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Developing a Centralized Appointment Booking System with Agile Methodology & Tools

– Centralized Appointment Booking system



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The aim of this thesis was to explore the development of a centralized appointment booking system, with a focus on the importance of effective methods for identifying and improving teamwork flow. The primary objective was to explore how Agile methodology and supporting tools contribute to a streamlined, effective and collaborative development process. Agile methodology played a pivotal role by breaking the project into manageable tasks, enabling iterative development and quick adaptation to changes. Using a version control system (VCS) such as Git helps with version control and code security and even helps to fix bugs without disrupting the main codebase. Additional tracking tools such as Trello are used to monitor the process and maintain the workflow to complete the task on time. These tools collectively increased the project organization and improved overall productivity.

Key findings indicate that the project successfully achieved its goal through the development of an effective, functional application within the expected timeline. Through Agile methodology and project management tools, the thesis successfully developed a functional system that improves the booking process for various industries. This Agile methodology combined with these tools assured ease within the development process, chances of minimal errors and improved collaboration, proving that this approach works to achieve the objectives of the thesis.

Keywords: Booking system, Appointment, Customer service, Online booking, Health, Restaurant, Agile Methodology, Swift, iOS

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List of abbreviations

API	Application Programming Language
FAQ	Frequently Asked Questions
MVP	Minimum Viable Product
PM	Project Management
SMS	Short Message Service
TDD	Test Driven Development
UI	User Interface
UX	User Experience
VCS	Version Control System
WIP	Work In Progress
XP	Extreme Programming

1 Introduction

Completing day-to-day tasks is no longer a significant challenge in today's world, as technological advancements have brought about considerable changes. Traditionally people book appointments for routine services by making phone calls or visiting websites but this often creates confusion as there are many different sites with different user interfaces. It consumes time because there is not one single place to handle everything. This thought led to the idea of providing a Centralized Appointment Booking System. This system will help everyone from resident users to service providers and administrators by making the task of booking appointments much simpler and more satisfying. This system will be a commitment to making technology that puts people first, turning a problem into a tool, and making the service booking experience considerably better.

In addition, this thesis focuses on applying Agile Project Management method and tools to develop a Centralized Appointment Booking System. This application is crucial for almost every domain including healthcare, education, and social services such as personal care and government services where scheduling plays an important role. The agile methods assist in increasing development speed, enhancing user experience and reducing costs. Agile Project Management is a method that focuses on flexibility, teamwork and continuous, iterative improvement. This approach is popular as it aids teams in swiftly adapting to the changes and focuses on delivering value to the customer.

1.1 Introduction of Agile Project Management

Founded by a small group of developers in 2001, Agile Manifesto focuses on four key values acknowledgement of individuals and their interactions over rigid processes, functional software instead of comprehensive documentation, customer collaboration rather than contract negotiation, responding to change over following the strict plan. These principles promote a more flexible and customer-focused approach. Flexibility is a key feature to agile methods, but

frameworks such as Scrum and Kanban allow teams to stay organized. Agile Project Management allows developers to develop and iterate a Centralized Appointment Booking System in step by step, testing its functionality at each step and receiving feedback from users. This ensures that the system can develop over time to satisfy the requirements of both the organization and its users perfectly. (Stare, 2011)

Agile project management is a flexible approach to managing and developing software that focuses on continuous improvement and customer satisfaction. Unlike traditional project management that follows a rule-wise process, Agile makes a difference and encourages the team to adopt the planning easily and work collaboratively, and deliver small tasks on time, functional parts of a project regularly. So team can collect feedback and make improvements together. (Daraojimba et al., 2024)

1.2 Importance of Efficient Appointment Booking Systems

An online booking app enables users and service providers to easily manage and schedule appointments. This streamlines the process, saving both time and effort by providing all necessary features in one platform. It also helps service providers use their time and resources better, making them more efficient. Nowadays, where everyone wants things to be easy, having online booking apps that are simple to use is a good approach, it will help service providers to keep up with what users need and make things better for everyone. (Anees, 2023)

1.3 Scope and Objective

The prime goal of this thesis is to explore how Agile Project Management methods and tools play a role in developing a Centralized Appointment Booking System that can create a unique place where people can make appointments for different types of services, such as healthcare, education and hospitality, where appointment management is a tool that will help the user easily. This is going to

make a user friendly, seamless UX application from a user point of view. Agile principles help in greater flexibility, greater user satisfaction, and efficiency in developing these systems. Users will be able to create an account, book an online appointment, receive a confirmation about the appointment via a notification reminder and check history as well. All such functionalities will also aid the app to be functional and useful for the users in real time.

Using Project Management Method and Tools in the Appointment Booking System can improve efficiency and flexible teamwork. This approach will apply the core principle of Agile and examine its impact on the software development process and related challenges and benefits. The Agile methodology encourages collaboration with coworkers, shifts the emphasis from individual progress to overall progress, and creates the process of adjusting development process based on customer feedback which as a result creates better products and satisfied users.

