generation system that reduces response times, helps in searching ticket histories, and ensures that service documentation is properly maintained. It also automates routine tasks such as assigning ticket numbers and the first categorization so that helpdesk staff can focus on solving real technical problems instead of dealing with administrative overhead. Our research objectives were designed to provide measurable insights into system performance improvements. We sought to measure changes in initial helpdesk service response time before and after the implementation of the Microsoft Copilot Studio-based chatbot integrated with Power Apps. We also wanted to measure changes in helpdesk service ticket resolution time before and after chatbot implementation. Lastly, we intended to measure changes in helpdesk service ticket history search time before and after chatbot implementation. These three metrics give a complete picture of how the system affects operational efficiency.

The choice of Microsoft Copilot Studio was based on practical considerations as well as recent research findings. Earlier research has shown that the use of chatbots can enhance customer interaction and satisfaction in online marketing in Indonesia [5]. This market has a high receptivity to conversational AI solutions when they are properly implemented. At the same time, AI-powered communication strategies have been successfully applied in customer service for several industries [6]. Microsoft Copilot Studio is an advanced platform for organizations to customize conversational AI solutions and build standalone copilots to meet specific business needs [7]. It offers low-code development tools so that organizations do not need extensive skills in AI but can still customize at a powerful level. From the academic point of view, there are not many studies comparing Microsoft Copilot Studio with other chatbot frameworks used in Indonesian helpdesk services. Most of the existing studies discuss general chatbot development or specific frameworks such as Rasa and do not cover Microsoft's new products in Indonesia for organizations. Therefore, this literature gap provides justification from an academic point of view for conducting this study while distinguishing it from previous research that generally focuses on chatbot development without integration into customer management systems. By integrating Microsoft Copilot Studio with Power Apps, we develop a more

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comprehensive solution that meets both the conversational AI and data management needs. This integration enables functionalities such as ticket tracking, analysis of historical data to improve performance over time, and monitoring of results—features typically unavailable in separate chatbot solutions.

## 2. Related Work

The development of helpdesk systems has evolved significantly, with organizations increasingly adopting automated solutions to address service delivery challenges. Rachmawati (2023) designed a helpdesk system using the Knowledge Management System (KMS) method at PT. XYZ, focusing on organizing and storing knowledge systematically to enable faster problem resolution [11]. Clarin (2023) proposed a priority-based scheduling algorithm for helpdesk support systems, introducing a mathematical model that automatically assigns priority levels to incoming tickets based on predefined criteria such as issue severity, user role, and business impact [11]. While both studies demonstrated improvements in response times and resource allocation, they did not address real-time user interaction capabilities or automation of initial user interactions that could reduce ticket volume altogether.

The integration of artificial intelligence into helpdesk services has gained considerable attention in recent literature. Erlina *et al.* (2023) examined the application of AI-based chatbots as online service and information systems in educational institutions, highlighting how conversational AI can handle routine inquiries, provide instant responses, and operate 24/7 without human intervention [13]. Winarti *et al.* (2023) introduced ChatGPT-based chatbot technology at MAN 1 Kota Tangerang Selatan, demonstrating that even users without technical backgrounds could effectively utilize AI chatbot technology [14]. Nurdin (2024) implemented a helpdesk chatbot application specifically for information system services in higher education, showing a 40% reduction in routine support tickets and allowing IT staff to focus on more complex technical issues [26]. Parundekar *et al.* (2022) explored chatbot-based solutions for supporting software incident management processes, proposing an architecture that integrates chatbots with existing incident management workflows where the chatbot serves as the first point of contact, gathering incident details and automatically creating tickets [27]].

Microsoft has continuously enhanced its low-code platforms to support business process automation. Microsoft Copilot Studio, introduced in 2023, enables organizations to customize Copilot for Microsoft 365 and build standalone copilots tailored to specific business needs, providing intuitive interfaces for designing conversational flows and integrating with external data sources [15][16]. Power Automate facilitates workflow automation across applications and services, with the 2025 release wave 1 introducing enhanced AI capabilities and improved integration options [17]. When combined with Copilot Studio, Power Automate enables end-to-end automation from user interaction to backend process execution. Power Apps serves as a low-code platform for building custom business applications that can integrate with various data sources and services [22].

