

The Development of Telegram Bot API to Maximize The Dissemination Process of Islamic Knowledge in 4.0 Era

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ABSTRACT

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Information technology is developing quickly in this era as if the world is in our hands. All forms of information can be accessed quickly, including Islamic information by utilizing internet technology. One of well-known medium to spread information is social media. Telegram, as one of the social media that has various beneficial features and widely used by people, has the potential to be a medium for disseminating Islamic knowledge. To improve the dissemination process of Islamic knowledge, we used one of the services found on Telegram namely chatbot. By utilizing Telegram Bot API, we make a bot that can automatically provide output according to the command given by the user in this case, giving various Islamic knowledges that users need such as Tafsir, hadith, daily prayer, and even Islamic history with a reliable source. Based on the testing result, the bot is showing a good result because it's displaying the expected output and all features are working fine as they should be. We hoped that this bot can maximize the dissemination process of Islamic knowledge in Indonesia and reach wider audience coverage.

Keywords: *Islamic Knowledge; Telegram; Chatbot; API; Shalat Reminder;*

I. INTRODUCTION

The usage of information technology in a daily basis have become a habit and a common phenomenon in society nowadays [1]. Communication activity that was originally a complicated process and considered hard now is a very simple task to do [2]. Internet technology plays a vital role in disseminating information in the era of the industrial revolution 4.0.

As a country with the largest Muslim population in the world [3], the flow of information exchange and information dissemination regarding Islamic knowledge with the internet is massive. Various ways are done by many people to share the information to each other and increase the effectiveness of utilizing various tools and applications. Some of the implementations of disseminating this information are carried out through the creation of an Islamic-based application [4], furthermore, there are also those who create websites that contain information about Islam [5].

Even though there are many ways to exchange and spread information about Islamic knowledge, One of the popular medium for disseminating Islamic knowledge is using social media [6]. Social media, which initially became well known medium for communicating between humans, has developed into medium for disseminating information to the society around the world. The convenience of obtaining information is also one of the many advantages provided by the development of information technology at this time [7]. In terms of Islamic knowledge dissemination, people can simply share information through social media. Even with the simplest tool, there are people known as preachers who actively share their knowledge through their personal social media accounts on a regular basis [8].

In Indonesia itself, there are so many social media platforms and one of them is Telegram. Telegram can be considered one of the popular social media because it has many functions and benefits [9]. For example, Telegram application is increasingly being used by many people for their daily needs [4]. The usage of Telegram has become a common thing to do by various citizens and for various purposes. Not only used as a medium of communication between individuals [10], Telegram is also widely used by many various groups of society. For example, telegram can be used as a quiz medium to help students understand the lesson [11].

Telegram is also known to have various useful features. There are several features that are considered popular among the user, for example the default feature, messaging by text or images [12], or creating groups to exchange information between members, and even creating channels and bots to spread various information. One of the beneficial features that telegram had is bot. Chatbot can be defined as an artificial intelligence-based program that can automatically send messages to the user and also can be used as medium to communicate with humans [13]. Telegram, according to its official website, provides a space for developers that want to use the Open API and Protocol for Telegram Bot development [14]. Bot can be used by allowing users, either personal or group, to send a specific command to be answered by a computer program with the information that we've previously provided [15]. Besides from being known for its diversity of features, Telegram is also an application that we can easily access, popular for its guaranteed message security [16], and clearly free to use the various features in it. Because of these reasons telegram is considered very popular in society, many people are attracted to use it, gets attention from various parties, and managed to reach a wide audience around the world including Indonesia.

Inspired by the flexibility of Telegram bot, and the potential it has to be used as an information dissemination medium, we want to improve and also maximize the dissemination process of Islamic knowledge by using one of the services found on Telegram, chatbot to provide Islamic knowledge and Islamic teachings that can reach a wider community. By utilizing Telegram Bot API, the bot can automatically provide output according to the command given by the user and give information that the user needs. With Islamic bot, we want to provide new options for the public in accessing information about Islamic knowledge, and also provide convenience for Muslims in Indonesia because the information can be accessed anytime and anywhere. We hoped that with this bot, the information dissemination process can be carried out more efficiently because of its easy to use tool everywhere and every time and also increasing its effectiveness because it can reach out to wider audience coverage [17].

