

Enhancing Software Development Efficiency: Scrum Framework in the MAMOI Project for Infusion Monitoring System

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Info Artikel

Riwayat Artikel

Diterima: 22-01-2024

Disetujui: 03-04-2024

Kata Kunci

Agile Scrum;

MAMOI;

Infusion Monitoring;

Hospital;

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ABSTRAK

MAMOI is an infusion monitoring system for hospitalized patients using a web-based application integrated with an IoT device that has a load sensor to monitor the remaining infusion water. The system aims to monitor the percentage of remaining infusion fluid in the infusion bag and know when to replace the infusion bag. In this research, the Agile Scrum method is applied to the development of MAMOI. This method was chosen because it can be adjusted to the needs and changes that occur during development. MAMOI development is divided into several sprints, each of which lasts two weeks. In each sprint, the development team focuses on developing predefined features. The results showed that the Agile Scrum method can be applied well in the development of MAMOI. The system can be completed within 4 months with good quality.

1. Introduction

During the era of the fourth industrial revolution, advancements in technology have resulted in advances across multiple industries, including the field of healthcare. An essential component of healthcare is the surveillance of patients, particularly those receiving inpatient care in hospitals. [1]. Efficient surveillance is vital, particularly in the context of intravenous fluid delivery, which is an essential component of medical treatment. [2].

Intravenous fluids are crucial for facilitating the patient's recovery process. Ensuring the equilibrium of bodily fluids is a crucial aspect of healthcare, and even a slight alteration in the amount of fluid administered can significantly affect a patient's medical state. Hence, a complex and effective system is necessary to oversee and regulate the administration of intravenous fluids, particularly for hospitalized patients who necessitate meticulous supervision. Nevertheless, in practice, the monitoring of infusion fluid is frequently conducted manually by healthcare professionals, such as nurses [3]. This monitoring entails the systematic observation of the infusion container in person and the subsequent recording of data at consistent intervals. While prevalent, this methodology possesses a number of drawbacks that could potentially compromise the efficacy and efficiency of patient treatment. [4].

Initially, this manual procedure requires a substantial amount of time from medical workers, who may otherwise be dedicated to more immediate and crucial responsibilities. The scarcity of human resources in hospitals, coupled with the burden of heavy workloads, hampers the capacity to provide adequate attention to IV fluid monitoring. Furthermore, the potential for human error poses a significant obstacle. Errors or delays in documenting or

addressing alterations in intravenous fluid amounts can significantly affect the well-being of patients. Hence, there is a want for more advanced and automated methods to enhance the precision and effectiveness of intravenous fluid monitoring [5].

The advent of Internet of Things (IoT) technology introduces inventive alternatives to surmount these obstacles. By connecting Internet of Things (IoT) devices with monitoring systems, a system can be developed to continuously monitor the amount of infusion fluid remaining in the bag in real-time. MAMOI is a specific example of this notion, serving as an infusion monitoring device designed for patients who are hospitalized [6]. MAMOI provides IoT technology and employs the Agile Scrum development methodology, which is both structured and flexible. This approach has demonstrated efficacy in software development projects, particularly when there is a need to include modifications and tailor-made adjustments during the development process.

The implementation of Agile Scrum methodology was utilized in the development of MAMOI, employing a sequence of two-week sprints. This enabled the development team to concentrate on creating predetermined features, while also being adaptable to any modifications that may arise along the development process. The primary focus of this paper is the notable achievement of MAMOI. The project not only developed a novel solution for monitoring IV fluids, but also enhanced our understanding of how the combination of Agile Scrum and IoT technologies may enhance the efficiency of patient monitoring in hospital settings.

In the creation of MAMOI, this research encompasses not only the use of technology, but also a thorough examination of how development techniques and technology can synergistically enhance each other to attain optimal outcomes. Hence, this publication will thoroughly examine the sequential stages of MAMOI's development utilizing the Agile Scrum approach, along with its influence on patient monitoring and overall healthcare services.

