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MEDTRACK: Intelligent Software Model for Medicine Dispenser System

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Abstract

Patient non-compliance is one of the major challenges in the healthcare sector, particularly for individuals undergoing long-term treatment. To address this issue, this study developed an intelligent medication monitoring system integrated with an automatic tablet dispenser. To construct the application, we utilize the Waterfall method to ensure a structured and systematic development process. In the initial phase, data were collected through interviews with potential users and healthcare professionals to identify problems and user needs. The software was evaluated using the System Usability Scale (SUS), achieving an average score of 83.6, which falls into the Acceptable category. The testing results from users and healthcare professionals indicate that the application is beneficial, easy to use, and has strong potential for further development. By applying the Waterfall approach, the application was systematically developed and successfully addressed user needs based on structured planning from the early stages.

Keywords:
Intelligent Dispenser, Medication Monitoring, Waterfall, SUS Evaluation

1. Introduction

Medication adherence is one of the most persistent challenges in healthcare, particularly among patients with chronic conditions and the elderly. Several studies highlight the lack of compliance with prescribed medication schedules, which leads to ineffective treatment, worsening health outcomes, and increased healthcare costs [1], [4]. Despite continuous health campaigns, many individuals continue to misuse or neglect their medication. This problem is compounded by the absence of reliable monitoring systems, leaving healthcare providers unable to ensure that patients follow their prescriptions. Thus, medication adherence requires not only patient awareness but also technological intervention to bridge the compliance gap.

Traditional medicine dispensing methods, whether manual or semi-automated, present serious usability and monitoring issues. Most dispensers require significant patient involvement, such as remembering schedules or properly operating the device [2]. Manual pillboxes, though commonly used, fail to provide real-time feedback or alerts when doses are missed. Similarly, healthcare staff often rely on direct questioning to assess compliance, a method that is prone to inaccuracies and self-reporting bias. These limitations demonstrate the inadequacy of conventional dispensing solutions in addressing the complexities of adherence management.

Recent technological advancements, particularly in the Internet of Things (IoT), have motivated researchers to design intelligent medicine dispensers capable of remote monitoring and automated alerts [3], [7]. While these systems show promise, they also

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encounter critical challenges such as high implementation costs, limited scalability, and poor integration with existing healthcare platforms. Some IoT-based dispensers remain prototype-level, without sufficient field testing or consideration of user diversity, especially among elderly patients with limited technical skills. Consequently, despite innovations, IoT adoption in medicine dispensing remains fragmented and insufficient for large-scale deployment.

Another pressing concern is usability, which directly influences patient acceptance of medicine dispensing systems. Studies show that automated devices often face resistance due to complex interfaces, poor ergonomics, and a lack of personalization features [5], [22]. Patients with dexterity impairments, visual limitations, or cognitive decline struggle with existing models, reducing the potential effectiveness of these solutions. Furthermore, many devices overlook the importance of mobile integration and real-time communication with caregivers or healthcare providers [20], [21]. These shortcomings reinforce the need for user-centered design approaches that prioritize accessibility and patient comfort.

Mobile health (mHealth) applications have gained traction as supplementary tools for medication reminders, yet they too present limitations. Many mHealth apps lack regulatory approval, exhibit inconsistent performance, and rely heavily on user input, which can be unreliable [15], [23]. Moreover, the fragmentation across different smartphone platforms and operating systems complicates widespread adoption [10], [11], [13]. While mobile reminders may support patients with basic adherence, they cannot replace comprehensive dispensing systems that physically control and monitor medicine intake. Therefore, current mHealth solutions serve as partial aids rather than holistic adherence systems.

In addition, studies show that current approaches often fail to integrate usability metrics such as the System Usability Scale (SUS) into their evaluation [19], [25]. Without proper assessment, developers risk releasing systems that are technologically advanced but practically unsuitable for real-world use. Usability testing ensures that systems align with patient needs and healthcare objectives, but this step is frequently overlooked in research prototypes. This gap underscores the importance of designing medicine dispensers that not only incorporate advanced technologies but also undergo rigorous usability evaluation.