The use of Agile Method and Tools such as Trello, Notion and Version Control systems such as Git will help in creating a good software project that fulfils business objectives and is user-friendly yet feature-rich. Agile involves adapting frameworks such as Scrum or Kanban, which provide structure that is flexible and changeable to manage tasks and workflows. This framework manages the complexities in software development through continuous communication, iterative releases, and adaptability to changes. The next chapter will explore how Agile methodologies accomplish these goals, the accompanying tools and technology to effectuate proper software development.

2 Agile Project Management

Agile Project Management (PM) is a flexible and successful method for managing software development. This chapter explains an overview of agile project management, challenges faced before the Implementation of the Agile PM Method, Agile Methodologies & tools and the importance of Agile PM in Modern Software Development.

2.1 What is Agile Project Management

Agile Project Management (PM) Method is a flexible and continuous approach to project management that aims to provide customers with benefits continuously rather than all at once at the end of the project. Though Agile initially belonged to software development, because of its success in managing complex tasks that need regular modification, it has now spread to other sectors. Agile focuses on breaking down large tasks into small tasks, which are called iterations. Each iteration provides a functional product that can be tested and reviewed; therefore, adjustments can be made based on customer feedback. (Daraojimba et al., 2024)

Agile Project Management's main concepts come from the Agile principle, which highlights the value of flexibility and collaboration. It focuses on people and their interactions above strict processes and tools, showing that effective communication is required for success and growth. Agile helps teams offer value to customers faster by focusing on creating software that works quickly rather than getting stuck in detailed documentation. To make sure that user feedback is the main part of the development process, it also works together with consumers rather than only sticking to a step-by-step process. Lastly, it allows teams to adjust to changing requirements and challenges by allowing them to do so instead of sticking to a fixed plan. (Stare, 2011)

The fundamental concepts within Agile Project Management include user stories, sprints, backlogs, daily standups, and sprint reviews. User Stories keep the team focused on the delivery of features that are most important by describing the

feature from the user's point of view. The backlog is a list of features and tasks that require attention but are based on priority. Sprints are short time frames where the team can focus on the specific tasks. These would be the daily standups, which are brief meetings among team members to discuss who did what and what issues arose. Finally, at the end of each sprint, there are sprint reviews to show completed work and customer feedback to be considered. All these are in teamwork towards the organization and focus on the needs of customers by the teams. (Omonije, 2024)

Agile teams may provide good solutions that fulfill the needs of customers by following these principles. The Agile project management method also needs close collaboration between developers, testers, designers and project managers in cross-functional teams. This supports ongoing communication by ensuring the work is in concert with customer requirements as it develops. Even though each one is a little different in their approach, they all have the same core basic Agile concepts. Scrum, Kanban and Extreme Programming (XP), these Agile frameworks are the most regularly used. (Hoda et al., 2008)

2.2 Agile Methodologies

Agile methodologies are frameworks that support teams in implementing the core principles of Agile Project Management. They focus on iterative and flexible development, allowing the team to work in a short process. Each methodology has its own guidelines; they all have the same kind of aim to improve teamwork, accept changes, updates and provide value in a short timeline. The sections below describe some of the more popular agile methodologies. (Stare, 2011)

Scrum

Scrum is an Agile framework that provides a flexible and organized way to manage projects, especially in software development. In scrum, key roles include the product owner, who prioritizes features based on user needs, the scrum master, who helps the team to follow Agile principles the easy way, and the development team, responsible for developing the system. Important tools in

Scrum have a product backlog, which lists tasks and the sprint where the team focuses on features. (Hoda et al., 2008)

Scrum tracks progress and creates teamwork with a number of activities. The team selects tasks for the next sprint during sprint planning, and daily standups guide everyone on challenges and developments. Each sprint ends with a sprint review showing complete work and a sprint retrospective helps the team decide what worked well and what needs improvement. This process helps with the development of a system that is easier to use and simpler by making sure that the system meets the needs of the user. (Hoda et al., 2008)

Kanban

Kanban is a flexible and visual way of managing ongoing tasks, which makes it good for development projects that need to adjust based on customer requirements. The Kanban Board is a view that displays tasks at different stages, like feature design, development, testing and deployment. This setup makes things easy for the team to track the progress of tasks or fix bugs in the system development process. By setting Work-In-Progress (WIP) limits, it allows the team to focus on completing current tasks before starting new tasks. This helps to avoid an overload of tasks and improvements wherever there is a need for features. (Omonije, 2024)

Extreme Programming

An agile methodology, Extreme Programming (XP) focuses on creating high-quality software quickly. Safety and feedback are important in any system, and XP includes techniques like pair programming, in which two developers collaborate to write and review code in real-time. With this collaboration, it makes sure that the functionality of any system works better and faces thorough testing before release. XP also makes use of test-driven development (TDD), in which programmers create automated tests before starting any coding. This makes sure that system functions are tested from the beginning. (Hoda et al., 2008)

