



## Development of A Telegram Chatbot for Final Project Services Using the Design and Development Research (DDR) Approach

Laisa Nurin Mentari<sup>1\*</sup>, Tiffany Nabarian<sup>2</sup>, Slamet Santoso<sup>3</sup>, Dymas Sutryсно<sup>4</sup>

<sup>1,4</sup>Information Systems, Sekolah Tinggi Teknologi Terpadu Nurul Fikri, Depok

<sup>2,3</sup>Information Technology, Sekolah Tinggi Teknologi Terpadu Nurul Fikri, Depok

Email: <sup>1\*</sup>[laisanurin@gmail.com](mailto:laisanurin@gmail.com), <sup>2</sup>[nabarian@nurulfikri.ac.id](mailto:nabarian@nurulfikri.ac.id), <sup>3</sup>[slamet@nurulfikri.ac.id](mailto:slamet@nurulfikri.ac.id), <sup>4</sup>[dymassutryсно32@gmail.com](mailto:dymassutryсно32@gmail.com)

### Abstract

Final project administration in higher education involves multiple stakeholders and frequently encounters issues such as delayed information delivery, document inconsistency, and repetitive student inquiries, which increase administrative workload and hinder the final project process. This study aims to analyze user needs and develop a chatbot as an academic information service for final project administration at STT Terpadu Nurul Fikri. The research employs the Design and Development Research (DDR) approach, focusing on the needs analysis, design, and development stages. User requirements were identified through interviews, observations, and academic document analysis. Based on these findings, a Telegram-based chatbot was designed and developed using Python and Telegram Bot API, providing academic etiquette guidelines, general final project information, implementation procedures, schedules, references, and frequently asked questions. The novelty of this study lies in its systematic emphasis on the needs analysis stage as the foundation for chatbot development, an aspect that has been limitedly explored in previous studies. Functional validation was conducted using black-box testing, and the results show that all implemented features functioned as intended, achieving a 100% functional success rate. These results indicate that the developed chatbot prototype is technically stable and ready to serve as a foundation for further user-based evaluation and system enhancement.

**Keywords:** Academic Chatbot; Design and Development Research (DDR); Final Project Administration; Needs Analysis; Telegram Bot.

## 1. INTRODUCING

The development of digital technology in higher education is increasingly demanding the availability of academic services that are fast, responsive, and easily accessible to students. One important aspect that requires special attention is the provision of information related to the final project process, such as registration procedures, administrative requirements, and writing guidelines. Many universities still face challenges in providing structured and real-time information services, leading students to often experience confusion when seeking administrative information that should be easily accessible [1]. This condition impacts delays in the academic process and decreases the effectiveness of communication between students and campus authorities.

A similar situation occurred at Nurul Fikri Integrated Technology College (STT-NF), where the high volume of repetitive questions related to the final project process became a significant administrative burden. Academic staff have to answer the same questions from many students, but responses cannot always be provided quickly due to limited staff and operating hours. The decentralized information dissemination system requires students to contact various parties to obtain answers to these standard procedures. This





situation underscores the need for technology-based academic service innovation to improve the efficiency of communication flow and ensure the accuracy of information received by students.

One technological solution that is increasingly used in the context of education and public services is the implementation of chatbots. Chatbot technology has the advantage of providing self-service quickly, consistently, and without time limitations. Research by Muhammad Ashfaq et al. shows that chatbots are able to increase user satisfaction because they can provide instant responses to repetitive questions without experiencing fatigue like human staff [2]. In an academic context, several studies conclude that chatbots can assist in delivering administrative information, support the learning process, and improve the overall user experience [3].

In recent years, chatbots integrated with popular messaging platforms like Telegram have shown high effectiveness in administrative services. Telegram provides a lightweight, fast, and easily accessible interface, and is widely used by students, making it an ideal medium for disseminating academic information. Research conducted by Rianto et al. shows that the Telegram chatbot is capable of accelerating the delivery of academic information thru the structured application of the forward chaining method [4]. Another study by Qalimaturrahmah & Santoso found that integrating Natural Language Processing into Telegram chatbots can improve the accuracy of responses to student statements because the system is able to understand context more naturally [5].

Additionally, the implementation of chatbots in academic settings has proven to significantly reduce staff workload. Previous research stated that Telegram chatbots are effectively used as a medium for delivering academic information because of their ability to provide automatic responses, eliminating the need for students to wait for administrative staff's working hours. This effectiveness aligns with the research by Gilang Citra Leonardo et al., which utilized a PHP and MySQL-based Telegram bot developed using the Webhook method, capable of providing various information such as class schedules, grades, KRS registration, short semester applications, and research applications. With this automated service, students can quickly obtain academic information thru their smartphones at any time, without having to manually contact administrative staff [6].