Customer Relationship Management (CRM) principles have become increasingly relevant in helpdesk operations. Permana and Tukiran (2024) conducted a literature review on CRM implementation in modern marketing management, revealing that CRM systems help organizations understand customer needs, track interaction history, and personalize service delivery [18]. Suwandi *et al.* (2023) examined CRM implementation for improving service quality and customer loyalty, demonstrating that systematic customer data management enables organizations to anticipate needs and resolve issues proactively [19]. In helpdesk operations, CRM integration allows support staff to access complete user histories and identify recurring problems more effectively. Our research differs from previous studies by combining Microsoft Copilot Studio with Power Apps to create an integrated solution that addresses both conversational AI and data management requirements. While existing studies focus primarily on standalone chatbot implementations or separate ticketing systems, our approach provides seamless ticket tracking, historical data analysis, and performance monitoring within a unified platform specifically designed for Indonesian organizational helpdesk services.

## 3. Research Method

This study employs a descriptive quantitative approach with a pre-experimental one-group pretest-posttest design to examine helpdesk service efficiency improvements following chatbot system implementation [23]0. The design allows comparison between conditions before and after deploying the Microsoft Copilot Studio-based chatbot integrated with Power Apps. Data analysis uses descriptive quantitative methods without statistical significance testing, as the research aims to describe helpdesk service performance changes rather than test hypotheses inferentially [10]. The research was conducted at PT XYZ during March–May 2025. System development follows the Waterfall method, providing systematic and sequential stages for building the information technology system [20][21].

### 3.1 Data Types and Sources

The study utilizes two data categories [8][10]:

1) Primary data collected through interviews with PT XYZ's helpdesk team and service ticket logs handled manually via WhatsApp and email before chatbot implementation, including:
   a) Requirement Definition documents from interviews
   b) Manual ticket initial response times
   c) Manual ticket resolution times
   d) Ticket history from manual systems
2) Secondary data from historical archives of helpdesk service tickets previously handled manually through WhatsApp and email, covering initial response times, ticket resolution duration, and ticket history search times for comparison with post-implementation conditions.

### 3.2 Research Instruments

The study employs several instruments [23]:

1) Observation forms recording response times, resolution times, and ticket search duration
2) Interview guidelines exploring user and helpdesk staff experiences
3) System logs from Microsoft Power Apps and chatbot for process time verification

### 3.3 Population and Sample

The research population consists of all helpdesk service tickets at PT XYZ. Samples were selected through purposive sampling based on [10]0:

1) Helpdesk service tickets recorded in manual systems (WhatsApp and email) before chatbot implementation
2) Tickets recorded through the chatbot system after implementation

### 3.4 System Development Stages (Waterfall Method)

System development proceeded through five Waterfall model stages [20][21]:

1) Requirements Analysis
   Identifying functional and non-functional helpdesk system requirements through user interviews and historical data analysis.
2) System Design
   Designing the chatbot using Microsoft Copilot Studio for ticket creation automation, with Power Apps as a supplementary module for two-way communication. Diagrams include use case, activity, class, and sequence diagrams.
3) Implementation
   Building the chatbot based on designed conversation flows, integrating Power Automate for automated workflows, and deploying Power Apps to support staff-user communication.
4) Testing
   Evaluating system features including automatic responses, ticket creation, ticket tracking, and history search. Results were assessed using initial response time, resolution time, and ticket search indicators.
5) Maintenance
   Monitoring chatbot performance post-implementation and making improvements based on user feedback.

### 3.5 Efficiency Measurement Indicators

Chatbot system effectiveness is measured through quantitative comparison assessing service efficiency improvements based on three main indicators [23]0:

1) Initial response time
2) Ticket resolution time
3) Ticket history search time.

