AN ARTIFICIAL INTELLIGENCE-BASED CHATBOT FOR SUPPORTING HUMAN RESOURCES MANAGEMENT USING RAPID APPLICATION DEVELOPMENT

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Abstract

Human Resources Management is a critical component of organizational operations, particularly in managing attendance, performance evaluation, and the dissemination of company policies. Manual employee management practices often result in inefficiencies and delays in information delivery. This study aims to design and develop an artificial intelligence–based chatbot to support employee management using the Rapid Application Development (RAD) method. The research was conducted through observation, interviews, and literature review to analyze system requirements. The chatbot was developed using the RASA framework, Python and JavaScript programming languages, and a MySQL database. The results indicate that the chatbot is capable of accelerating employee access to information, reducing the administrative workload of human resources staff, and improving service efficiency. This study extends existing chatbot research by integrating AI-based conversational systems with core employee management functions to support organizational digital transformation. This study contributes to the application of AI-based chatbots in human resource management systems.

***Kata kunci**: Chatbot; Artificial Intelligence; Human Resources Management; Rapid Application Development, RASA Framework.*

CHATBOT BERBASIS KECERDASAN BUATAN UNTUK MENDUKUNG MANAJEMEN SUMBER DAYA MANUSIA MENGGUNAKAN PENGEMBANGAN APLIKASI YANG CEPAT

Abstract

Manajemen Sumber Daya Manusia merupakan komponen penting dari operasi organisasi, terutama dalam mengelola kehadiran, evaluasi kinerja, dan penyebaran kebijakan perusahaan. Praktik manajemen karyawan manual sering mengakibatkan inefisiensi dan keterlambatan dalam penyampaian informasi. Penelitian ini bertujuan untuk merancang dan mengembangkan chatbot berbasis kecerdasan buatan untuk mendukung manajemen karyawan menggunakan metode Rapid Application Development (RAD). Penelitian dilakukan melalui observasi, wawancara, dan tinjauan literatur untuk menganalisis persyaratan sistem. Chatbot dikembangkan menggunakan kerangka kerja RASA, bahasa pemrograman Python dan JavaScript, dan database MySQL. Hasil penelitian menunjukkan bahwa chatbot mampu mempercepat akses karyawan terhadap informasi, mengurangi beban kerja administrasi staf sumber daya manusia, dan meningkatkan efisiensi layanan. Studi ini memperluas penelitian chatbot yang ada dengan mengintegrasikan sistem percakapan berbasis AI dengan fungsi manajemen karyawan inti untuk mendukung transformasi digital organisasi. Studi ini berkontribusi pada penerapan chatbot berbasis AI dalam sistem manajemen sumber daya manusia.

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Kata kunci: Chatbot; Kecerdasan Buatan; Manajemen Sumber Daya Manusia; Pengembangan Aplikasi Cepat, Kerangka Kerja RASA.

1. Introduction

Human Resource Management (HRM) plays a strategic role in ensuring organizational sustainability and operational effectiveness. Core HR activities, including employee attendance management, performance evaluation, and the dissemination of organizational policies, require information systems capable of delivering data in a timely, accurate, and consistent manner[6]. However, in practice, many organizations continue to rely on manual or semi-manual processes, which often lead to operational inefficiencies, delays in information flow, and increased administrative workloads for human resource departments [9].

The rapid advancement of information technology has encouraged the adoption of automated systems to improve organizational service quality and operational efficiency. One technological innovation that has gained increasing attention is the use of artificial intelligence (AI)–based chatbots, which leverage natural language processing to facilitate interactive communication between systems and users [13]. Prior studies have demonstrated that chatbots are effective in accelerating information delivery, enhancing service responsiveness, and reducing reliance on direct human intervention, particularly in domains such as customer service and education [14].

Despite these advantages, the implementation of chatbots within the context of employee management remains relatively underexplored. Existing research predominantly positions chatbots as general-purpose informational tools, with limited integration into comprehensive employee management functions such as attendance monitoring, performance assessment, and decision-support reporting for [15]. Furthermore, from a system development perspective, many previous studies have adopted traditional development methodologies that lack flexibility and responsiveness to evolving user requirements [16].

