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Transforming Workplace Efficiency: Using Agile Development Methodologies for Developing Meeting Management System

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***Abstract*—This In today's digital era, individuals are seamlessly connected across various digital platforms, from social media giants like Facebook, Twitter, and Instagram to knowledge-sharing hubs like StackOverflow and Quora. The relentless advancement of digital technologies has ushered in a wave of unprecedented accessibility and connectivity. While this transformation has brought tremendous benefits to society, organizations face new and intricate challenges in adapting to evolving task preferences, performance expectations, and operational requirements. In response to this dynamic landscape, this paper proposes an innovative paradigm shift aimed at enhancing quality, efficiency, and time-to-completion for critical tasks. Central to this transformation is the concept of digitizing manual processes, which offers a transformative approach capable of significantly reducing task durations while ensuring heightened efficiency and minimizing associated risks. One illustrative example involves the automation of employee attendance tracking within a company, seamlessly integrating data into a centralized database. This digitized process not only expedites task completion but also facilitates the generation of detailed reports presented graphically, allowing human resource managers to make informed decisions swiftly. This is just one instance where digitalization outperforms traditional manual methods, leading us to conclude that digitalization is a pivotal strategy for boosting organizational productivity. Moreover, traditional practices in managing meetings, characterized by manual participant notifications, have presented substantial inefficiencies. Secretaries often bear the brunt of coordinating meeting schedules, making phone calls, and sending emails to ensure all involved parties possess accurate information. This paper embarks on a comprehensive investigation to ameliorate this situation by injecting a digitalization approach into the existing meeting management system.**

***Keywords*—Agile Development, Workplace Efficiency, Digital Transformation, Meeting Management**

I. INTRODUCTION

Nowadays, most people are more accessible to different types of digital platforms. They have social media platforms such as Facebook, Twitter, Instagram, and more for communication purposes. They also have knowledge platforms like StackOverflow [1] and Quora [2] to get new information to help them solve their current problem in their field. The development of digital technologies nowadays is increasing from time to time. Even though this is a good thing for society, the company faces many new challenges to keep up with the evolution of task preferences, performance, and requirements. The new approach is that the company must introduce a new method to improve the quality and efficiency and reduce the time required for that particular task. Digitalizing some of the manual functions is one of the new approaches. Digitalizing the manual tasks can significantly reduce the time required to complete the job and has high efficiency with much lower risk than manually.

Moreover, many situations can apply this approach. For example, save the employees' attendance in a company into the database, and its detailed report will be auto-generated and presented in a graph within a short time frame. Plus, there might be download features for human resource manager usage. Some tasks are done manually from this example and usually take significantly more time than the digitalized ones. Hence, digitalizing is an approach that must be applied to help the company improve its work productivity. Some companies still

use traditional practices in handling a meeting, such as manually notifying the meeting participants. This approach has raised a problem because the secretary must do many manual tasks. Some set up the meeting schedule with the client, phone calls, and email so that any involved party got the correct information for the two meetings. This project aims to improve the situation throughout the study by injecting the digitalizing approach into the current meeting management system.

II. Background

Organizations encounter workflow challenges due to fragmented processes, inadequate communication, legacy systems, and manual tasks. Resistance to change, compliance demands, and limited training compound these issues. Addressing these complexities necessitates a holistic approach involving process redesign, technology adoption, and a culture of continuous improvement to boost workplace efficiency.

To realize the idea of developing the meeting management system, Encik Fadzuan bin Arbain, CEO of Hyper Analytics Sdn Bhd [3], has contacted his clients to get the requirements required for creating the meeting management system. Based on that, the meeting management system requires three phases, before, during, and after. This system will help the users to organize their meetings much more efficiently. With the automation and digitalization of some manual works, such as creating the minutes meeting automatically, the time taken will be much less than manually. The team members can view the meeting details, take notes, and share files using the system. Before this, users need to do most of the tasks manually. For example, there is a need for an external application to share files related to that meeting through WhatsApp, Email, or Telegram since the meeting through online conferencing tools might not provide the real-time share feature. Hence, the existing meeting management system hopes the users to enhance current meeting management to be more efficient and systematic.

External video conferencing tools such as Zoom [4], Webex [5], and Google Meet [6] manage most meetings manually and automatically. In the first phase of the meeting, before the meeting, the meeting details such as date, time, agenda, and description will be done using external video conferencing tools. Then, distribute the meeting details to others through email or other communication tools. During the meeting, the participants will join by using the same selected video conferencing tools used in the previous phase. The features available might vary depending on the means chosen by the meeting secretariat. The following subsection will explain the features available on some video conferencing tools: Webex and Zoom. Once the meeting is complete, the meeting secretariat will manually create the minutes meeting. Plus, the meeting secretariat must manually create any other report or action if required. If there are any future meetings, they will be notified just before the meeting end or through a digital platform such as email. Therefore, this section will share two other existing systems for meeting management.

III. Methodology

The project needs to have its methodology to ensure its development. In general, the method is a framework that the developer will use to structure, plan, and control the result of a project. Hence, specifying the Software Development Life Cycle (SDLC) is crucial. Many methodologies, such as Waterfall, Prototype, Scrum, and Kanban, can be used [7]. Depending on the selected method, it may change how the meeting management system develops.

