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Research Article

Enhancing Field Activity Reporting through a Real-Time Telegram Chatbot Integrated with the Google Sheets API

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ABSTRACT

Purpose of the study: This study aims to design and develop a Telegram chatbot integrated with the Google Sheets API as a smart evidence reporting solution to improve the efficiency, accuracy, and timeliness of field activity reporting.

Methodology: This study employed the Design Thinking approach as a user-centered system development method, consisting of five stages: empathize, define, ideate, prototype, and test. Data were collected through observations and interviews with staff involved in the field activity. A Telegram chatbot prototype was developed using the Telegram Bot API and integrated with Google Sheets through Google Apps Script. System evaluation was conducted using Black Box Testing to assess functionality and User Acceptance Testing (UAT) to measure user perception and acceptance.

Main Findings: The results show that the developed chatbot system functions effectively as a smart evidence reporting tool. The integration enables real-time, automated, and structured storage of field activity data in Google Sheets. Black Box Testing confirmed that all system functions operated as expected, while User Acceptance Testing indicated a high level of user satisfaction, with an acceptance rate of 88%. The chatbot successfully supports fast data input, reduces reporting errors, and improves operational efficiency during field activities.

Novelty/Originality of this study: The novelty of this study lies in the use of a widely adopted messaging platform as the primary interface for structured field activity reporting. By leveraging Telegram as a conversational interface and integrating it directly with cloud-based data storage, this study presents a lightweight, low-cost, and easily deployable reporting solution.

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1. INTRODUCTION

The rapid advancement of information and communication technology has brought significant changes across various sectors, including industry and public services [1]-[3]. Digital transformation is no longer an option but a necessity for organizations seeking to improve efficiency, effectiveness, and service quality [4]. Companies are required to adopt digital solutions that streamline operational processes and support data-driven decision-making [5]. State-owned enterprises play an important role in accelerating digital adoption at both

internal and external levels [6]. As a leading telecommunications and information technology company in Indonesia, PT. Telkom Indonesia holds a strategic position in implementing and promoting digital transformation initiatives [7]. Its responsibility extends beyond infrastructure provision to the development of innovative digital solutions [8]. One of the operational units under PT. Telkom Indonesia is Witel Priangan Timur, located in Indramayu, West Java. This unit is responsible for delivering telecommunications services and digital solutions within the Priangan Timur region. Witel Priangan Timur manages various operational activities that involve direct engagement with customers, government institutions, and strategic partners. Within this unit, the Business Government Division plays a critical role in handling collaborations with public sector institutions. The division conducts routine field activities such as site visits, customer data collection, service monitoring, and coordination meetings. Each activity generates important evidence that must be documented and reported for evaluation purposes [9]. Accurate and timely reporting is therefore essential to support managerial oversight and operational planning [10].

Currently, the process of recording and reporting field activity evidence in the Business Government Division is still carried out using semi-manual methods [11]. Data from field activities are typically recorded after the visit and entered separately into spreadsheet files. This approach introduces several inefficiencies in daily operations. Delays in data entry often occur due to workload constraints or limited access during fieldwork [12]. Manual input also increases the risk of typographical errors and inconsistent data format [13]. In addition, the absence of direct validation during data entry allows incomplete or duplicate records to occur [14]. These limitations reduce the overall reliability and usefulness of the collected data [15]. Additional challenge arises from the lack of real-time monitoring and data aggregation capabilities [16]. Since evidence data are not recorded immediately during field activities, management faces difficulties in tracking progress on an ongoing basis. The scattered nature of data storage further complicates the reporting process [17]. As a result, compiling reports often requires additional time and manual verification. This situation affects the timeliness of performance evaluations and slows down decision-making processes. Delayed access to accurate data can hinder strategic planning and operational responsiveness [18]. Consequently, the organization requires a more integrated and real-time reporting mechanism [19].