## 4. Result and Discussion

### 4.1 Results

The implementation of Microsoft Copilot Studio-based chatbot at PT XYZ's helpdesk service environment yielded quantifiable outcomes that demonstrate operational improvements. Evaluation compared conditions before and after system deployment, focusing on three primary indicators: initial response time, ticket resolution time, and ticket history search time. Data analysis employed descriptive quantitative methods by comparing average values of helpdesk service efficiency indicators across both periods. Statistical inferential

testing was not applied, as the research objective centered on describing direct and factual service performance changes rather than generalizing to broader populations. Historical helpdesk service data before chatbot deployment revealed that average initial response time reached 2 days 19 hours 13 minutes, while average ticket resolution time extended to 5 days 6 hours 20 minutes. Ticket history searches required approximately 14 minutes per query. These figures indicate that reporting and problem-solving processes operated manually with low efficiency and lacked systematic documentation. The nearly three-day delay in initial response represented a major obstacle in delivering responsive helpdesk services to users. Following chatbot implementation, efficiency improvements emerged across all measured indicators. Initial response time was eliminated entirely because tickets are created automatically by the chatbot when users first submit complaints. Average ticket resolution time decreased dramatically to 42 minutes, while ticket history search time dropped to 2 seconds through integrated automated recording and retrieval systems. Table 1 displays the comparison of service performance metrics before and after implementation:

Table 1. Comparison of Helpdesk Service Performance Metrics Before and After Chatbot Implementation

| Indicator | Before Implementation | After Implementation | Improvement |
|---|---|---|---|
| Initial Response Time | 2 days 19 hours 13 minutes | Instant (automated) | ~100% |
| Ticket Resolution Time | 5 days 6 hours 20 minutes | 42 minutes | ~99.4% |
| Ticket History Search Time | 14 minutes | 2 seconds | ~99.8% |

Table 1 demonstrates substantial efficiency gains across all measured indicators. Automated ticket creation eliminated response delays entirely, while integrated systems reduced resolution and search times by over 99%. The chatbot interface developed using Microsoft Copilot Studio reflects interaction flows between users and the system, from automatic ticket creation to integrated ticket history access.
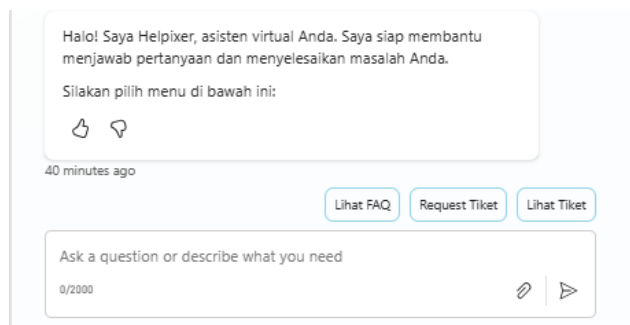


Figure 1. Chatbot Welcome Interface
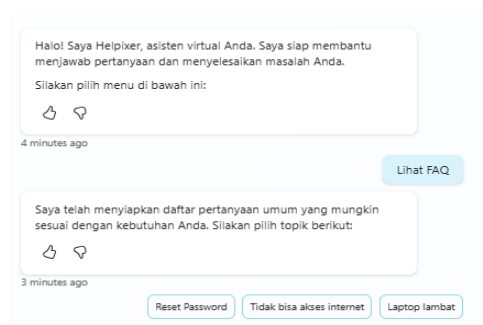


Figure 2. FAQ interface Showing Common Questions and Answers

The welcome screen greets users and guides them through available features, establishing immediate engagement without requiring staff intervention (Figure 1). The FAQ feature delivers immediate answers to common questions, reducing dependency on staff availability and accelerating problem resolution for routine inquiries (Figure 2).
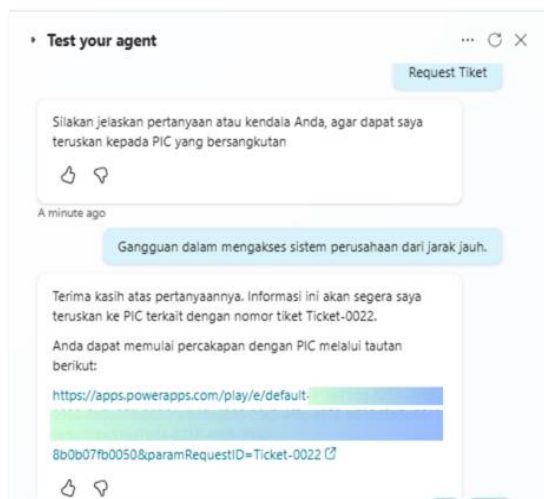