In response to these gaps, this study proposes the design and development of an artificial intelligence–based chatbot specifically tailored to support employee management processes. The proposed chatbot is not merely intended as an informational interface but as a functional component of human resource administration, facilitating access to employee-related information and supporting routine HR services ([17]. The Rapid Application Development (RAD) method is employed as the system development approach due to its iterative nature, rapid prototyping capabilities, and emphasis on active user involvement throughout the development lifecycle [18]

The objective of this research is to design and develop an AI-based chatbot that enhances the efficiency of employee management and improves the delivery of human resource information services. This study is expected to contribute to the growing body of knowledge on AI-driven human resource management systems and provide practical insights for organizations seeking to adopt intelligent technologies to optimize HR operations.

2. Literatur Review

To support the preparation of this study, a comprehensive understanding of relevant concepts, theories, and prior research is required. This subsection discusses the literature related to chatbot technology, employee management, artificial intelligence (AI), and the Rapid Application Development (RAD) software development method. In addition, previous studies that serve as the foundation for analyzing and designing chatbot systems to support human resource administration processes are reviewed. The following section presents relevant prior studies that support and relate to the topic of this research.

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2.1. Artificial Intelligence

Artificial Intelligence (AI) is a technology that enables machines to mimic human cognitive abilities, such as perception, knowledge acquisition, and decision-making. The rapid development of AI has brought significant changes across various aspects of human life, including the way people work, learn, and interact with one another [1].

2.2. Chatbot

A chatbot is a computer program designed to interact with users through text or voice by utilizing Artificial Intelligence, Machine Learning, and Natural Language Processing (NLP) technologies. Chatbots operate by recognizing user keywords or intents to generate appropriate responses [2]. Based on their development approach, chatbots can be classified into rule-based chatbots and AI-based chatbots. Rule-based chatbots rely on IF–THEN logical rules and are suitable for structured question scenarios, whereas AI-based chatbots leverage NLP and machine learning techniques to understand context and learn from user interactions [3], [4]. The advancement of modern chatbot technology has enabled its application as an information service medium and a support tool for business processes, including employee management.

2.3. Human Resource Management

Employee Management, or Human Resource Management (HRM), is a systematic process that encompasses planning, organizing, directing, and controlling activities related to workforce management to achieve organizational objectives effectively and efficiently. HRM views employees as strategic assets that must be optimally managed through functions such as planning, recruitment, development, control, compensation, and maintenance [5], [6]. Manual employee management practices face various challenges, including low efficiency, a high potential for errors, limited data accessibility, and increased administrative burdens on human resource departments [7], [8]. Consequently, the digitalization of employee management has become an essential requirement for modern organizations to enhance productivity, transparency, and data-driven decision-making quality [9], [10].

3. Research Method

This study is conducted to address employee management challenges through the implementation of an artificial intelligence–based chatbot. The stages of the research can be seen in the following figure.

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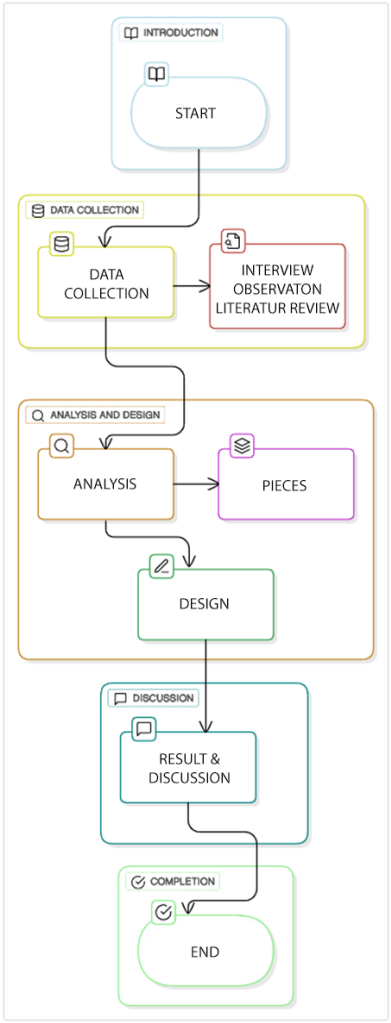

Figure 1. Stages of the research

Accordingly, the research methodology is focused on a systematic, structured, and reproducible system development process. The study adopts the Rapid Application Development (RAD) method, as it is well suited for developing applications that must accommodate dynamic user requirements while maintaining relatively short development cycles.

