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A Systematic Literature Review on Chatbot Development for WhatsApp: Programming Language, Method and Utility

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Abstract
The development of chatbot technology in recent years has shown rapid advancements across various sectors, particularly on popular communication platforms such as WhatsApp. A systematic review is necessary to identify advancements related to chatbot development on WhatsApp. Therefore, this study presents a systematic literature re-view on the development and use of WhatsApp chatbots using the PRISMA framework. From an initial search of 41 studies, followed by filtering according to categories, eight relevant articles were identified from various digital data-bases through focused searches using the keyword "WhatsApp chatbot". The review results indicate that Natural Language Processing (NLP) methods are the most commonly applied approach in chatbot development, with Python being the dominant programming language. This is attributed to Python's flexibility and strong library support, such as NLTK, spacy, and TensorFlow, which enable more efficient chatbot development. The findings reveal that WhatsApp chatbots have been applied in various sectors, including healthcare, business, and education. The study's outcomes highlight the challenges and opportunities in future chatbot development, such as the integration of additional features and the enhancement of conversational context understanding. By providing in depth insights into trends and best practices, this study contributes to the development of WhatsApp chatbots as increasingly relevant and effective automated communication tools.
Keywords: *chatbot, whatsapp, prisma, nlp, phyton*

Abstrak
Perkembangan teknologi chatbot dalam beberapa tahun terakhir telah menunjukkan kemajuan pesat di berbagai sektor, khususnya pada platform komunikasi populer seperti WhatsApp. Tinjauan sistematis diperlukan untuk mengidentifikasi kemajuan yang terkait dengan pengembangan chatbot di WhatsApp. Oleh karena itu, penelitian ini menyajikan tinjauan pustaka sistematis tentang pengembangan dan penggunaan chatbot WhatsApp menggunakan kerangka kerja PRISMA. Dari penelusuran awal terhadap 41 penelitian, diikuti dengan penyaringan menurut kategori, delapan artikel relevan diidentifikasi dari berbagai basis data digital melalui pencarian terfokus menggunakan kata kunci "chatbot WhatsApp". Hasil tinjauan menunjukkan bahwa metode *Natural Language Processing* (NLP) adalah pendekatan yang paling umum diterapkan dalam pengembangan chatbot, dengan Python sebagai bahasa pemrograman yang dominan. Hal ini disebabkan oleh fleksibilitas Python dan dukungan pustaka yang kuat, seperti NLTK, spacy, dan TensorFlow, yang memungkinkan pengembangan chatbot yang lebih efisien. Temuan tersebut mengungkapkan bahwa chatbot WhatsApp telah diterapkan di berbagai sektor, termasuk perawatan kesehatan, bisnis, dan pendidikan. Hasil studi ini menyoroti tantangan dan peluang dalam pengembangan chatbot di masa mendatang, seperti integrasi fitur tambahan dan peningkatan pemahaman konteks percakapan. Dengan memberikan wawasan mendalam tentang tren dan praktik terbaik, studi ini berkontribusi pada pengembangan chatbot WhatsApp sebagai alat komunikasi otomatis yang semakin relevan dan efektif.
Kata Kunci: *chatbot, whatsapp, prisma, nlp, phyton*

1. Introduction

The development of chatbot technology in recent years has shown rapid growth in various sectors, especially on popular communication platforms such as WhatsApp. WhatsApp itself has more than two billion monthly active users, making it a very potential platform for chatbot development as an efficient means of automated interaction [1]. WhatsApp is a messaging application that functions as a replacement for SMS or short message services via cross-platforms that are often connected to the internet. So to increase efficiency in work, it is widely used as a new technology such as chatbots. Chatbots on WhatsApp are used

in various applications, ranging from customer service, education, and health, to e-commerce, with the aim of increasing responsive-ness and user experience [2].

The rapid development of technology in this era has led to the widespread use of WhatsApp as a communication platform, and many organizations and businesses are switching to using chatbots to increase service efficiency [1]. However, developing chatbots on this platform presents unique challenges, especially in choosing the appropriate framework, development tools, and implementing best practices. A systematic review is needed to identify trends and best practices in WhatsApp chatbot development. This can help developers and researchers understand and choose the most effective technology [3].