II. METHODOLOGY

2.1 Literature Review

Telegram Bot

Bot is a program that can work automatically. In Telegram, bots mean special Telegram accounts in the form of channels designed to be able to handle and display messages automatically [18]. Users can interact with bot by sending messages or well known commands either through private messages or through groups. At its development, the telegram bot account doesn't require an additional phone number because this account only serves as an interface for code running on a server. Bot can be built according to the client's requirements and can be programmed to act as if they were being operated by a human. An Islamic bot later will be very useful for providing information upon requests from users to get information regarding to Islamic knowledge, looking for information, or as a daily Islamic reminder.

Telegram has a Bot Application Programming Interface which can be called Tele Bot API which is an open-source technology that allows creating bot apps within Telegram designated for the developers. This bot uses an HTTP-based interface that can be connected to bot that was previously developed by the developer for Telegram [19]. In general, this Telegram bot can be created by two methods:

- Long-Polling Method

The bot is accessed through the laptop/computer itself as a server and database. The local server performs periodic checks on the bot to check if the message is coming in. If there's message, the incoming message will be executed based on the user's request. Otherwise, the server condition is idle [20].

- Webhook Method

The server is hosted and uses HTTPS so that other users can use it. The Telegram Bot Application Programming Interface (API) is an open-source technology provided by Telegram Messenger LLP to build Telegram bot applications for developers. This bot API is an HTTP-based interface for connecting bots developed by developers with the Telegram system [21].

Islamic Knowledges

In Islam, learning activities and seeking knowledge are included as obligations that must always be carried out by every Muslim for their whole life [22]. These activities inspire its adherents to continually explore knowledge all the time. The knowledge coverage here is not limited to sciences such as mathematics, physics, or chemistry, but knowledge here also includes religious knowledge variety such as Tafsir, hadith, sirah nabawiyah, etc [23]. Accessing general knowledge is very easy to do because the sources are spread all over the world. However, seeking Islamic knowledge certainly has its own challenges. Some of the problems is, the sources of Islamic knowledge that aren't available as much as general knowledge, and even language barriers because the available languages are often in English or Arabic, where there are still many Indonesian local people who don't really understand these two languages. Religion has many branches that have their own specialization. Some of them are:

- Sirah Nabawiyah:

Sirah nabawiyah is a branch that discusses the life history of Prophet Muhammad SAW starting from his birth (and even before his birth) to his death and sometimes also discusses the society condition after his death. From these stories, people will observe and do research about wisdom and lessons that can be learned from his story [24].

- Hadith

Hadith is everything that is based on the Prophet Muhammad SAW words, actions, statements (taqrir) and so on. Ibn Taimiyah gives a limitation, that what is meant by hadith is something that is relied on Rasulullah SAW after he was appointed as a Prophet, which consists of words, actions, and taqrir. [25]. For Muslims, hadith has a high value after the Qur'an, so that hadith can be used as a reference for Islamic law and guidelines.

- Tafsir

Tafsir is a branch that explains the meaning of verses in the Qur'an. Not everyone can interpret the Qur'an, and even only mufassirin who have the authority can interpret the Qur'an [26].

2.2 Data Acquisition

To process data collection and acquisition, there are 2 techniques that we used. The first is primary data collection, obtained through the procurement of online questionnaires distributed to people. The other one is secondary data collection, which is carried out through related research literature studies, regarding the system development that will be made.

In this research, we use google form as an online questionnaire maker platform to get the bot requirements that people want and need so the bot can effectively provide the right information and right features. Before distributing the questionnaires, first, we make a list of questions that are relevant to the bot needs. The questions we've managed include the following:

Table 1. Data Collection: Questionnaire

Question	Answer
Have you ever used any Whatsapp or telegram bot before?	a. Yes b. No
How effective is the bot in disseminating information?	On a scale of 1-5 (Not effective-Very effective)
How big is your interest in using Islamic bot?	Scale 1-5 (Don't have any interest-Very interest)
What information would you like to know from the Islamic bot?	a. A brief tafsir from a verse in Holy Qur'an b. Profile of the Prophets Companions and Islamic leaders c. Meaning of a certain Islamic prayer d. Meaning of a Hadith e. Islamic History
What features would you expect to be available in a bot?	a. Prayer times according to zone b. Daily Islamic Reminder c. Murottal of the Priests