Another study by Lestari & Subekti showed that integrating classification-based text analysis can improve chatbot intelligence in understanding user needs and generating more targeted responses [7]. In the context of religious and cultural learning, the use of Telegram chatbots has also been proven to increase the effectiveness of self-directed learning, demonstrating that this technology is flexible and can be applied to various educational needs [8]. Similar research by Furqan et al. confirmed that NLP-based chatbots have successfully improved the quality of information services in higher education settings [9].

Furthermore, research by Najma et al. revealed that the use of chatbots in academic services is becoming increasingly important to overcome the limitations of curriculum information access, which has traditionally relied on manual responses from lecturers and educational staff. This dependence often hinders the rapid and consistent provision of information, especially outside of working hours [10]. Research by Detriasmita confirms that chatbots are an effective solution for students to instantly obtain basic information about academic services, study programs, and campus officials without having to navigate multiple web pages or manually interact with staff [11].

Ardiansyah's research also shows that chatbots are capable of improving the quality of administrative services by providing information quickly, efficiently, and responsively, while also reducing the workload of administrative staff. Thru functional, interaction,





compatibility, security, and performance testing, the chatbot system developed in the study achieved an accuracy level of 90% [12].

Meanwhile, another study by Deni developed a TF-IDF-based Telegram chatbot to facilitate access to academic information at Nusantara PGRI University Kediri, which showed high effectiveness in answering natural language-based questions [13]. Similar results were found by Adryan, where the developed chatbot achieved a 100% success rate in answering questions and received an "Excellent" score for Clarity and Accuracy based on the User Experience Questionnaire evaluation [14].

Further contributions related to the application of Large Language Models (LLMs) are also demonstrated thru studies focusing on the development of a conversational thesis reference search system in universities. Another study by Yola developed an AIML-based chatbot for providing campus information, including new student registration, study programs, tuition fees, and other services. Testing thru black-box, white-box, and user acceptance testing (UAT) shows that the system is capable of providing fast and accurate answers [15]. Alvin's research showed similar results, although aspects of speed and responsiveness still need improvement. His findings confirm that rule-based systems are superior in structured conversations, while LLMs are more effective for dynamic conversational contexts [16]. This shows that the development of academic chatbots is no longer just a technological trend, but has become a strategic necessity in improving the quality of higher education services.

Although the various studies mentioned above show that chatbots have been widely implemented in diverse academic services, there is still very limited research specifically developing chatbots for thesis services, especially those using a structured system development approach like Design And Development (DDR). The lack of research related to thesis services creates a significant research gap, considering this service is one of the most crucial administrative services requiring accurate, consistent, and up-to-date information.

Chatbot development cannot be done haphazardly, so a systematic framework is needed to ensure that the resulting solution truly meets the needs of students and academic units. Therefore, this study uses the Design and Development Research (DDR) approach, a developmental research model that systematically integrates theoretical and practical findings. This approach ensures a systematic design process thru an iterative cycle of needs analysis, design, and development, thus supporting the creation of effective and relevant solutions [17]. In the context of this research, development is focused on the two main stages of DDR, namely Need Analysis and Design and Development, while the Evaluation stage is not performed because the scope of the research only extends to the completion of the initial prototype and functional demonstration.

Based on this research gap, this study focuses on developing a Python-based Telegram chatbot to support thesis information services at STT-NF. The developed system is expected to provide fast, accurate, and consistent automated services, while also reducing the administrative burden on campus. Additionally, the results of this research are expected to serve as a reference for other universities in developing effective chatbot-based academic services that align with the latest developments in educational technology.

## 2. METHODOLOGY

### 2.1 Design and Development Research (DDR)

This study employs the Design and Development Research (DDR) approach, which focuses on the systematic design and development of technology-based products through iterative stages. The DDR approach is suitable for this research because it integrates theoretical analysis with practical implementation to produce functional artifacts that

Laisa Nurin Mentari: \*Corresponding Author



Copyright © 2026, of All Authors.

address real user needs. The DDR stages applied in this study include needs analysis, design, development, and initial technical testing [18].

The needs analysis phase was conducted to identify problems and user requirements related to academic thesis information services. Data were collected through direct observation of existing academic service processes, semi-structured interviews with academic staff and students involved in thesis administration, and analysis of academic documents such as thesis guidelines and institutional regulations. The output of this phase is a set of functional and informational requirements that define the scope and features of the chatbot.

Based on the results of the needs analysis, the design phase focused on translating user requirements into a structured system design. This phase produced several design artifacts, including conversation flow diagrams, system architecture, and knowledge base structure. The conversation flow was designed to ensure clarity, accuracy, and consistency in delivering thesis-related information to users.

The development phase involved implementing the designed system into a functional chatbot prototype. The chatbot was developed using the Python programming language and integrated with the Telegram Bot API as the communication platform. The knowledge base was structured to support predefined academic queries, enabling the chatbot to respond automatically to frequently asked questions related to thesis procedures.