Along with the rapid growth of computer-based information systems, intelligent digital solutions have increasingly been adopted to address such operational challenges [20]. Automation and smart systems are designed to reduce manual workloads and minimize human error [21]. These systems also enable faster data processing and more consistent information management. Intelligent technologies allow users to interact with systems in a more intuitive manner. By simplifying complex processes, they help improve user productivity and system acceptance. Such developments are particularly relevant for organizations with high field activity intensity. Therefore, adopting intelligent solutions becomes a logical step to enhance operational efficiency [22], [23]. One of the most widely used intelligent systems in modern information management is the chatbot [24]. A chatbot functions as a digital assistant capable of interacting with users through natural language [25]. It can guide users step by step in performing specific tasks, including data input and information retrieval. Chatbots reduce dependency on complex user interfaces and allow users to work within familiar communication platforms. This interaction model improves accessibility and ease of use, especially for field personnel. By enabling direct communication between users and systems, chatbots support faster and more accurate data entry [26], [27].

Telegram is a popular instant messaging platform that supports chatbot development through its Bot API [28]. The platform offers advantages such as fast message delivery, cross-device accessibility, and strong security features. Telegram chatbots can be easily customized to meet specific operational requirements. In parallel, Google Sheets provides a cloud-based spreadsheet service that supports real-time data storage and collaborative access [29]. Data stored in Google Sheets can be updated instantly and accessed by authorized users from different locations. Integrating a Telegram chatbot with the Google Sheets API allows data submitted through chat interactions to be stored automatically in a structured format [30]. Despite the availability of chatbot technologies and cloud-based storage systems, previous implementations in organizational have largely focused on customer service automation rather than structured internal reporting workflows. This reveals a research gap in the integration of conversational interfaces with real-time cloud databases specifically for field activity evidence reporting. Furthermore, limited studies have examined lightweight, low-cost architectures that align with the daily communication habits of field personnel while maintaining structured data validation and centralized monitoring.

Based on these conditions, an integrated system is needed to improve the field activity reporting process at PT. Telkom Indonesia Witel Priangan Timur. Existing reporting practices mainly rely on conventional spreadsheet usage without direct system integration, resulting in delayed data entry, limited real-time visibility, and repetitive manual work. Moreover, most available digital reporting tools are designed as standalone applications that require additional training and are not fully adapted to the daily communication habits of field staff. This creates a gap between the availability of digital technology and its practical utilization in operational reporting activities. The urgency of this research lies in the need for a real-time, structured, and user-friendly

reporting mechanism that can minimize reporting delays, reduce human error, and provide immediate managerial visibility over field operations. Without such a system, decision-making processes remain reactive rather than proactive, potentially affecting organizational performance and service quality.

This study addresses that gap by focusing on the design and development of a Telegram chatbot integrated with the Google Sheets API as a smart evidence reporting solution. The novelty of this research lies in the utilization of a widely used messaging platform as the primary interface for structured field data collection. Instead of introducing a new application, the system leverages Telegram as a familiar environment, reducing user resistance and learning time. The integration with Google Sheets enables automatic, real-time data storage in a structured and standardized format without additional manual processing. Furthermore, the chatbot functions not only as a data input tool but also as a digital assistant that guides users step by step during the reporting process.

The objectives of this research are: (1) to analyze the limitations of the existing semi-manual field reporting system; (2) to design and develop an integrated Telegram chatbot-Google Sheets reporting system based on user-centered principles; and (3) to evaluate the system's functionality and user acceptance in supporting real-time evidence reporting. Accordingly, the research questions addressed in this study are: (1) What are the key operational gaps in the existing semi-manual evidence reporting system? (2) How can a Telegram chatbot integrated with the Google Sheets API be designed to support structured and real-time field activity reporting? (3) To what extent does the proposed system improve reporting efficiency, accuracy, and user acceptance?

2. RESEARCH METHOD

This study employed a Research and Development (R&D) approach using the Design Thinking framework as the system development model. The research design combined qualitative and quantitative methods (mixed-method approach), where qualitative data were used during the problem identification and system design stages, and quantitative data were used to evaluate system acceptance and usability. This study adopts the Design Thinking method as the main approach for developing a Telegram chatbot integrated with the Google Sheets API. Design Thinking is a user-centered system development approach that emphasizes real user needs through iterative and collaborative processes. The method was selected because it allows the solution to be closely aligned with actual operational conditions in the field. In the context of this research, Design Thinking supports the development of a smart reporting evidence system that prioritizes usability, efficiency, and practical implementation. Design Thinking consists of five main stages: Empathize, Define, Ideate, Prototype, and TesT.