2. METODE

The development of our application called MAMOI is guided by the Scrum framework in this research. Scrum is a versatile framework specifically created to assist individuals, organizations, and teams in accomplishing their objectives by creating adaptable solutions to intricate situations. It encompasses a collection of procedures, approaches, and systems, which can be implemented alongside or in instead of current methods. Scrum enables continual improvement by emphasizing the comparative efficacy of existing management, environmental, and work practices. The fundamental tenets of this approach are based on verifiable data and a streamlined mindset. The former prioritizes the acquisition of information by firsthand experience and making judgments based on observed data, whereas the later centers around the elimination of inefficiencies and the maximization of value [7]. Scrum employs an iterative and incremental methodology to guarantee predictability and mitigate risk. It enables autonomous teams composed of skilled persons with the requisite competence to accomplish the work, while promoting ongoing learning and growth. The success of Scrum is attributed to its four formal inspection and adaption events, which are conducted within a larger framework called a Sprint. The effectiveness of these events stems from the diligent implementation of Scrum's fundamental principles: transparency, inspection, and adaptation.

2.1. Scrum Values

We adhered to Scrum values during the development of the MAMOI application. The qualities of dedication, focus, respect, and courage act as guiding principles for Scrum teams, influencing their work, decision-making, and behavior. These ideals are crucial in creating the team's mindset and approach inside the agile Scrum process. Dedication entails a steadfast commitment to producing outcomes of superior quality, while focus underscores the need of directing one's efforts towards the most crucial activities. Respect cultivates cooperation and

comprehension among team members, whereas courage promotes the undertaking of measured risks and the direct confrontation of obstacles.

Within the framework of agile Scrum, it is crucial that decisions, activities, and the implementation of Scrum adhere to and strengthen these fundamental principles. Scrum events and artifacts provide a chance for Scrum Team members to enhance their comprehension of these values. The Scrum Team and its collaborators demonstrate commitment, concentration, esteem, and bravery, which makes Scrum's empirical principles of transparency, inspection, and adaptability evident. The interaction between these principles and pillars leads to the development of trust among the team and its stakeholders.

2.2. Scrum Roles

The Scrum team takes on the responsibility for all production activities, which encompass communicating with stakeholders, conducting product research and development, supervising operations and maintenance, and managing diverse requirements. Figure 1 illustrates a visual representation of Scrum responsibilities.

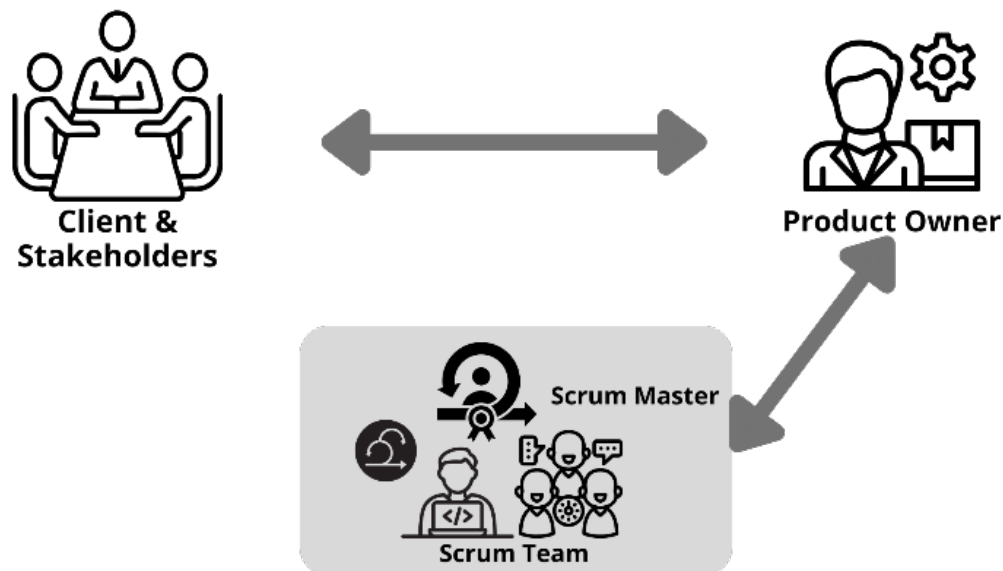


Figure 1. Scrum Roles Illustration

An ideal Scrum team should ideally consist of a minimum of 10 members or fewer, with the optimal size falling within the range of 7 to 9 individuals. The team has three important roles: the product owner, the Scrum master, and the development team. Every team member is required to autonomously arrange themselves and actively engage in product development or facilitate collaboration among team members.