Considering these challenges, there is a clear demand for an intelligent, user-friendly, and integrated medicine dispensing solution. An effective system must combine the strengths of IoT automation, real-time monitoring, and mobile integration, while addressing shortcomings in usability, accessibility, and patient engagement. MEDTRACK is proposed as a response to these issues, aiming to deliver an intelligent software model that ensures timely medication intake, supports healthcare providers with accurate monitoring, and improves overall adherence in diverse patient populations. By tackling the shortcomings of existing approaches, MEDTRACK seeks to advance the development of reliable, scalable, and patient-centered medication management solutions.

This study aims to develop a medication consumption monitoring application integrated with an IoT device to improve user adherence to prescribed medication. The application was developed using the Waterfall method, in which each stage is conducted sequentially and systematically, from requirements analysis to testing. This approach ensures that the resulting application provides comfort and ease of use, thereby supporting users in maintaining adherence to their medication schedules.

2. Related Works

Ridha et al. [1] examined patient compliance with antibiotic usage at a community health center and reported that adherence remained below 60% in most observed cases. They showed that a substantial proportion of patients either forgot to take their medication or intentionally discontinued treatment once symptoms subsided. This behavioral pattern resulted in treatment inefficacy and contributed to risks of antibiotic resistance. Their findings strongly emphasized that traditional prescription methods were insufficient to ensure adherence, thereby justifying the development of technology-driven interventions such as medication reminders or automated dispensers to bridge this compliance gap.

Kini et al. [2] reviewed dispenser mechanisms in existing automated pill dispensers and identified both strengths and weaknesses in their technical design. They reported that many devices achieved dispensing accuracy above 90%, yet usability and adaptability remained problematic, particularly for elderly users. The study concluded that mechanical reliability alone could not guarantee sustained adherence if the interface or interaction model was not intuitive. This highlighted the necessity of integrating user-centered design principles and adaptive features to improve acceptance and long-term use of medication dispensing systems.

Guerrero-Ulloa et al. [3] proposed an IoT-enabled medicine dispenser to supervise real-time medication intake. Their prototype combined a pill-box mechanism with sensors to detect pill removal, linked to an internet-based monitoring system accessible to caregivers. Experimental trials indicated an improvement of adherence rates by approximately 25% compared to manual methods, particularly for elderly patients who previously demonstrated lower compliance. Nevertheless, the study noted challenges related to device cost, dependency on stable internet connectivity, and system maintenance, which limited large-scale applicability. These findings underlined both the feasibility and the technological barriers of IoT-based dispensers.

Backes et al. [4] investigated digital support systems for medication adherence, particularly through mobile health applications recommended by healthcare providers. They observed that while adherence improved by nearly 20% in users actively engaged with digital reminders, issues of data privacy and app reliability remained unresolved. Moreover, many healthcare professionals were hesitant to recommend third-party apps due to the absence of clear clinical guidelines. The study concluded that despite technological potential, regulatory frameworks and professional trust significantly affected the adoption of digital adherence tools in real-world healthcare systems.

Patel et al. [5] designed and tested an automated dispensation device integrated with a digital adherence dashboard for caregivers. Their evaluation involved usability testing with both patients and healthcare providers. Results showed that adherence improved to 82% when patients used the device, compared to baseline adherence levels of 65% with traditional pill-boxes. The dashboard provided caregivers with real-time adherence tracking, which enhanced monitoring accuracy by 30%. However, the complexity of system setup and the need for user training emerged as limiting factors. The study highlighted the importance of balancing advanced features with simplicity in design for broader adoption.

Krishna et al. [7] advanced the field by developing an IoT-based smart pill dispenser integrated with health monitoring functions. Their device not only dispensed medication but also collected physiological data such as heart rate and blood pressure. The experimental implementation showed that adherence rates increased by nearly 28%, while caregivers benefited from the additional health metrics for patient monitoring. However, challenges arose in terms of data management and limited interoperability with existing healthcare systems. This indicated that while multifunctional devices offered substantial promise, they required robust infrastructure support and seamless integration with healthcare databases to achieve sustainability.

Jenyo and Amusan [20] presented a mobile-based medication reminder and adherence system on the Android platform. Their pilot study involved 60 patients and reported an adherence improvement of up to 35% after consistent use of the app over six weeks. Notifications and reminders reduced instances of missed doses, and patients reported higher confidence in managing their medication routines. Nevertheless, long-term engagement declined when users became accustomed to the notifications, reflecting a challenge in sustaining adherence improvements over extended periods.

