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Development of a Monitoring Information System for New Sales Indihome with a Telegram Bot at PT Telkom Akses Bengkulu

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Abstract*— Monitoring of Indihome New Sales data at PT Telkom Akses Bengkulu is still done manually via a Google Spreadsheet dashboard. The process of taking screenshots and distributing daily reports by the helpdesk causes delays in information delivery and is inefficient in supporting real-time management needs. This study aims to design and implement a Telegram bot to automate dashboard screenshot capture, simplify report distribution, and improve data monitoring efficiency. The method used is the prototype method with data collection techniques through observation and interviews. The data used consists of daily sales monitoring data from the Google Spreadsheet dashboard, which is updated hourly with dynamic data volumes, and is then analyzed to determine system requirements. The results of the study show that the system is capable of reducing processing time from 2–5 minutes to approximately 30 seconds. Additionally, the system facilitates information distribution through command features and interactive buttons, with outputs in the form of images and text. The implementation of this system contributes to improving the efficiency and speed of accessing real-time monitoring information.

Keywords- Bot Telegram, Google Spreadsheet, Monitoring Data, Python, Web Automation

I. INTRODUCTION

Advances in information technology within the telecommunications industry require a data monitoring system that is fast, accurate, and easily accessible. At PT Telkom Akses Bengkulu, specifically in the Pagar Dewa Service Area, Indihome new sales data is monitored via a Google Spreadsheet dashboard updated hourly by the operations team. This data is used by various levels of management, including assistant managers, for daily evaluation and reporting. However, management tends not to access the dashboard directly but instead asks the helpdesk to send screenshots and daily reports. This manual process has the potential to cause issues, particularly when the helpdesk is unable to access the system, thereby hindering the delivery of real-time information. This aligns with research stating that information technology-based monitoring systems play a crucial role in providing fast and accurate information to support decision-making [1].

Based on these issues, this study proposes the development of a Telegram bot capable of automatically capturing screenshots and daily reports from the Google Spreadsheet dashboard and distributing them directly to users. This system simplifies the helpdesk's ability to obtain and convey information without manual processes. Users can access data via commands or interactive buttons within the Telegram app, thereby enhancing work efficiency and the speed of information distribution. The use of bots in automation systems has been widely implemented to improve the efficiency of information distribution and real-time user interaction [2][3][4].

Several previous studies have implemented Telegram bots for monitoring, reporting automation, and real-time information delivery in various fields. Telegram bots have been used to simplify user interaction, distribute information automatically, and support monitoring activities through command-based features. In addition, web automation technologies have also been applied to reduce repetitive manual work in accessing and processing web-based data. However, most previous studies focus on general monitoring, notification systems, or chatbot-based services, while studies that specifically integrate Telegram Bot, Google Spreadsheet dashboard monitoring, automated screenshot capture, and daily report distribution are still limited. Therefore, this study contributes by developing a Telegram bot integrated with Playwright-based web automation to support New Sales Indihome data monitoring at PT Telkom Akses Bengkulu. Previous research has shown that chatbot-based systems are capable of supporting real-time monitoring with high efficiency [5], and that web automation technologies like Playwright are effective in performing automated interactions with web pages [6].

The objective of this study is to design and implement a Telegram bot to automatically take screenshots of the Google Spreadsheet dashboard for New Sales Indihome monitoring data at PT Telkom Akses Bengkulu Service Area Pagar Dewa. This study also aims to build a system that can improve data monitoring efficiency, facilitate report distribution, and support real-time information needs.

A. Data Monitoring

Data monitoring is the process of regularly observing data to determine the status and progress of an activity. Within an organization, data monitoring plays a crucial role in supporting information-based decision-making, particularly

in environments that require rapid responses, such as the telecommunications industry. Structured and easily accessible data helps management evaluate performance more effectively.

The implementation of real-time data monitoring ensures that the information obtained is always up-to-date. This is crucial in operational activities such as sales monitoring, which is dynamic in nature. Therefore, the use of information technology-based monitoring systems serves as an effective solution to enhance the efficiency and speed of information distribution [7][8].

B. Telegram Bot

A bot is a computer program designed to interact automatically with users via digital communication platforms. One widely used platform is Telegram, which provides a Bot API for building automated messaging systems. Through Telegram bots, users can access information using commands or interactive buttons without needing additional apps.