The final stage, initial technical testing, was conducted to evaluate the functionality and technical performance of the chatbot prototype. This testing focused on functional testing, including response accuracy, command execution, system stability, and the chatbot's ability to handle predefined academic queries. The results of this testing indicate that the chatbot functions according to the specified requirements and is technically ready for further refinement.

This study is limited to the design and technical development of the chatbot prototype and does not yet include end-user evaluation or usability testing. Such evaluations are planned for future research to assess user satisfaction, effectiveness, and long-term system performance [19]. Nevertheless, the DDR approach in this study successfully produces a functional prototype and provides a methodological contribution to the development of academic chatbot systems in higher education environments.

## 2.2 Research Flowchart

The research flow diagram in Figure 1 shows the sequence of processes carried out, from needs identification to the final development stage. Each stage in the Design and Development Research (DDR) model is applied in a structured manner to ensure that chatbot development proceeds systematically and is user-needs oriented. The diagram illustrates the connection between the Need Analysis and Design and Development stages, including the research workflow and key decision points in each development phase. With this flowchart, the entire research process can be understood more clearly, easily replicated, and provides a strong foundation for development and evaluation in subsequent research.



**Figure 1. Diagram of Research Stages Using the DDR Model**

This research uses the Design and Development Research (DDR) model, which consists of two main stages: Need Analysis and Design and Development. The Need Analysis stage was conducted thru interviews, observations, and document analysis to identify problems

and user needs in the Final Project information service at STT-NF. The analysis results were used as the basis for determining the features and functional requirements of the chatbot. Subsequently, the Design and Development stage included designing interaction flows, use cases, system architecture, and developing a Python-based chatbot using the Telegram Bot API, culminating in internal technical testing to produce a ready-to-use and further developable chatbot prototype.

**2.3 Literature Review**

Based on that study, this research aims to develop a Python-based Telegram chatbot for final project services using the Design and Development Research (DDR) model. A summary of relevant previous research is presented in Table 1 below.

**Table 1. Literature Review**

Author & Year	Key Research Findings	Relevance to This Research
Sumiyati <i>et al</i> [20]	This research develops a web-based helpdesk chatbot using the waterfall method, going thru the stages of requirements analysis, design, implementation, and testing. As a result, the chatbot was able to provide academic information quickly and accurately, improve service efficiency, reduce administrative burden, and increase customer satisfaction.	This research demonstrates the effectiveness of a web-based academic chatbot in improving service efficiency. However, it is limited to general academic services and does not specifically address Final Project processes, which involve more complex and stage-based information. Additionally, the chatbot is implemented on a web platform, whereas this research focuses on a Telegram-based chatbot to provide more accessible, real-time, and mobile-friendly Final Project services at STT-NF.
Rival Haikal Hafizh <i>et al</i> [21]	This research addresses students' limitations in accessing academic and financial information outside of working hours by developing a chatbot based on a comparison of LSTM and Transformer algorithms using 2,565 question data. With the SEMMA method, the Transformer model showed the best performance with an accuracy of 0.84, precision of 1.00, and recall of 0.84 compared to LSTM with an accuracy of 0.82. The chatbot	This study emphasizes chatbot performance optimization using advanced NLP models such as Transformer and LSTM to answer academic and financial queries. Nevertheless, it prioritizes algorithm comparison rather than service-specific information management. In contrast, this research focuses on designing a structured knowledge base and response flow tailored specifically to Final Project services, without



	was then implemented on the website and received positive responses from users.	emphasizing complex machine learning models, but rather service accuracy and usability.
Arfiyan Khusnul Umam <i>et al</i> [22]	This research develops the Tanya Phone chatbot on Telegram to provide information on mobile device specifications, prices, and reviews. Thru the stages of needs analysis, conversation flow design, and development with the Telegram API, the chatbot was tested using black-box testing and all features functioned well. Its implementation is able to provide a quick and accurate response and helps improve users' digital literacy.	This research confirms that Telegram-based chatbots are effective for delivering information quickly and accurately. However, the chatbot is designed for commercial product information and digital literacy improvement, not for academic administrative services with procedural complexity. This research addresses this gap by implementing a Telegram chatbot specifically for managing Final Project information, including requirements, procedures, and timelines.
Ahmad Zuli Amrullah, <i>et al</i> [23]	This research develops an AIML-based chatbot as a virtual assistant to answer questions about PMB, such as requirements, fees, study programs, and campus information. Chatbots are able to respond quickly and reduce the administrative burden of handling repetitive questions. The test results showed 100% validity thru Black Box Testing and a user acceptance rate of 94.67%, indicating the system is highly suitable for use.	This study proves that AIML-based chatbots are effective in handling repetitive campus administrative questions, particularly for new student admissions (PMB). However, it does not cover Final Project services, which require more detailed, stage-oriented, and continuously updated information. This research fills that gap by focusing on Final Project services and implementing structured response validation to ensure information consistency.
Amrul Ahyar, dan Purwaningtyas [24]	This research shows that AI chatbots are very effective in terms of response speed, with a mean of 4.2, but accuracy (3.8) and information relevance (3.7) are still moderate. Chatbots are most widely used for college coursework and academic consultations, with the main	This research highlights students' reliance on AI chatbots for academic purposes while identifying limitations in information accuracy and relevance. However, it does not propose a concrete system design or implementation to address