3. Proposed Method

3.1 Waterfall Approach

The primary method adopted in this study is the Waterfall approach, which is utilized to develop an application for monitoring medication consumption. The development process comprises several stages, namely requirements analysis, system design, implementation, and testing. The application is integrated with an Internet of Things (IoT) device, specifically an automatic tablet dispenser. The Waterfall method was selected as it is particularly suitable for projects with clearly defined requirements and scope from the outset. This method differs from other approaches in that each stage must be completed before the next process [24].

Mathematical Formulation of the Waterfall Method for MEDTRACK is as follows:

1) Phase graph and precedence

Let the ordered set of phases be

$$\mathcal{P} = R, D, I, T, DP, M$$

for Requirements, Design, Implementation, Testing, Deployment, and Maintenance. Define a strict total order

$$R \prec D \prec I \prec T \prec DP \prec M.$$

The project state at $p \in \mathcal{P}$ is $s_p \in \mathcal{S}_p$ with transition

$$\Phi_p: \mathcal{S}_p \to \mathcal{S}_{p^+}, s_{p^+} = \Phi_p(s_p), \quad (1)$$

where p^+ denotes the immediate successor of p.

2) Deliverables, verification, and acceptance

Each phase produces deliverables X_p and must satisfy verification predicates $V_p(X_p) = 1$ and acceptance predicates $A_p(X_p) = 1$ to advance:

$$\forall p \in \mathcal{P} \setminus M: A_p(X_p) \wedge V_p(X_p) \Rightarrow \text{enter } p^+.$$

If not satisfied, a rework mapping sends control back to the nearest upstream phase:

$$\text{if } A_p(X_p) = 0 \text{ or } V_p(X_p) = 0, s_p \leftarrow \mathcal{R}_p(s_p), \mathcal{R}_p: \mathcal{S}_p \to \mathcal{S}_p. \quad (2)$$

3) Time, cost, and resources

Let t_p be duration, c_p cost, and $r_p \in \mathbb{N}$ team size for phase p. Project totals:

$$T_{\text{tot}} = \sum_{p \in \mathcal{P}} t_p, \qquad C_{\text{tot}} = \sum_{p \in \mathcal{P}} c_p, \qquad c_p = \kappa_p r_p t_p + \xi_p, \quad (3)$$

with κ_p unit labor cost and ξ_p fixed phase cost.

4) Requirement–artifact traceability for MEDTRACK

Let $\mathcal{R} = \{r_1, \ldots, r_m\}$ be functional/non-functional requirements (e.g., adherence alert latency, IoT connectivity uptime), $\mathcal{A}_p$ artifacts at phase p, and $\mathcal{T}$ test cases. Define bipartite incidence matrices

$$\mathbf{M}_{RA} \in \{0,1\}^{m\times|\cup_p \mathcal{A}_p|}, \mathbf{M}_{RT} \in \{0,1\}^{m\times|\mathcal{T}|}.$$

Coverage metrics:

$$\text{Design coverage } \mathsf{Cov}_D = \frac{1}{m}\sum_{i=1}^{m}\mathbb{I}\Big(\sum_j (\mathbf{M}_{RA})_{ij} > 0\Big), \quad \text{Test coverage } \mathsf{Cov}_T = \frac{1}{m}\sum_{i=1}^{m}\mathbb{I}\Big(\sum_k (\mathbf{M}_{RT})_{ik} > 0 \tag{4}$$

5) Quality and defect dynamics

Let Z_p be defects injected in p and Y_p defects removed in p. Cumulative open defects after phase p:

$$Q_p = Q_{p^-} + Z_p - Y_p, Q_R = Z_R,$$

where p^- is the predecessor phase. For MEDTRACK, SLA-style quality constraints (e.g., medication schedule accuracy α, uptime u) are

$$\alpha \geq \alpha^\star, u \geq u^\star, Q_T \leq Q_T^\star.$$

A Poisson/Exponential model (optional) for defect arrivals in phase p:

$$Z_p \sim \text{Poisson}(\lambda_p t_p), \mathbb{E}[Z_p] = \lambda_p t_p. \tag{5}$$