II. RESEARCH METHOD

The research methods used in the development of this system consist of several stages, namely system development, data collection, data analysis, and system workflow design. Each stage is carried out systematically to ensure that the developed system meets user needs and improves efficiency in the data monitoring process.

A. System Development Methods

The system development method used in this study is the prototype method. This method was chosen because it provides users with an initial overview of the system and allows for gradual improvements through an iterative process based on user needs [11]. The prototype model used follows an iterative approach consisting of several stages, each of which plays a crucial role in the system design process. These stages are illustrated in Figure 1.

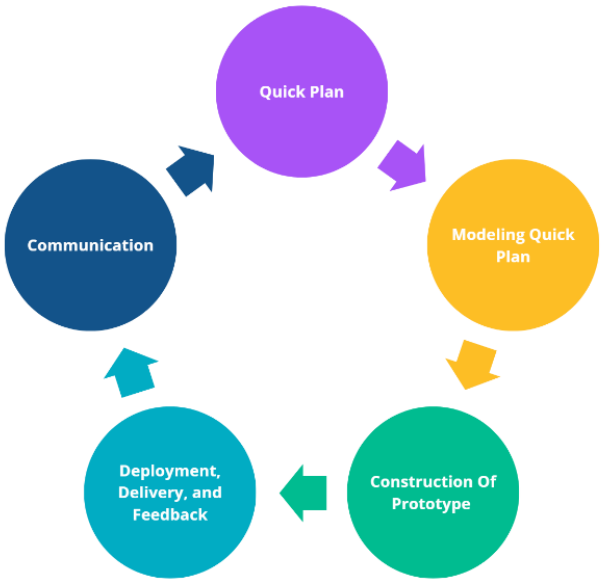


Fig. 1. Iterative Prototype Model (adapted from [11])

During the communication phase, system requirements were identified through observation and interviews to understand the issues in the New Sales Indihome data monitoring process, particularly regarding the manual screenshot capture and distribution of daily reports. Next, during the quick plan phase, initial system planning was conducted based on the identified requirements. The modeling phase involved designing a Telegram bot system integrated with a Google Spreadsheet dashboard. The construction of the prototype phase involved implementing the system using the Python programming language, utilizing the python-telegram-bot, Playwright, Pandas, and Pillow libraries. After the prototype was completed, the deployment and feedback phase was conducted through system testing and evaluation based on usage results. This process was repeated until the system functioned according to user needs.

B. Data Collection

Data collection for this study was conducted through observation and direct interviews at PT Telkom Akses Bengkulu, specifically in the Pagar Dewa Service Area. Observations were conducted to understand the workflow for monitoring Indihome New Sales data and the process of manually taking dashboard screenshots by the helpdesk.

Additionally, interviews were conducted with relevant parties, namely the helpdesk as the primary users of the system, to identify system requirements and challenges encountered during the data monitoring process. The data used in the system is sourced from a Google Spreadsheet dashboard containing daily sales monitoring information updated hourly from 8:00 AM to 12:00 AM. This data includes sales volume, daily progress, and activity reports used as performance evaluation metrics.

C. Data Analysis

Data analysis was conducted by identifying system requirements based on the results of observations and interviews. The data obtained was then analyzed to determine the features required for the system, such as dashboard screenshot capture, daily report generation, and information distribution via Telegram.

Additionally, an analysis was conducted on process efficiency before and after system implementation. Manual processes were compared with automated processes to assess improvements in efficiency, ease of use, and the speed of information distribution. The results of this analysis served as the basis for determining the system design and evaluating the performance of the developed system.

D. System Workflow

The system workflow begins when a user (helpdesk) accesses the Telegram bot via the Telegram app. The system architecture consists of several main components, namely Telegram users, Telegram Bot API, a Python-based backend system, Playwright as the web automation tool, Google Spreadsheet as the data source, Pandas for processing daily report data, and Pillow for image processing. The Telegram bot provides several commands to support the monitoring process. These commands are used to access the main menu, dashboard screenshots, diagram information, and user guidance. Each command is later tested using Black Box Testing to ensure that the feature works according to its expected function. The user then issues a command or selects an available interactive button to request monitoring data. After receiving the command, the bot executes the automation process by opening the Google Spreadsheet dashboard using

web automation technology.Next, the system takes a screenshot of a specific section of the dashboard as needed. After the screenshot is captured, the system verifies the success of the process. If the process succeeds, the system proceeds to image processing using Pillow and extracts daily report data using Pandas. The results are then combined and sent back to the user via Telegram. However, if the process fails, the system sends a failure message to the user.