The waterfall method is a sequential method suitable for a project where a similar project has developed before. This method has six phases, starting from the analysis phase to the implementation phase [8]. Compared with the meeting management system created by the end of this project, the waterfall method is not very compatible to be used due to the lack of an existing system entirely focused on meeting management. Plus, since there is a need to focus on four modules of the project, it would be great if there is an iteration phase to give an extra focus on each module. Hence, it leads to not choosing the waterfall method due to the mentioned problems.

From the study, the Agile method starts by getting the users and documenting a goal statement on a problem's scope, opportunities, and values to be addressed [9]. This project can use several frameworks, like Scrum and Kanban. Since this project focuses more on the three phases in a meeting that includes four modules, choosing the agile method with Scrum as its framework is a good choice. Based on the findings, Scrum focuses or works through a set of intervals called sprints [10]. Due to this, it is possible to divide the tasks for each module through each sprint. So, it will ensure some of the valuable increment of work by the end of each sprint. Scrum has a phase where it can iterate several times depending on the project team leader, and it will be great for this project [11]. Additionally, since the development phase is fast, the time required to finish developing the meeting management system will decrease while maintaining its quality.

However, the Scrum methodology has a disadvantage in terms of documentation [12]. Since the Waterfall method has good documentation, it leads to combining both Scrum and Waterfall methods called the Waterfall-Scrum Hybrid method. Fig. 1 shows the modified Waterfall-Scrum Hybrid Methodology.

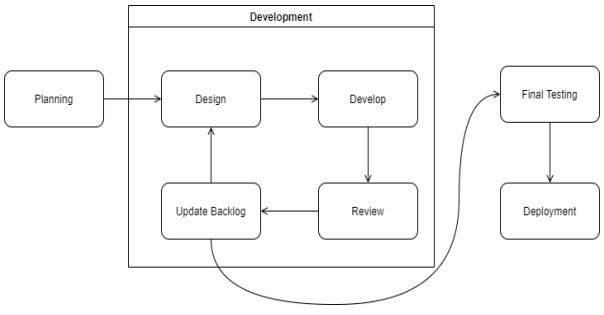

Fig. 1. Modified Waterfall-Scrum Hybrid diagram

A. Planning

During the planning phase, several documents are completed by the end: the proposal, report PSM 1, Software Requirement Specification (SRS), Software Design Document (SDD), and Software Test Document (STD).

B. Development

The development phase is taken from the Scrum Methodology. The development phase has four internal stages: Design, Develop, Review, and Update Backlog. The stages will iterate until all sprints are complete. Table 2 shows the list of user stories of the meeting management system, while Fig. 2 shows the burndown chart for the Meeting Management System development. Tables 1 until 5 are the use cases assigned to each sprint.

TABLE 1. List of User Stories

No	*User Story*
1	As a staff, I want to login into the system.
2	As a staff, I want to log out of the system.
3	As a staff, I want to view my user profile information.
4	As a staff, I want to update my user profile information.
5	As an admin, I want to add new staff.
6	As an admin, I want to view all staff.
7	As an admin, I want to update selected staff.
8	As an admin, I want to delete selected staff.
9	As a secretary, I want to view the list of meetings for participant management.
10	As a secretary, I want to view all of the meeting participants.
11	As a secretary, I want to remove the selected participant.
12	As a secretary, I want to add participants to the meeting.
13	As a secretary, I want to create a meeting.
14	As a secretary, I want to view the list of meetings for agenda management.
15	As a secretary, I want to view the list of agenda.
16	As a secretary, I want to add a new agenda.
17	As a secretary, I want to update the agenda.
18	As a staff, I want to view the meeting dashboard.
19	As a secretary, I want to update the participant.
20	As a secretary, I want to delete the agenda.
21	As a secretary, I want to view the list of created meetings.
22	As a secretary, I want to delete a meeting.
23	As a secretary, I want to edit a meeting.
24	As a secretary, I want to start a meeting.
25	As a secretary, I want to end a meeting.
26	As a secretary, I want to cancel a meeting.
27	As a staff, I want to set meeting attendance status.
28	As a staff, I want to view the meeting summary.
29	As a secretary, I want to view the meeting discussion.
30	As a secretary, I want to add a new meeting discussion.
31	As a secretary, I want to update a meeting discussion.
32	As a secretary, I want to delete a meeting discussion.
33	As a staff, I want to view the meeting minute.
34	As a staff, I want to update the assignment status for me.
35	As a secretary or chair, I want to view the list of assignments.
36	As a secretary or chair, I want to add a new assignment.
37	As a secretary or chair, I want to update the assignment.
38	As a secretary or chair, I want to delete the assignment.
39	As a chair, I want to set assignment approval.

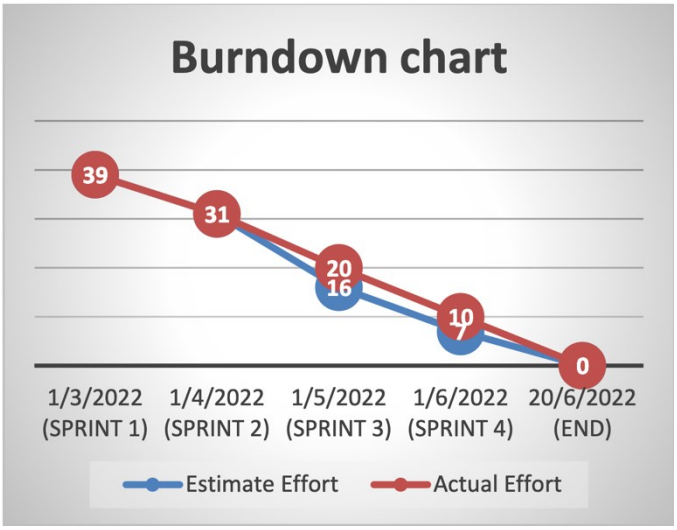

Fig. 2. Burndown chart

TABLE 2. Sprint 1 To-do List

No	*Use Cases*
1	UC001: Login
2	UC002: Logout
3	UC003: View Staff Information
4	UC004: Update Staff Information
5	UC005: Add New Staff
6	UC006: View All Staff
7	UC007: Update Selected Staff
8	UC008: Delete Selected Staff