6) Waterfall feasibility/optimization view

Select resources and schedules to minimize time or cost subject to precedence and quality:

$$\begin{aligned} \min_{\{t_p, r_p\}} \quad & w_T\,\mathbb{E}[T_{\text{tot}}] + w_C\,\mathbb{E}[C_{\text{tot}}] \\ \text{s.t.} \quad & R \prec D \prec I \prec T \prec DP \prec M, \\ & \mathsf{Cov}_D \geq c_D^\star,\ \mathsf{Cov}_T \geq c_T^\star, \\ & \alpha \geq \alpha^\star,\ u \geq u^\star,\ Q_T \leq Q_T^\star, \\ & \mathsf{RE} \leq \Gamma,\ r_p \in \mathbb{N},\ t_p > 0. \end{aligned} \tag{6}$$

This mathematical formulation represents the optimization of the teacher placement problem using the Waterfall method. The objective function minimizes a weighted combination of the expected total time $\mathbb{E}[T_{\text{tot}}]$ and the expected total cost $\mathbb{E}[C_{\text{tot}}]$, where w_T and w_C are their respective importance weights. The constraints enforce the sequential order of the Waterfall $R \prec D \prec I \prec T \prec DP \prec M$, ensuring that requirements (R) come before design (D), then implementation (I), testing (T), deployment (DP), and maintenance (M). Coverage constraints $\mathsf{Cov}_D \geq c_D^\star$, $\mathsf{Cov}_T \geq c_T^\star$ guarantee sufficient requirements and testing validation. Quality constraints require reliability (α), usability (u), and testing quality (Q_T) to meet or exceed thresholds. Resource efficiency RE must remain within a maximum limit Γ. Finally, decision variables include the number of resources $r_p \in \mathbb{N}$ and task durations $t_p > 0$, ensuring feasible allocation of teachers across schools. The formula captures the multi-objective trade-off between time and cost in teacher placement under the structured phases of the Waterfall development model, while enforcing coverage, quality, and resource constraints.

3.2 Research Flow

The initial stage involves a requirements analysis, carried out through interviews with potential users. These users are individuals who require regular medication or have a history of consistent medication consumption. The purpose of the interviews is to identify existing problems and gather information on their needs for a medication monitoring application integrated with an automatic medicine dispenser. In addition to prospective users, interviews are also conducted with healthcare professionals, such as doctors, nurses, and other medical practitioners, to gain insights from an expert perspective regarding the application's development. The findings from this stage serve as the foundation for system design.

System design represents a crucial stage in the application development process, as it provides a structured overview of the system's functionality and interaction flow. At this stage, a medication monitoring application integrated with an automatic medicine dispenser was designed. The design was based on the results of the user requirements analysis and input from healthcare professionals, as previously described. A use case diagram was created to map user interactions with the system, while an activity diagram was developed to illustrate the process flow, such as adding medicines and creating consumption schedules. An Entity Relationship Diagram (ERD) was designed to define the system's data structure, and the user interface was prototyped using Figma to visualize the application's layout and support the implementation process in the subsequent phase.

The implementation stage involves translating the system design into program code. The application was developed using Android Studio with the Kotlin programming language. The implementation followed the previously designed interface and included key features such as adding medicines, creating medication schedules, and recording medication history. Firebase was employed both as the database and to facilitate integration between the application and the IoT device. The testing phase aims to verify that the implemented system functions correctly and fulfills the requirements defined in the analysis phase after the completion of the implementation process. In this study, we adopt the SUS approach to evaluate the application's usability based on user perceptions.

4. Result and Analysis

In this study, we gathered data through structured interviews with two primary groups of informants. The first group comprised prospective users who had current medication consumption needs or a documented history of regular medication intake. These interviews were designed to identify existing challenges and gather comprehensive data regarding user requirements for a medication consumption monitoring application integrated with automatic tablet dispensers. Additionally, interviews were conducted with healthcare professionals, including physicians, registered nurses, and other qualified medical practitioners. These expert interviews aimed to obtain professional perspectives on the development and implementation of medication consumption monitoring applications, providing valuable insights into clinical requirements and potential integration challenges within existing healthcare frameworks. Table 1 displays the interview question requirements of this study.

Table 1 Interview Question Requirements

Respondent	Questions
User	Are you currently sick, or have you been sick recently?
	How many types of medication do you have to take, and how many times a day?
	How do you usually remember when to take your medication?
	Have you ever forgotten to take your medication? If so, what was the reason?
	Do you need an app to remind you to take your medication so you don't forget?
	If you need a medication reminder app, what features and design would you require?
	Have you ever provided medical care to patients?