This study uses the Systematic Literature Review (SLR) method with PRISMA guidance to identify and analyze frameworks, tools, and best practices used in developing chatbots on the WhatsApp platform. The PRISMA method was chosen to ensure transparency in the selection and screening process of relevant literature so that the research results can be a strong foundation for developers and academics interested in this area [4]. Through the PRISMA approach, we will evaluate relevant studies within a certain time frame, filter appropriate results based on strict inclusion and exclusion criteria, and review and synthesize key findings [5]. This study is expected to provide in-depth insights into the most effective technology choices and recommended best practices in developing chatbots for WhatsApp, while identifying research gaps that still need to be ad-dressed.

2. Material and Method

The Systematic Literature Review (SLR) method used in this study is a systematic, explicit, and reproducible approach. This method includes the stages of identification, evaluation, and synthesis of published scientific works, both research results and thoughts from researchers and practitioners in the field. With SLR, this study aims to identify, review, and evaluate all relevant research in order to obtain a comprehensive picture of the topic discussed [6].

In its implementation, this research is structured through several essential and sequential stages to ensure methodological rigor and comprehensive analysis.

1. Literature Identification: Collecting literature from various sources, such as journals, articles, and conference proceedings related to the research topic.
2. Study Selection: Conduct screening based on predetermined inclusion and exclusion criteria to en-sure that only qualified literature will be analyzed further.
3. Quality Evaluation: Assessing the quality of the selected literature to ensure the validity and rele-vance of the information to be used.
4. Synthesis of Results: Integrating findings from various studies to answer research questions and provide structured conclusions.
5. Reporting Results: Compiling the results of the synthesis in a systematic and structured format, so that it can make a significant contribution to the development of science on the topic being studied.

Table 1. Journal Selection Criteria

Inclusion	Exclusion
Keyword: “WhatsApp Chatbot”	Articles published more than 5 years ago
Studies Published Internationally	Not Focused on WhatsApp
Articles Published 5 years	
Studies On Proposed Frameworks and Models Related to This Study	

Based on the **Table 1**, inclusion and exclusion criteria are used to filter and select the literature to be used in the systematic literature review. Inclusion criteria include literature that uses the keyword "WhatsApp Chatbot," which allows to focus on studies that are relevant to the research topic. In addition, only studies pub-lished internationally are included, to ensure wide accessibility of information and understanding of the con-text globally. Articles considered are those published within the last five years, in order to maintain relevance to the latest developments. Studies related to frameworks and models in chatbot development are also included in the inclusion criteria because this topic is directly related to the research objectives.

Conversely, exclusion criteria include literature published in years older than the specified time frame, be-cause it is likely that the information presented in the study is no longer relevant to the latest trends and tech-nologies. In addition, studies that do not focus on the WhatsApp platform will be excluded,

to ensure that all included literature truly supports the research objectives related to chatbot development on the platform. The following are questions that will answer this study.

RQ1. The programming language used in developing chatbots for WhatsApp.
RQ2. Methods used in creating chatbots on the WhatsApp platform.
RQ3. The purpose of the application is to develop chatbots on the WhatsApp platform.

Literature Search Methods

Methods The literature search in this study will be conducted through various recognized academic databases, such as Scopus, Google Scholar, and Connected Papers. These platforms were chosen because they provide access to high-quality and reliable research articles, journals and publications. Using these databases, this re-search seeks to cover a wide range of literature from relevant recent studies, ensuring that only sources with academic validity are included in this review.

The literature search process will focus on specific publication timescales, with the aim of identifying recent trends and innovations relevant to the research topic. The focus on a more recent publication timeframe will help this research present up-to-date information regarding frameworks, tools, and best practices in chatbot development for WhatsApp. In addition, this time limit allows for the elimination of sources that may be outdated and less relevant to current technological developments and user needs.

