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Analysis of the application of the SCRUM method to the development of the SITASI: final project management application

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ABSTRACT

This study examines the application of the Scrum methodology in developing a Final Project Management Application, known as SITASI, which serves as a platform for students and supervisors to manage and monitor all processes related to final projects or theses. The research question evaluates how Scrum influences development efficiency, application quality, and user satisfaction in this context. The research utilizes a software development analysis to comprehensively understand and plan the project before commencing the development process. The study aims to design a tailored solution that aligns with user expectations by identifying user needs and potential challenges. Result of this research, the study emphasizes the significance of team and technology factors in driving the adoption of Scrum in developing the SITASI application. The findings suggest that effective teamwork and leveraging appropriate technological tools like Scrum can positively impact the application's development process. While individual and organizational factors did not significantly influence, the study highlights the importance of a conducive work environment for successful application development. By understanding these factors, developers, and stakeholders can make informed decisions to enhance the implementation of Scrum and improve the efficiency and quality of the final project management application, SITASI.

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1. INTRODUCTION

SITASI is a final project management application or system students and supervisors use to manage and monitor all processes related to the final project or thesis. This system aims to improve the final project completion process's efficiency, transparency, and quality(Chen et al., 2022; Rao et al., 2021). Some features owned by the Final Project Information System Final Project Registration allow students to register the final project topic to be worked on and choose a supervisor through this system. Supervisor Management, supervisors can accept or reject requests to be a final project supervisor from students. The system can also facilitate changes in supervisors if needed. Schedule and Deadline, the system can present important schedules, such as proposal submission deadline, final project submission deadline, and final project seminar schedule(Yu et al., 2005; Yu & Buyya, 2006). File Management, Students can upload and save files related to their final projects, such as proposals, reports, and presentations(Almeida et al., 2023; Başari et al., 2017; Chang et al., 2012).

Progress Monitoring, The supervisor and final project coordinator can monitor the progress of the student's final project, provide comments, and provide feedback. Communication and Discussion, The system can provide facilities to communicate between students and supervisors through messages or discussion forums. Assessment, Upon completion, the supervisor can provide an assessment and feedback on the final project that has been submitted. Archive, The system can keep records and archives of students' final assignments for future reference. Reporting and Statistics, The system can also generate reports and statistics related to the progress of the student's final project and the supervisor's performance. Security and Privacy: Given the importance of the confidentiality of some information, the system must have adequate security to protect student data. Accessibility, The system should be easily accessible by students and supervisors from various devices, such as computers, tablets, or smartphones (Almeatani et al., 2019). The Final Project Information System will be beneficial in simplifying the administrative process and monitoring of the final project, increasing collaboration between students and supervisors, and improving efficiency and accuracy in completing the final project. Thus, students can focus more on the substantial aspects of their research and complete the final project better(Almeida et al., 2023; GROS-NAVÉS et al., 2022; Jean Cross Sihombing, 2022).

In this study, a software development analysis was conducted on the development of SITASI. Analysis in software development is critical because it serves as an essential early stage to understand and plan the project thoroughly before the development process begins(Sihombing & Ferdiando, 2023; Wiechmann et al., 2022). Analysis helps map and understand the needs of users or customers using the software. By understanding their needs, developers can design a solution that fits and meets the users' expectations. In analysis, identify problems and challenges that may arise during development. The development team can take preventive measures or prepare alternative solutions by identifying these issues early. Analysis helps in determining the boundaries and scope of the project. The development team can stay within the set time and budget limits by identifying what to include or exclude from the software. Analysis helps in planning the project thoroughly. The development team can estimate the time and cost required to complete the project based on an in-depth understanding of the requirements and their complexity(Putri et al., 2023).