	<p>constraint being students' difficulty in crafting prompts. The survey instrument is reliable, with a Cronbach's Alpha of 0.827. Overall, AI chatbots are considered capable of improving the efficiency of accessing academic information, although they still require improvement in context understanding and interaction.</p>	<p>these limitations. This research addresses this gap by developing and testing a purpose-built chatbot with a curated knowledge base and clear response flow for Final Project services, validated through black-box testing.</p>
--	---	---

Based on previous studies, chatbots have been widely implemented for academic services, general information dissemination, admissions, and commercial purposes. However, there is still a lack of research that specifically focuses on the development of a chatbot for Final Project services, which require structured, stage-based, and continuously updated information. Moreover, existing studies either emphasize algorithm performance or user perception, without addressing service-specific knowledge management and response validation. Therefore, this research aims to fill this gap by developing a Telegram-based chatbot dedicated to Final Project services at STT-NF, focusing on information accuracy, accessibility, and functional validation.

### 3. RESULT AND DISCUSSIONS

#### 3.1 Results of Needs Analysis

In the Analyze stage, a needs analysis was conducted on the final project administration process, involving various stakeholders such as final-year students, thesis advisors, head and vice-head of the study program, program staff, and BAAK staff. This administrative process often faces various obstacles, including delays in information delivery, errors in form filling, document format inconsistencies, and numerous repetitive questions regarding final project procedures and requirements [25]. This issue adds to the workload of administrative staff and has the potential to hinder the timely completion of students' final projects

To understand these needs and obstacles more deeply, this research conducted a needs analysis thru interviews and observations involving final-year students, supervising lecturers, and administrative staff. The analysis results indicate that students need faster, more accurate, and more easily accessible information about their final projects, particularly regarding procedures, guidance flow, document formats, important deadlines, and writing guidelines [25]. On the other hand, administrative staff need a solution that can reduce repetitive questions, minimize errors in file collection, and ensure information consistency.

Based on the analysis results, the chatbot emerges as a potential solution capable of providing quick and accurate access to procedural information, document templates, technical guides, and final project administration schedules. Chatbots can also function as interactive assistants, helping students understand administrative steps while reducing staff workload by automating responses to common questions. This approach provides a more structured foundation for designing a more contextual, effective, and needs-based chatbot administration system, particularly at STT Terpadu Nurul Fikri.

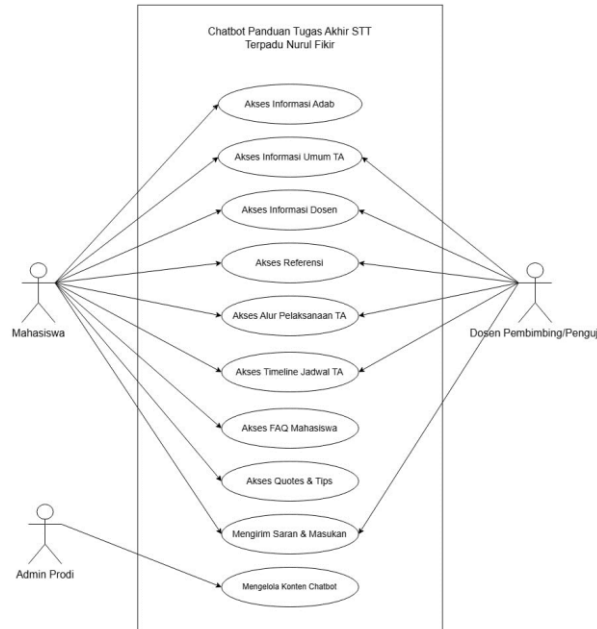
#### 3.2 System Design Results

The system design results are presented in the form of diagrams and models as follows.

##### 3.2.1 Use Case Diagram



A Use Case Diagram is used to describe the interactions between students, supervising lecturers, and examining lecturers with the chatbot system, including functions such as viewing FAQs, downloading templates, the thesis process, and so on.