This process runs automatically in approximately 15–30 seconds, thereby improving efficiency compared to manual processes. The process time measurement was conducted by comparing the manual reporting process with the automated process. In the manual process, the time was calculated from opening the dashboard, capturing the screenshot, copying the daily report, and sending it manually. In the automated process, the time was calculated from the moment the user sent a command through Telegram until the bot returned the dashboard screenshot and daily report. To clarify the system workflow described above, a system flowchart is presented in Figure 2.

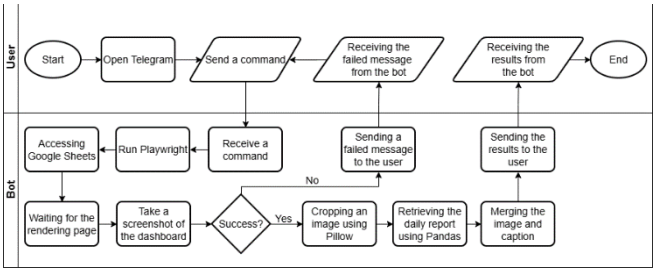


Fig. 2. Telegram Bot System Workflow Diagram

III. Result And Discussion

This section presents the results of the implementation of the developed Telegram bot system and an analysis of the system's performance in supporting the monitoring of Indihome New Sales data. The discussion focuses on improving data monitoring efficiency through a comparison between manual and automated processes, the ease of information distribution, the results of system implementation and testing, an analysis of the research findings in relation to previous studies, as well as the identification of challenges encountered during system development and opportunities for further development.

A. Improving Data Monitoring Efficiency

The results of the implementation show that the developed Telegram bot is capable of improving efficiency in the data monitoring process. The system allows users, particularly helpdesk staff, to obtain dashboard screenshots and daily reports simply by using commands or interactive buttons within the Telegram app. The output consists of dashboard images accompanied by daily report text as captions, making the information received more comprehensive and easier to understand. An example of the system's output can be seen in Figure 3.



Fig. 3. Telegram Bot Interface

Compared to manual processes, automated systems offer significant efficiency gains. In manual processes, users must open the Google Spreadsheet dashboard, take a screenshot, copy the daily report, and send it manually, which takes approximately 2 to 5 minutes. Meanwhile, using a Telegram bot, this process can be automated in about 30 seconds. These results indicate that the system can save work time and improve user productivity in data monitoring. This aligns with previous research stating that information technology-based automation systems can enhance operational efficiency and user performance [12].

B. Ease of Information Distribution and System Implementation

The Telegram bot developed not only improves efficiency but also simplifies the distribution of information to users. The system is equipped with several key features, such as commands to display the dashboard, diagrams (work order status, technical issues, and customer issues), and a help menu. Additionally, the bot is private, meaning it can only be accessed by specific users, and it provides interactive buttons (keyboard shortcuts) that make it easier for users without having to type commands manually. The Telegram bot interface is shown in Figure 3.

System testing was conducted approximately 20–30 times under normal usage conditions. Testing using the Black Box Testing method showed that all major system features functioned properly and as expected [13]. The results of the Black Box Testing are presented in Table 4.

Table 4. Results of Black-Box Testing of the Telegram Bot System

No	Command Tested	Test Scenarios	Expected Results	Status
1	/dashboard	Displaying the dashboard	Displaying a screenshot of the dashboard and daily report as a caption, and display an error message if the screenshot cannot be displayed	Valid
2	/diagram_wo	Displaying the WO chart	Displaying a screenshot of	Valid

		when data is available and when no data is available	the WO status diagram when data is available and display an informational message when no data is available	
3	/diagram_teknis	Displaying the technical constraints diagram when data is available and when no data is available	Displaying a screenshot of the technical constraints diagram when data is available and display an informational message when no data is available	Valid
4	/diagram_pelanggan	Displaying the customer constraint diagram when data is available and when no data is available	Displaying a screenshot of the customer constraint diagram when data is available and display an informational message when no data is available	Valid
5	/help	Show help	Displaying a use guide for the bot that includes a list of commands, descriptions of each feature, and general instructions on how to use the bot	Valid
6	/start	Start the bot	Displaying the menu keyboard and the bot's welcome message	Valid
7	/unknowncommand	Sending an unrecognized command	Displaying the error message “Command not recognized”	Valid
8	user tidak terdaftar	Unauthorized access	Access denied and displaying the message “Access not available”	Valid