The use of the Scrum method in developing final project management applications, such as SITASI, is due to Flexibility and Adaptability: Scrum is a flexible and adaptive framework. In developing a final project management application, needs and requirements often change or must be fully defined. Using Scrum, the development team can quickly adapt to changing needs and get feedback from users at regular intervals(Bin et al., 2021; Sverrisdottir et al., 2014). This system allows priorities to be adjusted according to actual needs, reducing the risk of developing applications that do not meet user expectations. Scrum encourages close collaboration between the development team and stakeholders, such as students and mentors(Cucolaş & Russo, 2023a, 2023b; Rizaldi et al., 2016). Through regular meetings such as Daily Standup, Sprint Planning, and Sprint Review, the team can openly communicate about the project's progress, challenges faced, and possible issues. Strong collaboration helps ensure that the entire team genuinely understands and accommodates the vision and goals of application development. Scrum emphasizes transparency in the entire development process(Chantit & Essebaa, 2021a; Kadenic et al., 2023; Moguerza et al., 2021).

With Scrum boards, burndown charts, and other artifacts, all team members and stakeholders can easily see the real-time status of the project. This transparency helps all parties to have a clear understanding of the development of the application, reduces misunderstandings, and increases trust among team members. The Scrum method focuses on managing time within a limited period called a Sprint. In these Sprints, the team focuses on delivering a certain amount of features or work that can be completed within a specific time. This approach encourages the gradual completion of tasks, avoids delays, and increases efficiency in application development. Scrum encourages continuous testing and evaluation throughout the development process(Chantit & Essebaa, 2021b; Chaouch et al., 2019; Dewi & Irham, 2021).

By conducting regular testing, the team can quickly identify and fix potential bugs or issues, thus improving the overall quality of the final project management application. By actively involving users or stakeholders in the entire development process, Scrum helps ensure that the resulting application meets the users' needs and expectations(Heikkilä et al., 2015; Shafiee et al., 2020). Continuous feedback from users helps steer the development of the application in a more relevant and practical direction. Overall, using the Scrum method to develop the final project management application brought significant benefits, including flexibility, strong collaboration, transparency, increased speed and efficiency, improved quality, and fulfillment of user needs. With this approach, final project management applications, such as SITASI, can be developed more effectively and positively impact users and related stakeholders.

Analysis helps in designing a suitable software architecture. The development team can design an efficient and scalable solution by understanding the interactions between various software components and functionalities. By conducting a thorough analysis, the development team can avoid repetitive changes during the development process that can cause delays or additional costs. Analysis helps identify errors or flaws in planning and design before development begins. By identifying errors early, the development team can avoid costly rework and save time. The analysis involves intensive interaction with users, stakeholders, and development team members. This enables better communication and collaboration, thus ensuring that all parties understand and agree with the project plan and goals. By conducting a careful analysis before starting development, the development team can reduce project risks, optimize the use of resources, and increase the chances of achieving a successful outcome in software development

The research question of this study is: "How does the application of the Scrum method in the development of a final project management application contribute to development efficiency, application quality, and user satisfaction?" This question aims to evaluate the impact of implementing Scrum in the development of a final project management application, focusing on improving the efficiency of the development process, product quality, and end-user satisfaction. This research will identify the benefits of implementing Scrum and identify aspects that can be improved to develop the final project application more effectively and efficiently.

2. RESEARCH METHOD

This research consists of five stages: Implementation SCRUM, Hypothesis Test, Measurement Model (Outer Model), Structural Model (Inner Model), and Analysis, as shown in Figure 1.