**Gambar 2. Use Case Diagram**

The Use Case Diagram for the Final Project Guidance Chatbot at STT Terpadu Nurul Fikri illustrates the interactions between three main actors: Students, Supervising/Examining Lecturers, and Study Program Administrators. Students, as the primary users, can access various information features, such as etiquette, general information about Final Projects, lecturers, references, implementation flow, schedule timeline, FAQs, and quotes and tips, as well as submit suggestions and feedback. Supervising/Examining Lecturers have access to general information, lecturer data, references, implementation flow, and the Final Project timeline to ensure alignment in understanding procedures. The Study Program Administrator plays a role in managing, updating, and validating all chatbot content. Overall, this diagram shows that the chatbot serves as an integrated academic information service center to support the smooth administration and implementation of the Final Project.

**3.2.2 Flowchart for Using the Final Project Administration Chatbot**

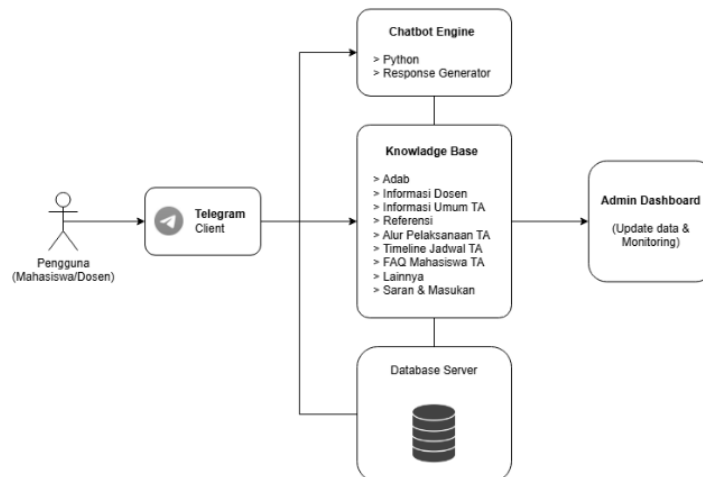
Figure 3 shows the flowchart for using the STT Terpadu Nurul Fikri Final Project administration chatbot thru the Telegram application. The process begins when the user opens the chatbot and runs the /start command. The chatbot will display a welcome message and the main menu. Users can then select various information menus, such as Etiquette, Lecturer Information, General Final Project Information, References, Implementation Flow, Schedule Timeline, FAQ, and Suggestions and Feedback. After the information is displayed, users can end the session or return to the main menu to continue interacting.



**Figure 3. Flowchart for Chatbot Usage**

### 3.2.3 System Architecture

The system architecture is designed so that students can access the chatbot via Telegram, with the chatbot processing questions, retrieving information from a database containing documents, and providing an admin panel for staff to update data and monitor chatbot activity. This design ensures the chatbot can provide information that is fast, accurate, and easily accessible, meeting the needs of both students and administrative staff.



**Figure 4. Chatbot System Architecture**

Figure 4 shows the architecture of the Final Project chatbot system, which consists of three main layers: the Client Layer, the Application Layer, and the Data Layer. Users interact thru Telegram as the main interface, while the Application Layer handles input processing using a chatbot engine integrated with a knowledge base and admin dashboard. Supporting data is stored on the database server in the Data Layer and is used to generate accurate responses. This tiered architecture ensures efficient information flow and facilitates the future management and development of the chatbot system.

### 3.3 System Implementation

The chatbot was implemented using Telegram as the primary platform due to its ease of access, high popularity among students, and stable API support. Chatbots are developed to respond to both text-based commands and menu options provided by Telegram.

#### 3.3.1 Initial Chatbot Display

The initial display is the first interface that appears when a user opens the chatbot through the Telegram application. On this display, the chatbot shows a welcome message and brief information about its function as an administrative information service for Final Projects. The initial display also provides a main menu or usage instructions so that users can interact with the chatbot easily and purposefully.



Figure 5. Initial View of the Chatbot

#### 3.3.2 Main Menu

The main menu serves as the primary navigation for the chatbot, containing a list of services accessible to users. This menu is presented in the form of interactive buttons to make it easier for users to select the information they need, such as FAQs, schedules, guideline documents, and so on.

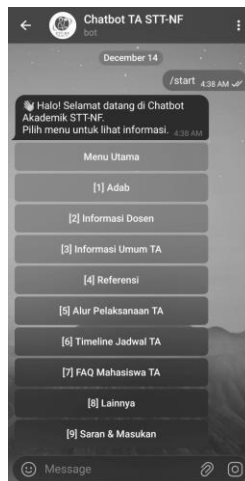
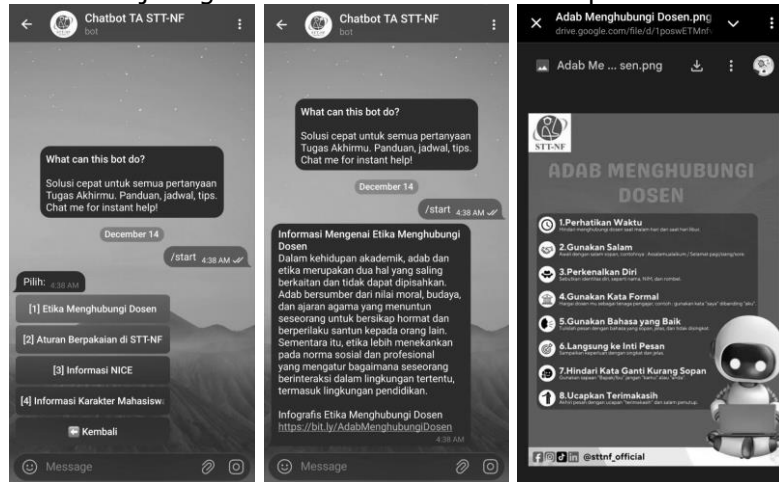