Literature Selection Strategy

The literature selection strategy in this study was carried out by using specific keywords to identify relevant studies, such as "WhatsApp Chatbot development." The keywords were selected with the aim of covering im-portant aspects of developing chatbots for the WhatsApp platform, including frameworks, tools, and best prac-tice recommendations that support the development of chatbot technology effectively.

Once the literature has been successfully identified, the next step is to filter the search results to ensure rele-vance to the research topic. The screening process begins by reviewing the abstract of each literature to evalu-ate whether the content of the study is in line with the focus of this research. Literature that passes this stage will then be further evaluated by reviewing the full content. This approach allows for the identification of stud-ies that are not only relevant but also make a meaningful contribution to the understanding of chatbot devel-opment on WhatsApp.

In the full content review stage, each selected study will be assessed based on the criteria of relevance, credi-bility, and methodological quality. Research discussing specific methods, frameworks, or tools will be further assessed in the context of their effectiveness and practical applications. This aims to ensure that the included literature truly provides comprehensive insights and meets the research needs related to frameworks, tools, and best practices in developing chatbots for WhatsApp. Thus, this strategy is expected to produce a rich and in-formative literature review to support the research objectives. Tools Used to Assess Literature Quality.

Literature Assessment

The assessment of the quality of literature in this study was carried out using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. PRISMA is a standard tool that is widely used to ensure that the literature review process is carried out systematically, transparently, and accurately. This guideline helps in identifying, filtering, and selecting relevant literature for further review, thereby im-proving the quality and accuracy of systematic review results [5].

In the application of PRISMA, the literature quality assessment process consists of several important stages. First, the identification process is carried out to collect all relevant literature through a search in the database. After that, the literature is filtered by removing duplicate literature, followed by an initial review based on the title and abstract to assess whether the study meets the inclusion criteria that have been set. This stage is continued with a more in-depth screening, namely a full review of the contents of each study that passes the initial selection to ensure its suitability to the focus of the study. The final stage in the PRISMA method is the systematic assessment and reporting of selected literature [4]. By using the PRISMA flowchart format, this study can describe the number of literature identified, screened, evaluated, and included in the final review. This approach ensures that all assessment and selection steps can be traced transparently, allowing this study to compile a comprehensive and weighted literature review in supporting the findings that will be generated from the study [4].

3. Results

Based on the search results, 41 (forty-one) references were found whose titles matched the keyword criteria entered in the query. However, not all of these references could be included in this study. Of these, 12 (twelve) national-scale articles were excluded because they did not meet the scope of the study. In addition, there were 11 (eleven) journals that were not included in the 2019-2024 period, so they were also excluded from the list of references used.