Continuous integration is an important part of XP that allows developers to regularly combine their code updates into a shared codebase. It means any system requires new features to be added or updated regularly, so this XP becomes helpful for developers to share codes. This keeps the system updated and ensures few problems with its operations. Another important part of XP is frequent releases that allow users to quickly identify changes or new features. By following these rules, XP makes sure that any system is always improving, remains stable, and makes changes well based on user needs. (Hoda et al., 2008)

2.3 Agile Tools and Technologies

Agile tools make it easy for teams to collaborate, track progress and manage software development more useful. They allow the system to improve regularly based on user needs. These tools are very important in managing the tasks, keeping the project on track and continuously updating the system to ensure the success of the system. (Bukłaha et al., 2023)

Project management Tools

Project management tools are useful for reviewing, planning, organizing and tracking tasks in Agile methods such as Scrum and Kanban. Trello and Notion are popular project management and collaboration tools for helping a team with task management, progress tracking and collaboration easily. (Singh, 2024)

Trello is a popular project management tool that helps the team visualize their tasks for easier arrangement. It uses a board-and-card system, where each board represents a project, and individual tasks are as cards. Users can move these cards across columns. (Trello, n.d.)

Notion is a flexible workspace tool that is capable of organizing tasks, notes and projects all in one place. From note-taking to task management and team collaboration, everything is possible with one tool. The user can easily create documents, databases and checklists by combining different functions. Its user-

friendly interface makes it easy to set up information in one place that the team needs. (Notion, n.d.)

Communication Tools

Communication tools are important for the Agile setting because they help teams work together easily and effectively. In developing software systems, give clear communication between developers, designers, and customers as well as make sure that the feedback is improved and issues are solved quickly, which leads to a smooth development process. (Bukłaha et al., 2023)

Microsoft Teams is a communication and collaboration tool that allows teams to communicate and collaborate with each other. This includes chats for quick messaging, video calls for virtual meetings and file storage to store documents that can be shared with the team. It also provides many features such as creating channels for different projects. This tool also works well with other applications from Microsoft. (Bukłaha et al., 2023)

Version Control System

Version Control System (VCS) like Git is more important for managing code changes. They allow multiple developers to work on different parts of the same project at the same time. Git is a version control system that helps developers manage changes to their code. It allows each developer to have a copy of their code on their computer, so they can work independently without disturbing others. Git keeps all records of the code changes made, which helps to collaborate well and make sure that everyone stays on the same page and updated on the recent code development. (FreeCodeCamp, n.d.)

2.4 Challenges Faced Before the Implementation of Agile PM Method

This section will focus on the challenges and limits faced while using the traditional method before the introduction of agile.

Inflexibility in Requirements

In the traditional project management method like waterfall, all requirements have to be planned in detail before starting the project. That makes it difficult to change already planned requirements. This strict planning process creates delays in projects and if any adjustments or new needs occur, then this disturbs the entire workflow and causes few setbacks. (Omonije, 2024)

Delayed Feedback Loops

In traditional project management, the testing part was performed at the end of the project after development, this means that issues were found late in the project, which was more time-consuming to fix. Moreover, customer feedback often came too late in the process, generally after the product was released, and by the time the final product may not meet the user's needs and expectations. (Stare, 2011)

Long Project Timelines

Traditional project management method such as waterfall, adopt long timelines that create delays before delivering the product to market. This made it challenging to show progress to customers and could affect the spirits of the team. Furthermore, these long times create the risk of a real-time product delivery failure in case the final product does not meet the customer's needs or if goals change while the project is being developed. (Daraojimba et al., 2024)

Mediocre communication and collaboration

In traditional project management, teams have limited communication with developers, testers and stakeholders about the project. This lack of collaboration led to miscommunication and misleading goals. Customers also have limited visibility into the project's development because they were only updated at review meetings. The result could surprise them with delays or other issues that lead to frustration and a lack of confidence in the project's success. (Demir, 2009)

Failure to Respond to Change

Traditional project management method has a hard time adapting to change, making it difficult for teams to make changes when the market demands or customer feedback suggests any updates. Even if the team recognizes the need for changes to be made in the mid-project, they have to stick with the original plan of workflow. Additionally, making changes to scope or requirements was usually costly and disruptive, this strict process made it difficult to focus on what the customer actually wanted. (Hoda et al., 2008)

Ineffective Risk Management

In traditional project management, risk management was usually unusable because issues were typically detected late in the process, such as during testing or developing. These delays create chances of missing deadlines and delivering poor-quality products. Additionally, many projects faced cancellation, or the team struggled to respond to regular changes in real-time with unexpected technical challenges. (Tomanek et al., 2015)

2.5 Importance of Agile PM in Modern Software Development

Businesses must be flexible and quick to react in the rapidly changing digital world of today. The agile project management method supports the developer's work in organizing and making things easy for any type of challenge. Agile allows teams to create software that works on a regular basis and quickly adjusts to changing requirements as software development gets complex and customer demands increase. This keeps the project on schedule and ensures that the customers are happy. (Singh, 2024)

Agile allows the team to deliver software in smaller, usable parts quickly and regularly, instead of waiting for the entire system to be developed. This helps businesses meet user's needs on time and accept the market changes faster. Agile is built to handle changes easily. If new requirements come up, teams can adjust without major delays. This is especially important in fast-moving fields like

healthcare and e-commerce, where customer needs can change quickly. Agile gives additional facilities for regular communication between team members and customers as well. Regular meetings, like daily check-ins and sprint reviews, keep everyone updated and involved, which helps the project run smoothly.