Figure 6. Main Menu

#### 3.3.3 Menu Etiquette

The Adab Menu is a chatbot feature that provides guidance on student ethics and etiquette in completing their Final Project, particularly when communicating with their supervisors and administrative staff. This menu aims to help students understand

professional attitudes, polite communication rules, and academic ethics that need to be applied during the Final Project guidance and administrative process.



**Figure 7. Results of Selecting the Manners Menu**

### 3.4 Functional Testing (Black Box Testing)

The system was tested using a simple black box testing method to ensure that each chatbot feature functions as intended. The testing focused on user interaction with the chatbot without looking at the internal code structure.

**Table 3. Black Box Testing Results**

No	Tested Features	Test scenario	User Input	Expected output	Test results
1	Start command	The user initiates the chatbot interaction	/start	The chatbot displays a welcome message and the main menu	Successful
2	Main Menu	The user selects the main menu	Click the main menu	The chatbot menu list is displayed	Successful
3	Menu of Etiquette	The user selects the Manners menu	Click the Etiquette menu	The chatbot displays information on the etiquette of the Final Project	Successful
4	General Information for the Academic Year	The user selects the General Information menu for the Academic Year	Click the General Information menu for the Academic Year	Information on the thesis procedures and regulations is displayed	Successful
5	Lecturer Information	The user selects the "Faculty Information" menu	Click the Faculty Information menu	The chatbot displays data on supervising/examining lecturers	Successful
6	Flow of Thesis Implementation	The user selects the Implementation Flow menu	Click the TA Implementation Flow menu	The chatbot displays the stages of final project implementation	Successful

7	Timeline for Final Project Schedule	The user selects the Timeline menu	Click the TA Schedule Timeline menu	Information on the displayed final project schedule	Successful
8	Student FAQ	The user selects the FAQ menu	Click the FAQ menu	The chatbot displays common questions and answers	Successful
9	References	The user selects the References menu	Click the References menu	The list of references or links is displayed	Successful
10	Suggestions & Feedback	The user selects the Suggestions & Feedback menu	Survey Input	Users are asked to fill out the provided survey form	Successful

Based on Table 3:

- Number of test scenarios: 10
- Number of features successfully tested: 10
- Number of failed features: 0

Percentage Calculation:

$$\text{Success Rate} = \frac{10}{10} \times 100\% = 100\%$$

The percentage of testing results presented in this study is calculated based on the functional testing scenarios listed in Table 3. A total of 10 test scenarios were executed using black-box testing, and all tested features produced outputs that matched the expected results, resulting in a 100% functional success rate. This percentage reflects system functionality rather than user satisfaction or usability evaluation. The absence of functional errors indicates that the Telegram-based Final Project chatbot is functionally stable and capable of delivering academic information accurately according to user input, confirming that the system is ready to be used as a supporting tool for Final Project services at STT-NF.

### 3.5 Discussion

The research findings indicate that the developed Final Project administration chatbot has been able to provide basic information services independently to students. The existence of chatbots helps reduce the need for students to contact administrative staff directly, especially for routine and repetitive questions. Compared to previous research that developed chatbots for academic services, the results of this study are consistent with the finding that chatbots can improve the efficiency of information services and accelerate the delivery of information to users. However, the main difference in this research lies in the implementation focus, which emphasizes the system analysis, design, implementation, and deployment stages, without directly involving user evaluation. The limitation of this research is that the user satisfaction evaluation stage has not yet been carried out, so the effectiveness of the chatbot from the user experience perspective cannot yet be measured. Nevertheless, the results of internal implementation and testing indicate that the system is ready to be used as an initial information service and can be further developed in subsequent research.

## 4. CONCLUSION

This study aims to design and conduct the initial development of a chatbot as a medium for administrative information services related to Final Projects at Nurul Fikri Integrated



Technology College using the Design and Development Research (DDR) approach. The research focuses on the needs analysis, system design, and implementation stages, resulting in a Telegram-based chatbot prototype that provides academic information services tailored to user requirements. The developed features include academic etiquette guidelines, general information on Final Projects, implementation procedures, schedule timelines, reference guidance, and frequently asked questions (FAQs) for students.