The questionnaires were distributed to various social media platforms such as Facebook, Twitter, and Instagram. From this data collection

activity, we get a total of respondents consist of 36 females and 21 males, with an average age of 19 years. Based on the previous questionnaire, we did a simple exploratory data analysis to see the overall data distribution and after that the following conclusions can be drawn:

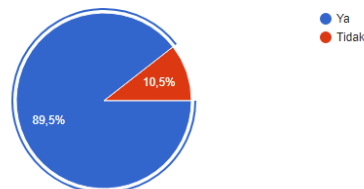


Figure 1. Telegram Usage Experience

51 respondents have used Telegram bot, so it can be interpreted that the usage of the bot, especially among young people, is very common because it reaches 89.5% of all respondents that already used telegram.

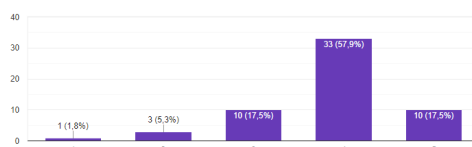


Figure 2. The level of effectiveness of bots in disseminating information

More than half of the respondents, 57,9% percent agree that the level of effectiveness of bots in disseminating information has a value of 4 from 1-5 scale, so it can be concluded that the performance of bot for disseminating information is really good.

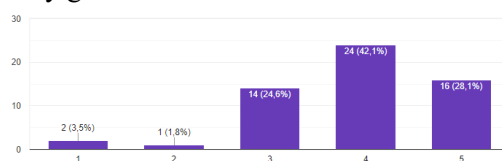


Figure 3. The level of interest of respondents to use Islamic bots

The average level of interest of respondents to use Islamic bots is on a scale of 4 (from 1 to 5 scale), which means that people are enthusiasts waiting for bot that contain Islamic knowledge.

The information that respondents want to know from the Islamic bot is mostly about the story of the prophet and his companions, the meaning of prayer and hadith as well as a brief interpretation of the verses in the Holy Qur'an and the most expected feature available in a bot is the

prayer schedule according to the zone, as well as the murottal of the imams.

Furthermore, for secondary data collection, we do a 2-way literature study, the first one was a literature study on telegram bot technology and the second was an Islamic literature study which included a feasibility study and the truth of the material contained in the bot. For material on interpretation/tafsir, we take the interpretation sourced from the official ministry of religion in Indonesia, for murottal we take the audio from an open-source API called Quran-API, for sirah nabawiyah material we take from various sirah books, for hadith material, and the meaning of prayer are taken from an open-source API called hadith-API which contains a collection of the most trusted hadiths. We are very careful in finding sources of material because every article must come from a trusted source.

2.3 System Design and Analysis

Tools Used

a. Python 3.8

Python is one of the high-level programming languages and considered as the most popular programming language today. Python was first created by guido van rossum in 1991 which was originally created to manage and handle the amoeba operating system developed by Andrew S. Tanenbaum. The name python itself was inspired by a television program series entitled Monty Python's Flying Circus. Python is increasingly popular because of the various advantages and conveniences it offers. Some of the advantages of python are Easy to Understand, Dynamic, Totally Free, and Multi-Platform.

In python programming, we can create various kinds of modules which later we can put together into a folder or also called a package. These various packages can then be compiled into a single entity called the Library. In 2020, python is recorded to have more than 137,000 libraries developed through open source projects so that we can access them for free [27]. To search and see the various python libraries available, you can directly visit the pypi page. To install the library in python, you can use the pip command, which is a module in python that acts as an installer to install various frameworks and other libraries. After installing pip, then user can simply install other libraries by typing the following command:

```
Pip install library_name
```

Some of the famous libraries found in python are Pandas, NumPy, Matplotlib, and Sklearn.

b. Telegram Bot API

Telegram is a cloud-based messaging service with an end-to-end encryption system. Telegram allows clients to send messages by text, images, and audio simply and safely. In addition to the end-to-end encryption system, Telegram also has a self-destruction messages system and a multi-datacenter infrastructure.

With the Application Programming Interface (API) provided by Telegram, the Telegram Bot API client can easily create an automated messaging system using bots. Because Telegram is a cloud-based application, automatic messaging can be done quickly and effectively.

