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Applying Personal Scrum Methodology in System Development for Project-Based Learning Course

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Abstract: Educators today are tasked with developing lifelong learners who can survive and thrive in a global knowledge economy. Hence, project-based learning is seen as one of the ways an educator can use to promote learner autonomy in higher education. The software development course at Universiti Teknologi MARA (UiTM) is one of the project-based learning courses that require students to go through all phases of system development to solve real case studies. However, some students found that project-based learning is quite challenging since it often involves long-term projects that require clear time management skills. This long-term project needs sustained motivation from students. Without proper guidance and milestones, students may lose interest or fail to stay engaged. Agile methodology is suitable to be implemented for system development in realising project-based learning. Scrum methodology, a framework derived from Agile, helps ensure that system development is completed on time by dividing the development process into small, manageable cycles called sprints. The time-boxed nature of sprints helps avoid scope creep and delays, as the team must complete specific deliverables within a set time frame. In this paper, the development of a web-based system for home cleaning service is demonstrated using the Personal Scrum Methodology.

Keywords: Agile methodology, Project-Based learning, Personal Scrum, Scrum, System methodology

1 Introduction

Project-Based Learning (PBL) is an educational approach where students learn through actively engaging in real-world projects. PBL requires students to research and answer challenging questions, problems, or challenges. This learning approach is different from traditional learning, which relies on lectures and textbooks. At university, there are many courses that apply the PBL approach in delivering their contents to students, including the software development course.

In UiTM Malaysia, for Project Course (CSP650), students may propose to develop any information technology-based project. Some of the usually proposed projects are online system development. This course is a PBL that requires ongoing assessment from the lecturer in charge of assisting the class. Assessment is also given by the lecturer, who will evaluate the final presentation of the project developed. This course is suitable to be implemented as PBL as it involves several development phases, and each phase has its own deliverable. The phases start with a preliminary investigation of system requirements. Then, followed by development strategies, data design, system implementation, and the final phase is system operation and support.

Selecting the right and appropriate system development methodology is vital to ensure the delivery of system implementation. Most methodologies used by software development organisations are meant to provide effective everyday operation, cost and time savings, project completion on schedule, provide a detailed plan, and other advantages. Among the known software development methodologies for the development of a web-based system are agile methodology, scrum methodology, waterfall model, prototype methodology, spiral model, and others.

Students usually make mistakes in analysing system requirements and designing the data design as they are still in the learning process. This will lead to some problems in system implementation. Hence, agile software methodology is acceptable for PBL courses as it is designed to help students deliver the functional output frequently compared to traditional methodology, which delivers one large output after a lengthy development period. Agile prioritises flexibility, collaboration, and iterative progress. The flexibility and iterative progress help students fix all the changes needed as customers ask for it.

In this paper, one of the students' projects was selected to demonstrate how to implement Personal Scrum Methodology. This system is a web-based system for booking house cleaning services. The project will go through Personal Scrum phases started with Sprint Planning until Sprint Retrospective.

2 Literature Review

The software development course is one of the project-based learning courses where students need to go through several phases in developing a real case study. This approach to learning could develop learner autonomy. This section will explain project-based learning. Besides, the methodology used in developing a web-based system for home services will be described.

A Project-Based Learning

The increased interest in learner autonomy is mainly due to the rapid growth of information technology and globalisation. In addition, the idea of learner autonomy is entailed in the Malaysian Education Blueprint [1]. Educators today are tasked with developing lifelong learners who can survive in a global knowledge economy [2]. Hence, project-based learning is seen as one of the ways an educator can use to promote learner autonomy in a software development course. This course must be carried out by a project-based learning approach because it is inherently project-oriented. It provides a realistic setting that is quite different from in-class and instruction-based teaching and learning. Moreover, being engaged in a project work encourages students to be more responsible for their learning while providing a memorable and authentic learning experience [2].

Working on simulated projects helps students gain hands-on experience and understand how to tackle real-world problems. For example, in the planning phase, students need to learn how to gather user requirements. There are also functional requirements and non-functional requirements the students need to specify in the planning phase before development starts.

B Scrum Methodology

The Software Development Life Cycle (SDLC) is a fundamental framework that governs the process of software development, encompassing planning, design, implementation, testing, deployment, and maintenance stages. As software engineering practices continue to evolve, various SDLC models have emerged, each offering distinct approaches to managing the development process [3].