The population of this study consisted of employees in the Business Government Division of PT. Telkom Indonesia Witel Priangan Timur who are directly involved in field activity reporting. The sample used in the testing phase consisted of 15 employees acting as Sales Assistants and field officers. The sampling technique applied was purposive sampling, where respondents were selected based on specific criteria; (1) actively involved in field activities, (2) responsible for reporting activity evidence, and (3) willing to participate in system testing. This technique was chosen to ensure that respondents had direct experience with the reporting workflow and could provide valid evaluations of the developed system.

The empathize stage aims to gain a deep understanding of user needs, experiences, and challenges related to the evidence reporting process [31]. At this stage, observations and interviews were conducted with staff from the Business Government Division of PT. Telkom Indonesia Witel Priangan Timur who are directly involved in field activity reporting. The observation focused on how evidence data were recorded during and after field visits. Several issues were identified, including the time-consuming nature of manual and semi-manual data entry. Users also reported frequent difficulties in ensuring data completeness and accuracy.

The define stage focuses on formulating the core problems based on insights obtained from the empathize stage [32]. At this phase, the collected data were analyzed to identify recurring issues and user pain points. The main problem was defined as the absence of an efficient and integrated system for real-time field activity reporting. Additional issues include the lack of direct data validation and the limited accessibility of existing reporting tools during fieldwork. Users require a system that is easy to use, fast, and accessible through commonly used platforms. The outcome of this stage is a clear problem statement that serves as the foundation for designing the proposed chatbot system.

The ideate stage involves generating solution concepts based on the defined problems [33]. During this phase, various ideas were explored to improve the reporting process while maintaining simplicity and usability. The selected solution is a Telegram-based chatbot integrated with the Google Sheets API to support smart evidence reporting. Telegram was chosen as the main interface due to its familiarity among users and ease of access across devices. The system concept includes automatic data storage using Google Apps Script as an API connector between the chatbot and Google Sheets. Data input is designed in a structured tabular format to ensure consistency and ease of analysis.

The prototype stage aims to translate the proposed solution into a functional system that can be tested by users [34]. At this stage, a Telegram chatbot prototype was developed and integrated with Google Sheets through Google Apps Script [35]. The chatbot was designed to guide users step by step in entering field activity data. Input attributes include real-time visit date, point of interest name, sales assistant code and name, respondent name and position, phone number, internet service provider, and activity outcomes. Once the data are submitted, they are automatically recorded in Google Sheets in a structured. The integration of google apps shown in Figure 1.
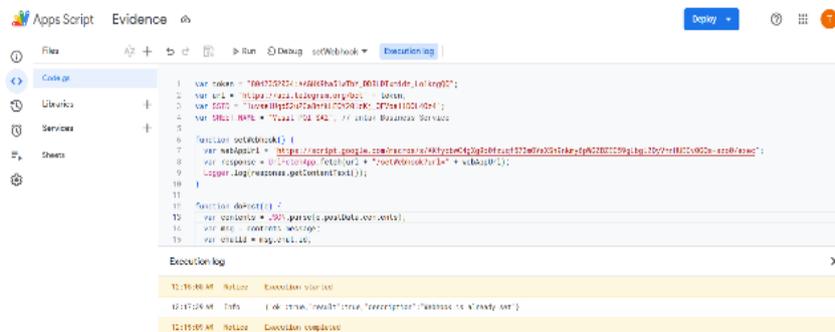

Figure 1. Integration of Google Apps

The final stage of the Design Thinking process is testing, which aims to evaluate system functionality and user acceptance. Testing was conducted by involving staff from the Business Government Division as end users. Several testing methods were applied to ensure system reliability and usability. Black box testing was used to verify that all chatbot functions operate according to the defined requirements. User Acceptance Testing was conducted to assess whether the system meets user expectations and operational needs. In addition, the System Usability Scale was used to evaluate the overall usability of the chatbot. The results from this stage were used as a basis for system refinement and improvement to ensure alignment with user needs [36]-[40].

