Integration of Design Thinking and Scrum in Development of Retail Marketplace Website

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Abstract—Dalam bidang Ritel tradisional, Perlu diadakannya perubahan dan adaptasi terhadap perkembangan yang ada. supaya tidak terjadi ketertinggalan. Di Indonesia, Usaha Kecil dan Menengah (UKM) dapat beradaptasi dengan bantuan perkembangan teknologi, perkembangan pada UKM tersebut terjadi sekitar 12%. Berdasarkan masalah tersebut, pengembangan website marketplace ditujukan untuk pelaku Usaha UKM dalam memasarkan produkunya dengan memanfaatkan teknologi. Proses pengembangan perangkat lunak dibutuhkan untuk mengembangkan website marketplace yang sesuai dengan market dan kebutuhan pengguna. Maka pada penelitian ini menerapkan design thinking yang diintegrasikan dengan scrum dalam mengembangkan website marketplace untuk retail bertujuan untuk memahami pengaruh dan kebermanfaatan integrasi tersebut dalam proses pengembangan perangkat lunak. Hasil dari pengukuran usability dengan metrik system usability scale (SUS) diperoleh rata-rata nilai dari SUS dengan nilai 71.5 dan rata-rata kecepatan performa tim memperoleh rata-rata nilai sebesar 14 poin yang berarti dalam satu sprint, tim idealnya dapat menyelesaikan poin sebesar rata-rata poin tersebut. Maka dapat disimpulkan bahwa design thinking dan scrum dapat menjadi kombinasi yang tepat untuk menciptakan produk berdasarkan permasalahan yang ada dengan menenun solusi yang tepat dan mewujudkan solusi tersebut dengan cepat.

Kata Kunci: UKM, Marketplace, Design Thinking, Scrum, Software Development

Abstract—In traditional retail, change and adaptation are necessary for existing developments not to be left behind. In Indonesia, Usaha Kecil Menengah (UKM) can adapt to the help of technological developments. The development in UKM occurs about 12%. Based on these problems, the development of marketplace websites is aimed at UKM businesses marketing their products by utilizing technology. The software development process is needed to develop a website marketplace that suits the market and user needs. Therefore, this study applies design thinking integrated with scrum in the development of website marketplace for retail aims to understand the influence and usefulness of integration in the software development process. The usability measurement with the metric system usability scale (SUS) obtained an average value from SUS of 71.5. The average performance velocity of the team got an average value of 14 points which means in one sprint. Team can ideally complete the point by the average of those points. It can be concluded that design thinking and scrum can be the right combination to create a product based on existing problems by finding the right solution and realizing the solution quickly.

Keywords: UKM, Marketplace, Design Thinking, Scrum, Software Development

1. INTRODUCTION

Retail is one of the economic indicators of the trade component that contributes a considerable 19-31% to Gross Regional Domestic Income (PDRB) in every region in Indonesia [1]. The business competition in the development of Information technology has increasingly advanced over time, and the impact has been felt by most of the community where the simple process becomes modern and fast-paced so that it impacts all sectors, one of which is the retail sector [2]. For traditional retail to not be abandoned, it needs to make changes and adapt to existing developments. Even if UKM in Indonesia can adapt to technological developments, it can encourage UKM growth by 12% [3].

Online shopping has become a consumer choice, and it is undeniable that online shopping also has the convenience of getting the desired item besides not spending time and effort. The marketplace is one form of technological development to facilitate business owners in marketing their product [4][5]. Based on these problems, the development of a marketplace website is intended for consumers who want to make the process of buying and selling products offered and for UKM businesses, especially the retail sector, to market their products by utilizing technology. A Software development process is needed to develop the marketplace website to create a product that meets the market and users’ needs. There are several software development methods such as Waterfall, V-Shaped, and Agile. Each method has its advantages and disadvantages [6].