Developers are still deploying traditional linear models like the Waterfall methodology, which provide clear documentation and a structured approach. It helps in tracking progress and maintaining a systematic view of the project. However, its sequential nature can be a significant drawback when

changes or amendments arise during the project. Once a phase is completed, it is challenging to go back and make modifications without disrupting the entire process. Besides, customer involvement is typically limited to the early stages of the project during requirements gathering. This can lead to a lack of continuous feedback, making it difficult to accommodate changing customer needs and preferences. Hence, this limitation has led to advocating agile methodology. Agile promotes a continuous feedback loop through iterative development cycles, enabling teams to identify and address issues early in the process. Frequent testing and review facilitate continuous quality improvement, leading to higher-quality software products. Agile methodologies prioritise customer collaboration throughout the development process. This customer-centric approach ensures that the software aligns with end-user needs and expectations, ultimately enhancing customer satisfaction and software quality [3][6].

Agile methodology can be implemented through various adaptive frameworks such as Scrum, Lean, Kanban, and eXtreme Programming. However, the most widely used and proven to be the most effective Agile framework is Scrum. Scrum was created by Jeff Sutherland in partnership with Ken Schwaber in the early 1990s. In project management, Scrum teams contribute their diverse expertise and commit to working together progressively on a project. The recently released, evolved version of the Scrum guide was from 2020. As defined in the Scrum guide, Scrum is an Agile framework that enables people, teams, and organisations to create value via adaptive solutions for complex work problems. There are three broad categories in the Scrum framework: roles, events, and artifacts. The roles involve team members (developers), a product owner, and a Scrum master. The events include the sprint, sprint planning, daily Scrum, sprint review, and sprint retrospectives. The artefacts are the product backlog, release plan, and sprint backlog. Figure 1 demonstrates the Scrum framework, including the roles, artefacts, and Scrum events [4].

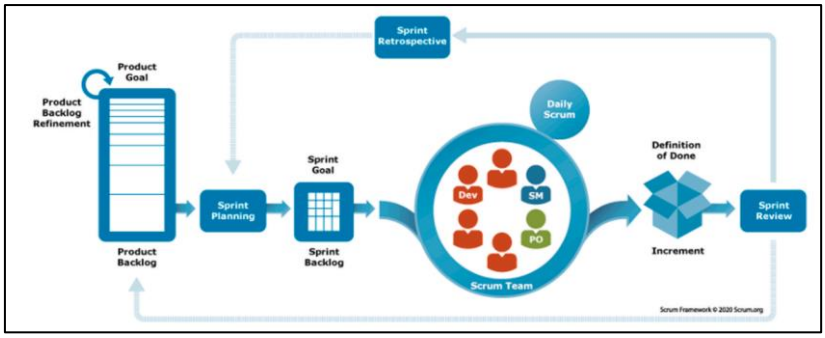

Figure 1: The Scrum Framework Received from Scrum.org

C Personal Scrum Methodology

The Personal Scrum Methodology is not the same as Scrum, despite being its inspiration. It sets distinct goals and performs a different phase process, but it is managed by just one person. The idea and practice of Agile, which breaks down projects into manageable phases to aid in figuring out solutions, has a more significant impact on it. The Personal Scrum System helps individuals to complete projects without the involvement of other organisations except those that are specific and closely related to the completion of the project, such as clients or users who use this system. [5]

D Home Cleaning Web-Based System

One of the most interesting future markets is home services. The demand for home services and home security systems has grown enormously because of the quickly-distributed technology of mobile network contexts. Despite the substantial effect of mobile home services applications on the information and communication technology (ICT) sector and society at large, few studies have been carried out that examine the causes for using home services and how service providers easily spread consumer acceptance of these services as well as enhance their quality [7].

The way homeowners use and connect to services has completely changed with the introduction of internet technology for home services. Online marketplaces benefit communities of buyers and sellers by facilitating efficient relationships. The main purpose of the online system for household services is to provide home service right to the door. It provides answers to all domestic issues with increased effectiveness, simplicity, and, most importantly, a delicate touch. The technology demonstrates how to book highly qualified professionals with only one click and promptly completes the service. Ensuring that the proposed system is essentially a market for household services, and it is a platform where prices have been standardised, so, there is no need for arguing about the price [8][12].