SCRUM FRAMEWORK

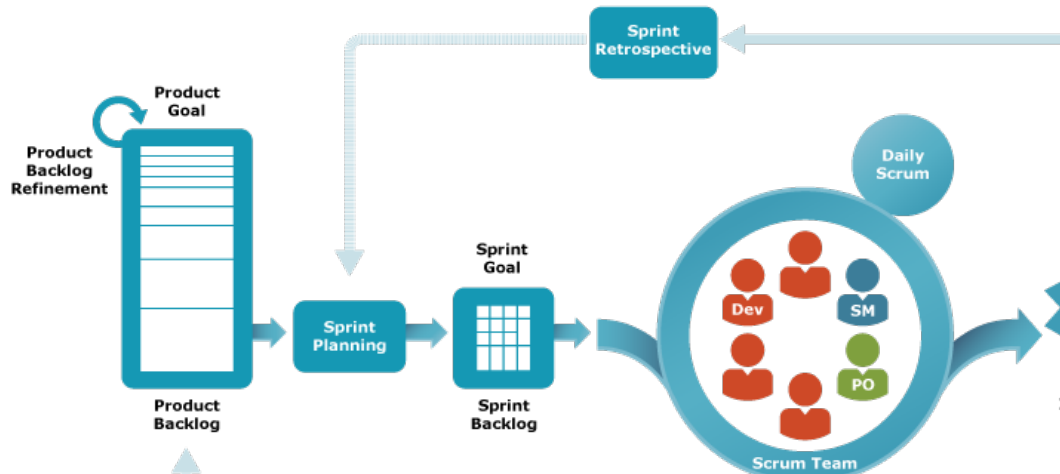


Figure 2. Scrum Framework

The primary responsibility of the product owner, in the context of the Scrum team, is to optimize the value of the product being developed. This person is accountable for efficiently managing the product backlog, defining and communicating product objectives, generating and communicating product backlog items, and delivering those items. The product owner serves as the advocate for the stakeholders' desires in the product backlog, and team members must adhere to the decisions made on the product backlog [8].

The Scrum master, in the second role, possesses an extensive comprehension of Scrum and fulfills the responsibilities of a facilitator and coach for the team. This individual is responsible for ensuring that all members of the team and organization have a comprehensive understanding of Scrum, both in terms of its theoretical concepts and practical implementation. The Scrum master oversees the team's efficiency and acts as a "servant leader", leading by example rather than using an authoritarian style. The Scrum master not only ensures a proper comprehension of agility and Scrum, but also aids the product owner in uncovering methodologies, conveying information, and resolving hindrances or disputes, while refraining from engagement in product development content or external communication [9].

The third position encompasses the development team, which serves as the project's technical and self-organizing entity. The development team is characterized by its cross-functional nature, wherein each member possesses the requisite skills and expertise to actively contribute to all facets of the project. Within the agile literature, developers encompass a range of persons who actively contribute to the production process. This includes programmers, analysts, solution designers, UI/UX designers, testers, and other relevant roles. An optimal development team typically has 3 to 9 persons, although for more extensive projects, a scaled model can be implemented, involving numerous Scrum teams. The production process is governed by the development team, which has decision-making authority [10]. During a sprint, often lasting no more than a month, all concepts are transformed into tangible value. The tasks encompass sprint planning, daily scrums, sprint reviews, and sprint retrospectives. It is imperative to refrain from making any substantial alterations during the sprint, and to ensure that the product's quality remains intact, while refining the product backlog as needed [11].

The purpose of Sprint Planning is to coordinate and structure the tasks that will be carried out during the sprint, leading to cooperative efforts by the Scrum team. During sprint planning, external stakeholders have the opportunity to offer suggestions [12]. The primary objective of the daily scrum is to demonstrate the advancement made towards accomplishing the sprint goals and make necessary modifications to the subsequent work plan. This brief 15-

minute activity enhances the level of communication among Scrum team members [13]. During a sprint review, the Scrum team showcases the outcomes of their efforts and their advancement towards the product objective to stakeholders. This session aims to analyze the outcomes of the sprint and identify the most effective development approach to accomplish the product objective.

2.3. Scrum Events

Scrum events are crucial for establishing consistency and reducing the need for superfluous meetings in the Scrum framework, as highlighted in the Scrum principles. To ensure simplicity, it is advisable that all events take place concurrently and at the same venue. The five primary Scrum events, depicted in Figure 2, consist of the sprint, sprint planning, daily scrum, sprint review, and sprint retrospective. [14].