Figure 3. Ticket Request Interface
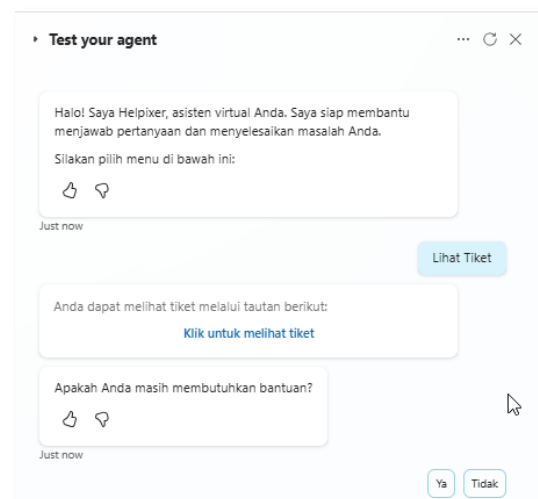


Figure 4. View Ticket Request

When users need to create tickets, the system displays a PowerApps link as a supporting application for two-way communication with the person in charge.



Figure 5. View Ticket in PowerApps

Users can view their ticket status and history through the PowerApps interface, which facilitates direct communication between users and technical staff.



Figure 6. Two-way Communication Interface in PowerApps

Implementation results show that chatbot integration successfully transformed helpdesk operations at PT XYZ. The elimination of initial response time addresses one of the most critical pain points in manual systems, where users previously waited nearly three days for acknowledgment. Automated ticket creation ensures immediate system registration and tracking, removing the uncertainty users experienced under the previous manual process. The dramatic reduction in ticket resolution time from over five days to 42 minutes reflects improved workflow efficiency. Automated routing, instant information retrieval, and streamlined communication channels enable faster problem-solving. The PowerApps integration facilitates direct communication between users and technical staff without the delays inherent in email or messaging app-based systems. Staff members can now access ticket information, update status, and communicate with users through a unified platform rather than juggling multiple communication tools. Ticket history search time improvement from 14 minutes to 2 seconds demonstrates the value of structured data storage and retrieval. Manual systems required staff to search through email threads or chat histories, often involving multiple applications and manual sorting. The automated system provides instant access to organized records, allowing staff to quickly reference previous tickets, identify recurring issues, and apply proven solutions. The FAQ feature proved particularly valuable in reducing workload for routine inquiries. Common questions about password resets, software installation procedures, and basic troubleshooting no longer require staff intervention, allowing technical personnel to focus on more complex issues that demand specialized expertise. Users benefit from immediate answers regardless of time or staff availability. These improvements align with the research objectives of enhancing helpdesk service efficiency through chatbot technology. The quantitative data supports the effectiveness of Microsoft Copilot Studio and Power Apps integration for helpdesk automation in organizational settings. The near-complete elimination of waiting times and the dramatic reduction in resolution times

represent tangible benefits that directly affect both user satisfaction and operational costs. The automated documentation and retrieval capabilities also create a knowledge base that grows with each interaction, potentially enabling even greater efficiency gains over time as the system learns from accumulated data.