Furthermore, most cleaning services websites just record consumer comments, and sentiment research is not a standard feature of their websites. The lack of freely accessible online datasets of customer feedback for cleaning services limits sentiment analysis processing. The findings of the analysis could be utilised to generate strategies for improving services, increasing customer happiness, and reducing service cancellations. Internet marketing has gained significance since it determines the support plan that each website offers and how users select home services. Regarding the situation at hand, the researchers recommend building a cleaning services website [9].

3 Methodology

The Personal Scrum Methodology was employed for the house cleaning service web-based system development project after numerous considerations were made through investigation and research in the selection of the software development methodology.

The Personal Scrum Methodology is made up of a few sprints, each is designed to complete a particular set of responsibilities carried out by one person throughout the process. Implementing the Personal Scrum Methodology for the development of Clean Genie, a web-based system for home services, offers a structured and iterative approach to project management, aligning with the dynamic needs of the industry. Besides, this system was developed by a student. By breaking down the project into manageable sprints, each typically lasting 2-4 weeks, the development can focus on delivering incremental value to users. As can be seen from Figure 2, there are five phases, or events, that make up each sprint and provide direction for the development process [5].

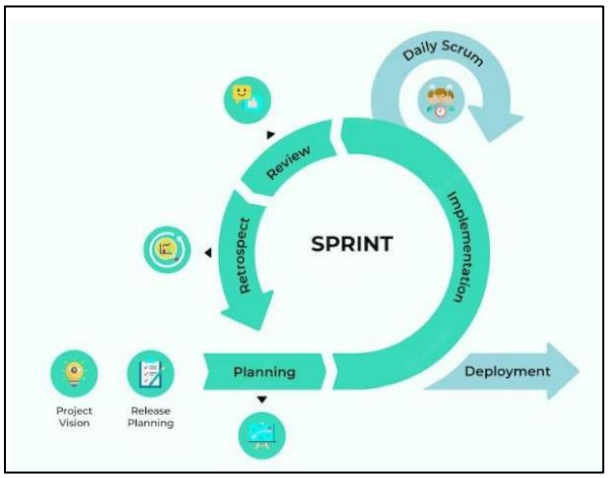

Figure 2: Five phases in Sprint [5]

A Sprint Planning

In the planning phase of the Personal Scrum Methodology, the product owner is responsible for defining the product vision and prioritising the backlog, creating a product backlog. This is a prioritised list of all the features and tasks that need to be completed. For example, in the case of the Clean Genie project, a web-based system for home services, the product backlog might include features like user registration, service booking, payment processing, service provider management, and customer reviews. Then, these features will be prioritised based on factors such as customer needs, market demands, and business goals. The team would then select a subset of items from the product backlog to work on during the next sprint, creating the sprint backlog. The team would estimate the effort required for each task in the sprint backlog and commit to completing a certain amount of work during the sprint. This commitment was made during the sprint planning meeting, which was attended by the product owner, the development team, and the scrum master. By defining and prioritising these requirements, we can ensure that Clean Genie, a web-based system for home services, meets the needs of its users and stakeholders. The requirements for Clean Genie can be categorised into functional and non-functional requirements. Table 1 displays all the functional requirements for Clean Genie.

Table 1: Functional Requirements for Clean Genie

Functional Requirements	**Description**
User Registration and Authentication	Users should be able to create an account using their email address and password and then log in securely to access the platform.
Service Booking	Users should be able to browse available services, select a service, and book an appointment based on their location and preferred time.
Service Provider Management	Administrators should be able to manage service providers, including adding new cleaners, updating the information and assigning them to specific service requests.
Service Request Processing	Users should be able to submit service requests and view the status of their requests.
Payment Processing	Users should be able to pay for services securely using payment methods, such as online payment platforms and then upload receipt as evidence of services payment.
Review System	Users should be able to leave reviews and ratings for service providers, and view reviews left by other users to help them make informed decisions.
Status Tracking	Users and service providers should be able to track service status about new service requests, appointment updates, and other relevant information.
Service Customisation	Users should be able to customise their service requests, such as selecting specific cleaning services or requesting services like standard cleaning, deep cleaning or specialised cleaning based on the costs given.
Service Cancellation	Users should be able to cancel appointments within a specified time frame.