These events offer occasions for the Scrum Team and stakeholders to evaluate and decide on the subsequent actions in their work. The Sprint Review is a meeting when the progress made during the Sprint is assessed and any modifications to the surroundings are deliberated. Sprint Retrospectives are specifically intended to devise solutions for enhancing quality. The Scrum team evaluates the effectiveness of the previous sprint, including factors such as individuals, communication, processes, tools, and the criteria for completion. A Sprint Retrospective, lasting no more than three hours, signifies the conclusion of a sprint that spans one month. The duration of the event is typically modified to accommodate shorter sprints [15].

2.4. Scrum Artifacts

The objective of the project is to enhance the clarity of information pertaining to the product being developed and to ensure a dedicated effort in monitoring the progress of each individual involved. This methodology strengthens the reliance on empirical evidence and is in accordance with the fundamental principles of Scrum, benefiting both the team and its stakeholders.

The Product Backlog is a crucial artifact in Scrum, consisting of a prioritized list that outlines the necessary enhancements for the product. The Scrum Team use it as a repository of tasks, which are organized and prioritized by the product owner. The product owner disseminates the prioritized list with input from the entire Scrum team and stakeholders. The commitments linked to the Product Backlog are the product objectives that delineate the envisioned future condition of the product. These goals function as overarching objectives, highlighting the importance of accomplishing the previous goal prior to on to the subsequent goal [16].

The Sprint Backlog, as the second artifact, is a meticulously devised plan exclusively crafted by and for the development team. The process entails categorizing each specific characteristic into a sequence of assignments, integrating design and efficient scheduling to ensure timely completion of the activities. The Sprint Backlog is continuously updated during the Sprint to monitor progress during the Daily Scrum. The obligations linked to the Sprint Backlog are the sprint objectives, which are established by all Scrum roles during sprint preparation. The objectives outlined here delineate the intended accomplishments of the forthcoming sprint, providing the opportunity for dynamic adaptation and customization of the tasks [17].

The third component of Scrum is The Increment, which symbolizes gradual progress towards accomplishing the Product Goal. Every Increment represents the successful completion of high-quality work that has the potential to be delivered. Each successive increment builds upon the preceding increments, guaranteeing compatibility within the sprint. Several increments can be produced during a sprint, fostering harmony among them. The Increment entails a commitment known as the "definition of done," which serves as an official statement for assessing the quality of a project. This definition promotes transparency among

team members, facilitating the coordination of a collective comprehension of the work that has been accomplished [18].

2.5. Tools

We utilize a range of tools to improve the team's capacities in carrying out certain activities, especially in the administration of individual duties. Each team member can access these tools using shared links, facilitating smooth cooperation.

Miro board, available at miro.com, presents itself as a swift, complimentary, and user-friendly internet-based digital whiteboard specifically created for collaborative tasks. The Miro board provides users with an unlimited canvas, enabling flexible utilization in various activities such as research, design, strategic planning, training sessions, or managing agile workflows. [19].

Jira Software (atlassian.com) is another popular solution for agile Scrum management, with Miro board. Jira offers a resilient framework for agile project management, encompassing functionalities such as Scrum boards, kanban boards, and configurable processes. It enables teams to efficiently strategize, monitor, and deploy software. Jira effortlessly connects with other Atlassian technologies, offering a holistic solution for software development teams [2].

Notion (notion.so) is a cutting-edge workspace designed for collaborative projects. It offers customized markdowns that can be used with different templates, such as kanban boards, tasks, wikis, and databases. Notion has exceptional versatility, functioning as a robust instrument for capturing notes, organizing and managing information and data, as well as overseeing projects and tasks. It offers teams a flexible platform to optimize their joint endeavors effectively [20].

3. RESULTS AND DISCUSSIONS

During this study project, we carry out all necessary tasks and create essential materials in accordance with the principles outlined in the Agile Scrum handbook. In addition, we generate thorough documentation and visual depictions to demonstrate the use of the Agile Scrum approach into the development process of our mobile application in the MAMOI Project for Infusion Monitoring.

3.1. Results

The MAMOI software development process commences by assigning Scrum roles to the individuals participating in the project. The product owner engages in collaboration with stakeholders to collect product requirements and establish product backlog items. The product backlog items are prioritized and distributed over multiple sprints for implementation.