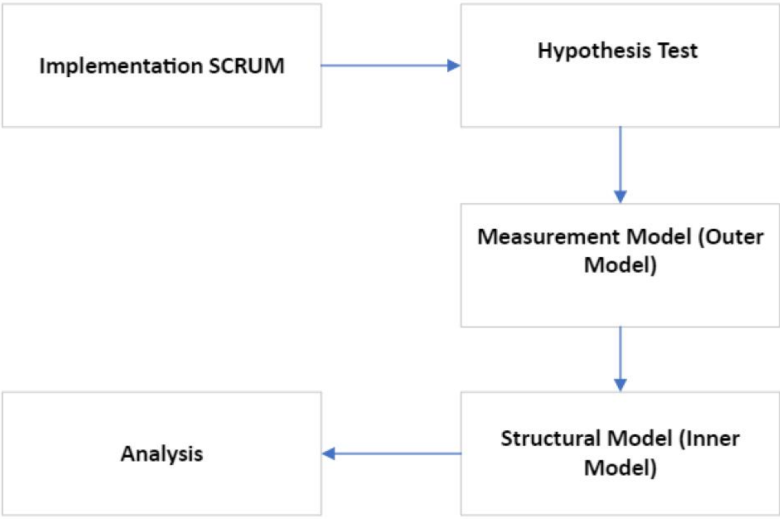

Figure 1. Methods framework

Implementation SCRUM

The implementation of Scrum in the development of the final project management application can be done with the following steps: Development Team and Roles, Product Backlog, Sprint Planning, Sprint, Sprint Review, Sprint Retrospective, Iteration, Collaboration and Feedback and Flexibility as shown in Figure 2.

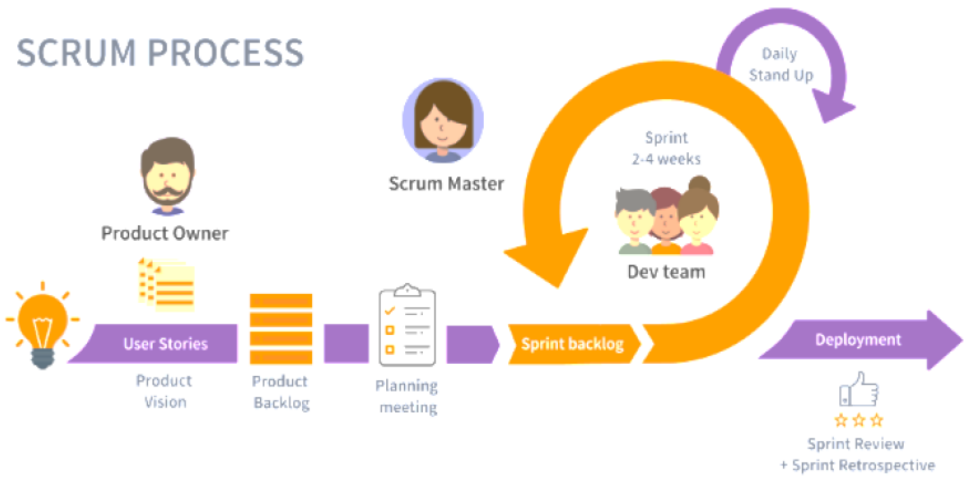

Figure 2.SCRUM process

Hypothesis Test

The hypotheses of this study consist of the following:

H1: Team factors contribute significantly to scrum adoption.

H2: Individual factors contribute significantly to scrum adoption.

H3: Technology factors contribute significantly to scrum adoption.

H4: Organizational factors contribute significantly to scrum adoption.

The research framework, as shown in Figure 3

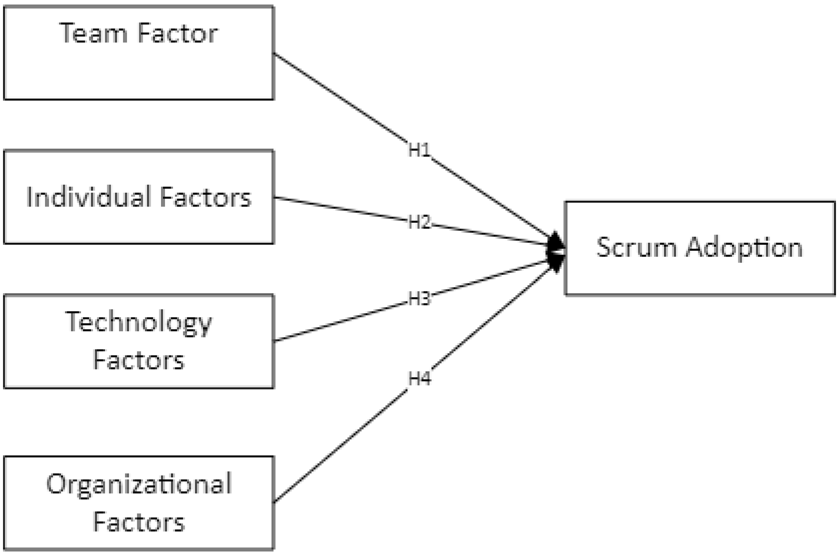

Figure 3. Research framework

Measurement Model

The measurement model in this study used for testing validity, and reliability is as follows:

1. Validity test, A validity test shows the extent to which the measuring instrument is used in measuring what is measured. Validity connects to the instrument's accuracy, which states that the measuring instrument measures validly. Construct validity uses two validities, namely, convergent validity and discriminant validity.
2. 2.Reliability test, A reliability test is an index that shows measurements can be trusted or relied upon consistently. The reliability tests in PLS used in this study 2 (two) methods are Cronbach's alpha and composite reliability. Cronbach's alpha assesses the lower limit of the reliability value of a construct, and composite reliability measures the actual value of the reliability of a construct. Composite reliability is considered a better measurement in estimating the internal stability of a construct. The rule of thumb for measuring Cronbach's alpha or composite reliability should be above 0.7.

Structural Model

The structural model is a causal relationship between latent variables built based on the substance of the theory. Structural model measurement in SmartPLS is assessed using R^2 values for path coefficient values, t-values for each path, and dependent constructs to test significance with constructs in the structural model. Structural model measurements are used with the R-Square (R^2) test, t-statistic test, and path coefficient.

Analysis

Analyzing the application of the Scrum method in software development involves a thorough evaluation of how Scrum is implemented, its impact on the development process, and the results achieved. By conducting a thorough analysis of the implementation of the Scrum method, development teams can gain valuable insights into the effectiveness and impact of using this method in software development. This analysis can help the team to continuously improve practices and optimize the implementation of Scrum to achieve better results in application development.

3. RESULTS AND DISCUSSIONS

Implementation SCRUM

The implementation of Scrum in developing the SITASI application involves the following steps: Form a team consisting of relevant members, such as students working on the final project, supervisors, and possibly some additional team members if needed. Assign roles to each member, including a Scrum Master responsible for facilitating development using Scrum. Identify the needs and features of the final project management application. Develop a Product Backlog containing a prioritized list of features to be developed. The Product Owner, usually the supervisor or project coordinator, is responsible for the Product Backlog and prioritizes it according to needs. Once the Product Backlog is in place, the team conducts a Sprint Planning meeting to select items from the Product Backlog and determine what work will be done during the next Sprint. Start the Sprint with a predetermined time duration.

The team works to implement the features selected in Sprint Planning. The team conducts a Daily Standup to report progress and obstacles encountered and discuss how to overcome these obstacles. Upon completion of the Sprint, hold a Sprint Review meeting to check the deliverables and review whether all features have been completed according to the predefined definition of "done."Next, hold a Sprint Retrospective meeting to evaluate the work process during the Sprint and identify improvements that can be made in the next Sprint. This process is repeated in each subsequent Sprint until all features in the Product Backlog have been implemented and the final project management application is ready for use. During the development process, provide opportunities for students, supervisors, and other team members to collaborate and provide feedback. Communication between team members and stakeholders will help steer development toward the desired goal. Scrum makes it possible to deal with changing needs and requirements more adaptively. If priorities or needs change, the team can adjust the Product Backlog and Sprint Planning to accommodate the changes.

With the implementation of Scrum, the development of the final project management application will be more structured, transparent, and directed. The application will develop gradually by prioritizing the most critical features first. Scrum also encourages strong collaboration and provides flexibility to handle changing needs during application development—the application results as shown in Figure 4.