One software development method is Agile with a Scrum framework that can provide flexibility to control and manage requirements for software development better, and scrum is designed to improve production capabilities in the development process [7]. The main focus of scrum is not the delivery of radical innovations, and scrum has a lack of attention to the design that can create the wrong product or not follow the user needs to produce products that are accepted by the market and must be reworked [8][9]. Therefore, Design Thinking is necessary for the software development process to gather information to find hidden aspects or user needs, communicate ideas, and find the solution [8][10]. Based on research by Häger et al. [11], entitled DT®Scrum, research is still needed to apply different tools, techniques, and scopes to design thinking and scrum integration. Another method is the design sprint created by Google Venture has a five-day process for solving problems through prototyping and brainstorming with users. The difference between design sprint and design thinking is that design
sprint is a linear process and sensitive to time and focuses on solving problems, in contrast to design thinking which is an iterative process and focuses on defining and solving problems [12][13]. Therefore, in this research, applied design thinking integrated with scrum in the development of website marketplace for retail aims to understand the influence and usefulness of integrating design thinking and scrum in the software development process.

The research is structured as follows. Related work will be discussed in section 2. Furthermore, section 3 will discuss the results of the performance website development marketplace for retail with the integration of design thinking and scrum. Finally, section 4 will discuss the conclusions of the research.

2. RESEARCH METHOD

2.1 Literature Study

Based on research by Häger et al. [11], a combination design thinking and scrum aim to create a software development process that delivers innovative customer-oriented products. This scrum combination process provides an overall process framework for all activities, not only during the software development process but also accommodates in the design process [11]. However DT@Scrum still needs to be tested and implemented in the development process in a company. The purpose is to identify any challenges and opportunities in the company.

Based on research by Michael et al. [10], observations of the DT methodology applied to use the software development are made of. From these observations, it is beneficial that DT can improve the process of obtaining requirements, identify errors in understanding the requirements of prototyping, and facilitate implementation after the prototype is validated directly with the client. However this research, still need to investigate and monitor the major challenges practitioners face in software development teams when using Design Thinking and their suggestions for adopting methodologies broadly in real contexts [10].

Based on research by Higuchi et al. [14], DT can contribute to the production and improvement of game design because DT can explore new ideas and increase production efficiency when combined with Agile Development, also the researchers provide advice for future research to focus on identifying the advantages and disadvantages of DT integration and agile development methods.

Therefore, this research focuses on understanding the influence, usefulness and identifying challenges of integrating design thinking and scrum in the software development process to develop a marketplace website for retail.

2.2 Research Scheme

In this study, there are five stages, namely the stages of literature studies, problem identification, design thinking stages, development stages, and measurement stages. There are several stages for development, such as the initial development stage and fully integrated development stage. The following is an overview of the stages of research that can be seen in figure 1.

![Diagram of Research Process]

**Figure 1.** The stages of research process

2.3 Design Thinking

Design thinking is a collaborative process that uses sensitive and creative techniques to meet users’ needs with a technically visible and viable business strategy. Design Thinking is a human-centric approach to solving problems...
and helping people and organizations become more innovative and creative [8]. Design Thinking is included in iterative methodologies that present new approaches to solving complex problems by applying design knowledge [8]. There are several stages in the design thinking process, namely understand, observe, synthesis, ideate, prototyping, and test stages [8].

2.4 Scrum

Scrum has become a process framework for managing complex product work. Scrum is not a fixed process, technique, or method. Instead, it is a framework where you can use a variety of approaches and techniques. Scrum describes the relative effectiveness of product management and work techniques so the product, team, and work environment can improve continuously [7]. The core of Scrum is sprint, which is a time frame of one month or less, during which "completed" product upgrades can be used and possibly released. Sprints have a consistent duration during the development process. Once the previous sprint is over, the new sprint will begin immediately. Sprint includes Sprint Planning, Daily Scrums, the development work, the Sprint Review, and the Sprint Retrospective [7].