TABLE 3. Sprint 2 To-do List

No	*Use Cases*
1	UC009: View Meeting List for Participant Management
2	UC010: View All Meeting Participant
3	UC011: Remove Meeting Participant
4	UC012: Add Meeting Participants
5	UC013: Create Meeting
6	UC014: View Meeting List for Manage Agenda
7	UC015: View Agenda
8	UC016: Add Meeting Agenda Item
9	UC017: Update Meeting Agenda
10	UC018: View Meeting Dashboard
11	UC019: Update Selected Meeting Participant
12	UC020: Delete Selected Meeting Agenda
13	UC021: View the List of Created Meeting
14	UC022: Delete Selected Meeting
15	UC023: Edit Selected Meeting

TABLE 4. Sprint 3 To-do List

No	*Use Cases*
1	UC024: Start Meeting
2	UC025: End Meeting
3	UC026: Cancel Meeting
4	UC027: Set Meeting Attendance Status
5	UC028: View Meeting Summary
6	UC029: View Meeting Discussion
7	UC030: Add New Meeting Discussion
8	UC031: Update Meeting Discussion

TABLE 5. Sprint 4 To-do List

No	*Use Cases*
1	UC033: View Meeting Minute
2	UC034: Update Assignment Status
3	UC035: View the List of Assignments for the Selected Meeting
4	UC036: Add Assignment for the Meeting Participant
5	UC037: Update Selected Assignment
6	UC038: Delete Selected Assignment
7	UC039: Set Assignment Approval

ii. Design

The user interfaces for the use cases for the current sprint will be designed.

iii. Develop

The developer started to develop the use cases for the current sprint.

iii. Review

Test the developed features based on the use cases for the current sprint.

iv. Update Backlog

Update the sprint backlog. If some use cases fail to develop, set the use cases to the next sprint. Add the following sprint use cases into the backlog.

C. Final Testing

The final testing is where the document User Acceptance Test (UAT) document is completed. Then, the stakeholders will test the system using the UAT document.

D. Deployment

In the deployment phase, the code will deploy to the server and be accessible using the internet.

IV. User Requirements and Design

Requirement analysis and design are crucial phases as they take a significant role during project development. This section's primary goal is to list all of the criteria with the functionalities. During the analysis and design process, there are two documents: Software Requirement Specification (SRS), Software Testing Document (STD), and Software Design Document (SDD), which support the project's development. SRS aims to define the meeting management system's functionality and constraints. As for SDD, it provides a detailed design description of the system interacting with the database [13].

i. Requirement Analysis

Table 6 shows the type of users of the Meeting Management System. There are five types of users: Admin, Secretary, Participant, Chair, and Staff.

TABLE 6. User Type of Meeting Management System

User Type	*Characteristics*
Admin	This user is also a part of the staff. The admin's main task is to manage the staff information in the system.
Secretary	This user is also a part of the staff. As the meeting secretariat, they will mainly involve most system features like creating a meeting, managing participants, managing the meeting agenda, and updating the meeting minutes.
Participant	This user is also a part of the staff. participant, one of their functions is updating their assignment progress.
Chair	This user is also a part of the chairperson that manage the assignments or set the approval of the assignment.
Staff	Some of the features available for the staff are viewing the meeting dashboard.

There are four use case diagrams, and each module has one use case diagram. Fig. 3 shows the use case diagrams of the meeting management system.