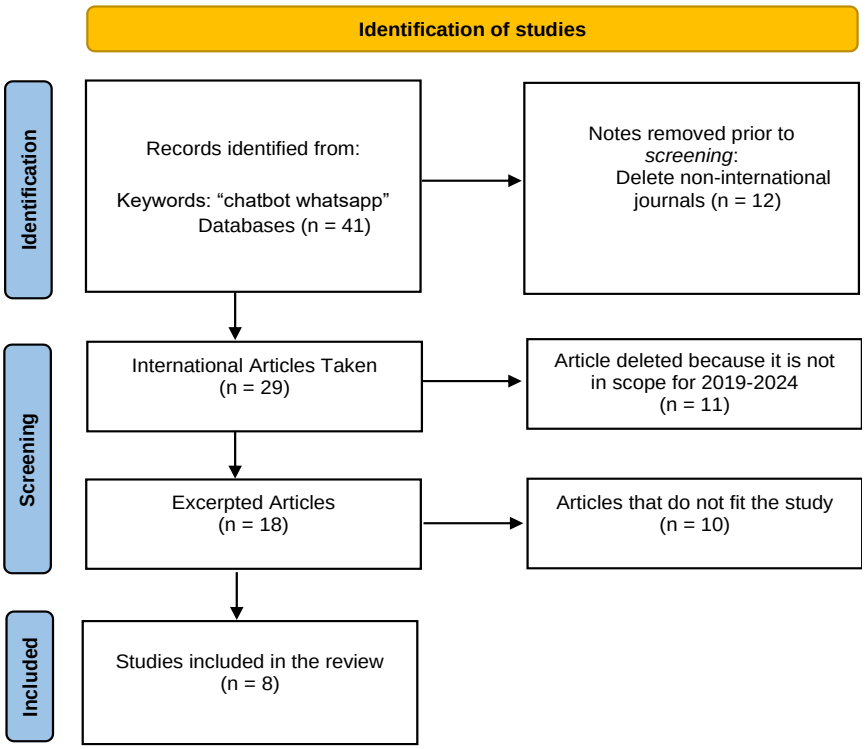

Fig. 1: Output Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)

Table 2. Research Jurnal

Writer	Year	Title
Malvin, et al [7]	2022	WhatsApp Chatbot Customer Service Using Natural Language Processing and Support Vector Machine
A. Ramaditiya, et al [8]	2021	Implementation of WhatsApp Chatbot using Python Programming for Broadcast and Reply Message Automatically.
N. A. Khan and J. Albatein [9]	2021	COVIBOT - An Intelligent WhatsApp Based Advising Bot for Covid-19
Sofiyah, FR, et al. [10]	2024	The artificial intelligence chatbot as an alternative customer services strategy to improve the customer relationship management in real-time responses
Thakkar, Jash., et al [11]	2019	Erasmus-AI Chatbot
Alia, Princess Ariatna., et al [12]	2024	Implementation of Chatbot on WhatsApp Using Artificial Intelligence with Natural Language Processing Method
Teo Kuo Hong & Mohamad Johan Ahmad Khiri [13]	2021	FCSIT WhatsApp Chatbot
Valderrama Jonatan & Aguilar Alonso Igor [14]	2023	Creation of a Chatbot Based on Natural Language Processing for WhatsApp

In addition to these constraints, 8 (eight) other articles were excluded because they were not relevant to the research topic focused on " WhatsApp Chatbot ". After going through a selection process based on the inclusion criteria that had been set, 10 (ten) articles were obtained that met the requirements. These

articles are not only in the 2019 – 2024 timeframe but are also relevant to the research topic, so they can be used as a basis for analysis and development of further studies.

From the mapping of previous studies in **Table 1**, it was found that the most frequently appearing keyword in this study was " WhatsApp Chatbot " This shows that WhatsApp has become one of the popular platforms in developing chatbots that aim to provide automated and efficient services to users [2]. After understanding the concepts used in these studies, the next step is to explore the methods applied to developing WhatsApp chat-bots. This search includes technical approaches such as Natural Language Processing (NLP) algorithms, integration with Application Programming Interface (API), programming languages used, and testing techniques to ensure chatbot performance in various usage scenarios.

Table 3. Method and Language

Writer	Method	Programming Language
Malvin, et al [7]	Support Vector Machine (SVM) waterfall development method	Python
A. Ramaditiya, et al [8]	Research and Development (R&D)	Python
N. A. Khan and J. Albatein [9]	Natural Language Processing (NLP)	Python
Sofiyah, FR, et al. [10]	Long Short-Term Memory (LSTM) and NLP	Python
Thakkar, Jash., et al [11]	NLP with Dialog flow and NLG	JavaScript
Alia, Princess Ariatna., et al [12]	Natural Language Processing (NLP)	Python
Teo Kuo Hong & Mohamad Johan Ahmad Khiri [13]	Natural Language Processing (NLP) and Agile Kanban	JavaScript
Valderrama Jonatan & Aguilar Alonso Igor [14]	Natural Language Processing (NLP)	Python

Based on the literature table above, it can be seen that research in chatbot development from 2019 to 2024 mostly utilizes modern methods in the form of Natural Language Processing (NLP). NLP is used because of its ability to understand and analyze natural human language, so that it can provide relevant responses that are in accordance with the context of the conversation. In the context of chatbot research, the NLP method is the main choice to improve the chatbot's ability to interact with users naturally. Several studies also combine NLP with other supporting technologies, such as Long Short-Term Memory (LSTM) [10] to strengthen language understanding and integrate platforms such as Dialog flow for more interactive chatbot implementations.