3. RESULT AND DISCUSSION

3.1 Design Thinking Phase

The initial stage of research for developing a retail marketplace website is the Design Thinking phase. In this research, the design thinking process is carried out for one month, and this stage aims to solve a problem and find solutions innovatively and creatively. At this stage, the process in design thinking begins to be implemented.

a. Understand: This stage is the team determines user criteria, problem hypotheses, and goals to be achieved using design thinking.

b. Observe: At this stage, the team observes and collects user problems by conducting interviews and then mapping in a hook model and validating the problem table.

c. Synthesis: At this stage, the development team groups the information obtained using the user journey map, prioritization challenge matrix, determining the value proposition, and UX matrix.

d. Ideate: At this stage, the team determines the solution to the problem obtained based on the information collected using scenario mapping, solution matrix, future hook model canvas, and user flow.

e. Prototyping: At this stage, the team builds a low-fidelity prototype from the results of a predetermined solution.

f. Test: At this stage, it is a testing process of the prototype that has been built.

From this phase of Design Thinking can be known user problems and solutions of these problems. A table of problems obtained from the interview process at the observe stage with 12 respondents who felt some of the same problems can be seen in table 1.

| Problems                                      | Number of respondents |
|-----------------------------------------------|-----------------------|
| Lazy to leave the house to shop for daily necessities | 3 Person              |
| The item sought does not exist.               | 8 Person              |
| The cost of other marketplace postage is prohibitive | 5 Person              |
| Queuing when shopping                         | 5 Person              |
| Spending beyond the planned budget            | 3 Person              |
| Items purchased are not appropriate           | 5 Person              |
| Poor service provided                         | 2 Person              |
| Goods damaged at the time of delivery         | 2 Person              |

From the table 1, it is obtained most of the problems experienced by potential users are when shopping often the items sought are not there, the cost of postage in other services is expensive, queueing when shopping and the goods purchased are not appropriate. So from the problems that have been outlined, it is determined that the purpose of the development of this retail marketplace website is to make it easier for users to shop for needs from home comfortably and appropriately and increase sales in the retail sector.

3.2 Initial Development Phase

Then the stage after the design thinking is the initial development phase that aims to build a high-fidelity prototype and validate solution ideas to prospective users. At this stage also doing some stages of design thinking again to perfect a predetermined solution.

a. Prototype: The team built a prototype from the previous stage in a low-fidelity prototype into a high-fidelity prototype.

b. Test: The team performs prototype testing on prospective users.
c. Synthesis: The team process collects problem findings from the testing process.
d. Ideate: The team process determines solutions based on problem findings and redefines the features to be built as Minimum Valuable Products (MVP).

The validation of this stage is to use usability testing of five user respondents by testing with three scenarios and using a usability scale (SUS) measuring tool to measure user perception of the prototype results of the solution that has been created. The test scenario table can be viewed in table 2. Based on Roobae’s research [15], experts such as Nielsen, Lewis, and Virzi believe that 80% of usability problems can be identified by sampling as many as five users.

| Goals | Scenario | Success Ratio |
|-------|----------|---------------|
| Shop by way of an order delivered | You are eager to cook brown rice, but you feel lazy to leave the house. Therefore you finally decided to order 1 kg of brown rice through the KIOOS website by way of an order delivered and paid cash on delivery | 100% |
| Shop by taking orders on the spot | You were told by your mother to shop for brown rice at ‘warung jajan’. Because you do not want to be complicated to have to wait in line and do not know whether the goods exist or not, you finally decide to order it in advance and pick it up later. Try buying 1 kg of brown rice at ‘warung jajan’ by taking it later. | 100% |
| View order list | After making an order, it turns out that you want to see the list of orders that you have ordered | 75% |