In this research, a telegram bot API is used, namely python-telegram-bot which is an open-source API so that people can use it for free and all telegram users can contribute to developing the API. Telegram bots have provided various methods that can be directly used by users, including [28]:

Table 2. Telegram Bot API Methods

Method	Description
logOut()	Mainly used for log out from the cloud bot API server before being used to launch the bot locally
sendMessage()	Mainly used to send a text message
forwardMessage()	Used to do forwarding process of a message of any kind
copyMessage()	Mainly used to Copy messages of any kind
sendPhoto()	Useful to send photos.
sendAudio()	Used to send audio files (must be in the .MP3 or M4A format)

c. JSON

JavaScript Object Notation or well known as JSON is a data format that tends to be easier to read and write by humans and is currently being used by many people to store and transfer data.

JSON is often used in APIs and even web services because it has a very simple and lightweight data structure [29]. In addition, writing the JSON format doesn't depend on one programming language so JavaScript JSON can be used with various other programming languages such as C++, PHP, Ruby, to Python [30]. Because of this flexibility and advantages, JSON is referred to as the most ideal data format for exchanging data between applications. In this study, JSON is used to transfer and store data from the Quran & hadith API into the Telegram Bot server. Here is an example JSON object writing in a code:

```
{
  "quran": "Al-Fatihah: 1",
  "juz": "1."
}
```

d. Oracle Cloud

Oracle is a provider of database management system developers. Covering many services, Oracle Cloud is one of the services that provides a set of cloud storage services that developers and companies can use to build and run various services and applications. Often called OCI, this service offers high-performance computing. Another advantage is that the existing OCI storage capacity is flexible and can be accessed from the local network more securely. OCI also provides a choice of free services that can be used by students if they upload a student card that is proven to be authentic through the verification process. In this study, we used the free package offered by OCI and get cloud storage for up to 4 Virtual Machines (4VCPU Cloud) equipped with up to 12GB of RAM capacity.

e. Trello

Trello is a project management application that is widely used to do work tasks involving collaboration between teams. Trello is a Cloud-based application, so on Trello every progress of a project can be displayed and viewed by all related members as long as they're connected to the internet [31]. Having an attractive and easy-to-understand user interface, Trello provides various features such as boards to view the entire project and has the ability to divide the project's process into groups which later can be divided again based on their specialty tasks.

Trello is considered an easy-to-use application and is known as free to operate, making it one of the most widely used project management

applications. The benefits of Trello are very pronounced in work that involves teams, because Trello is able to connect individuals and teams, and provides various social interaction features that maximize the collaboration process [32]. In this study, we use Trello to organize bot development according to its features, as well as organize the scientific publications management [33]. Each feature on the bot has its own field and material so it needs to be divided into some parts so that work can be carried out on its respective parts and each part will not be mixed and jumped each other.

Features of The System

Telegram bot is an auto-reply service so when the user typed the name of the feature/command to which it is intended, a new message will immediately be displayed containing information from the selected command. The following features will be available on the telegram bot as shown below along with the description of information that will be obtained from calling these features:

Table 3. Telegram Bot feature lists

Feature Name (Command)	Information gathered
/menu	Calling all of the features/commands that are available on the bot along with the details
/quranayat	Sending one of a verse from the Holy Qur'an.
/sholatreminder	Sending prayer reminders to the user based on the time.
/tafsir	Calling information about the interpretation of a verse in Holy Qur'an
/quransurat	Calling out & displaying all verses from a selected surah in the Holy Qur'an.
/murottal	Sending murottal audio from an imam.
/hadis	Sending hadith and along with its meaning

/jadwalsholat	Sending & displaying Prayer schedule from a selected city
/ayatkursi	Sending ayatul kursi to the user
/asmaulhusna	Calling one of asmaul husna based on its number or random
/dinastiislam	Sending Islamic history based on Islamic dynasty that ever ruled in the world.
/perangislam	Sending Islamic history based on the war that ever happened
/sahabatnabi	Sending a history about one of the Prophet's Companion based on selected numbers.
/kisahnabi	Sending one of Prophet history based on its name.
/doaharian	Sending one of the prayer from the list

	the list of available menus	messages containing data from the retrieved database
Alternate Flow	1. The user enters a command other than /menu	2. The system does not process anything.
Final Condition	The user sees a list of available menus on the bot	
Special Requirements	Users must be connected to the internet	

Bot System Architecture

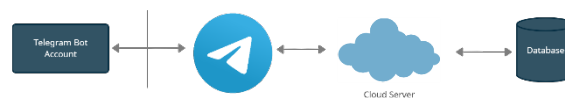


Figure 4. Telegram Bot System Architecture

In the Telegram bot flowchart, the user will send a request or command on the bot menu through their device. The requests from users will be read by the Telegram API and then forwarded to the cloud server. The cloud server will receive the command and process according to what it's received, it will access the database if needed. Furthermore, the results will be sent to the user.