From the **Table 3**, it can be seen that the majority of studies use the Python programming language to develop NLP based chatbot systems. Python was chosen because of its flexibility and extensive ecosystem, including supporting libraries such as NLTK, spacy, and TensorFlow. In this case, Python is used to capture user input in the form of defined keywords or phrases, analyze them using NLP algorithms, and provide relevant output. Several other studies use the JavaScript programming language, especially with frameworks such as Node.js [13], showing diversification in development approaches. However, Python's dominance remains apparent, indicating the superiority of this language in developing NLP-based chatbots.

Based on these findings, further research can utilize Python to develop or refine WhatsApp chatbots. WhatsApp as a popular platform provides a great opportunity to present chatbots that are able to interact with users effectively through NLP. By integrating NLP methods and utilizing Python libraries, chatbot systems can be designed to recognize more conversational context, provide more relevant responses, and improve the overall user experience. Research can be focused on improving the accuracy of chatbot understanding of user input and adjusting responses based on specific needs in the WhatsApp environment.

Chatbots have been developed for various purposes in various sectors, as shown in the table above. In the health sector, chatbots are used to help treat certain symptoms by providing initial information to users. This technology not only facilitates access to medical information but also increases efficiency in providing health services, especially for people who need a quick response.

In business, chatbots are an effective solution to handle various customer questions related to products or services. The use of chatbots allows companies to provide responsive customer service that is available 24/7. In addition, chatbots can improve user experience by providing relevant product recommendations based on customer needs, thus helping companies build better relationships with their consumers.

Table 4. Utility

Writer	Utility
Malvin, et al [7]	Chatbots to speed up the exchange of product information to customers
A. Ramaditiya, et al [8]	WhatsApp chatbot system to send broadcast messages and reply to messages automatically
N. A. Khan and J. Albatein [9]	WhatsApp chatbot to provide initial medical advice based on patient symptoms during Covid-19 pandemic
Sofiyah, FR, et al. [10]	Chatbot system for real-time customer relationship management
Thakkar, Jash., et al [11]	Answering questions about registration procedures and other activities on campus
Alia, Princess Ariatna., et al [12]	Answering questions asked by several buyers regarding the products they want to buy
Teo Kuo Hong & Mohamad Johan Ahmad Khiri [13]	Chatbot to consult with faculty staff or search for information through the faculty website to obtain information.
Valderrama Jonatan & Aguilar Alonso Igor [14]	Chatbot to provide services to customers regarding their products

In the world of education, chatbots are widely used for administrative purposes in the campus environment. For example, chatbots can help students get information related to class schedules, academic announcements, or the registration process quickly and easily. With this technology, educational institutions can simplify the flow of communication and ensure that students get access to accurate information without having to go through complicated procedures.

5. Discussion

Finding

RQ1 investigates the current state of research on chatbot applications on the WhatsApp platform. To answer this question, 8 published research articles were examined. According to the findings, the majority of Chatbot system applications use the Python programming language in their development. This shows the relevance of NLP in creating chatbots that are smarter and more responsive to user input. In addition, Python is the most widely used programming language due to its flexibility and the existence of libraries that support NLP development, such as NLTK, Spacy, and TensorFlow. These advantages make Python the main choice for chatbot implementation on various platforms, including WhatsApp.

In addition to Python, several studies also use JavaScript, especially in integration with frameworks such as Node.js to support chatbot architecture [13]. JavaScript is used to speed up development and provide scalability in implementation. However, Python still dominates because of its strength in NLP development and machine learning. Thus, Python and its supporting libraries play an important role in creating chatbots that can not only understand user conversations but also provide a more interactive and relevant experience on the WhatsApp platform.

RQ2 Based on the results of the analysis of the table, it was found that there are various methods used in developing chatbots on the WhatsApp platform. Of the eight articles reviewed, the most frequently used meth-od is Natural Language Processing (NLP). This method is the basis for understanding the user's natural language and providing relevant responses. NLP is widely applied because of its ability to process text, recognize patterns in conversations, and produce output that suits user needs. In addition, some developers also integrate NLP with other approaches to improve chatbot performance.