Figure 3 illustrates the use case for this system development.

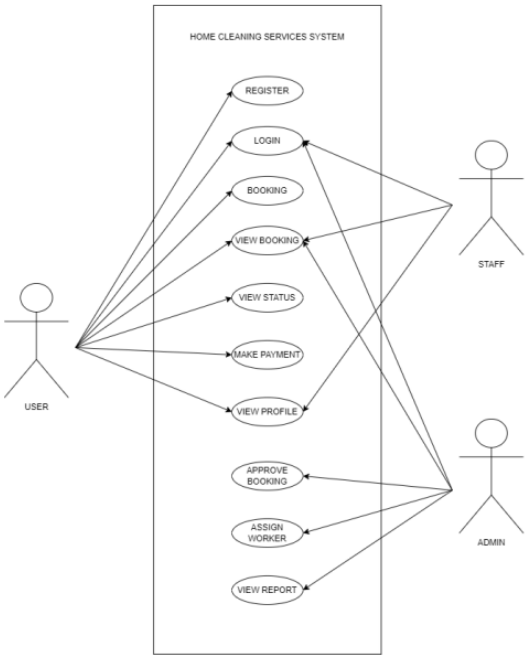

Figure 3: The use case of Clean Genie

The use case diagram outlined above illustrates the various interactions and functionalities within the Clean Genie home cleaning services system. It visually represents the actors involved, including users, cleaners or staff, and the admin. The diagram also highlights the essential use cases, showcasing the functionalities that each actor can perform. The register and login use cases are fundamental for the user actor, allowing individuals to create accounts, log in, and access the system's features. These actions are crucial for both customers and cleaners or staff. The booking use case enables users to book cleaning services by searching for available cleaners, selecting services, specifying dates and times, and making payments. This use case is interconnected with the view booking and make payment use cases, emphasising the flow from service selection to payment completion [10][11].

The view profile use case, associated with the user actor, allows users and cleaning staff to view and update their profile information. This ensures that personal details are current and accurate. For cleaners or staff, the view bookings use case enables them to access information about upcoming and past bookings, including details such as date, time, customer information, and requested services. This use case is linked to the broader booking process, ensuring that service providers have access to relevant details.

The view reports use case is exclusive to the admin actor, providing administrators with the capability to generate reports on various aspects of the system, including bookings, payments, and overall system activity. This feature facilitates data analysis and decision-making. The approve booking and assign worker use cases are specific to the admin actor, reflecting their role in managing and overseeing the booking process. Admins can approve or reject booking requests from customers and assign tasks to cleaners or staff members for specific bookings.

B Sprint Implementation

In the implementation phase of Clean Genie, several key steps were involved. One of the critical tasks was writing the code that makes the system work.

This typically involves using a combination of programming languages such as HTML, CSS, and JavaScript. These languages are commonly used for web development and are well-suited for creating user interfaces and handling user interaction. During the coding process, developers use integrated development environments (IDEs) like Visual Studio to write and organise their code. Visual Studio is a popular IDE that provides a range of features to facilitate coding, debugging, and testing. To set up the database for this system, phpMyAdmin was used. For server-side, XAMPP that includes Apache, MySQL, PHP, and Perl was used [13].

C Sprint Review

In the sprint review phase, the system was delivered to stakeholders in a sprint review meeting. A sprint review is the chance to examine, polish, and modify the product based on suggestions from stakeholders to suit the demands of the users who use the product. During the sprint review of Clean Genie, the completed features and functionalities were demonstrated. This included showcasing the customer booking capabilities, cleaner profiles, and any other implemented admin tasks. Stakeholders, including potential users and administrators, got a firsthand look at the progress made [14].

D Sprint Retrospective

In the Personal Scrum Methodology, the retrospective phase marks the final stage of the software development life cycle. This phase is crucial as it signifies the delivery of the software product to the end users or clients for actual use. In the context of a project like Clean Genie, the end user would be individuals seeking cleaning services [15].