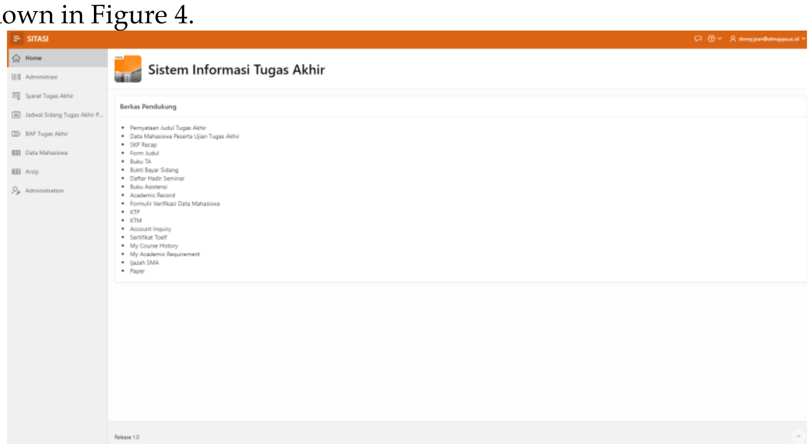

Figure 4. SITASI application

Convergent Validity Test

From the outer model results of the convergent validity test, it is known that all indicators are valid and have a value> 0.7. All indicators with a value of> 0.7 and can be pretty high have a positive relationship with each latent variable. Therefoe, these indicators can measure the latent variable well, as shown in Table 1.

Table 1. Results of convergent validity test

Variable	Indicator	Outer Loading	Desc.
Team Factors	T1	0.815	Valid
	T2	0.785	Valid
	T3	0.762	Valid
	T4	0.824	Valid
	T5	0.849	Valid
Individual Factors	I1	0.757	Valid
	I2	0.903	Valid
	I3	0.845	Valid
	I4	0.782	Valid
	I5	0.916	Valid
	I6	0.789	Valid
Technology Factors	TK1	0.683	Invalid
	TK2	0.810	Valid
	TK3	0.894	Valid
	TK4	0.890	Valid
	TK5	0.934	Valid
	TK6	0.568	Invalid
	TK7	0.853	Valid
Organizational Factors	O1	0.815	Valid
	O2	0.960	Valid
	O3	0.894	Valid
	O4	0.805	Valid
SCRUM Adoption	AS1	0.762	Valid
	AS2	0.765	Valid
	AS3	0.830	Valid

Discriminant Validity

Discriminant validity can be assessed from cross-loading or the correlation between its indicators and existing latent variables. Discriminant validity assessment has a criterion that the value of the cross-loading itself must be greater between the construct and its indicators than with indicators or with other constructs.

Table 2. Discriminant validity results

Indicator	Scrum Adoption	Individual Factors	Construct Technology Factors	Organizational Factors	Organizational Factors
AS1	0.765	0.383	0.535	0.387	0.274
AS2	0.761	0.480	0.499	0.239	0.165
AS3	0.830	0.506	0.476	0.375	0.437
I1	0.231	0.752	0.499	0.628	0.318
I2	0.307	0.902	0.767	0.745	0.394
I3	0.311	0.842	0.699	0.713	0.298
I4	0.606	0.782	0.732	0.739	0.279
I5	0.427	0.916	0.636	0.674	0.492
I6	0.496	0.785	0.505	0.732	0.515
TK2	0.440	0.668	0.832	0.682	0.376
TK3	0.454	0.794	0.894	0.756	0.457
TK4	0.183	0.647	0.912	0.655	0.275
TK5	0.377	0.702	0.949	0.717	0.297
01	0.552	0.626	0.607	0.816	0.496
02	0.416	0.802	0.775	0.964	0.465
03	0.589	0.866	0.745	0.897	0.438
04	0.643	0.513	0.575	0.807	0.398

T1	0.33	0.299	0.317	0.328	0.814
T2	0.516	0.295	0.265	0.372	0.785
T3	0.573	0.449	0.287	0.393	0.827
T4	0.495	0.368	0.265	0.317	0.825
T5	0.286	0.439	0.429	0.555	0.849

Based on the results of Table 2, all cross-landing values and the correlation between indicators and their latent variables have a high value of> 0.7 or by comparing the root value of average variance extracted where each construct with the correlation between constructs and other constructs with the model, it can be said that it has good discriminant validity. At this stage, the discriminant and convergent validity tests are fully valid on all existing indicators and variables.

Hypothesis Result

H1: Team factors contribute significantly to scrum adoption.

Based on the results of the hypothesis testing of the team factor variable, it produces a value that is quite influential or significant which is associated with scrum adoption with an original sample value of 0.655, a t-statistic with a value of 2.990 which is still above the value of 1.96, and with a p-value of 0.23 below 0.05, so it can be stated that the team factor hypothesis has a positive effect related to scrum adoption in this study is accepted. Therefore, the team factor also affects the application of scrum adoption in developing the SITASI application.