One additional method used is Long Short-Term Memory (LSTM) [10], which is a type of Recurrent Neural Network (RNN) designed to address the problem of data sequences in conversations. LSTM helps chatbots understand the context of longer conversations, so they can provide more contextual answers. In addition, there is integration with Natural Language Generation (NLG) to allow chatbots to produce more natural and cohesive text output [11]. The use of NLG provides added value in creating a conversational experience that is more similar to human interaction.

Another method found in the study is the Support Vector Machine (SVM) combined with a software development model such as waterfall [7]. SVM is used in the early stages for data classification or grouping, especially to understand user intent in conversations. In addition, there is also an agile Kanban methodology ap-plied to support chatbot project management, allowing for continuous iteration and system improvement. This method shows that WhatsApp chatbot development can be done with various

approaches according to needs, from text data processing to designing a system that is adaptive and responsive to change.

In addition, there is the use of the Research and Development (R&D) method, which is a systematic approach to developing chatbots [8]. This method involves the stages of exploration, design, development, and evaluation iteratively. Through R&D, developers can identify user needs, design specific solutions, and test chatbot prototypes before full implementation. With this approach, the chatbots developed become more relevant to user needs and have a higher success rate. R&D also supports the development of innovative chatbot technology, including integration with WhatsApp platform features, such as group message management, multimedia, and API.

RQ3 explores the various purposes of using WhatsApp chatbots in various application contexts. From the literature review, identify several main purposes of using WhatsApp chatbots, including customer service, broadcasting, healthcare, education, and increasing user satisfaction. WhatsApp chatbots are designed to accelerate real-time information exchange, improve operational efficiency, and provide a better user experience through automation.

In customer service, WhatsApp chatbots are used to speed up responses to customer inquiries or complaints, provide product information, and assist in real-time customer relationship management. This allows companies to establish faster and more efficient communication with customers, while reducing the manual workload on customer service teams. In addition, chatbots are also used for broadcast functions, where broadcast messages can be sent to multiple recipients at once, such as product promotions, information updates, or important re-minders.

In the healthcare sector, WhatsApp chatbots have become a very useful tool, especially during the Covid-19 pandemic [9]. The application is used to provide initial medical guidance based on patient-reported symptoms, assist in triage processes, and support automated booking of medical examinations or consultations. This use has helped reduce the pressure on medical personnel while providing quick and easy access for patients.

In the education sector, WhatsApp chatbots are used to answer students' questions in real time, such as aca-demic information, schedules, or administrative processes. This use not only increases the efficiency of communication between students and educational institutions but also provides a more responsive and flexible learning experience. In addition, chatbots can also help manage tasks and reminders, thus supporting student productivity.

The use of WhatsApp chatbots for user satisfaction is also one of the main goals. By providing a fast, relevant, and personalized interaction experience, chatbots can increase user satisfaction in various sectors. The ability to respond automatically and consistently makes chatbots a reliable solution in handling user needs, both on an individual and organizational scale.

Research Implications

Based on the findings, future chatbot development needs to be more directed at implementing Natural Language Processing (NLP) on specific platforms such as WhatsApp. By utilizing the Python programming language and its supporting libraries, such as NLTK, spacy, and TensorFlow, developers can create chatbots that are able to recognize more complex language patterns, provide more personalized responses, and adapt to user needs. In addition, the integration of technologies such as Long Short-Term Memory (LSTM) to understand the context of longer conversations, and Natural Language Generation (NLG) to produce more natural and context-based responses, can enrich the quality of chatbot interactions, making them more responsive and hu-mane.

Furthermore, technology development can also be directed at improving the chatbot's ability to handle multi-lingual conversations or cross-cultural conversation contexts, considering WhatsApp users come from various geographical and linguistic backgrounds. This step will expand the application of chatbots to a global scale, while providing an inclusive experience to users [15].