Use Case

The goal of modeling the use case is to represent the requirements of people without an extensive amount of training or certain abilities to understand and explain them [34]. The following picture below is a use case to show the bot main menu.

Table 4. Use Case: Main Menu

Use Case ID	1	
Use Case Name	Showing Bot Main Menu	
Actor	User	
Initial Condition	User has not logged in to the application	
Main Flow	Actor	System
	1. User opens the Telegram	3. The system retrieves data from the database
	2. User enters command /menu	4. The system replies to
	5. The user sees	

Telegram Bot Flowchart

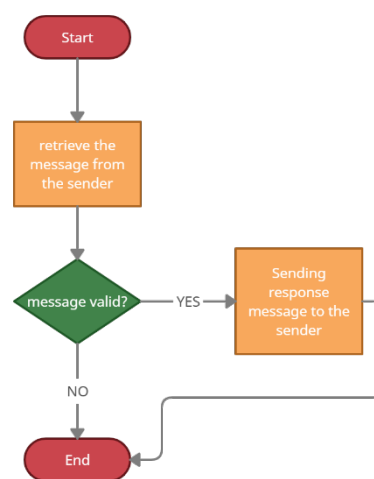


Figure 5. Flowchart of Data retrieval on Telegram Bot

Data retrieval on the Telegram Bot begins with receiving messages from the user (sender). If the message is valid, the program will match the

message sent by the user against the list of commands contained in the program, after the program finds a suitable command, the program will send the appropriate response message to the user. If the message is invalid, the program will not process or send any messages.

III. RESULT AND DISCUSSION

3.1 Implementation and Testing

After designing the system and features, the next step is to build a system based on the requirements that have been prepared previously. Using various features provided by the Telegram bot API, we created a bot that will provide information about Islamic knowledge as well as other Islamic information such as prayer schedules in a day according to the selected city to a collection of prayers that can be practiced in everyday life. After the implementation, the bot will be tested in terms of its functional specifications without testing the design and program code. This experiment was conducted to determine whether the functions, inputs, and outputs of the software were in accordance with the expected results. Here are some test results on the telegram bot system:

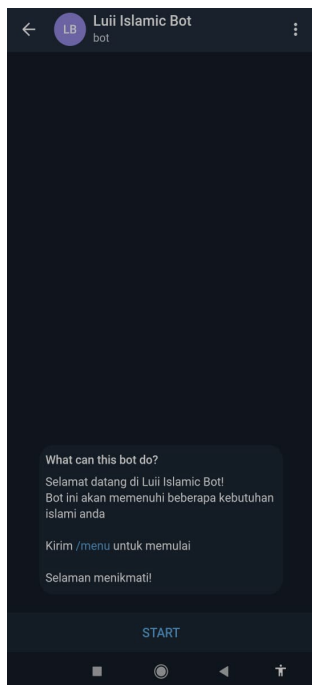


Figure 6. First appearance of Islamic Telegram Bot

The first thing that is tested is the bot's ability at first to display the entire menu. In the picture, it can be seen that when the user entered the bot, they will receive a welcome message telling him that to

start using this bot the user needs to press the start button and type the command /menu to see all the features available in the bot.

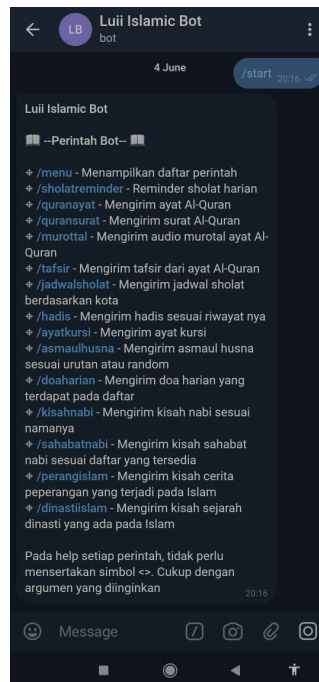


Figure 7. The menu of Islamic Telegram Bot

The following picture above is an example of the response from the bot after we enter the "/menu" command. The bot will display a list of available features along with a description of these features, and what information the user will get when typing the command later.