H2: Individual factors contribute significantly to scrum adoption.

Based on the results of the hypothesis testing of the individual factor variable, it produces a value that is not sufficiently influential or significantly associated with scrum adoption with an original sample value of 0.495, t-statistics with a value of 1.950 which is still below the value of 1.96, and with a p-values value of 0.054 which is already above 0.05. However, the resulting value is still not absolute, so it can be stated that the individual factor hypothesis has no significant effect, and the hypothesis is **rejected**. Therefore, individual factors are not sufficiently influential on the application of scrum adoption in developing SITASI applications.

H3: Technology factors contribute significantly to scrum adoption.

Based on the results of hypothesis testing of the technological factor variable, this variable produces a significant value. This variable produces a moderately influential or significant value associated with scrum adoption with an original sample value of 0.655, a t-statistic with a value of 3.127, already above the value of 1.96, and a p-value of 0.04, already below 0.05. Therefore, the hypothesis of the technology factor is quite influential or significant concerning scrum adoption. Positively related to scrum adoption so that the hypothesis in this study is accepted. This research is **accepted**. Technological factors are quite influential on the application of scrum adoption in the development of the SITASI application because many respondents benefited and benefited from the application of scrum adoption—respondents who benefit and benefit from the application of the scrum method as a software method. The method is a software method. Thus, technological factors are the primary influence on the team of developers to become more productive, improve work performance, and improve the quality of the SITASI application being worked on is getting better. The SITASI application is getting better.

H4: Organizational factors contribute significantly to scrum adoption.

Based on the results of the last hypothesis testing of the organizational factor variable, it is also more or less the same to produce a value that is not sufficiently influential or significantly related to scrum adoption with an original sample value of -0.615, t-statistic with a value of 1.661 which is still below the value of 1.96. However, with a p-value of 0.097, already below 0.05, the resulting value still needs to be absolute, so it can state that the hypothesis that organizational factors have a positive effect related to scrum adoption in this study is rejected. Therefore, organizational factors are also not enough to influence the application of scrum adoption in developing SITASI applications. However, organizational factors are still needed because, through a healthy organization, the work environment becomes more fun and makes work easier. Work feels easier so that scrum adoption can run under predetermined targets By the predetermined target.

Discussions

Based on the results of the hypothesis testing, here is a summary of the findings for each hypothesis: H1: Team factors contribute significantly to scrum adoption. Result: The hypothesis is accepted. Interpretation: Team factors have a positive and significant effect on the application of scrum adoption in developing the SITASI application. H2: Individual factors contribute significantly to scrum adoption. Result: The hypothesis is rejected. Interpretation: Individual factors are not significantly influential in the application of scrum adoption in developing SITASI applications. H3: Technology factors contribute significantly to scrum adoption. Result: The hypothesis is accepted. Interpretation: Technology factors have a positive and significant effect on the application of scrum adoption in developing the SITASI application. Technological factors, such as the scrum method, contribute to higher productivity and improved work performance among the team of developers. H4: Organizational factors contribute significantly to scrum adoption. Result: The hypothesis is rejected. Interpretation: Organizational factors are not significantly influential in the application of scrum adoption in developing SITASI applications. However, they are still crucial for creating a healthy work environment, which can lead to more accessible and more efficient work processes. In summary, the study concludes that team and technology factors are significant drivers of scrum adoption in developing the SITASI application. On the other hand, individual and organizational factors do not show significant influence, although the latter is still considered essential for creating a positive work environment.

4. CONCLUSION

This research investigates the implementation of Scrum methodology in developing the Final Project Management Application (SITASI), a platform for students and supervisors to manage and monitor all processes related to the final project or thesis. The research findings show that effective teamwork and utilization of appropriate technological tools, such as Scrum, positively impact the application development process. Although individual and organizational factors did not significantly influence, this study underscores the importance of a conducive work environment for successful application development. Future research is expected to examine the improvement of individual and organizational factors in their contribution to Scrum adoption in the context of application development, as well as conduct in-depth explorations related to measuring the effectiveness and impact of Scrum implementation on final project management applications such as SITASI to provide deeper insights in future development.

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