By frequently reviewing progress and testing the software, Agile helps identify and fix issues early, reducing the risk of major problems later. It also encourages teams to improve their processes continuously, leading to better results and system enhancements. Agile's iterative approach and customer involvement throughout the project increase the likelihood of meeting customer expectations, resulting in higher satisfaction and loyalty. (Omonije, 2024)

3 Business Objectives

Online appointment scheduling has become an important and suitable feature for users. A centralized appointment booking system makes things easy for daily planning and improves the overall user experience by making all kinds of appointment options within a single place.

The booking system aims to improve appointment scheduling by offering a simplified, user-friendly interface that improves user comfort and service availability inside businesses. With the help of customizable searching, real-time availability updates and personalized profiles, users can easily set up appointments and avoid the frustration of manual booking. The program expands the reach and visibility of service providers by serving various types of industries, such as restaurants, healthcare, cosmetics and legal.

The booking system also prioritizes compliance with Agile Project Management, a methodology that fosters flexibility, speed, and collaboration. Agile's iterative approach enables the team to implement features progressively and release updates smoothly. This methodology allows for quick adaptation to changes, promotes teamwork, and prioritizes user feedback to ensure the final product aligns with user needs and expectations. These objectives show how the Agile methods improve the development process, while the booking system objectives focus on user and service provider benefits.

3.1 Related to Agile Methodology

Faster Time-to-Market

Agile Project Management breaks down projects into short cycles for the quick delivery of functional software. This method helps businesses to release features much faster than the traditional project management method. Under agile, the team is quick to allow any feedback and updates that need to change quickly.

Agile focuses on creating a Minimum Viable Product (MVP) at the start to speed up the development process. The MVP focuses on important features for user needs and also allows teams to launch it quickly. After the main release, the team can continuously improve the system by adding new features and making adjustments based on user feedback. This approach makes sure the system keeps aligned with customer expectations over time while achieving the main goal of development. (Demir, 2009)

Ongoing Enhancement and Evaluation

In Agile, continuous evaluation is a main part of getting updates regularly and reviewing both product and team processes at the same time. This helps ensure that the project responds to user needs and changes quickly. By getting regular updates and making small changes, teams can solve problems early before they become bigger issues. After each sprint, agile helps to team hold meetings to discuss what went well and what could be better. That could enable the team to learn from its experience and improve at the next sprint. The ongoing process helps the team accept and improve the workflow for the potential delivery of the increment with user expectations. (Omonije, 2024)

Risk Management

Agile Methodology helps to manage risk by dividing projects into small parts called sprints. Each sprint offers the chance to spot and address risks early on, whether they're technical challenges, shifting customer needs, or market changes. This step-by-step approach reduces the major issues and makes a better release at the end.

Furthermore, Agile promotes continuous testing and regular feedback. This helps to find any bugs or issues early and can be fixed before they become a bigger issue. This helps to reduce risk, agile teams can adjust their strategies and deliver more reliable, high-quality results, ensuring that the project stays on track and is completed within the expected time and budget. (Tomanek et al., 2015)

Increased Customer Satisfaction

The Agile methodology focuses on improving customer satisfaction by involving them in the development process. More frequent delivery of the software helps to have a good alignment of the system to meet the customer's needs and expectations. This regular delivery helps to build trust and keep users interested, making them more likely to keep using the system and recommend it to others.

For this to be achieved, the Agile team has to place some focus on user feedback regarding each sprint. Customers can test new features and share their thoughts with developers which helps to give direction for future development. This collaboration ensures that the team understands what the users want and is able to make quick changes, it leads to a final system that undergoes changes to meet the demands of the customers. (Stare, 2011)

3.2 Related to the Booking System

Easy Booking for User Convenience

The online booking system is aimed at making the process of appointment booking easy for users and saving them spending too much time and effort. The booking system helps users book appointments smoothly with a simple interface, giving suggestions and recommendations. The system aims to enhance the experience of booking an appointment by managing profiles, adjustable searching and real-time availability updates, the system makes a new stage for how easy it can be to book appointments in the industry. (Patel & Vaghela, 2019)

Increase Service Providers Efficiency

One of the core parts is that the platform supports different types of service providers by system, which may include cosmetics professionals, healthcare, and restaurants, enhancing their operational efficiencies and visibility. In other words, with the support of this platform, the service providers will be able to list their services, therefore making it easier for customers to find their services. This can lead to business growth through increased exposure and customer investment.