The User Acceptance Testing (UAT) instrument was adapted from the Technology Acceptance Model (TAM) developed by Davis (1989), particularly the constructs of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). The System Usability Scale (SUS) instrument was adopted from Brooke (1996). Minor modifications were made to adjust the wording to the chatbot reporting. The UAT questionnaire consisted of closed-ended statements measured using a five-point Likert scale (Strongly Agree to Disagree). The instrument as shown in Table 1.

Table 1. Instrument for UAT Questionnaire

Variable	Indicator	Item Number
Perceived Ease of Use (PEOU)	Ease of understanding chatbot responses	1, 3
Perceived Usefulness (PU)	Effectiveness in reporting activities	2, 4

Prior to data analysis, reliability testing was conducted using Cronbach's Alpha. The reliability coefficient obtained was $\alpha = 0.87$, as high internal consistency and reliability of the instrument. Data collection methods in this study included observation (using structured observation sheets), semi-structured interviews (using interview guidelines), questionnaires (UAT and SUS instruments), and system testing documentation (Black Box testing scenarios). Qualitative data from observations and interviews were analyzed using thematic analysis to identify operational gaps and user requirements. Quantitative data from UAT and SUS were analyzed using descriptive statistical analysis. The percentage of acceptance was calculated using (1):

$$\text{UAT Score} = \frac{\sum \text{obtained score}}{\text{maximum score}} \ \dots(1)$$

The results were then categorized into acceptance levels (Very Good, Good, Fair, Poor) based on percentage intervals. SUS scores were calculated according to Brooke's scoring procedure and interpreted using standard usability benchmarks. The flowchart shows in Figure 2, the operational workflow of the Smart Evidence Reporting system based on a Telegram chatbot integrated with the Google Sheets API. The system is designed to facilitate automatic, real-time, and structured reporting of field activity data.
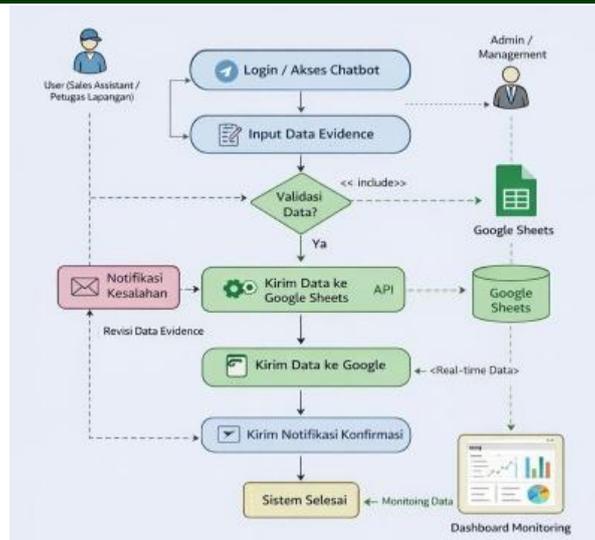
Figure 2. Flowchart Design

The process begins when the User (Sales Assistant or Field Officer) accesses the chatbot via the Telegram application. This access serves as the primary entry point for system interaction without requiring additional applications, thereby increasing flexibility during field operations. After accessing the chatbot, the user proceeds to input evidence data by entering field activity information according to the predefined format, including officer identity, visit details, and activity outcomes. The submitted data then enter the validation stage, where the system checks data completeness, format, and consistency. If the validation process indicates that the data are invalid or incomplete, the system automatically sends an error notification to the user via the chatbot and requests data revision. This mechanism minimizes input errors and ensures data quality.

Once the data are validated, the system transmits the data to Google Sheets through the Google Sheets API. This integration enables automatic and real-time storage of data in a cloud-based spreadsheet prepared as the reporting database. Google Sheets functions as a centralized data repository that can be accessed by administrators or management personnel. Then, after successful data storage, the system sends a confirmation notification to the user indicating that the evidence report has been properly received and recorded. The stored data can subsequently be displayed on a monitoring dashboard, allowing management to perform data monitoring, analysis, and decision-making more quickly and accurately. The process concludes when the reporting workflow is completed.