Rapid Application Development (RAD) is a system development methodology that emphasizes speed, flexibility, and active user involvement throughout the development process. RAD enables systems to be developed within a relatively short timeframe by employing an iterative approach and continuously refined prototypes based on user feedback [18]. As illustrated in Figure 1, the RAD process consists of five main stages: requirements planning, analysis and modeling, system design, prototype development, and testing and implementation.

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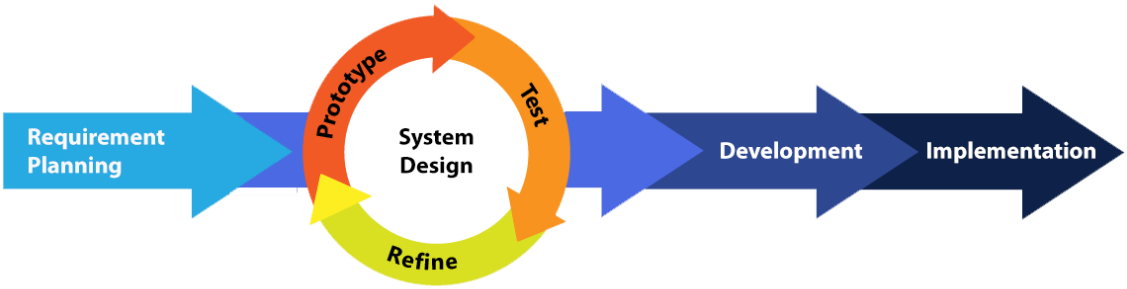

Figure 2. Rapid Application Development (RAD) Method

This method is considered appropriate for chatbot development at the research site, PT Maxfos Prima, due to relatively well-defined system requirements, the need for rapid adaptation, and the direct involvement of HR personnel and employees in the system evaluation process [19]. In this study, the RAD approach is regarded as particularly relevant for chatbot development at PT Maxfos Prima, as it effectively accommodates dynamic system requirements and enables rapid adjustments based on continuous user feedback.

3.1. Requirement Planning

This stage represents the initial phase of the development process. At this stage, the researcher identifies existing problems and collects relevant data by conducting site visits to the research location, PT Maxfos Prima, as well as carrying out interviews with related stakeholders. The purpose of these activities is to identify the overall objectives of the system and the required information needs. During this stage, active involvement and collaboration between both parties are essential to accurately identify system requirements for the development of the proposed system.

3.2. System Design

During the system design stage, the design of the chatbot system to be developed is carried out, along with iterative refinement of the system design whenever discrepancies are identified between the proposed design and the user requirements defined in the previous stage. This iterative process continues until the design aligns with user needs. The outputs of this stage include general software specifications, data structures, and other system design components required for the development phase.

3.3. Development

During the development stage, the agreed-upon chatbot system design is transformed into an application, progressing from a beta version to the final version. This stage also involves development activities and integration with other system components while continuously considering feedback from users or clients. If the development process proceeds smoothly and the application meets user requirements, the process advances to the subsequent stage. However, if the developed application does not adequately address user needs, the process returns to the system design stage for further refinement.

3.4. Implementation

This stage represents the final phase of the development process, in which the system design agreed upon in the preceding stages is implemented. Prior to the deployment of the chatbot system, thorough testing is conducted to detect and correct any errors within the developed application. During this phase, users evaluate the chatbot system and provide feedback, after which formal approval of the system is obtained once it meets the defined requirements.

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4. Result & Disscussion

4.1. Results of Chatbot System Development

The primary outcome of this study is the development of an artificial intelligence–based chatbot system designed to support employee management at PT Maxfos Prima, which served as the research site. The developed chatbot system functions as an automated interaction medium between employees and the human resource management division, particularly in providing employee-related information and administrative services.

To illustrate the functional requirements of the system and the interactions between users and the system, this study produces a Use Case Diagram. As shown in Figure 3, the Use Case Diagram represents two main actors, namely employees and HR staff, along with an additional actor, the Head of the HR Department. Employees interact with the chatbot system to obtain information related to attendance, company policies, and employee data. Meanwhile, HR staff are granted access rights to manage employee data, monitor reports, and perform system management activities through a dashboard interface. The Use Case Diagram defines the system boundaries and highlights the main functionalities provided by the chatbot as a result of the requirements analysis stage.