It also gives service providers who otherwise may not be discovered by the customer an opportunity to showcase their services on the platform. Besides that, the system facilitates appointment management, monitoring of customer preferences, and service offering enhancement. (Patel & Vaghela, 2019)

4 Comprehensive Agile Project Management for Appointment Booking System

4.1 Introduction

This section highlights the key results of applying Agile Project Management principles, frameworks, tools for development and continuous management which are important for creating a safe centralized appointment booking system. This approach helps to ensure that a system is built efficiently, focusing on continuous improvement that meets user's expectations and allows flexibility for users and service providers.

4.2 Adapting Scrum to a System

The scrum framework was used as the main methodology for the developing process. Here is the key highlighted including the team organization, defined roles and scrum implementation.

Team Organizations and Roles

The project included a small Agile team of members, each assigned with a separate responsibility to ensure workflow and goal achievement:

Project Manager/Scrum Master: Manage the scrum process and ensure the team follows the Agile principle with a decided timeline to meet user satisfaction. Organized planning sessions, daily stand-up meetings, sprint reviews and review meetings were helpful for the team in the development process. This resolved difficulties and allowed continuous workflow.

Developer: Responsible for coding the main functionalities such as user authentications, notification services, booking appointments and payment integration. Basically, the developer team worked on API integrations and front-end features.

UI/UX Designer: The designer focused on creating a user interface, ensuring smooth navigation for a user-friendly working flow and visually appealing booking experience.

Product Owner: managed internally by the project manager because of the absence of an external client. This required working as the link between user requirements and the developer team to focus on backlogs perfectly.

Implementation of Scrum Ceremonies

Sprint: The team followed a specific timeline to complete tasks and each sprint had a fixed pair of several days to deliver the task such as user authentication and booking appointments to complete. This timeline allowed the team to work in flow and helped to make changes.

Panning Sessions: At the start of each sprint, a specific time was held to define task priorities and goals to complete the task and helped to break down the sprints into small and manageable tasks. Features like user authentication, which has an easy development and designing process, whereas booking appointment sprint had a big task to complete because it required more time to fetch data through API integration. The more complex features such as implementing the payment system were divided into smaller tasks like integrating the payment gateway or testing the payment flow to make progress manageable and steady. This type of planning session was helpful for the team to manage tasks and helped to make required changes.

Sprint Reviews: At the end of each sprint, a review session was held for discussion of complete tasks and feature feedback. For features like user notification and search interface, the developer and designer team demonstrated their work to the project manager about the workflow and made sure that it satisfied user needs. This helps the team to receive feedback and modify features easily. Additionally, the discussion of upcoming sprint goals was held as well to help the team start work on new features.

Sprint Retrospectives: When the team had any delays in API integration and testing the system to see how it works, each sprint review meeting helped to correct the issues and increase the collaboration between the backend developer teams and the testing team. Each sprint was conducted with a retrospective to focus on identifying improvement.

Regular Testing: At the end of the sprint, there was a regular testing held by the testing team and project manager with designers and developers to check the feature's working flow such as appointment booking and user authentication, which require regular testing to maintain system workflow. This approach helps the team to identify the bugs early before the system is delivered.

By following the scrum framework, the team successfully managed the development process, encouraged teamwork and ensured the delivery of a high-quality system with user requirements.

4.3 Kanban for Managing Continuous Flow

To complete scrum, the team used the Kanban framework to manage ongoing tasks and improve flexibility. This approach was useful for visualizing workflow and managing reactive tasks without disturbing the sprint cycle.

Visualizing Workflow

A Kanban board was created using Trello for bug fixing and smaller updates. The team creates columns such as:

To-Do: The team created this column to make a list of actively performed tasks like fixing a notification bug for booking and rescheduling appointments and a search filter feature to provide additional service categories.

In Progress: Tasks from the To Do column that were actively being worked on were moved here. For example, designing the UI of the system's different flows such as appointment rescheduling, payment flow and authentication flow, was performed in-progress part by the team.

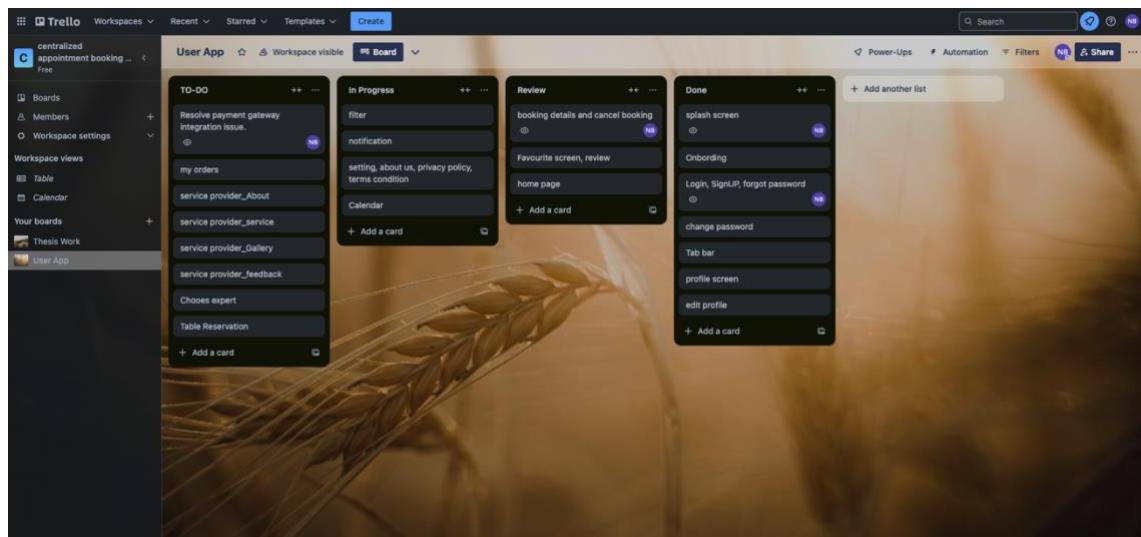
Review: After the in-progress column tasks were done, the team created the review column for quality assurance to ensure the system's flexibility. The team reviewed tasks such as API calling for booking performance to show data and confirm the booking by users and payment gateway functionality that was performed under different use cases.