4 Results and Discussion

Clean Genie was developed completely based on Personal Scrum Methodology. Upon logging into the home cleaning services platform, users are greeted with a personalised interface that prominently showcases their username, fostering a sense of individualised interaction. At the top of the navigation bar, several strategically placed buttons provide quick access to key sections of the platform, enhancing user convenience and navigation. The "Dashboard" button demonstrated by Figure 4 offers a comprehensive overview, while the "Profile" button directs users to manage their personal information. The "Booking" button streamlines the process of scheduling services, and the "Status" button provides real-time updates on service requests. Users can conveniently access their service history through the “Booking History” button, and the “Logout” button ensures a secure sign-out process. Complementing these features, a conspicuous “Request Now” button allows users to initiate service bookings effortlessly.

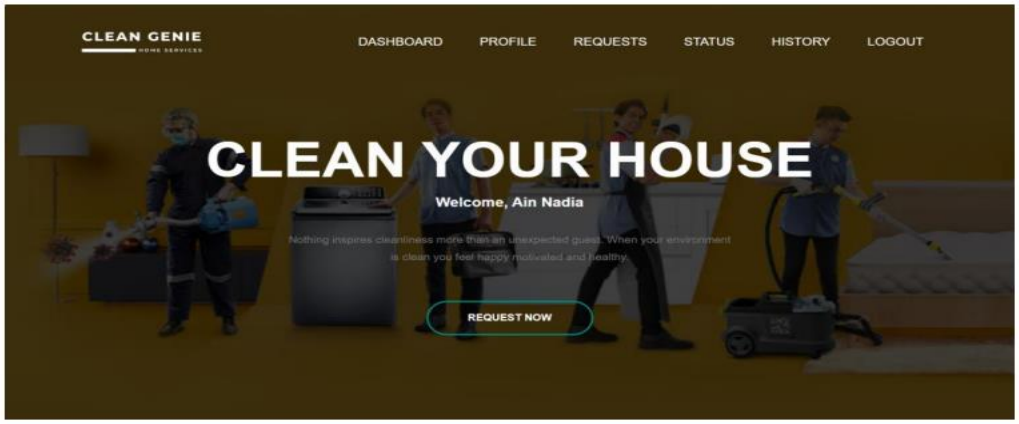

Figure 4: Clean Genie dashboard

An extensive heuristic evaluation was carried out to assess home services web-based system usability and efficiency. This evaluation focused on respondents residing in both urban and suburban areas to ensure that the system's usability aligns with real-life situations in diverse settings. A total of 20 respondents participated in the survey, providing valuable feedback on their experience with the web-based system. The results of the online survey were gathered and analysed to gauge the system's effectiveness and practicality in meeting the needs of users seeking home cleaning services.

The evaluation process aimed to validate the Clean Genie usability in varying living environments, acknowledging the potential differences in user preferences and requirements between urban and suburban residents. By obtaining feedback from a diverse group of respondents, the assessment sought to ensure that the web-based system, Clean Genie, is catered to the practical aspects of home cleaning services and could seamlessly integrate into the daily lives of users in different settings. Below are some of the evaluation results.

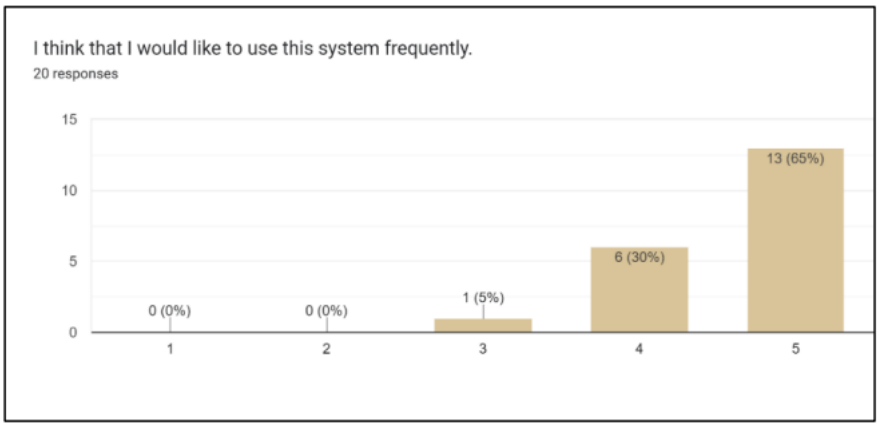

Figure 5: Frequency of Clean Genie usage

The depicted results shown by Figure 5 likely represent a survey focusing on the frequency of usage for Clean Genie for home cleaning services. The findings reveal a notable inclination among respondents towards embracing and utilising the system regularly. The majority, comprising 65% of participants, expressed a strong agreement in their willingness to frequently use the Clean Genie for home cleaning services. Another significant portion, constituting 30% of respondents, indicated a general agreement in their intention to use the system regularly. Additionally, 5% of participants remained neutral.