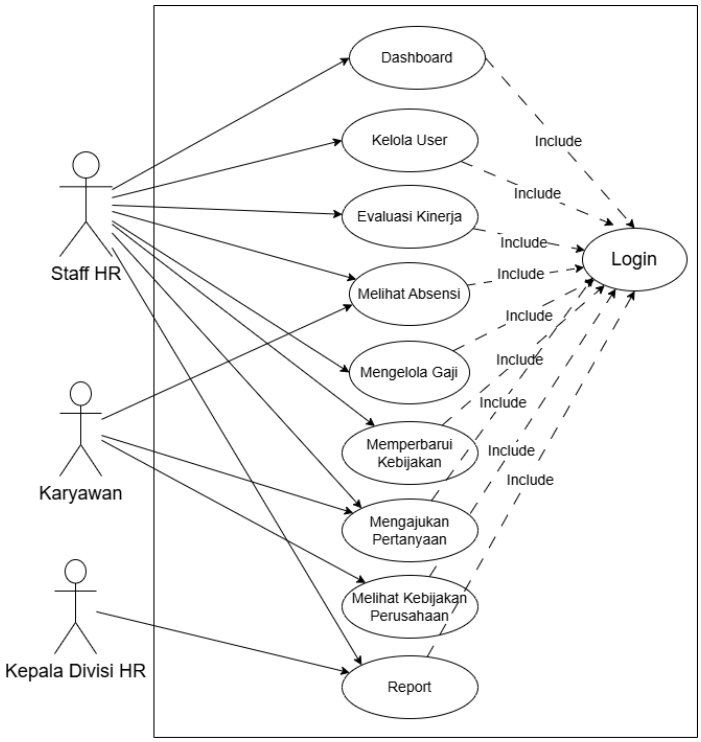

Figure 3. Use Case Diagram

For database design, this study utilizes a Class Diagram to illustrate the class structure and relationships within the chatbot system. As shown in Figure 4, the Class Diagram presents key classes such as User, Employee, Salary, Attendance, Policy, and Evaluation, which represent the core data entities supporting employee management functionalities.

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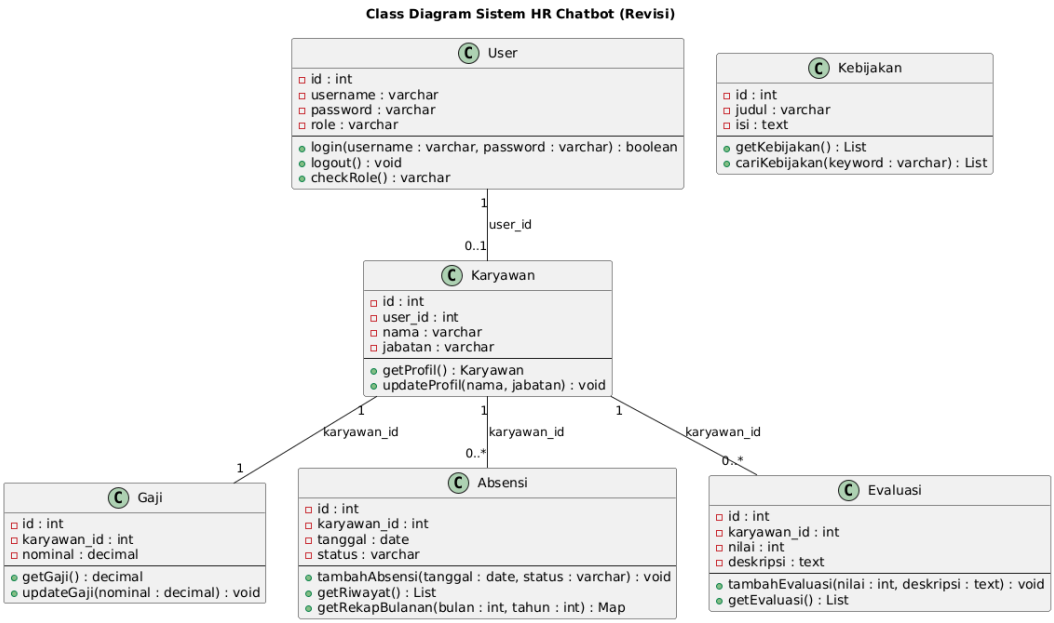

Figure 4. Class Diagram

The relationships among classes are designed to support integrated and consistent data management. This Class Diagram serves as the foundation for system implementation, particularly in database design and application logic development.