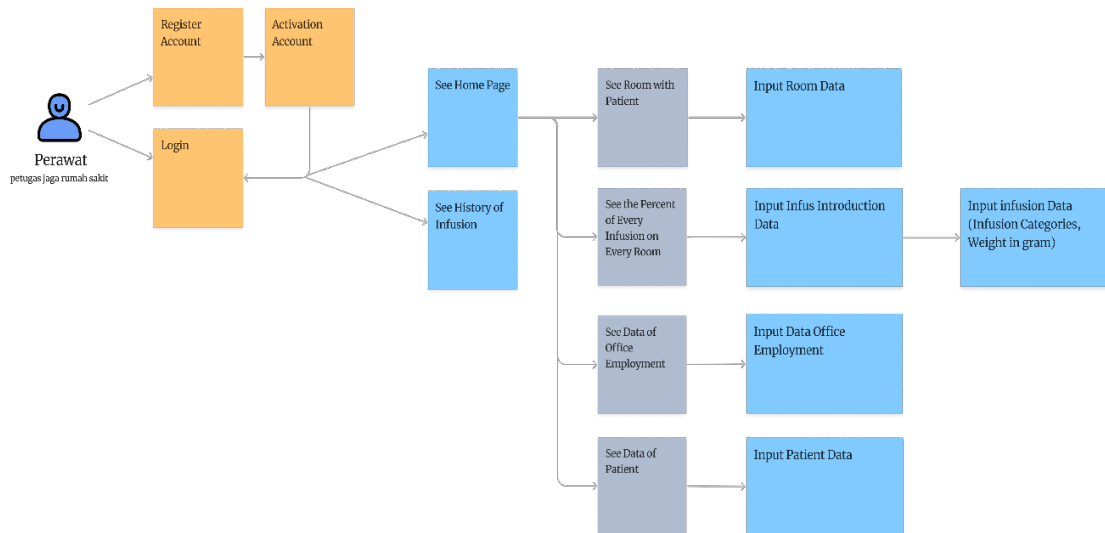


Figure 3. Narrative Story of MAMOI

To ensure the functioning and effectiveness of the MAMOI application for monitoring infusion in hospitalized patients, a set of user stories, as shown in Figure 3, were developed. As part of this study, it is anticipated that medical personnel will possess the ability to effortlessly enroll new patients into the MAMOI system. To initiate the process, begin by launching the MAMOI application. Proceed by inputting essential patient information, including their name, age, gender, and diagnosis. Finally, conclude by selecting the "Register" option to securely store the patient data. An important characteristic of the MAMOI app is its capability to enable medical personnel to measure the quantity of the leftover infusion fluid in the infusion bag. The procedure is launching the application, choosing the patient to be assessed, and activating the "Measure" function to obtain precise data from the load sensor.

Moreover, the MAMOI app offers the capability to send notifications to medical personnel when the remaining IV fluid is nearing the minimum threshold. The system consistently checks the remaining fluid, and in the event that it nears the minimum threshold, an alert will be dispatched to the medical professional's mobile device, allowing for swift access. Another crucial aspect is the capability for medical professionals to substitute depleted infusion bags. The medic can accurately record data on the change of the infusion bag by accessing the MAMOI app, choosing the relevant patient, and clicking the "Replace Infusion Bag" button.

In addition to these characteristics, the MAMOI program is specifically built to be adaptable to the specific requirements of hospitals. This includes capabilities such as user administration, generating reports, and seamless connection with existing hospital information systems. MAMOI is a complete and effective system for managing infusions in hospitals for inpatients. The articulation of product objectives should be unambiguously established at the outset of the Scrum methodology. Product goals delineate the overarching aims and ambitions of the product over an extended period of time. MAMOI aims to offer a solution for the effective and precise monitoring of infusions.

Table 1. List of User Story

User	Features	Storyline	Requirements
Medical Officer	Registering patients	Ensure all inpatients are registered	The medic opens the MAMOI app, enters the patient's data, and presses the "Register" button.

User	Features	Storyline	Requirements
Medical Officer	Perform infusion measurement	Easy and accurate measurement of remaining intravenous fluid	The medic opens the MAMOI app, selects the patient, and presses the "Measure" button. The system will read the data from the load sensor and display the percentage of remaining infusion fluid.
Medical Officer	Receive a warning	Ensure that medical personnel can immediately recognize if the remaining IV fluid is approaching the minimum limit.	The system will monitor the remaining IV fluid continuously. If the remaining IV fluid is approaching the minimum limit, the system will send an alert to the medic's mobile device.
Medical Officer	Changing the infusion bag	Change the infusion bag if the remaining infusion fluid has run out.	The medical officer opens the MAMOI application, selects the patient, and presses the "Change Infusion Bag" button. The system will record the infusion bag replacement data.