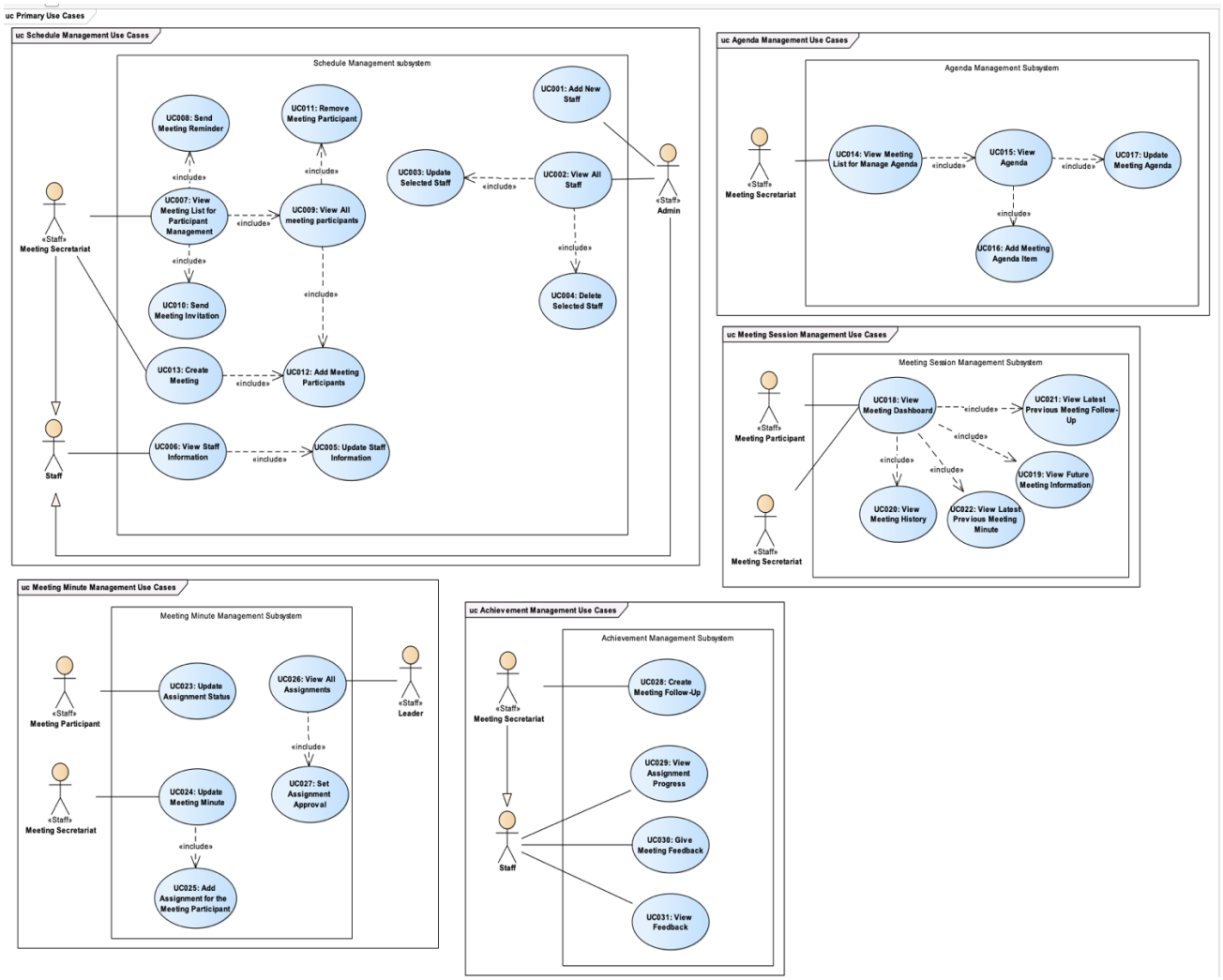

Fig. 3. Use Case Diagram for Meeting Management System

ii. Design

The architectural pattern chosen for this system is Model-View-Controller (MVC), with a service layer that divides the system into four major components that are interconnected. There are four modules: staff management, before-meeting management, meeting session management, and after-meeting management as shown as component diagram in Fig. 4. It makes the MVC with a service layer a suitable architecture for the system. However, the system security level will increase by adding a service layer, which will prevent the system from getting the data from the database directly except through the service. Hence, MVC with a service layer is a suitable pattern for the meeting management system.