## 4.2 Discussion

Based on the obtained results, the chatbot implementation significantly impacted helpdesk service efficiency at PT XYZ. The elimination of initial response time demonstrates that ticket initiation no longer requires manual intervention, which previously took an average of 2 days 19 hours 12 minutes. The chatbot system provides instant automatic responses (0 seconds) immediately after users submit complaints, eliminating the waiting time caused by limited helpdesk staff availability [1][6]. The findings align with research showing that AI-based chatbots can enhance communication speed and customer service responsiveness [6][13]. Furthermore, the reduction in ticket resolution time from an average of 5 days 1 hour 36 minutes to just 42 minutes 24 seconds (a 99.41% decrease) indicates that the escalation and follow-up processes have become more structured and faster [17][27]. Power Automate integration within the chatbot system enables workflow automation that connects ticket creation, staff notifications, and real-time status updates without manual intervention [7][17]. The efficiency demonstrates that systems built on Microsoft Copilot Studio and Power Apps can optimize helpdesk incident management significantly [15][16][27].

The speed improvement in searching ticket history from an average of 14 minutes 30 seconds to only 2 seconds (a 99.77% decrease) shows that data integration through the chatbot and Power Apps system provides centralized, accurate, and easily accessible service documentation [18][19][22]. The CRM system integrated with Power Apps allows structured storage and retrieval of ticket data in a centralized database, enabling helpdesk staff to quickly access customer service history for problem resolution references [18][19]. The chatbot implementation not only increases technical efficiency but also strengthens the strategic value of helpdesk services in supporting customer satisfaction and loyalty [1][26]. Regarding data security and privacy, the Microsoft Copilot Studio-based chatbot implementation integrated with Power Apps is secure because it can only be accessed by users who have Microsoft accounts and login domains authorized by the company [3][7]. All interactions and ticket data are stored in the Microsoft 365 environment protected by end-to-end encryption, multi-factor authentication, and Azure Active Directory-based identity management [3][7]. These mechanisms minimize the risk of data breaches or unauthorized access that previously occurred as weaknesses in the manual WhatsApp and email-based system [2][3][4]. The research results are analyzed descriptively without statistical significance testing [10][24]. We chose the approach because the research focuses on directly evaluating changes in helpdesk service performance at PT XYZ based on available actual data, rather than testing hypotheses inferentially or making predictions about other populations [9][10]. The descriptive quantitative method allows researchers to describe and compare conditions before and after system implementation objectively based on measurable indicators [10][23][24]. The differences shown between conditions before and after implementation adequately represent the chatbot system's impact on helpdesk service efficiency at PT XYZ 0.

## 5. Conclusion and Future Work

Based on the research and testing results, the chatbot made with Microsoft Copilot Studio and supported by Microsoft Power Apps has been able to increase helpdesk service efficiency at the IT Consultant company. The efficiency changes can be seen from the effect on eliminating initial response time, where ticket numbers are now generated automatically without manual intervention (from 2 days 19 hours 13 minutes to 0 seconds), speeding up problem resolution from an average of 5 days 6 hours 20 minutes to just 42 minutes because the person in charge can directly handle technical reports without being interrupted by repetitive questions, and very much faster access to history of tickets changed from 14 minutes to 2 seconds through centralized documentation via Power Apps integration.

The novelty of this research is the application of Microsoft Copilot Studio integrated with Microsoft Power Apps for automating internal helpdesk service processes at an IT Consultant company, which has not been studied extensively in Indonesia. In terms of operational impact, it reduces the workload on the helpdesk team and speeds up problem-handling processes while increasing recording accuracy with potential strengthening effects on customer satisfaction and loyalty. However, this study has limitations since it does not perform cost analysis of implementation, scalability evaluation for the system, or penetration testing for customer data security and privacy even though the system is already protected by Microsoft domain login authentication plus end-to-end encryption as well as Azure Active Directory-based identity management.

Future research plans include developing predictive analytics modules to determine ticket priorities based on urgency levels, integrating with SLA monitoring modules to track compliance with service agreements, evaluating system scalability in scenarios with larger numbers of tickets and users, conducting in-depth

assessments of customer data security and privacy through independent audits or penetration tests, adding file and media sending features to support more comprehensive documentation and communication, developing automatic notification features that provide real-time ticket status updates, and implementing monitoring dashboards that enable management to oversee overall helpdesk performance.

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