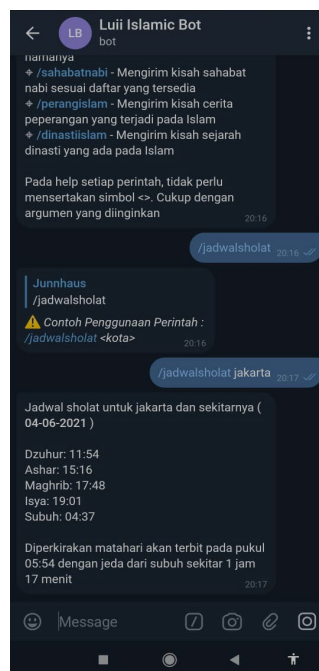


Figure 8. Displayed Information from /jadwalsholat command on Islamic Telegram Bot

It can be seen from the picture above, the implementation of the prayer schedule feature is based on the selected city which we can get by entering the command `"/salat prayer schedule <city>"`. In the beginning, the user needs to type the `/jadwalsholat` command, and then the bot will ask the user to enter the name of the destined city. When the user has entered the name of the city, the bot will display the prayer schedule for that day.

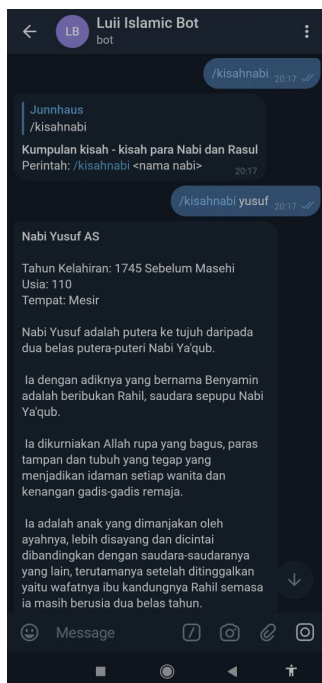


Figure 9. Displayed information from `/kisahnabi` command on Islamic Telegram Bot

Furthermore, the picture above displays the results of the implementation of other features, namely the story of the Prophet. To get the story of the selected Prophet, the user needs to enter the command `"/kisahnabi<name of the prophet>"`.

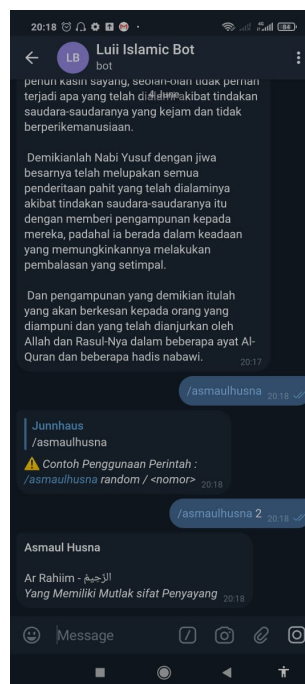


Figure 10. Displayed Information from `/asmaulhusna` command on Islamic Telegram Bot

From the implementation above, here we take an example of the Asmaul Husna feature which we can get by entering the command `"/asmaulhusna <random/number>"`. From the testing process and based on the implementation results, we can see that the bot system runs well according to its flow and displays the right result.

IV. CONCLUSION

4.1 Conclusion

From the results of the system design and testing process, we can conclude some conclusions:

- Both the Islamic Telegram Bot user and the server must be connected to an internet connection
- Islamic Telegram bots can run well on Android, iOS, and Desktop applications
- Telegram's cloud-based bot can speed up the response given by the bot from the input desired by the user.
- Islamic bot can be a new option for society to get Islamic information more easily.
- From the testing result, we can see that the bot runs well according to its flow. It means that our Islamic bot can be used to maximize the dissemination process of Islamic knowledge in this era.

4.2 Suggestion

From the results of system design, system testing, and conclusions, several things can be suggested for further application development:

- Utilization of the button feature on the Telegram Bot.
- Adding new features or commands

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