3. RESULTS AND DISCUSSION
3.1. Analysis of the Existing Semi-Manual Evidence Reporting System in Field Activities

The evidence reporting system currently implemented at PT. Telkom Indonesia Witel Priangan Timur, particularly within the Business Government Division, is still based on a semi-manual workflow. Field staff record visit results separately during or after field activities and later input the collected data into spreadsheet files. This process involves multiple manual steps that depend heavily on individual discipline and data recall. As a result, the reporting workflow lacks immediacy and structured control. Data entry is often postponed until after field activities are completed, which affects data timeliness. This condition reduces the effectiveness of reporting as a real-time operational tool. Several operational challenges were identified in the existing reporting process. One of the most common issues is the delay in data entry caused by workload constraints and limited time availability after field visits. Manual input increases the likelihood of data inconsistencies, including typographical errors and incomplete records. The absence of automatic validation mechanisms also allows duplicate data entries to occur. Additionally, staff must manually open and manage spreadsheet files, which is not practical in mobile or time-sensitive working environments. These limitations create additional administrative burdens for field personnel. Consequently, the accuracy and reliability of the reported data cannot always be guaranteed [41].

Then, significant weakness of the existing system is the lack of real-time data availability. Evidence data are not accessible immediately after activities are conducted, making it difficult for management to monitor field progress on an ongoing basis. This condition delays the compilation of activity summaries and performance evaluations. Decision-making processes that rely on up-to-date information become less responsive due to outdated data. Furthermore, the scattered nature of stored data complicates the consolidation and analysis process. Managers often need additional time to verify and reconcile data before it can be used. These issues limit the strategic value of evidence reporting within the organization. Based on the identified limitations, it is

clear that the existing system requires improvement through digital integration and automation. A more efficient solution should enable direct data input during field activities without relying on separate manual processes. Real-time data storage and accessibility are essential to support timely monitoring and evaluation. Automation can help reduce human error and minimize repetitive administrative tasks. An integrated system would also streamline the reporting workflow and improve overall productivity. These findings answer the first research question regarding the weaknesses of the existing reporting system, that delays, data inconsistency, and lack of integration significantly reduce operational efficiency and managerial responsiveness. Figure 3, shows the current manual process that relies heavily on delayed input and lacks system integration.

Figure 3. Manual Reporting Process

3.2. The Proposed Integrated Chatbot-Based Reporting System

As a solution to the identified limitations of the existing system, this study proposes the development of a Telegram chatbot integrated with the Google Sheets API as a smart evidence reporting system. The proposed system is designed to simplify and accelerate the process of recording field activity data through a conversational interface. By using Telegram as the primary interaction platform, users can access the system quickly without installing additional applications. The chatbot serves as the main entry point for data submission during field visits. This approach allows staff to record evidence directly at the time the activity takes place. As a result, reporting activities become more practical and better aligned with field conditions.

The system architecture is built using the Telegram Bot API as the user interaction layer and Google Apps Script as middleware for data processing. Google Apps Script plays a crucial role in connecting the chatbot with Google Sheets through API communication [42]-[50]. When users submit activity data via the chatbot, the data are processed and validated by the script before being stored automatically in the cloud-based spreadsheet. This architecture ensures that data input is handled consistently and securely. The use of Google Sheets enables real-time data storage and easy access for authorized users. This architectural design directly addresses the second research question concerning how a lightweight digital solution can automate and integrate evidence reporting in real time. Interaction between system components is showed in Figure 4.
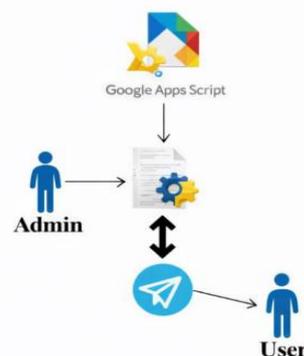
Figure 4. PriTi-Eviden Activity System Architecture

To initiate the reporting process, users are required to enter a predefined command through the Telegram chatbot interface. The command triggers the chatbot to guide users through the data input sequence using a structured format. Each input corresponds to specific activity attributes, such as visit information and evidence details. The predefined format helps ensure consistency across all reported activities. This structured

interaction reduces ambiguity and minimizes the risk of incomplete data submission. The standardized input format used by the chatbot is summarized in Table 2.