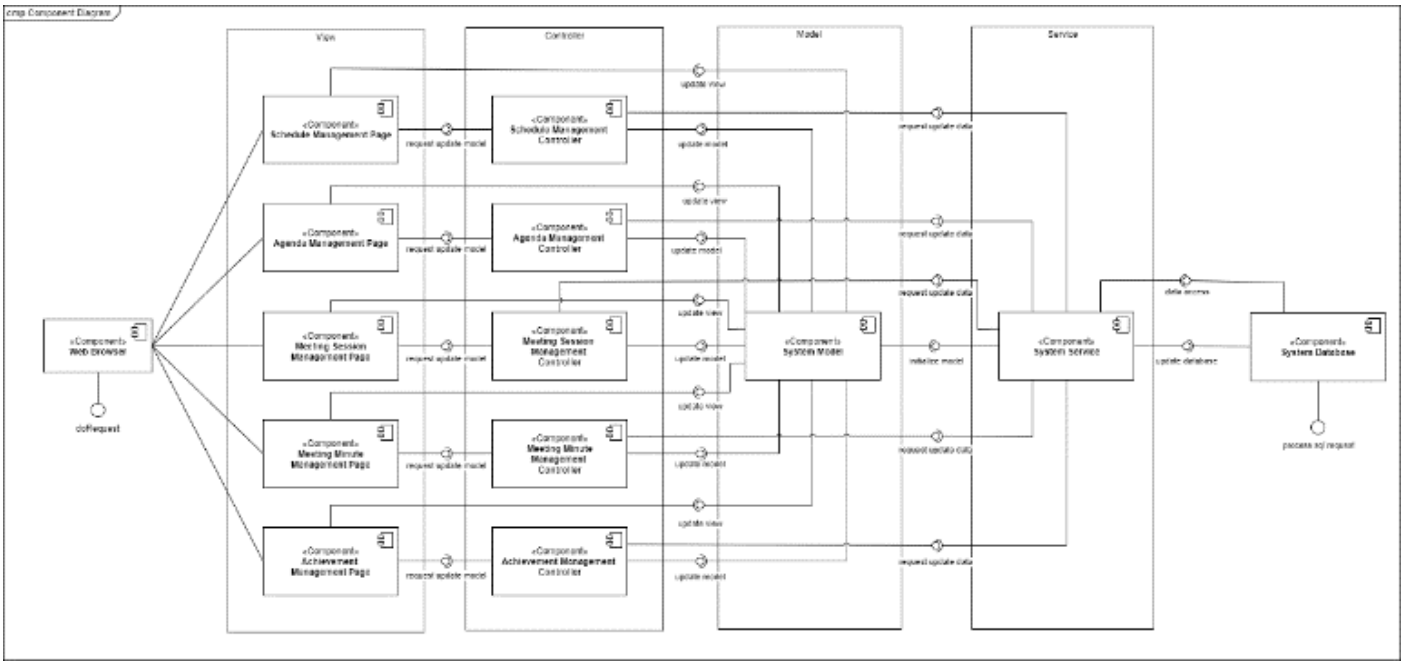

Fig. 4. Component Diagram for Meeting Management System

The architecture model has four parts (View, Controller, Model, Service-Fig. 5). It will get the input and requests from users and display the page on the view side (user interface). For the controller level, it will receive the request and necessary input from the view part. Then, it will perform the operation required for that particular request, like user login into the system. The controller will interact with the service level to get the data needed for the process from the database. Next, the model will receive input from both controller and service for its attributes' values. Then, using the getter and setter method will make its attributes' values available for the view and controller sides. Any changes made on the model side should reflect the view side. Next, the service will get the request from the controller side and the data from the database. It will interact with the model side for initializing the model attributes' values.

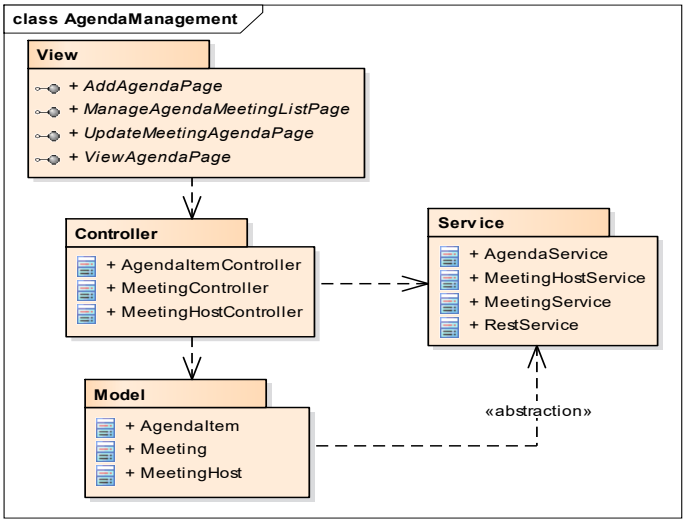

Fig. 5. Package Diagram for Agenda Management

iii. Implementation

This section is where the developer starts to program the system. The developer develops the functionalities of the Meeting Management System based on the use cases, framework, and diagrams described by the Software Requirement Specification document and Software Design document.

The web-based Meeting Management System was developed based on the architecture mentioned during the methodology phase: Model-View-Controller (MVC) architecture. The front end of the system will use NodeJS with the Express framework. The developer will use Hyper Text Markup Language (HTML) and Cascading Style Sheets (CSS) for the user interface's styling and user interface structure. Next, it will also use the JavaScript programming language to modify the user interface dynamically and request the data from the backend of the system using REST API requests. The following figures are some of the Meeting Management System user interfaces.

Fig. 6 shows the dashboard page of the meeting management system. The logged-in users can view the attendance and meeting summary from the dashboard, and they are also able to view the list of previous meetings, in-progress meetings, and future meetings.