In addition to system modeling, the results of this study also include the final user interface of the developed chatbot system. The chatbot interface is designed with a simple and user-friendly concept to ensure accessibility for all employees without requiring specialized training. The main chatbot interface provides a conversation area that allows users to input queries and receive direct responses from the system, as illustrated in Figure 5. From the employee perspective, the chatbot interface displays real-time conversational messages containing information related to attendance, company policies, and employee data.

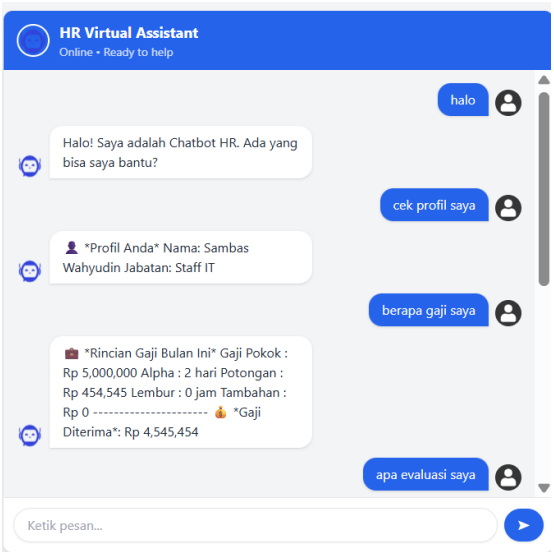

Figure 5. Chatbot Conversation Interface

Meanwhile, on the HR staff side, a dashboard interface is provided, as shown in Figure 6, which displays employee data summaries, attendance reports, and data management menus. The dashboard interface is designed to facilitate HR staff in monitoring and managing employee information in a structured and efficient manner.

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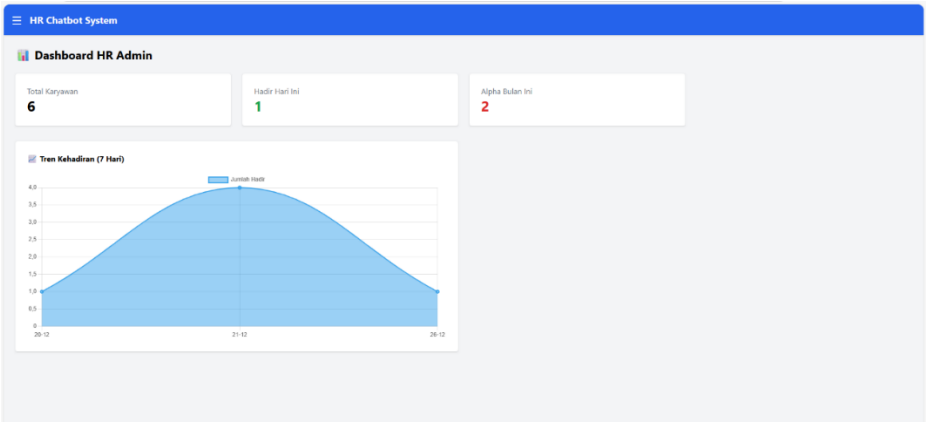
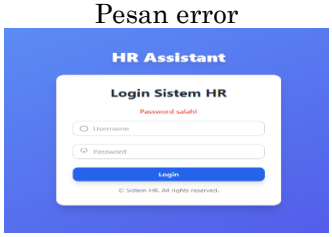


Figure 6. Dashboard Page

The final interface of the chatbot system serves as concrete evidence of the successful implementation of the proposed system and demonstrates that the chatbot was not only conceptually designed but has also been fully developed and deployed in accordance with the operational needs of PT Maxfos Prima. The usability of the interface indicates that the system can be readily adopted by users in a real organizational environment without requiring significant adaptation.

Functional testing of the system was conducted using the Black Box Testing method to validate system functionality from the user's perspective. The testing results indicate that all core system functionalities operate as intended and comply with the requirements defined during the planning stage. The chatbot is able to accurately receive user input, process queries using natural language understanding mechanisms, and generate appropriate responses, as presented in Table 1. These findings demonstrate that the developed system reliably supports employee information services and meets the functional specifications established in this study.