Further research can focus more on optimizing chatbots specifically for the WhatsApp platform, given the platform’s great potential for a variety of applications, such as customer service, education, and community management. Optimization can include developing a system that is able to understand the various contexts of conversations that occur on WhatsApp, such as personal messages, groups, and broadcast messages, so that chatbots can provide relevant and contextual responses. In addition, WhatsApp’s unique features such as voice messages, images, videos, and documents can be utilized to expand chatbot functionality, for example by integrating multimedia analysis.

Research can also explore further how to leverage WhatsApp Business API to support more advanced automation functions, such as customer data management, automated reminders, or conversation data

analysis for business decision making. By utilizing these API features, chatbots can be designed to meet increasingly com-plex and specific user needs. In addition, researchers can study the management of privacy and data security, given the characteristics of WhatsApp which uses end-to-end encryption, so that chatbots can remain safe and reliable in various usage scenarios.

Suggestions For Further Research

Further research could lead to the development of context-based chatbots, where the system understands not only text but also other elements such as emotions, intonation, or additional data that the user includes in the conversation. In addition, the development of multimodal chatbots that can process input in various formats (text, voice, and images) could also be an important focus. This step will not only increase the capabilities of chatbots but also their relevance in various usage scenarios on WhatsApp, especially for more complex needs such as automated customer service or online communication-based education.

Chatbot development can also be enhanced by leveraging modern machine learning models such as trans-former models (BERT, GPT, or ChatGPT). These models are known for their ability to understand the context of long and complex conversations while generating nuanced and relevant responses. The integration of these technologies allows chatbots to offer a more natural and interactive communication experience to users. For example, using transformer models, WhatsApp chatbots can track the context of multi-turn conversations (conversations that have several stages or steps) without losing important information, thereby improving the quality of responses.

On the other hand, attention to privacy and data security should also be a priority. Given that WhatsApp uses end to end encryption, further research can explore how chatbot systems can utilize data securely without compromising user privacy. The development of methods such as federated learning or differential privacy can help keep user data protected while allowing chatbots to leverage data-driven learning to continuously improve their performance. With this approach, chatbots on the WhatsApp platform can become a secure, reliable, and high-performance AI-based solution.

6. Conclusion

This study presents a systematic literature review on the use of WhatsApp chatbots using the PRISMA method approach. From the search results using the keyword "WhatsApp chatbot," eight relevant articles were found from various digital databases. Literature analysis revealed that the NLP (Natural Language Processing) method is the most frequently used approach, with the Python programming language as the main choice in its development. This finding also shows that WhatsApp chatbots have been applied in various fields, ranging from health, and business, to education. The variety of methods and technologies used reflects the flexibility of chatbots in adapting to the specific needs of each sector. Through this literature study, we identify important elements in the development and implementation of WhatsApp chatbots. This study not only provides insight into current technology trends but also serves as a guide for developers to optimize the use of chatbots in meeting user needs effectively and efficiently.

In this study, we present a systematic literature review on Chatbot applications. A systematic review protocol was used to analyze 8 articles from renowned digital databases such as Scopus, IEEE, ERIC, ScienceDirect and SpringerLink. The findings describe the current state of knowledge on Chatbot applications and identify the general benefits and challenges of using Chatbots. Furthermore, potential future areas that can benefit from this modern AI technology are identified and described as recommended by the literature. Finally, the study findings are discussed in terms of their implications.

From the research on review papers related to the WhatsApp chatbot, it is concluded that there are various methods used for development. Starting from using the waterfall method, R&D (Research and Development), Natural Language Processing (NLP), Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), Black-Box, Rapid Application Development (RAD), Pieces, Long Short Term Memory (LSTM), Fast Text, rule-based, User Acceptance Testing (UAT), Sentence Similarity Measurement (SSM), and Artificial Intelligence Markup Language (AIML).

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8. Abbreviations

Acronym	Full Form
NLTK	Natural Language Toolkit
BERT	Bidirectional Encoder Representations from Transformers
GPT	Generative Pre-trained Transformer

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