Table 1 contains narrative stories that serve as documentation for user requirements in the context of MAMOI. Subsequently, these narrative stories are transformed into product backlog items. Subsequently, the product backlog items are prioritized and allocated into many sprints for implementation. The MAMOI application development sprint strategy for each scrum team is illustrated in Figure 4.



Figure 4. Sprint Planning Developing MAMOI

The sprint backlog comprises the specific product backlog items that will be addressed and completed within the duration of two sprints. The sprint backlog is then utilized to

monitor the advancement of product development. During the development of MAMOI, two sprints were carried out, each accompanied by thorough sprint planning as shown in Figure 5.

SPRINT #1

Product Backlog	Sprints Backlog	Requestor	Priority	Dev
1. Produce Database a. Pasien b. Kamar c. User / Perawat d. Data Infus	1. Produce Database a. Pasien b. Kamar c. User / Perawat d. Data Infus	User	High	Backend
2. Produce API a. API List Pasien b. API Add Pasien c. API List Kamar d. API Add Kamar e. API List Pegawai f. API Add Pegawai g. API List Infus h. API Add Data Infus	2. Produce API a. API List Pasien b. API Add Pasien c. API List Kamar d. API Add Kamar e. API List Pegawai f. API Add Pegawai g. API List Infus h. API Add Data Infus	User		Backend
3. Slicing and Integrasi API a. Login Authentication b. Halaman Home c. Halaman Menu Kamar d. Halaman Add Pasien e. Halaman Add Pegawai	3. Slicing and Integrasi API a. API List Pasien b. API Add Pasien c. API List Kamar d. API Add Kamar	User		FrontEnd

SPRINT #2

Product Backlog	Sprints Backlog	Requestor	Priority	Dev
4. Slicing dan Konsumsi API List Infus Terpasang a. Halaman Tampilan Infus	4. Slicing dan Konsumsi API List Infus Terpasang a. Halaman Tampilan Infus	User	Medium	FrontEnd
5. Slicing Alert Infus <= 15%	5. Slicing Alert Infus <= 15%	User		FrontEnd

Figure 5. Product Backlog Items and Sprint Goals of MAMOI

The duration of a sprint in MAMOI development is one week. Every sprint is assigned a distinct objective. The primary objective of the initial sprint was to create and implement the functionalities of user sign-in, sign-up, authentication, profile management, and logout. By the conclusion of the initial sprint, the sign-in and sign-up functionalities were fully implemented. The authentication, profile, and logout functionalities were still being developed.

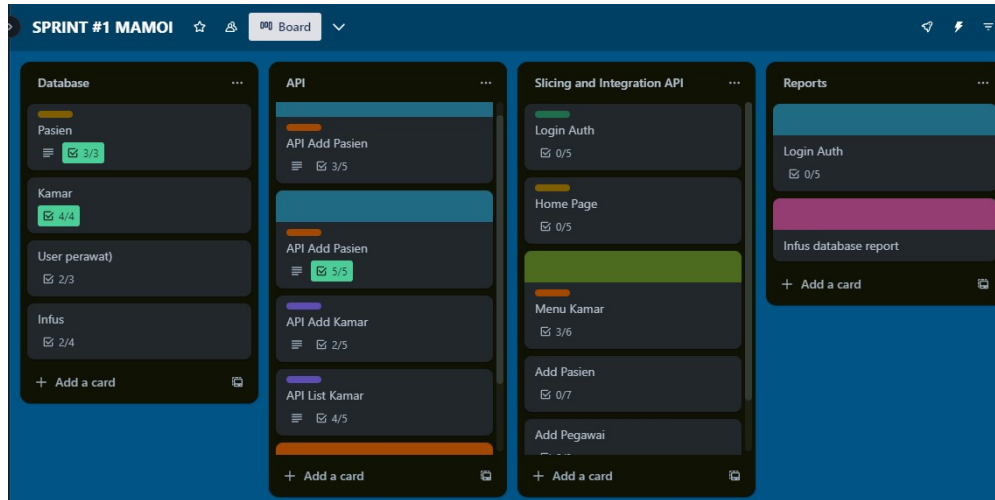


Figure 6. Sprint Backlog using trello

The MAMOI development team employs the Scrum methodology and utilizes Trello, as depicted in Figure 6, to monitor the advancement of product development. Scrum is a software development framework that emphasizes the iterative process and continuous improvement. Scrum employs five primary events, one of which is Sprint Planning. This event is utilized to ascertain the tasks that will be undertaken throughout the Sprint.