Done: After the review column was done, the team moved these tasks into the complete column.

This process helped the team to track progress and prioritize tasks smoothly.

Managing Reactive tasks with Kanban

The team used Kanban to make sure that the smaller and high-priority tasks like bug fixing or minor updates could be performed well without disturbing the ongoing sprint cycle. When an issue occurs with payment integration during a sprint, the team uses the Kanban board to track the task status, assign it to a developer, and resolve it while continuing sprint tasks.



Picture 1 Trello Visualizing Workflow.

The above figure shows how Sprint focused on implementing the user authentication part, but an issue was identified with the payment gateway integration.

The issue task was added to the To-Do column as a “Resolve payment gateway integration issue”. A developer team member was assigned to work on this issue and it moved to the in-progress column for resolution. Once it’s resolved, it moves to the review column for verification in case any obstacles occur. After successfully reviewing, it was marked as a complete task in the Done column.

This approach helps the team to identify issues without disturbing the ongoing sprint cycle and development timeline. Additionally, by integrating Kanban with Scrum, the team performed a balanced workflow.

4.4 Agile Tools for Effective Project Management

The team used effective project management tools for flexibility in communication, task management, and collaboration in the project.

The team gets help from Git as a primary version control system to manage the project codebase. The team developed features such as profile management, settings and notifications on a separate branch to avoid conflicts during integration. The team merged the code after it was updated and successfully reviewed to make sure the project stayed on track and ensured stability in the codebase. Then the team used Git Tracked as a history to review changes, every code modification, revert errors and maintain the performance of the project. The multiple members were working on the various features simultaneously without affecting each other’s progress.

The team used the Microsoft Teams platform actively to help in smooth communication. Specific channels were created to organize project task discussions, focusing on important aspects such as alerts for the team to manage urgent updates and required issues. Calendar synchronization for coordinating calendar integration and resolving schedule-related challenges. User feedback was for the team to collect and review user inputs for system improvement. With this help, the team had a real-time discussion to solve problems quickly, share updates and help to make effective decisions during the sprint.

4.5 Challenges Faced and Positive Takeaways

Difficulty in Adopting to Agile Tools: Initially, the team was unfamiliar with Agile tools such as Trello and Agile frameworks, resulting in a slow adoption process.

solution: Organizing training sessions and workshops to help the team understand Agile tools, leads to full adoption by the next sprint.

Inconsistent Sprint Progress: In the beginning, sprints faced delays as the team adjusted to Agile workflows.

solution: Implemented more practices with sprint planning and backlog refinement that reduced delays and achieved on-time delivery.

Communication Gaps between Teams: At the beginning of the project, communication gaps between the developer, tester and designer teams led to delays and misplaced expectations.

solution: Daily stand-up meetings were implemented for the team to share updates and discuss any issues related to the system. Additionally, created a more comprehensive project plan to ensure that everyone on the team was fully aware of the project's objectives and deadlines. This led to improved communication and smoother ease of teamwork.

Integration Problems: Integrating the booking system with existing third-party services like Alamofire, faced challenges.

solution: The development team worked with API documentation, performed tests and coordinated with Alamofire support to resolve the integration challenges.

4.6 Key Findings

Task Completion: During sprint outcomes, it indicated that the task completion rate had increased. This improvement was the outcome of enhanced prioritization and effective resource allocation.

Team Collaboration: The efficiency of team collaboration improved as the project moved forward. Improved communication channels and frequent stand-ups helped the development process.

System Reliability Improvements: Using continuous integration and testing improved the system reliability. This approach allowed smooth operations, reduced issues and kept the system stable and user-friendly.

Efficiency of Task Management: The efficiency of task management was greatly improved during the project. The other developments of the sprint backlog and direct goal setting produced well-defined tasks and reduced the area of vagueness.

User Satisfaction: User satisfaction improved with each sprint as the project progressed. The continuous feedback and regular updates to the system's design lead to a positive response.