Based on the test results in Table 4, the system demonstrates that most functions operate as expected. However, under certain conditions, issues still arise, such as failed screenshots due to incomplete page rendering, diagrams that do not appear because the rendering process is not yet complete, and response delays caused by internet connection issues. Overall, the system functioned properly in most testing scenarios and was able to support the data monitoring process, although several technical limitations were still found under certain conditions.

Although the system was able to run properly in most testing scenarios, several reliability issues still need to be considered. The success of the automation process depends on the stability of the internet connection, the accessibility of Google Spreadsheet, and the availability of the Telegram API. If one of these services experiences delays or connection problems, the bot response time may increase or the requested output may fail to be sent. In addition, changes in the Google Spreadsheet dashboard layout, such as column structure, chart position, or page display, may affect the accuracy of the captured screenshot. Therefore, the screenshot configuration needs to be adjusted if the dashboard layout changes.

From the security perspective, access control is important because the bot is used to distribute internal sales monitoring data. Therefore, the bot is designed as a private bot that can only be accessed by registered Telegram user IDs. This mechanism helps prevent unauthorized users from accessing dashboard screenshots and daily reports.

C. Analysis of Results and Comparison with Related Studies

Overall, the developed system successfully achieved the research objectives, namely improving the efficiency of data monitoring and facilitating real-time information distribution. The use of a Telegram bot has made processes that were previously performed manually more automated, faster, and more consistent. This demonstrates that the implementation of chatbot technology in monitoring systems can have a positive impact on operational performance.

These findings align with previous research indicating that chatbot-based systems can enhance efficiency in information dissemination and support real-time monitoring [14]. Furthermore, the use of web automation technology for data extraction and interaction with web pages has also proven effective in reducing manual labor and improving the consistency of results [15]. Thus, the implementation of the Telegram bot in this study can be considered successful and relevant for application in similar operational environments.

D. Challenges and Future Developments

Although the developed system has been functioning well, several challenges were encountered during the implementation process. One of the main obstacles is the rendering process of the Google Spreadsheet dashboard, which takes time before page elements can load completely. This can result in failed screenshots or incomplete displays. Additionally, adjusting the screenshot area requires manual configuration, which is quite time-consuming to achieve optimal results. Another challenge is the system's reliance on internet connectivity and third-party services, such as Google Spreadsheet and the Telegram API. Unstable connections can cause response delays or failures in data retrieval.

Therefore, future development can focus on optimizing the rendering process, automating screenshot area selection, and improving system stability through retry mechanisms or error handling.

IV. CONCLUSION

This study was motivated by issues in the process of monitoring Indihome New Sales data at PT Telkom Akses Bengkulu, which is still conducted manually, particularly regarding the capture of dashboard screenshots and the distribution of daily reports by the helpdesk to management. This process is inefficient and has the potential to hinder the delivery of real-time information. Therefore, this study offers a solution in the form of a Telegram bot capable of automating the process of capturing screenshots and distributing reports quickly and practically.

The results show that the developed Telegram bot successfully improved the efficiency of the data monitoring process, reducing the time required from approximately 2–5 minutes to about 30 seconds. Additionally, the system simplifies information distribution through command features and interactive buttons, and generates output in the form of dashboard screenshots accompanied by daily reports. Thus, the research objective to design and implement an automated system that enhances data monitoring efficiency, facilitates report distribution, and supports real-time information needs has been successfully achieved.

However, the developed system still has several limitations, such as its reliance on an internet connection and the Google Spreadsheet page rendering process, which can affect the success of screenshot capture. Additionally, the process of adjusting the screenshot area is still done manually, which takes time during the development phase. Therefore, future research could focus on developing automated features for determining the screenshot area, improving system stability through error-handling mechanisms, and adding automatic notification features or integration with other platforms to enhance system performance and flexibility.

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