Tabel 1. Tabel of Functional Testing

No	Function	Scenario	Input	Expected Output	Result
1	Login	Login valid	Username & password Correct	Masuk ke halaman sesuai role 	Successful
		Incorrect Password	Username benar, password salah	Pesan error 	Successful

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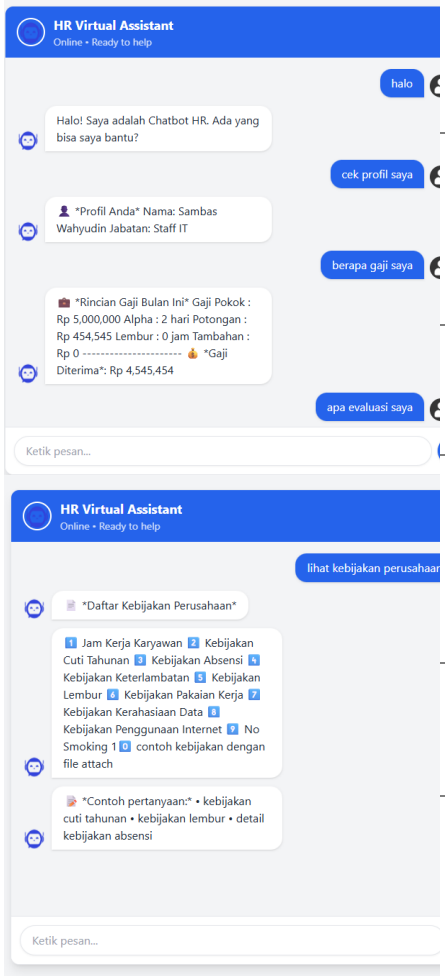
		Invalid Username	Username salah	Pesan error 	Successful
2	Dashboard	Dashboard Chart Display	Chart Display	Grafik tampil sesuai data 	Successful
3	Chatbot Conversation	Greeting Message	"halo"		Successful
		Salary Information Inquiry	"berapa gaji saya"		Successful
		Attendance Inquiry	"cek absensi saya"		Successful
		Performance Evaluation Inquiry	"nilai evaluasi saya"		Successful
		Profile Inquiry	"cek profil saya apa"		Successful
		Company Policy Inquiry	"lihat kebijakan perusahaan"		Successful

Based on the implementation results, the chatbot is capable of effectively responding to employee inquiries related to attendance information, company policies, employee data, and performance evaluation processes. The accuracy and consistency of the chatbot responses indicate that the system can reliably support routine employee information services. In addition, the system provides dashboard and reporting features that can be accessed by HR personnel to monitor employee data in a structured and timely manner, thereby supporting managerial decision-making. The integration of the chatbot with a MySQL database enables centralized and consistent data management, which contributes to improved data integrity and system reliability.

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4.2. Discussion

The results of the chatbot development indicate that the application of artificial intelligence can enhance the efficiency of information services and employee management administration at PT Maxfos Prima. With the implementation of the chatbot, information delivery processes that previously depended on manual interactions with HR staff can now be performed automatically and more rapidly.

These findings are consistent with previous studies reporting that chatbots are capable of improving service efficiency and information consistency within organizations. However, this study extends prior research by not only utilizing the chatbot as an informational question-and-answer tool but also integrating it with an employee management system that supports data monitoring and report generation for HR personnel. This integration represents a key contribution that differentiates this study from earlier works.

The findings of this research are directly aligned with the research objectives outlined in the introduction, namely the design and development of a chatbot to support more effective employee management processes. Although this study has not yet measured the long-term quantitative impact on organizational performance, the results demonstrate the potential of chatbot technology as a supportive solution for human resource services.

5. Conclusion

Based on the research results and discussion, this study successfully designed and developed an artificial intelligence–based chatbot to support employee management at PT Maxfos Prima. The chatbot provides automated employee information services related to attendance, company policies, and employee data, thereby reducing dependence on manual HR processes.

The Rapid Application Development (RAD) method proved effective by enabling iterative development with active user involvement, ensuring that the system meets operational needs. Functional testing using the Black Box Testing method confirmed that all core system functions operate in accordance with predefined specifications.

Furthermore, the chatbot functions not only as an informational tool but also as an integrated component of the employee management system through dashboards and reporting features for HR personnel, contributing to improved efficiency in information management and administrative services. The system architecture demonstrates scalability, allowing the chatbot to be adapted for implementation in other organizations with similar employee management requirements.

However, this study is limited by the absence of quantitative evaluations of user satisfaction and organizational performance impact. Future research may focus on integrating automated attendance systems, advanced performance analytics, and quantitative assessments to further evaluate the effectiveness of chatbot-based HR solutions.

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