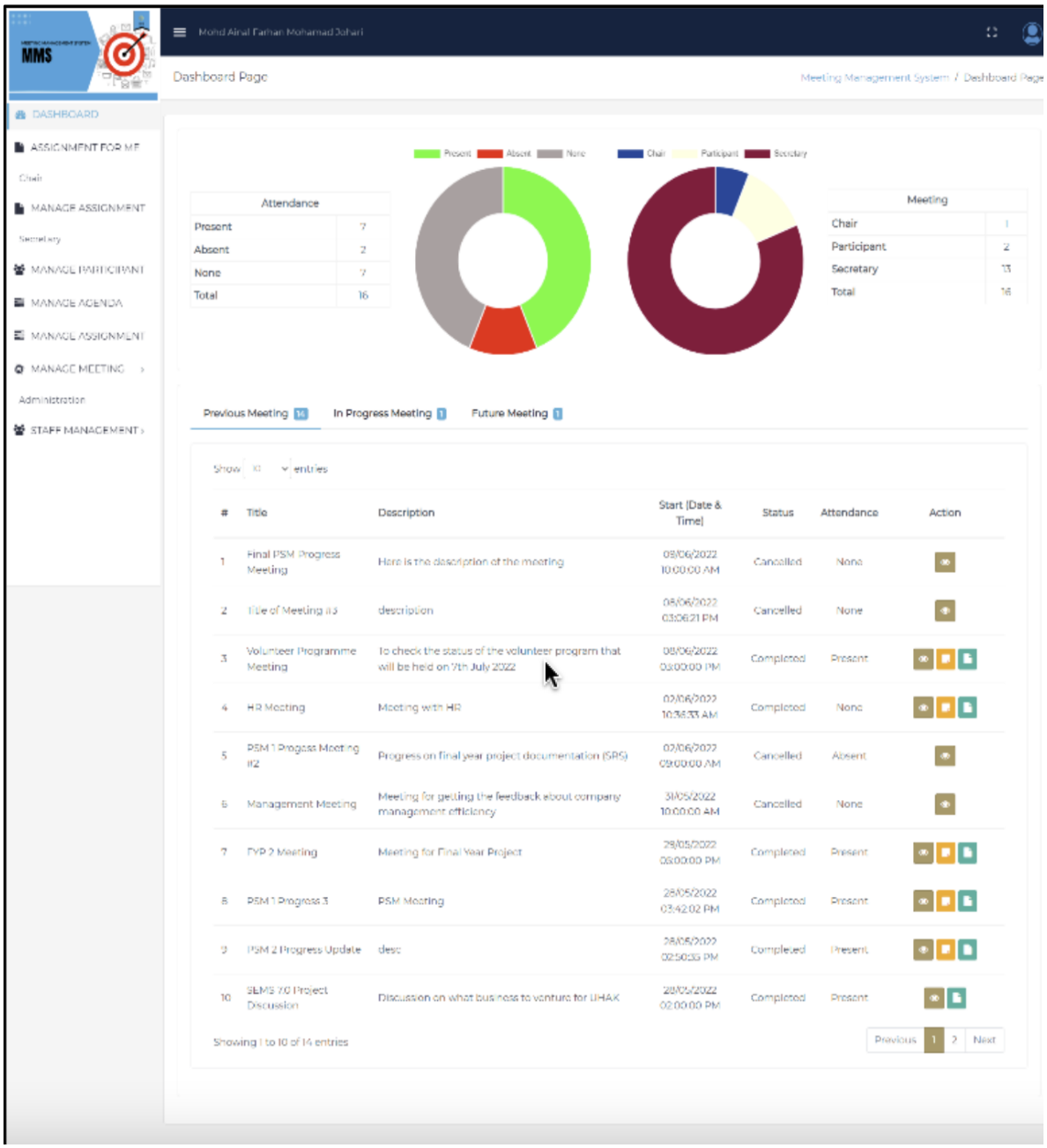

Fig. 6. Dashboard page

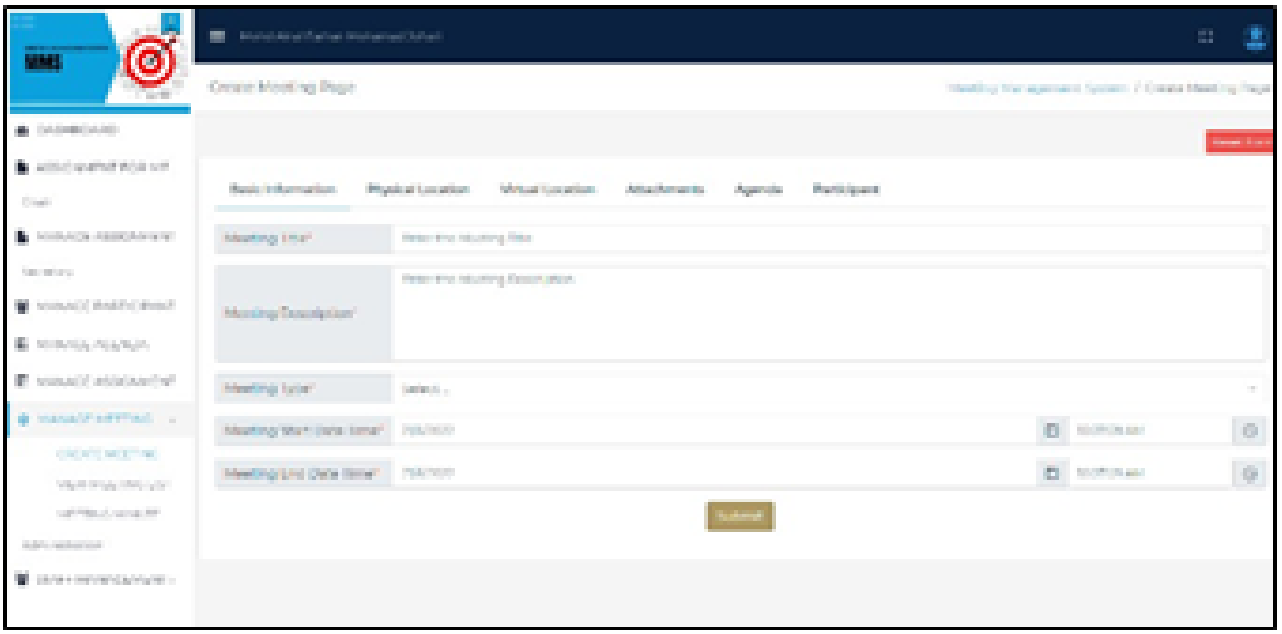

Fig. 7. Create a new meeting page

Fig. 7 shows the create meeting page. The logged-in users can create a new meeting, and the user will act as the secretary of the meeting automatically.

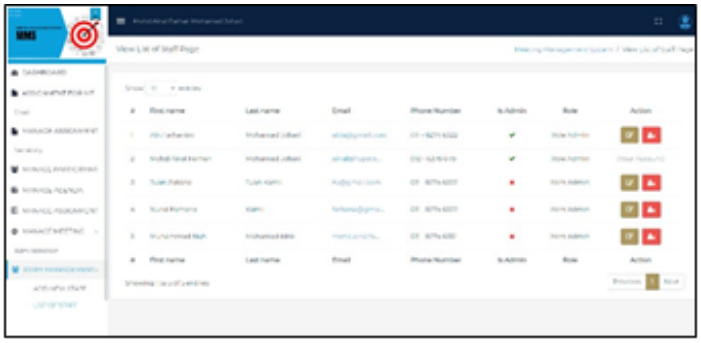

Fig. 8. Manage staff by admin page

Fig. 8 and 9 shows the manage meeting for admin and participants pages. The secretary can view, update, delete and add the participant to the meeting.