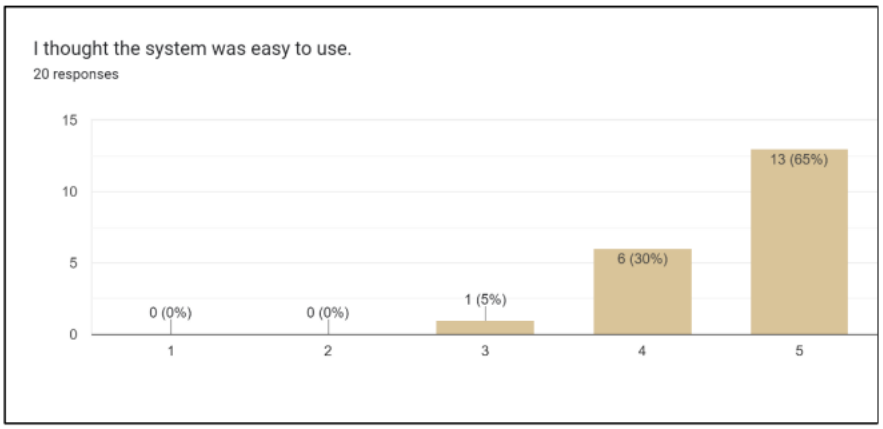

Figure 6: Result obtained for system ease of use

The survey result depicted by Figure 6 is for the question asking users to rate their agreement with the statement "I thought the system was easy to use", revealing a positive overall sentiment among the respondents. A significant majority, comprising 65% of participants, strongly agreed with the

statement, indicating a high level of satisfaction and ease of use for the system. Another 30% of respondents expressed agreement with the statement, reinforcing the positive feedback received, as a substantial portion found the system to be easy to navigate and utilise. Meanwhile, 5% of participants maintained a neutral stance.

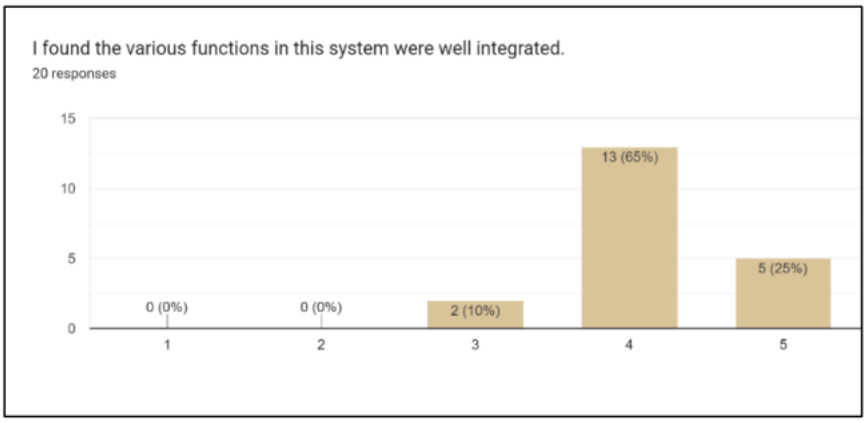

Figure 7:

The outcomes of the survey question illustrated by Figure 7 present a positive perspective on the system's integration in Clean Genie. A significant 65% of respondents expressed agreement with the statement, indicating a substantial majority that perceives the various functions within the system as well-integrated. Furthermore, 25% of participants strongly agreed, highlighting a noteworthy portion of users who highly appreciate the seamless integration of functions. Meanwhile, 10% of respondents remained neutral.

5 Conclusion

The impact of the home service system extends beyond convenience, offering users the flexibility to access services wherever they are and whenever they need them. This not only saves energy and time but also mitigates the potential financial burden associated with traditional service acquisition. The system's success is not solely measured by its technical capabilities but also by its ability to adapt to the evolving needs and preferences of users. These evolving needs could be handled by adopting Personal Scrum Methodology.

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