It can be seen that respondents can complete the test scenario. But one respondent cannot meet one of the testing scenarios. Therefore, it needs improvement and simplification of the transaction flow. The results of usability measurements using SUS can be seen in Table 3 below. SUS is often considered a Likert scale because there are questions about respondent level of agreement or disagreement to questions made on a scale of 1 to 5 points [16]. Based on Brooke’s research [17], the results of the SUS Score in the form of values 0 to 100 can be represented into several value groups such as “awful”, “poor”, “okay”, “good” and “excellent”. Obtained from SUS measurements with an average SUS score of 71.5 and falls into the category of “good” rating.

| SUS Questions | P1 | P2 | P3 | P4 | P5 |
|---------------|----|----|----|----|----|
| I can learn to use it quickly. | 4  | 4  | 5  | 4  | 4  |
| I think this app is too complicated. | 2  | 3  | 1  | 2  | 2  |
| I can quickly become skilled using this app. | 4  | 3  | 4  | 4  | 4  |
| I think I need an assistant to use this app. | 2  | 2  | 1  | 1  | 1  |
| This system is easy to learn how to use it. | 4  | 4  | 5  | 5  | 5  |
| I need to learn more when using this app. | 3  | 5  | 2  | 3  | 1  |
| Using this application is easy / no need to bother. | 4  | 3  | 5  | 4  | 5  |
| When I use this app, I feel confused. | 3  | 4  | 2  | 3  | 2  |
| This app helped me be more effective. | 4  | 3  | 4  | 4  | 4  |
| This app doesn’t meet my needs. | 1  | 5  | 1  | 2  | 2  |
| Total SUS Score | 72.5 | 45 | 90 | 75 | 75 |
| Rating | Good | Awful | Excellent | Good | Good |

3.3 Fully Development Phase

After obtaining the results of the previous process, the next stage is the Fully Development Phase stage. At this stage, the scrum process begins to be implemented in the software development process. Then in the development process required the team for the software development stage to run. Can be seen in table 4 shows a team of software developers in this study.

| Team Role     | Field of Work   | Number of Team Member |
|---------------|-----------------|-----------------------|
| Scrum Master  | Scrum Master    | 1                     |
| Product Owner | Product Owner   | 1                     |
| Development Team | UI/UX Designer | 1                     |
|               | Software Engineer | 2                     |
In this phase, there is a solution that has been obtained from the previous stage. Several stages can be seen as follows.

a. **Product Backlog**: Create a list of the needs of a product that will be realized in the scrum process.

b. **Sprint Planning**: At this stage, the planning process is carried out in the product backlog and determines the estimated time of working on a feature in the Sprint and determines the sprint backlog.

c. **Sprint Process**: The process of implementing an item from the sprint backlog with a predetermined time limit. In this study, the period of the sprint time was 1-2 weeks, and the daily sprint were done with a duration of 15 minutes.

d. **Sprint Review**: After completing the Sprint, the results of the work during the Sprint are reviewed to find out the errors that occurred in the software built during the Sprint.

e. **Sprint Retrospective**: The development team conducts a retrospective sprint to evaluate the previous Sprint when completed sprint review. If there is a deficiency, then it can be minimized in the next sprint.

The fully development phase was originally planned to be carried out by five people. But in the implementation is only implemented by three people where one person as a designer, one person doubles as a product owner and software engineer, and one person doubles as a scrum master and software engineer. Because several team members resigned, resulting in a change of role in the scrum process. Then in the middle of the scrum process, there is a plan to add people to fill the vacancy of the role on the scrum team. However, there are obstacles because there are no ideal candidates as members of the scrum team. It continued another alternative, namely simplifying flow in the transaction process and the development process was completed on time following release time has been set.