Figure 7. Sprint Calendar for MAMOI Application Development

The Daily Scrum is a meeting designed to assess the progress achieved and establish the tasks for the next day. Figure 7 Sprint Execution illustrates the utilization of this event to address the designated tasks outlined in Sprint Planning. The Sprint Review is an event that serves the purpose of evaluating the outcomes of the Sprint and obtaining input from users. The Sprint Retrospective is an event that is conducted to evaluate the Sprint and pinpoint areas that might be enhanced. Scrum has demonstrated its efficacy in enhancing the efficiency of software development. Scrum facilitates the concentration of development teams on critical tasks, enables regular user feedback, and allows for the identification of areas that require enhancement. Additionally, Figure 4 illustrates the specific duties assigned to each scrum team in this project.

The primary purpose of Daily Scrum activities is to evaluate the performance of the development team and examine the objectives of the project sprint. At the sprint review, the Scrum team showcases their work to stakeholders and engages in discussions about the advancement made towards achieving product objectives. The sprint review duration cannot exceed four hours when the sprint duration is one month. Figure 9 depicts the sprint review event during sprint 1, in which the Scrum team is showcasing the system design for the MAMOI application.

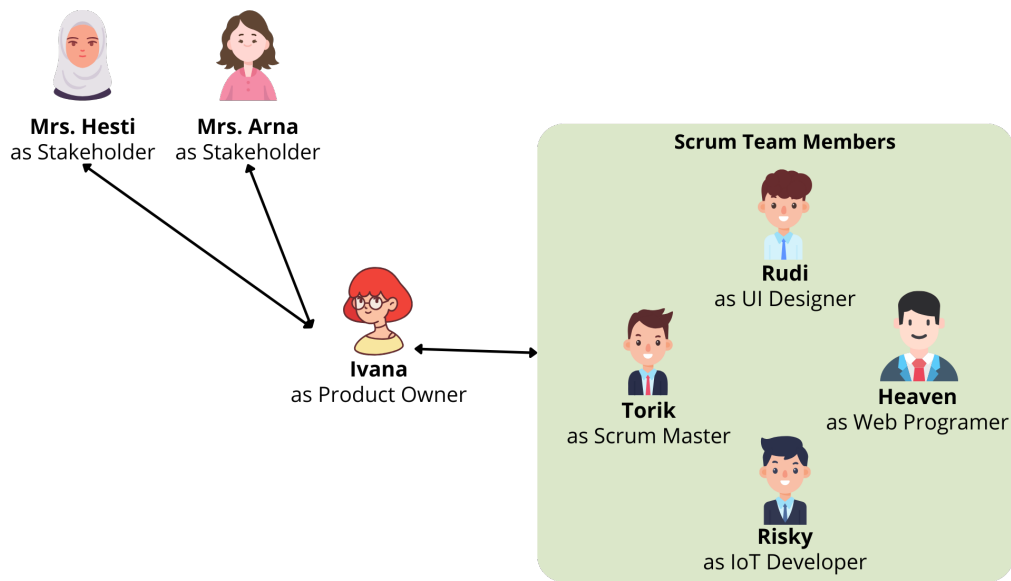


Figure 8. Scrum Roles in MAMOI

Figure 9 illustrates the function of scrum in the development of MAMOI applications. Ms. Hesti and Ms. Arna are the application stakeholders. The stakeholder is responsible for coordinating the application with Ivana, who serves as the application owner. Ivana will liaise with the team regarding the status of development and oversee the process of product development. In addition, she serves as the representative for the stakeholders' desires about the product backlog. Next, we have Torik fulfilling the role of the scrum master. Torik is responsible for overseeing the efficiency of the scrum team and preventing disagreements or barriers from developing.

Daily Meeting (28/10/2023)

	 Torik as Scrum Master	 Rudi as UI Designer	 Risky as IoT Developer	 Heaven as Web Programmer
What did you work on yesterday?	Facilitated the sprint progress, addressed team concerns.	Designed the user interface for the Mamoi application.	Developed IoT device firmware for the load sensor.	Implemented backend functionality for infusion monitoring.
What issues are blocking you?	None	Waiting for feedback from the team on UI design.	Waiting for clarification on certain requirements.	Faced technical issues with integration, seeking help from Risky.
What are you working on today?	None	Collaborating with Heaven to implement UI changes based on feedback.	Clarifying requirements and working on resolving blocking issues.	Debugging integration issues and continuing backend development.