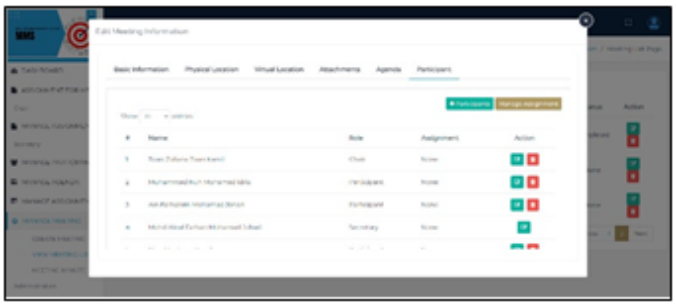

Fig. 9. Manage meeting participant's page

Fig. 10 shows the manage meeting agenda page. The secretary can view, update, delete and add the agenda to the meeting.

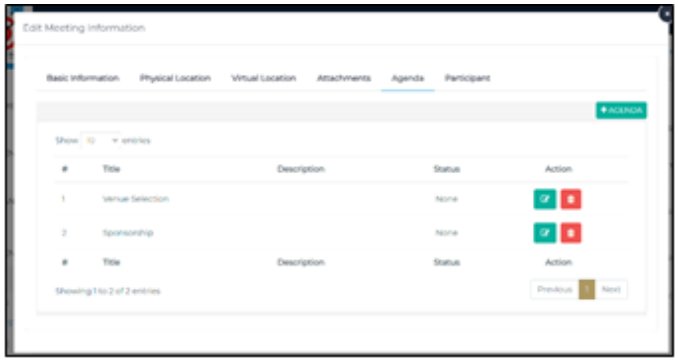

Fig. 10. Manage agenda by secretary page

V. SYSTEM TESTING

This section will explain the testing phase of the Meeting Management System. It is crucial to test the system functionalities to ensure that it works as required. It also ensures the system functionalities follow the specific requirement based on the previous system development phase. Plus, it helps the tester identify the issues or bugs before releasing the product to the stakeholder. The method used to test the Meeting Management System is User Acceptance Test (UAT).

A. User Acceptance Test (UAT)

User Acceptance Test (UAT) is a test conducted by the targeted user to evaluate the functionalities available from the Meeting Management System. It is similar to the black-box test,

where the user only interacts with the system using the provided user interface. The user will never interact with the system's internal operations or see the code.

The system also has client-side validations, one of which is input validation. For example, the new password field will display that the password length must be at least six and up to 20 letters. The following Fig. 11 shows the error message when the user inserts a password with a length of fewer than six letters.

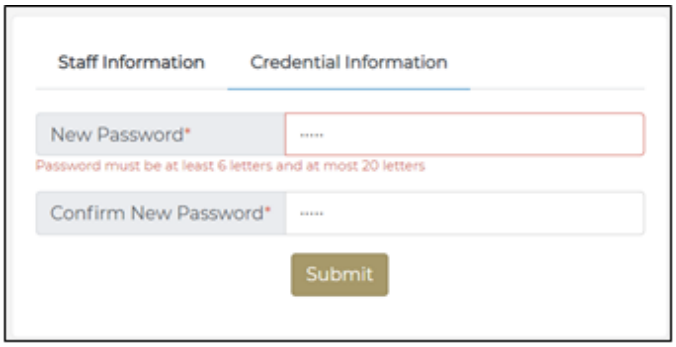

Fig. 11. Update the user password form

The user needs to evaluate 47 test cases for testing the system's functionalities, and each use case will have at least one test case. The following will describe some of the test cases scripts:

i. Successfully view the list of meetings for participant management

This test script is to test the ability of the meeting secretary to view the list of meeting for participant management as described in the use case UC009: View Meeting List for Participant Management.

TABLE 8. Test Script Ts010 Successfully View the List of Meetings for Participant Management

Test Case	TS010 Successfully view the list of meeting for participants management			
Objective	The user able to view the list of meetings for participants management.			
Pre – set Condition	1. The user already login into the system.			
Step No.	**Action or Instructions**	**Expected Result**	**Pass / Fail**	**Comments**
1.	The user click on the [MANAGE PARTICIPANT] tab.	The list of meetings will be displayed. 		
Final Result		**Passed**		**Failed**
Remarks				

Verified by:

Name :

Signature :

Date :

ii. Successfully view the list of meetings for participant management

This test script tests the ability of the logged-in user to view the attendance and meeting summary in the form of a table and graph via the dashboard page. This feature is described in the use case UC018: View Meeting Dashboard.