Table 2. Chatbot Evidence Input Format

Field	Value
Point of Interest (POI) Name	Counter HP
Sales Assistant Code	null
Sales Assistant Name	Shokikah
Respondent Name	John
Respondent Position	Employee
Phone Number	0812206764
Internet Service Provider	Indihome
Activity Outcome	Interested in Indibiz installation

Once the user submits the completed input format, the system processes the data and stores it automatically in Google Sheets. The chatbot then provides immediate feedback to confirm that the data have been successfully saved. This confirmation message reassures users that their reporting task has been completed correctly. The automatic storage mechanism eliminates the need for manual spreadsheet access after field activities. In addition, the system supports the submission of activity images in PNG format as supporting evidence. The chatbot interaction interface and the automatic data storage results are shown in Figures 5.

Figure 5. Chatbot Input Interface for PriTi-Eviden and Stored Evidence Data in Google Sheets

3.3. System Testing and Evaluation

Testing of the Telegram chatbot developed in this study was conducted using the Black Box Testing method. This testing approach focuses on evaluating system functionality by examining the outputs generated in response to specific inputs, without considering the internal structure of the system. The testing process was carried out by executing a series of predefined commands and usage scenarios. Each scenario was designed to represent actual user interactions during field activity reporting. The objective of this testing was to ensure that all chatbot features operate according to user requirements. Through this approach, the reliability of the chatbot as a reporting tool could be systematically assessed.

The results of the Black Box Testing indicate that all core functionalities of the chatbot performed as expected. Each command pattern submitted by users generated an appropriate response based on the input data provided. Data input, processing, and automatic storage into Google Sheets were executed without functional errors. The chatbot was also able to provide confirmation messages consistently after successful data submission. These outcomes demonstrate that the system logic and interaction flow function correctly. A summary of the functional testing results is presented in Table 3, showing that all testing scenarios were categorized as valid.

Table 3. Black Box Testing Scenarios and Results

No	User Type	Scenario Description	Result
1	Employee	There are 15 employees acting as Sales Assistants at PT. Telkom Indonesia Witel Priangan Timur (Indramayu). To input activity evidence, users are required to enter data using the following command format: /evidence followed by POI name, SA code, SA name, respondent name, respondent position, phone number, and ISP used.	Valid
2	Employee (Head Office)	There are 77 employees acting as Business Government staff at PT. Telkom Indonesia Cirebon. To input activity data, users are required to use the /evidence command followed by POI name, SA code, SA name, respondent name, respondent position, phone number, and ISP used.	Valid

Based on the Black Box Testing results, it can be concluded that the developed Telegram chatbot is capable of responding accurately to user requests in accordance with the available data. The system demonstrates stable performance during user interaction and data processing. In addition, the chatbot's ability to handle various input attributes supports flexible evidence reporting needs. As more complete and structured data are entered into the system, the chatbot can provide broader and more accurate responses. This capability strengthens its role as a digital assistant for evidence reporting activities. Overall, the functional testing confirms that the system meets its intended operational objectives.

In addition to functional testing, a User Acceptance Test was conducted to evaluate user perception and acceptance of the developed system. The UAT involved 15 respondents who acted as chatbot users during the testing phase. Participants were asked to assess the system based on ease of use, clarity of responses, and suitability of the chatbot in supporting reporting and information retrieval activities. User responses were classified into five categories: Strongly Agree, Agree, Less Agree, Disagree, and No Response. The recapitulation of UAT results, shown in Table 4, shows that most respondents rated the chatbot as strongly appropriate or appropriate for their reporting needs.