Figure 9. Sample of Daily Meeting Activity

The team performed the sprint review via Google Meet, during which the outcomes of the sprint were described in Figure 10 based on the team's conversation. The sprint retrospective activity entails assessing the team's performance throughout the sprint, recognizing encountered obstacles, and devising strategies to overcome them. The objective of a sprint

retrospective is to glean insights from the outcomes of the preceding sprint and utilize that acquired information to enhance the subsequent sprint. The length of a sprint retrospective is contingent upon the length of the sprint itself. For instance, if the sprint spans one month, the maximum duration of the retrospective is three hours. The study includes a retrospective sprint, where every member of the development team evaluates the sprint that has been completed.

3.2. Discussion

According to the outcomes of the conversation, there are multiple advantages of implementing the Scrum framework in the creation of the present MAMOI system. situations as indicated in Table 2.

Table 2. Advantages of Adopting Agile Scrum Methodology in MAMOI System Development

Case	Benefits
Task Estimation	Agile Scrum allows for accurate task estimation through the division of bi-weekly sprints, avoiding the risk of overestimation or underestimation.
Product Monitoring	Short sprints enable regular monitoring, allowing the team to regularly evaluate project progress and identify issues early.
Business Process Changes	Agile Scrum provides the flexibility to respond quickly to changing needs or priorities, keeping the product relevant to evolving business needs.
User Feedback	Continuous integration of user feedback in the sprint cycle ensures product adaptation to user expectations, increasing user satisfaction.
Project Transparency	Agile Scrum encourages transparency through regular monitoring, daily meetings, and sprint demonstrations, providing clear visibility into project status.

Table 2 provides evidence and examples that demonstrate the advantages of implementing agile scrum as a product development management approach in this system. Specifically, it highlights the improved efficiency and effectiveness in managing system development. The use of Agile Scrum Methodology in the creation of the MAMOI system yielded several noteworthy advantages. Agile Scrum facilitated the team in providing more precise estimates for task execution by dividing time into bi-weekly sprints, hence minimizing the chances of overestimating or underestimating the tasks. Short sprints enhance the effectiveness of product monitoring by facilitating frequent evaluation of project progress, hence enabling prompt detection of issues and swift corrective measures. The flexibility of Agile Scrum enables teams to effectively adapt to changing demands or priorities, ensuring that the product remains aligned with shifting business requirements. By incorporating customer feedback into each sprint cycle, the product is able to adjust to user expectations, resulting in higher levels of user satisfaction. The project transparency implemented by Agile Scrum, achieved through consistent monitoring, daily meetings, and sprint demonstrations, offers a distinct view of the project's progress, diminishes ambiguity, and fosters trust among team members and stakeholders.

Furthermore, as part of the MAMOI system development process, regular meetings are held where each developer member shares updates on their respective tasks within the scrum team. This facilitates a comprehensive understanding of the system development process

among all team members. At the conclusion of each weekly sprint cycle, a Sprint Retrospective takes place to assess the performance of each developer and determine the outcomes of the ongoing product development. This evaluation provides an assessment of the results achieved during the sprint cycle.

The Agile Scrum technique was successfully implemented in the creation of the MAMOI system due to the team's adherence to Scrum values, execution of authentic Scrum Events, and formation of a team in accordance with Scrum principles. The effectiveness of implementing the Agile Scrum approach in the development of the web-based MAMOI Application system and the Internet of Things is determined by the extent to which we adhere to Scrum standards in all activities. Implementing a well-documented Agile Scrum approach facilitates the monitoring of progress, identification of emerging difficulties, and determination of optimal solutions for overcoming hurdles in the system development phase.

4. CONCLUSIONS AND SUGGESTIONS

The utilization of Agile Scrum Methodology in the development of the MAMOI system yielded significant advantages, such as enhanced scalability and precision in task estimation through bi-weekly sprints, streamlined project monitoring, adaptability in addressing changes, and enhanced product quality and user satisfaction through continuous feedback. The project transparency that ensues aids in diminishing ambiguity and fostering confidence among teams and stakeholders. To enhance the efficacy of the implementation, it is advisable to bolster team communication and collaboration, engage stakeholders more regularly in sprint monitoring and assessment, and contemplate the utilization of sophisticated Agile project management technologies. Additional investigation can be conducted to assess the enduring effects and contemplate the incorporation of cutting-edge technology to enhance the effectiveness and adaptability of the MAMOI system.

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