5 Functional Requirements & Platform and Tech Stack

The functional requirements include features like alignment with agile framework management, system features management, support management and user management, built to ensure efficient operation while following the Agile method. Technologies are used for leverage to build a robust, effective and user-friendly system.

5.1 Functional Requirements

To successfully apply Agile methods in developing the appointment booking system, it's important to focus on the requirements and user's needs. These requirements assist in aligning the Agile frameworks and processes with project goals and support flexibility.

Alignment with Agile Framework Management

Monitoring and Documentation: This is needed for responsibility, as monitoring and documentation in Agile help leaders to see how well the team is performing. They allow project managers to see how the team is performing and what's going wrong and also keep that schedule in progress.

Real Time collaboration and communication: For teams working from different locations, Agile project management may need a collaboration platform such as Microsoft Teams. Teams can communicate, share information regarding updates or new requirements and resolve issues.

Iterative Development: Agile project management usually results in more feedback for the product to improve continuously in small increments. It means tools which allow the customers to take on inputs, test updates and do quality checks at every stage. In this way, the booking system caters to users and tends to repeat it for an even better user experience.

Support for Incremental Development: The system should help to develop newer functionality without disturbing existing functionality. This makes it easier for any of the Agile teams to deploy updates, receive quick feedback, and make frequent iterations on improving the booking experience.

Backlog Management: The project tool offers effective backlog management. It provides an easy approach for the teams to filter, categorize and track how many new features or tasks a team runs in. The team can attend to the most important features first because of proper backlog management.

Adaptable Role distribution: The system should support adaptable roles and responsibilities according to the requirements of the project. This allows team members to take on different tasks as needed, promoting teamwork and flexibility.

System Features Management

Intuitive Booking Process: A seamless, intuitive booking process is a critical aspect of making it easy for users to experience a great user experience. The booking appointments interface needs to be clear and simple. This can help users to use the app easily at each step.

Real-Time Notifications: Users should receive real-time notifications from the system for their appointments such as booking confirmations, updates and reminders. These notifications should be received from the push notification or via system alert, based on the user's device preferences.

Easy Access to Booking History: The system should give the user access to their past bookings and transaction history. The booking history section needs to be properly featured in the system navigation menu or dashboard for user's easy access.

Support Management

FAQs Resources for Self-Help: To address and assist users in finding answers to their system-related queries, the system should also include an FAQ (frequently asked questions) section for resolving user issues based on user

concerns. This would include, how to use the app, book an online appointment, payment methods accepted, cancellation policies, and troubleshooting tips.

Gather User Opinions Forms: In-System Feedback Captures user opinions and suggestions using opinion forms or surveys. It allows users to write reviews, rate and comment on the features of the system they use and help make features better to improve user experience.

User Management

User Registration & Profile Creation: The important parts of the appointment booking system are user registration and profile creation. The registration process is seamless where users can register easily using an email ID or mobile number.

Viewing and Editing Profile Information: Allows users to see and edit their profile information in the system. There should be a particular profile segment where users can view their personal details and also edit their preferences with a settings option. It must be a part of the user profile section and easy to edit the preference from the same area. It helps users to ensure that their account information is up-to-date.

Browsing and Searching for Service Providers: The core functionality of the system is to enable users to search for and locate their preferred service providers directly within the platform. The service directory must allow the users to browse different services and find respective service providers accordingly. The features such as filtered search and category-based options help to make the browsing process easier with a smooth user interface.

Viewing Service Provider Profiles: Users should also be able to see the complete profile of service providers from the system. Profiles should provide full information about the service provider's business.

Booking Appointments with Selected Service Providers: The process of booking an appointment is one of the important features of the system. From the system, users should be able to easily book appointments with their chosen specialists. It

should be simple in design, easy to understand and will guide users at every stage to make appointment bookings.

5.2 Platform & Tech Stack

The technology stack for developing a System in an Agile Project Management (PM) framework requires a balanced selection of tools and platforms that make sure flexibility, scalability, and user-centric design.

Xcode

Xcode is an integrated development environment for iOS development. It supports a full suite of tools for writing, debugging, testing code and along with a user interface designer for creating system layouts. It is optimized for Swift and Objective-C language and integrates with Apple's development tools for creating it good for iOS projects.

Swift

Swift is a primary programming language for iOS development and preferred for its speed, safety, and ease of use. It allows faster development and reduced bug incidence and making it suitable for Agile iterations where frequent updates are essential.

Alamofire

Alamofire is a Swift library that makes it easy to send network requests and work with data from APIs. It helps to handle HTTP requests and JSON data, and for developers to write less code, and speeds up app development.

UIKit

UIKit is the traditional framework for building iOS apps with detailed, interactive designs. It helps manage app screens, animations, and transitions, giving developers more control over the app's look and feel. For difficult projects,

developers mostly use UIKit with SwiftUI to create a flexible and good user experience.

Firebase Analytics

Firebase Analytics tracks how users use an app, tracking things like engagement and retention. It provides real-time data on user behaviour, helping teams decide what features to prioritize or improve.