Table 4. User Acceptance Test Results

TAM Construct	Maximum Score	Obtained Score	Percentage %	Category
Perceived Ease of Use (PEOU)	75	66	88%	Very Good
Perceived Usefulness (PU)	75	67	89%	Very Good
Total	150	133	88.67%	Very Good

The acceptance level of the system reached an accuracy rate of 88% based on the User Acceptance Test results. This outcome indicates a high level of user satisfaction with the chatbot's performance and usability. PT. Telkom Indonesia Witel Priangan Timur (Indramayu) utilizes the chatbot to support real-time and efficient data input during field activities. One of the most valued features is the chatbot's fast response to user input by utilizing stored data effectively. The combined results of Black Box Testing and User Acceptance Testing demonstrate that the Telegram chatbot delivers good performance, reliable functionality, and high user acceptance. These findings confirm that the proposed system is suitable as a smart evidence reporting solution.

The high acceptance rate shows that the conversational interface effectively reduces user workload and improves reporting efficiency. Compared to previous studies that primarily implemented chatbots for customer service or information retrieval, this study extends chatbot utilization into structured operational reporting, demonstrating its applicability in internal organizational workflows. From a theoretical, these shows reinforce the Technology Acceptance Model (TAM), showing that ease of use and perceived usefulness significantly influence user acceptance of digital reporting systems. From a practical perspective, the implementation of a chatbot-based reporting system can serve as a scalable model for other organizations seeking low-cost digital transformation solutions. The novelty of this research lies in the integration of a widely used messaging platform with cloud-based spreadsheet automation to create a real-time, structured, and lightweight evidence reporting mechanism without requiring complex enterprise systems.

However, this study has several limitations. First, the evaluation was conducted within a single organizational unit, which may limit generalizability. Second, the sample size for UAT was relatively small (15 respondents). Third, system performance was evaluated primarily in terms of functionality and user perception, without long-term performance metrics such as system scalability or data security stress testing. Future research is recommended to expand implementation across multiple organizational contexts, incorporate additional security and analytics features, and conduct longitudinal evaluations to measure long-term operational impact.

4. CONCLUSION

Based on the results of the system design, implementation, and testing, it can be concluded that the Telegram chatbot developed in this study has been successfully implemented as a smart evidence reporting solution. The integration of the Telegram Bot API with the Google Sheets API enables automated, structured, and real-time reporting of field activity data. Evidence data submitted through the chatbot are stored directly in standardized spreadsheet tables, which simplifies monitoring, evaluation, and data management processes. The system allows users to record activity evidence directly during field visits without the need to manually access spreadsheet applications. In addition, the chatbot can be accessed easily through the Telegram application on smartphone devices, supporting mobility and field-based operations. Thus, this study successfully answers the research objective of developing and evaluating a lightweight, real-time digital reporting system that improves efficiency, accuracy, and timeliness compared to the previous semi-manual approach. Furthermore, based on the empirical findings, this research proposes a practical concept of "Conversational-Based Operational Reporting," in which messaging platforms are not only used for communication but also function as structured data entry

interfaces integrated with cloud-based storage systems. This concept demonstrates that widely adopted messaging applications can serve as low-cost digital transformation tools for organizational workflows without requiring complex enterprise systems. The findings show that conversational interfaces combined with cloud automation can enhance user acceptance, streamline administrative processes, and strengthen real-time managerial control. Therefore, this approach may serve as a replicable framework for other organizations seeking scalable and resource-efficient digital reporting solutions.

AUTHOR CONTRIBUTIONS

Conceptualization, K.N. and N.W.A.; Methodology, K.N.; Investigation, K.N. and N.W.A.; Data Curation, K.N.; Formal Analysis, K.N.; Writing Original Draft Preparation, K.N.; Writing Review & Editing, N.W.A.; Visualization, K.N.; Supervision, N.W.A.; Project Administration, K.N. Both authors have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

The authors declare that no artificial intelligence (AI) tools were used in the generation, analysis, or writing of this manuscript. All aspects of the research, including data collection, interpretation, and manuscript preparation, were carried out entirely by the authors without the assistance of AI-based technologies.

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