The scientific contribution of this research lies in its systematic emphasis on the needs analysis phase as the primary foundation for chatbot development, an aspect that has received limited attention in previous studies, which predominantly emphasize system evaluation or performance after implementation. By structuring chatbot features directly from identified user needs, this study demonstrates a design-oriented approach that strengthens the relevance and usability of academic chatbot systems.

Functional validation was conducted using black-box testing, focusing on feature execution, response accuracy, and system stability. The testing results show that all implemented features functioned as intended, achieving a 100% functional success rate, indicating that the chatbot prototype is technically stable and ready for further development.

Despite these results, this study has limitations, particularly the absence of end-user evaluation to assess effectiveness, user acceptance, and satisfaction. In addition, the chatbot currently relies on a static knowledge base and does not yet implement adaptive natural language processing capabilities. Therefore, future research is recommended to incorporate user-based evaluation methods, enhance intelligent interaction mechanisms, and expand system integration with other academic information services. With continued development, chatbot-based systems are expected to contribute more comprehensively to the digital transformation of academic administrative services in higher education institutions.

## 5. ACKNOWLEDGMENT

The author expresses sincere gratitude to the Directorate General of Higher Education, Research, and Technology (Ditjen Dikti Ristek), Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia, for their financial support thru the Early Career Lecturer Research Grant (PDP) scheme.

This research was successfully carried out thanks to funding support as stated in Decree Number 0419/C3/DT.05.00/2025 and Agreement/Contract Number 148/SPK/LPPM/STTNF/VI/2025. This support enables research to be conducted and contributes to the development of innovations in the fields of artificial intelligence and higher education.

## 6. REFERENCES

- [1] M. C. Sáiz-Manzanares, R. Marticorena-Sánchez, L. J. Martín-Antón, I. González Díez, and L. Almeida, "Perceived satisfaction of university students with the use of chatbots as a tool for self-regulated learning," *Heliyon*, vol. 9, no. 1, Jan. 2023, doi: 10.1016/j.heliyon.2023.e12843.
- [2] M. Ashfaq, J. Yun, S. Yu, and S. Loureiro, "I, Chatbot: Modeling the Determinants of Users' Satisfaction and Continuance Intention of AI-Powered Service Agents," *Telematics and Informatics*, vol. 54, p. 101473, Dec. 2020, doi: 10.1016/j.tele.2020.101473.
- [3] V. Joey Ferelestian, B. Susanto, I. Kadek Dendy Senapartha, and J. Wahidin Sudirohusodo, "Development of a Telegram Chatbot for Student Information Using Wit.ai," no. 2, 2023, doi: 10.21460/jutei.72.257.