Healthcare Professional	Have you ever seen patients who forget to take their medication?
	What are the main reasons patients forget to take their medication?
	How do you monitor patients to ensure they take their medication on time?
	What are your thoughts on developing an app integrated with an automatic tablet dispenser?
	What do you think the app's interface should look like?

Interview results identified that the majority of respondents were elderly individuals with chronic diseases such as diabetes, bronchitis, and gout who require regular medication intake. Despite having limitations in remembering medication schedules and using technology, they expressed the need for smartphone application-based medication reminders featuring a simple interface, large text, bright colors, informative buttons, and clear information displaying medication names and consumption times. Interviews with healthcare experts confirmed that medication non-adherence is a prevalent issue among elderly patients due to declining memory and confusion in distinguishing between different types of medications. Healthcare professionals support the development of a monitoring application integrated with automatic dispensers and emphasize the importance of medication schedule notification features, along with a simplified interface incorporating large text and contrasting colors to enhance patient compliance with prescribed treatment regimens. Fig.1 illustrates the interaction between the user and the system of MEDTRACK.

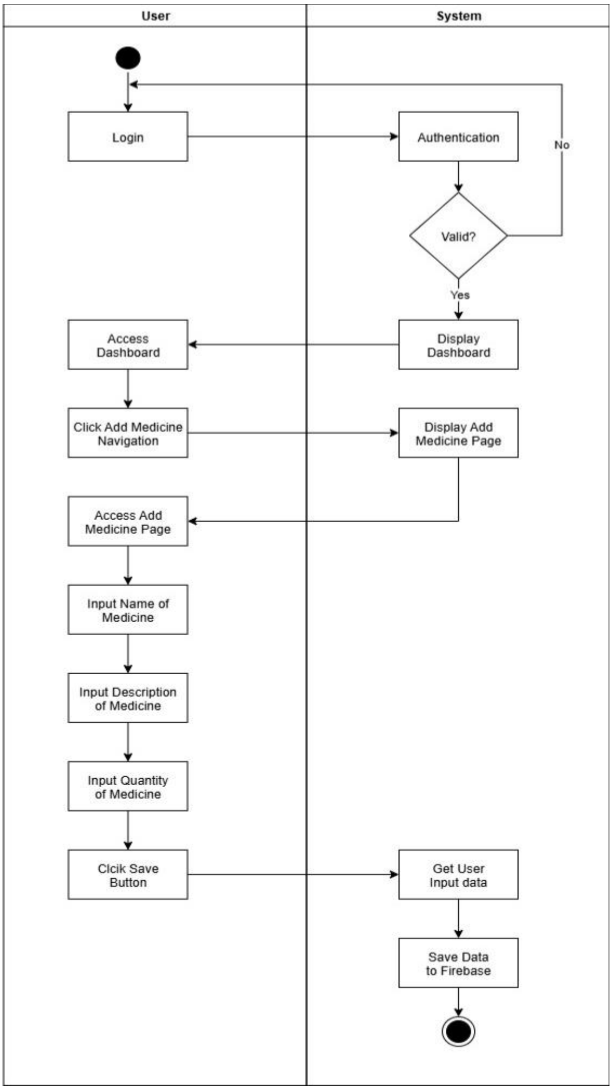

Fig. 1 Interaction between the user and the system of MEDTRACK

The implementation was carried out using Android Studio with the Kotlin programming language, while Firebase Realtime Database was utilized for data management. The application design followed a prototype model previously created using Figma. Fig. 2 depicts the application features of MEDTRACK.

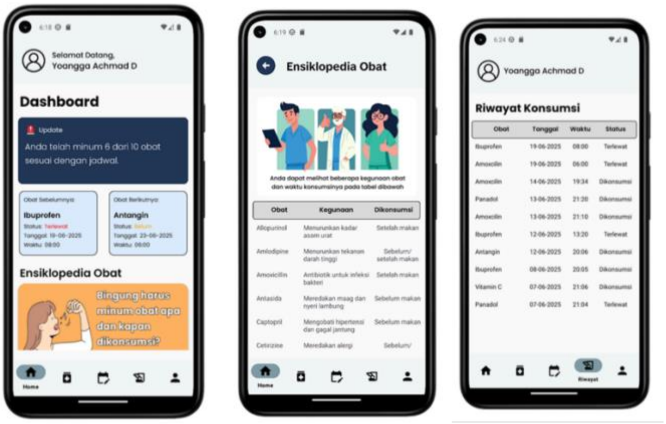

Fig. 2 Application features of MEDTRACK.