### 3.3.1 Product Backlog

After the problem and solution are obtained using design thinking methods, the next stage is fully development using scrum. The first step is to arrange a product backlog by determining the priority of a backlog item. From the product backlog that has been determined, the next step is to do sprint planning to plan the work to be done at the sprint stage and the results of sprint planning in the form of the sprint backlog. The product backlog in this study can be seen in table 5.

| Item Backlog                                              | Priority |
|-----------------------------------------------------------|----------|
| As a User, I want to create an account & log in to the KIOOS website | medium   |
| As a User, I want to confirm an account                    | medium   |
| As a User, I want to view the main page of the website     | high     |
| As a User, I want to see item details                      | high     |
| As a User, I want to view the store page                   | medium   |
| As a User, I want to search for items                      | high     |
| As a User, I want to add items to the cart                 | medium   |
| As a User, I want to make an order                         | high     |
| As a User, I want to change a profile                      | medium   |

### 3.3.2 Sprint dan Sprint Review

At this stage, the development team performs the implementation of the pre-planned sprint backlog. The estimated sprint time in this study is 1-2 weeks where after the sprint is completed sprint review to review the development team's work in a sprint that has been running.

### 3.3.3 Burn Down Chart

In projects that use scrum, the team makes measurements related to progress towards the release plan by updating the burndown graph in each sprint ended. The horizontal line on the burndown chart indicates the sprint, and the vertical line indicates the rest of the work at the beginning of each sprint [18]. Here's a burndown chart from this study.

![Burndown Chart Sprint 1](image)
As seen in figure 4, it shows the team's performance from the first sprint that began on June 30, 2021, with an estimated 36 estimation points. But at the time of implementation, there are obstacles so that the sprints are not running smoothly because the team feels that it is not ideal if the development phase is done with only two people who have a concurrent role with the role in the scrum. The team agrees at the middle of the Sprint to find team members, and the end of the first Sprint of work estimates the remaining 29 points.

As seen in figure 5, the second sprint on July 7, 2021, the team added the estimated points back to 37 points due to an important backlog to realize. In this second sprint, the team's condition is still carried out by two software developers because the team has not got new team member. Therefore, the development team tries to run the second sprint with two members of the development team. The result of this second sprint leaves a work estimation of 17 points and still cannot reach the target of the estimates that have been made. Before the third Sprint begins, the team plans to change the transaction flow of the website built to make simple flow transactions and realize the Most Valuable Product (MVP) of the website, consequently several stages of design thinking.

As seen in figure 6, the team-determined work estimation of 20 estimation points was carried out on July 15, 2021. The remaining estimated points are 0 points. This shows that the team can complete the entire pre-planned sprint backlog, and in this third Sprint, the MVP of the marketplace website is completed.

3.3.4 Velocity Chart

Velocity charts are used to determine the amount of work a team can complete on an upcoming sprint. In this study, the sprints conducted are as many as three sprints. The velocity chart of the sprint that has been done can be seen in figure 7, which shows that in the first sprint, the team can only complete 7 points estimate of the work estimation targeted at 36 points. In the second sprint, the team can only achieve a 15 points estimate from the estimated target of 37 points. In the third sprint, the team can complete 20 points of the targeted estimation.

The total velocity average value obtained by the team in this study is based on the results of team performance in the previous few sprints is 14 points which show that the team can ideally complete its work on time with an estimate of the average velocity value.
Based on research that has been done on the integration of design thinking and scrum in the development of retail marketplace websites obtained from the results of usability measurements using the metric system usability scale (SUS) that the average value of SUS is 71.5. The value of usability tests in a prototype website marketplace for retail belongs to a category of “good”. Based on measurement results, the average performance velocity of the team obtained average value is 14 points, which means in one Sprint. The team ideally achieved as many points like that. Therefore, it can be concluded that Design Thinking and Scrum can be the right combination to create a product based on existing problems by finding the right solution and realizing the solution quickly. However, in this study, there are still shortcomings, namely, in the development phase where the development team is only done by two people who play a double role in the Scrum that the sprint process carried out becomes hampered, and the work is less maximal. When going to implement the integration method to consider the number of team members and the ability of team members that the work produced is maximal and on time because these factors affect the team’s performance during the development phase. For further research, researchers provide suggestions for integrating Design Thinking with other software development methods.

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