- [4] R. Rianto, A. Rahmatulloh, and T. Firmansah, "Telegram Bot for Automation of Academic Information Services with The Forward Chaining Method," *Sinkron*, vol. 3, pp. 73–78, Mar. 2019, doi: 10.33395/sinkron.v3i2.10023.
- [5] M. Qalimaturrahmah and D. B. Santoso, "Chatbot-Based Academic Service and Information Application Using Natural Language Processing," *Journal of Information and Communication Technology*, vol. 8, no. 2, p. 2024, 2024, doi: 10.35870/jti.
- [6] G. Citra Lenardo, "Utilization of Telegram Bot as Academic Information Media at STMIK Hang Tuah Pekanbaru," vol. 1, no. 4, pp. 351–357, 2020, Accessed: Jan. 05, 2026. [Online]. Available: <https://doi.org/10.35746/jtim.v1i4.59>
- [7] D. Lestari and L. Subekti, "Implementing a Chatbot on Telegram as a Monitoring Assistant with Text Classification Analysis Using the Support Vector Machine Method," *Journal of Internet and Software Engineering*, vol. 5, no. 2, 2024.
- [8] Ni Putu Utari Dyani Laksmi, A.A. KOMPIANG Oka Sudana, and AA.Kt.Agung Cahyawan Wiranatha, "Innovative Learning Model for Dharmagita Based on Telegram Chatbot," *National Journal of Information Technology Education (JANAPATI)*, vol. 13, no. 2, pp. 248–257, Jul. 2024, doi: 10.23887/janapati.v13i2.78535.
- [9] M. Furqan, S. Sriani, and M. N. Shidqi, "Telegram Chatbot Using Natural Language Processing," *Walisingo Journal of Information Technology*, vol. 5, no. 1, pp. 15–26, Jun. 2023, doi: 10.21580/wjit.2023.5.1.14793.
- [10] N. R. P. Syallya, A. A. Pravitasari, and A. Helen, "NLP-Based Intent Classification Model for Academic Curriculum Chatbots in Universities Study Programs," *Jurnal RESTI*, vol. 9, no. 1, pp. 111–117, Feb. 2025, doi: 10.29207/resti.v9i1.6276.
- [11] D. Sientisna, I. G. A. G. A. Kadyanan, I. B. M. Mahendra, and V. G. A. Pradika, "Campus Information Service Chatbot," *JNATIA*, vol. 2, no. 1, 2023.
- [12] R. Ardiansyah, D. Marya, and A. Novianti, "Using the string matching method in the Polinema student information system with a chatbot," *JURNAL ELTEK*, vol. 21, no. 1, pp. 28–35, Apr. 2023, doi: 10.33795/eltek.v21i1.381.
- [13] D. Kristanto, R. A. Ramadhani, and A. B. Setiawan, "Development of a Campus Information Service Chatbot Using TF-IDF," *Jurnal Algoritma*, vol. 22, no. 2, pp. 103–115, Nov. 2025, doi: 10.33364/algoritma/v.22-2.2350.
- [14] M. A. Hasbi, R. Imanda, and M. Fathan Fauzan, "Implementation of a Large Language Model-Based Chatbot for Integrated Student Thesis Search with WhatsApp," *Arcitech: Journal of Computer Science and Artificial Intelligence*, vol. 5, no. 1, pp. 148–167, Jun. 2025, doi: 10.29240/arcitech.v5i1.13974.
- [15] P. Aplikasi, Y. Permata Bunda, P. Chairu Sablia, S. Informasi, F. Sains dan Teknologi, and U. Tjut Nyak Dhien, "Lisensi Lisensi Internasional Creative Commons Attribution-ShareAlike 4.0", doi: 10.30606/rjti.v3i3.3540.
- [16] A. Alvin, R. Robet, and F. Tarigan, "Implementation of a Web-Based Automated Academic Chatbot Using LLM and Rule-Based System Case Study: STMIK Time," *JIKO (Jurnal Informatika dan Komputer)*, vol. 9, p. 651, Oct. 2025, doi: 10.26798/jiko.v9i3.2209.
- [17] R. Omar, A. Z. Bin Mohamad Ali, and S. Xiangwei, "The Design of an Interactive Science Literacy Model Using Design and Development Research (DDR) in Early Childhood Education," *International Journal of Teacher Education and Professional Development*, vol. 8, no. 1, pp. 1–26, Jun. 2025, doi: 10.4018/ijtepd.382756.
- [18] S. Jaya et al., "Employing Design and Development Research (DDR) Approach in Designing Next Generation Learning Spaces (NGLS) In Teachers' Pedagogy and





- Technology Tools," *Review of International Geographical Education Online*, vol. 11, no. 7, pp. 1237–1246, 2021, doi: 10.48047/rigeo.11.07.116.
- [19] R. C. , & K. J. D. Richey, "Design and Development Research ," *Springer, New York*, 2014.
- [20] C. Adiwinata, R. Marbun, and P. Rahayu, "Implementation Of Helpdesk Chatbot Application For Information System Services In Higher Education," *Instek Journal (Informatics Science and Technology)*, vol. 9, pp. 272–284, 2024, Accessed: Jan. 05, 2026. [Online]. Available: <https://doi.org/10.24252/instek.v9i2.50073>
- [21] Rival Haikal Hafizh, "Development Of A Transformer Neural Network-Based Chatbot For Academic And Financial Information Services For Students At Muhammadiyah University Sukabumi," *JITET (Journal of Applied Informatics and Electrical Engineering)*, vol. 12, 2024, Accessed: Dec. 14, 2025. [Online]. Available: <http://dx.doi.org/10.23960/jitet.v12i3.5002>
- [22] A. khusnul Umam, E. Wijayanti, and A. A. Chamid, "Chatbot Development on the Telegram Platform as an Information Medium for Mobile Phones," *bit-Tech*, vol. 8, no. 1, pp. 33–40, Aug. 2025, doi: 10.32877/bt.v8i1.2150.
- [23] A. Z. Amrullah, A. S. Anas, and G. Primajati, "Implementation of a Chatbot as a Virtual Assistant for New Student Admissions at Bumigora University," *Jurnal Bumigora Information Technology (BITE)*, vol. 4, no. 1, pp. 17–26, Jun. 2022, doi: 10.30812/bite.v4i1.1664.
- [24] Amrul Ahyar and Franindya Purwaningtyas, "Analysis of the Effectiveness of AI Chatbot Usage in Academic Information Retrieval for UIN Sumatera Utara Students," *Library and Archival Information Science*, vol. 14, p. 77, 2025, Accessed: Jan. 05, 2026. [Online]. Available: 10.24036/jiipk.v14i1.134547
- [25] L. N. Mentari, "Needs Analysis for Chatbot-Based Final Project Administration: A Qualitative Study at STT Terpadu Nurul Fikri," *Journal of Computer Networks, Architecture and High Performance Computing*, vol. 7, no. 4, pp. 1217–1225, Nov. 2025, doi: 10.47709/cnahpc.v7i4.6973.