Dashboard functions as the main control center, summarizing medication consumption, upcoming schedules, and providing access to a “Medicine Encyclopedia” and health-related articles to support user education. Users can add and manage medicines through the Add Medicine page by entering details, setting schedules, and organizing stock in the dispenser device. Additionally, the Consumption History page records medication intake chronologically, highlighting both taken and missed doses to support adherence monitoring and provide valuable insights for healthcare professionals.

This study also conducts integration with an IoT Device with various hardware components, including the ESP32, RTC DS3231, ES08MA II analog servo motor, 16x2 I2C LCD screen, piezo buzzer, LED light, and pushbutton. An optimal pin configuration ensures stable communication and efficient utilization of pins on the ESP32. The operation of the automatic tablet dispenser system begins with the activation of the ESP32 and verification of the internet connection. If the connection fails, the system displays an error message and retries every ten seconds. Once connected, the system retrieves the medication schedule from Firebase and enters monitoring mode. At the scheduled time, the system activates the servo motor to dispense the medication within a five-minute window, accompanied by visual and audio indicators provided by the LED light and piezo buzzer. Fig. 3 depicts integration between software and IoT.

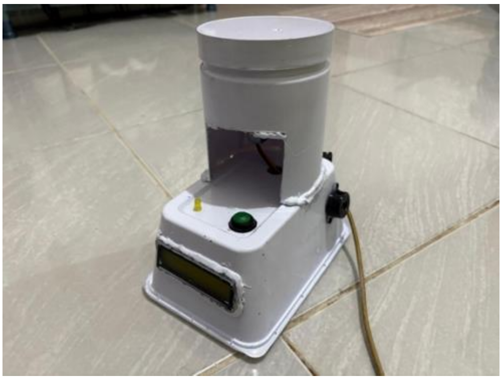

Fig. 3 IoT Device with MEDTRACK

The integration process utilizes Firebase as the data storage platform. When a user successfully creates a medication schedule, the information is stored in the JadwalKonsumsi collection with details such as medicine name, status (initially set as Belum/Not yet), taken (default value false), date, and time

In this study, we conduct an evaluation process with the SUS method to evaluate its usability. This usability evaluation is essential to determine the extent to which the application can be used easily, comfortably, and in accordance with user expectations, particularly for individuals who require regular medication in their daily lives. Under the user testing phase, participants were asked to complete the System Usability Scale (SUS) questionnaire. The list of questions used in the SUS evaluation is presented in Table 2.

Table 2 List of SUS Questions

No	Questions
1	I feel comfortable using this app.
2	This app is complicated to understand.
3	I find this app easy to use.
4	I need help from others to be able to use this app.
5	I feel that the features in this app are well integrated.
6	I find many inconsistencies in this app.
7	I imagine that most people will quickly learn how to use this app
8	This app feels confusing and difficult to learn.
9	I feel confident when using this app.
10	I have to learn a lot before I can use this app.

Table 3 SUS Questionnaire Data

Respondent	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
R1	5	1	5	1	5	1	5	1	5	1
R2	5	1	5	2	4	1	3	1	5	2
R3	5	1	5	1	5	1	4	1	5	1
R4	4	2	4	2	4	3	4	2	4	2
R5	5	1	5	1	5	1	5	1	4	1
R6	5	1	5	1	5	4	5	1	5	1
R7	5	5	5	1	5	2	4	1	5	1
R8	5	1	5	1	5	1	5	1	5	1
R9	4	4	4	4	4	4	5	4	4	5
R10	4	4	4	2	4	4	4	2	5	2
R11	5	1	5	1	5	1	5	1	5	1
R12	5	2	5	2	5	4	4	2	4	5
R13	5	1	5	2	5	1	5	1	5	1
R14	5	1	5	4	5	1	5	1	4	1
R15	4	2	2	3	5	2	4	3	5	2
R16	4	2	4	2	4	1	4	1	4	2
R17	4	2	4	2	4	2	4	2	4	2
R18	4	2	5	2	4	2	4	2	4	4