TestFlight

An Apple technology called TestFlight is used for testing iOS apps with real users before publishing. It helps developers for collecting feedback and solving problems that improve the quality of the system before it is released.

6 Conclusion

This thesis explores the importance of project management methodologies and tools in the development of a centralized appointment booking system. The implementation of Agile methodologies was required to break the project into smaller and more manageable tasks, allowing continuous development with the flexibility to accept changes. This methodology improved iterative development, increased adaptability and ensured the system could continuously improve. Project management tools such as Trello and Git were important in ensuring organization and collaboration. Trello enabled efficient communication and task monitoring among team members, whilst Git provided secure code management and continuous debugging, maintaining workflow integrity. These tools were important for supporting project efficiency and quality, highlighting their value in modern software development processes.

The key findings indicate that the combination of Agile methodology with these tools produced a functional and user-centric solution that addresses the specified requirements. The technology improves the booking process in many industries, including features that improve access and use. In addition to satisfying the basic goals, the system shows how modern project management methods may improve development processes and provide flexible, high-quality solutions.

In conclusion, the application of project management methodologies and tools was essential for delivering a well-structured, high-quality system. These methods ensured effective project management, flexibility in the challenges and a satisfying experience for both service providers and users. The result is a reliable platform that simplifies and enhances service booking across multiple industries.

References

Anees, M., 2023. Unlocking efficiency: Why online appointment scheduling is crucial for success. Available at: <https://workhub.ai/online-appointment-scheduling-is-crucial-for-success/> [Accessed: 10 May 2024]

Bukłaha, E. and Rzempala, J., 2023. PMS tools for agile projects. Silesian University of Technology Publishing House. Scientific Papers of Silesian University of Technology Organization and Management Series 185 pp.39-49. Available at: <http://dx.doi.org/10.29119/1641-3466.2023.185.3> [Accessed: 15 May 2024]

Daraojimba, E. C., Nwasike, C. N., Adegbite, A. O., Ezeigweneme, C. A., & Gidiagba, J. O., 2024. Comprehensive review of agile methodologies in project management. Computer Science & IT Research Journal vol. 5(1) pp.190- 218 . Available at: <https://doi.org/10.51594/csitrj.v5i1.717> [Accessed: 15 May 2024]

Demir, K. A., 2009. A survey on challenges of software project management. Proceedings of the 2009 International Conference on Software Engineering Research & Practice, July 13-16, 2009, Las Vegas, Nevada, USA, vol. 2. Available at:

https://www.researchgate.net/publication/221610941_A_Survey_on_Challenges_of_Software_Project_Management [Accessed: 29 Sep 2024]

freeCodeCamp. (n.d.). What is Git? A Beginner's Guide to Git Version Control Available at: <https://www.freecodecamp.org/news/what-is-git-learn-git-version-control/>

Hoda, R., Noble, J. and Marshall, S., 2008. Agile project management. International Conference on Extreme Programming and Agile Processes in Software Engineering, April 2008, Christchurch, New Zealand. DOI:[10.1007/11499053_47](https://doi.org/10.1007/11499053_47) [Accessed: 14 Oct 2024]

Notion. (n.d.). Project Management Guides. Available at: <https://www.notion.so/help/guides/category/project-management>

Omonije, A., 2024. Agile methodology: A comprehensive impact on modern business operations. International Journal of Science and Research. vol. 13 (12) pp 132-128 Available at: <http://dx.doi.org/10.21275/SR24130104148> [Accessed: 21 Oct 2024]

Patel, T. and Vaghela, S., 2019. Online appointment booking system. International Journal for Research in Engineering Application & Management vol. 4(11) pp.499-502. Available at:

<https://ijream.org/papers/IJREAMV04I1147134.pdf> [Accessed: 5 Oct 2024]

Reservio, 2023. 8 benefits of online booking system for your customers, Reservio Blog, 23 November. Available at: <https://www.reservio.com/blog/tips/benefits-of-online-booking-system-for-your-customers> [Accessed: 15 Sep 2024]

Singh, S., 2024. Popular project management tools for DevOps. Available at: <https://medium.com/@sachin28/popular-project-management-tools-for-devops-d1d886f55043> [Accessed: 14 July 2024]

Stare, A., 2011. Agile project management – a future approach to the management of projects?, Dynamic Relationships Management Journal vol. 2(1) pp.43-53. DOI:[10.17708/DRMJ.2013.v02n01a04](https://doi.org/10.17708/DRMJ.2013.v02n01a04) [Accessed: 17 Oct 2024]

Tomanek, M. and Juricek, J., 2015. Project risk management model based on PRINCE2 and Scrum frameworks. International Journal of Software Engineering & Applications vol. 6(1) pp.81-88. Available at:

<http://dx.doi.org/10.5121/ijsea.2015.6107> [Accessed: 23 Oct 2024]

Trello. (n.d.). Power-Ups for Trello. Available at: <https://trello.com/power-ups>