TABLE 9. Test Script Ts019 Successfully View the Attendance and Meeting Summary on the Dashboard Page

Test Case	TS019 Successfully view the attendance and meeting summary on the dashboard page			
Objective	The user able to view the attendance and meeting summary on the dashboard page.			
Pre – set Condition	1. The user already login into the system.			
Step No.	**Action or Instructions**	**Expected Result**	**Pass / Fail**	**Comments**
1.	The user click on the [Dashboard] tab on the left side bar.	The user able to view the attendance and meeting summary. 		
Final Result		**Passed**		**Failed**
Remarks				

Verified by:

Name :

Signature :

Date :

VI. Agile Transformation in Workplace Effiency

The application of Agile methodologies can be a potent catalyst for enhancing workplace efficiency. Agile's focus on iterative, collaborative, and adaptable approaches empowers teams to work in short cycles, facilitating rapid feedback and adjustment. Cross-functional teams foster streamlined communication, accelerating decision-making and problem-solving processes.

Based on this project, which leveraged Agile practices to manage product development, resulting in improved communication, enhanced prioritization, and faster product releases. In addition, enabling it to maintain competitiveness in the dynamic tech landscape.

The advantages of an Agile transformation encompass heightened productivity, superior output quality, increased adaptability to change, and elevated employee morale. Teams become more responsive to customer needs, minimizing wastage and elevating overall efficiency. Tailoring Agile practices to an organization's unique context and requirements is vital for a successful transformation.

VII. Meeting Management System Transformation in Workplace Effiency

Applying agile methodologies can be a powerful catalyst for improving workplace efficiency. Agile's focus on iterative, collaborative and adaptive approaches allows teams to work in short cycles, facilitating rapid feedback and adjustments. Cross-functional teams promote optimized communication and accelerate decision-making and problem-solving processes. This project applied agile practices to manage product development, resulting in better communication, better prioritization, and faster product releases. Additionally, this system provide competitiveness in the dynamic technology landscape.

However, introducing a meeting management system in the workplace can present numerous obstacles that require organizations to proactively adapt and effectively address these challenges. Chief among these barriers is resistance to change, which often stems from employees' familiarity with traditional approaches. In order to combat this resistance, organizations should conduct extensive training and highlight the benefits of the system, such as time savings and reduced administrative effort. Efforts to integrate the new system with existing tools and platforms may also present difficulties and require careful assessment of compatibility and investment in solutions that enable seamless integration.

Ensuring user adoption remains a key concern and requires user-friendly interfaces, robust training initiatives and mechanisms to encourage active participation and feedback. Compliance with data protection and security standards requires strict measures and compliance with relevant regulations. Addressing technical challenges and minimizing system downtime requires ongoing maintenance and reliable technical support. Transitioning from manual meeting management to a digital system may require a culture change in which organizations promote the benefits of the new system and involve employees in the decision-making process. Additionally, companies should allocate budgets to cover initial setup and ongoing costs while conducting assessments to measure long-term return on investment.

Effective training programs and an easily accessible help desk are critical elements to avoid the dangers of inadequate user training and support. Successful implementation also depends on strong change management strategies, including transparent communication, stakeholder engagement, and proactive resolution of concerns. Additionally, organizations should establish mechanisms for users to provide feedback to enable continuous improvement through regular assessments and system improvements based on user insights. By proactively managing these potential challenges, companies can facilitate the seamless integration and adoption of a meeting management system, ultimately improving workplace efficiency and productivity.

VIII. Conclusion

This system aims to develop a web-based meeting management system that will increase the efficiency of the meeting and make it more systematic. The existence of this system will decrease the workload for handling a meeting. For example, the meeting secretary does not require to manually create the meeting minute as the system will automatically generate the meeting minute.

Two types of methods to determine the features of the meeting management system. The first method is by searching and finding two existing systems related to the core functions of the proposed system, managing a meeting. The first method is for analyzing the existing systems' features. From there, it is possible to know the effectiveness of the solution provided by the existing systems. Knowing the solution's effectiveness makes it easier to determine which features are crucial and are not in demand. Plus, it will be easier to determine the new features that do not exist in the existing systems. For example, Zoom and Cisco Webex do not provide an auto-generated meeting minute, while Meeting Management System has that functionality.

The second method is by analyzing the document from En. Fadzuan bin Arbain, CEO of Hyper Analytics Sdn Bhd. Hyper Analytics Sdn Bhd is a software house company that provides a solution to the current community issue. En. Fadzuan said that most of his clients require a system to manage meetings. Then, he provides a document containing a list of features his clients specify. Then, selecting which features to include in the meeting management system is more manageable.

After identifying the requirements, the next phase is selecting the suitable system architecture and designing the diagrams like Sequence diagrams, Use Case diagrams, and Activity diagrams. Once completing the design phase, the project continues with the development phase, where the system starts to develop. Then, it will continue with the testing phase to ensure the system fulfills all of the requirements identified during the early phase.

To conclude, the system fulfills all of the requirements specified during the early phase by removing unnecessary work for the users. For example, the secretary does not need to create a meeting minute manually. Plus, there is no need to use other communication applications like WhatsApp and Telegram to share the details of the assignments assigned to the participant by the chair or the secretary. The secretary or the chair can assign a new task or assignment to the intended participant using the system. To make assignment management more systematic, logged-in users can view the list of assignments assigned to them through the system. So, the need for the users to jot down the assignment details will become lesser as they can check it using the system.

Acknowledgment

We wish to extend our heartfelt appreciation to the project panelists for their invaluable guidance and advice. Their unwavering support and active engagement have been instrumental in shaping the final presentation you are witnessing. Equally deserving of acknowledgment are the dedicated volunteers who have been actively involved in the study since its inception, providing valuable perspectives and insights at every stage.

CONFLICTS OF INTEREST

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

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