To calculate the System Usability Scale (SUS) score, each respondent answered 10 questions using a Likert scale ranging from 1 to 5, where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.
The calculation was carried out through the following steps:

1. For odd-numbered questions (1, 3, 5, 7, 9), the score was obtained by subtracting 1 from the respondent's answer value.

$$S_i = Q_i - 1 \quad (7)$$

- Q_i = Respondent's answers for item i (on a scale of 1–5)
- S_i = Contribution score for item i

2. For even-numbered questions (2, 4, 6, 8, 10), the score was obtained by subtracting the respondent's answer value from 5.

$$S_i = 5 - Q_i \quad (8)$$

3. All contribution scores (S_i) from the 10 questions were then summed to obtain a total score ranging from 0 to 40.

$$\text{Total Score} = \sum_{i=1}^{10} Si \quad (9)$$

4. The total score was multiplied by 2.5 to obtain the final SUS score, ranging from 0 to 100.

$$\text{SUS} = \text{Total Score} \times 2.5 \quad (10)$$

5. Finally, the average SUS score was calculated by summing all respondents' SUS scores and dividing the result by the total number of respondents.

$$\underline{x} = \frac{\sum x}{n} \quad (11)$$

- $\underline{x}$ = Average score
- $\sum x$ = Total SUS score
- n = Total respondents

Table 4 SUS Data Processing Results

Respondent	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total Score	SUS Score
R1	4	4	4	4	4	4	4	4	4	4	40	100
R2	4	4	4	3	3	4	2	4	4	3	35	87.5
R3	4	4	4	4	4	4	3	4	4	4	39	97.5
R4	3	3	3	3	3	2	3	3	3	3	29	72.5
R5	4	4	4	4	4	4	4	4	3	4	39	97.5
R6	4	4	4	4	4	1	4	4	4	4	37	92.5
R7	4	0	4	4	4	3	3	4	4	4	34	85
R8	4	4	4	4	4	4	4	4	4	4	40	100
R9	3	1	3	1	3	1	4	1	3	0	20	50
R10	3	1	3	3	3	1	3	3	4	3	27	67.5
R11	4	4	4	4	4	4	4	4	4	4	40	100
R12	4	3	4	3	4	1	3	3	3	0	28	70
R13	4	4	4	3	4	4	4	4	4	4	39	97.5
R14	4	4	4	1	4	4	4	4	3	4	36	90
R15	3	3	1	2	4	3	3	2	4	3	28	70
R16	3	3	3	3	3	4	3	4	3	3	32	80
R17	3	3	3	3	3	3	3	3	3	3	30	75
R18	3	3	4	3	3	3	3	3	3	1	29	72.5
Average Score												83.6

Based on the results of the System Usability Scale (SUS) questionnaire completed by respondents after using the medication consumption monitoring application, the application achieved an average SUS score of 83.6. According to the standard interpretation of the SUS scale, this score falls into the Acceptable category, which indicates that the application has a high level of usability and meets user expectations effectively.

5. Conclusion

The purpose of this study is to develop a software model to enable medication monitoring integrated with the Internet of Things (IoT). We adopted the Waterfall method to obtain an effective model. This study produced a software model with the integration of the IoT device to schedules are automatically schedule tablet dispensers. When medication is taken on time, the system records it as “Taken”. Conversely, if the medication is not consumed, it is recorded as “Missed”. This process enables real-time monitoring, which is highly beneficial for both users and healthcare professionals in evaluating treatment adherence. Most respondents stated that the application was easy to use, had a clear interface, user-friendly features, and was very helpful in improving adherence to medication schedules. Based on the usability testing conducted with respondents, the application obtained an average SUS score of 83.6, which falls into the Acceptable category according to the standard interpretation of the SUS scale.

Future work can focus on further enhancing the application through the development of additional features based on user feedback. Suggested improvements include implementing Google account login to simplify registration and access, optimizing the application interface by enlarging text size and improving the overall user interface design, and adding a recurring schedule feature to avoid repetitive schedule creation for the same medication. Other recommendations include providing low stock notifications to ensure medicine availability is monitored and adding allergy information in the user profile to support safer medication recommendations tailored to individual conditions.

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