MATICS: Jurnal Ilmu Komputer dan Teknologi Informasi ISSN : 1978-161X(p); 2477-2550(e)
(*Journal of Computer Science and Information Technology)* *Volume* 14, No. 2 (2022), pp 50-56
Received: October 11th 2022; **Accepted**: October 24th 2022; **Avalaible Online**: October 26th 2022

SCRUM Methodology Adoption in Designing Digital MSME Empowerment Application

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Abstract*—COVID-19 pandemic has significantly reduced most of MSME revenue, including Pelangi Nusantara Singhasari Foundation (PELANUSA). Market demand has decreased drastically, many activities and production have been delayed, which have an impact on the decline in sales turnover. This forces all activities to shift to the digital realm to ensure business continuity. In fact, the process of migrating community activities from conventional systems to digitalization poses a new problem for the management. The use of platforms that are still fragmented, the lack of knowledge of digital marketing concepts, to the limitations of the management in carrying out empowerment activities, especially for members of the disabled community. Specifically, disabilities members find it difficult to follow the concept of digital empowerment, because they still need special assistance from experts, especially for the deaf and speech-impaired members. Seeing this phenomenon, Institut Asia Malang collaborated with PT. Ina Gata Persada proposed an innovative solution in the form of a digital empowerment application called PELAWONS (PELANUSA for Women and Disabilities). The PELAWONS application is the first MSME digitalization empowerment platform that provides various empowerment features such as e-learning, e-commerce, and membership, which is equipped with deaf care features in the form of artificial intelligence speech-to-text & text-to-animation technology for members. with special needs (deaf and speech-impaired members). To achieve the suitability of the purpose of PELAWONS with functionality and timeliness, it takes an analysis and proper software design. SCRUM is considered to be able to produce good quality software according to user desires, can be used in large and small projects, and easy to adopt changes. We developed PELAWONS refers to the five main steps on SCRUM process: establishing SCRUM team, defining list of the product backlogs, arranging the sprint phase, analyzing the progress through daily scrum, and evaluating the result with sprint review. SCRUM methodology adoption in designing PELAWONS proven to be able to accelerate the application development process and reduce the risk of project failure through system flexibility.

***Index Terms*—MSME, product backlog, sprint, SCRUM, women empowerment**

I. Introduction

THE government's commitment to building an inclusive society is strengthened through Law no. 8 of 2016 concerning Persons with Disabilities (PWD), where PWD have the right to live independently and be involved in society. All stakeholders are deemed necessary to involve and empower PWD in economic development. This has encouraged the Pelangi Nusantara Singhasari Foundation (PELANUSA) to actively empower women, especially PWD and the marginalized. Established in 2012, PELANUSA is a social entrepreneur-based MSME community engaged in textile craft by utilizing garment waste in the form of patchwork as its main raw material.

PELANUSA was formed to address environmental problems while simultaneously improving the economy through a program to empower women from various backgrounds such as former female workers, out-of-school teenagers, early marriage women, to women with disabilities, by honing their skills to process patchwork into high-value products. Currently, 1,587 people have registered as members of the PELANUSA community spread throughout Indonesia.

The COVID-19 pandemic has significantly reduced PELANUSA's revenue by up to 50% in 2020. Market demand has decreased drastically, many activities and production have been delayed, such as tourist visits and student study tours, which have an impact on the decline in sales turnover. In fact, some of PELANUSA's investors have started to shift to other sectors due to the lack of income. In view of the not getting better condition, PELANUSA management has changed its business strategy as follows: (1) the focus of production was shifted to pandemic necessities, handicrafts and home decorations (2) marketing began to be carried out digitally through e-commerce and social media (3) activities Empowerment of members is changed to online through educational videos and holding live conferences.

Institut Asia Malang in collaboration with PT. Ina Gata Persada proposed an innovative solution

Manuscript received October 11, 2022. This work was supported in part by Informatics Engineering Department of Maulana Malik Ibrahim Islamic State University.

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application called PELAWONS (PELANUSA for Women and Disabilities). The proposed application is the answer to all partner problems with the following main features: (1) digital marketing – online shop (2) academic – online courses (live conference & video tutorials) (3) centralized communication – chat & online group discussion (4) deaf care - special feature for disabled (deaf) members. Types of application users are divided into two types, namely community members and public. Community members have the privilege to access all application features, while public users are limited to online shop features (as customers) and view certain video tutorials. Then the deaf care feature by collaborating with artificial intelligence technology and 3D animation for converting speech-to-text and text-to-vision/animation in sign language.

To achieve the suitability of the purpose of making applications with functionality and timeliness in making applications, it takes an analysis and proper software design. The AGILE method with the SCRUM approach is one of the frameworks that is widely used in managing flexible software development projects [1]. There are three roles allocated in a SCRUM team: The Product Owner (PO), a SCRUM Master (SM), and a cross-functional team. SCRUM specifies five activities for teams in order to achieve its goals: backlog refinement, sprint planning, daily scrum meeting, sprint reviews, and sprint retrospective [2].

A study specifically evaluated the effectiveness of the scrum method in software development for digital industries and organizations. The evaluation was carried out based on 7 parameters. Scrum method basically prioritizes speed and flexibility in software development projects. In terms of functionality, the existence of Scrum makes system functionality more secure. It doesn't require too many team members, so the scrum method is very effective in implementing software development in an industry or digital organization that is relatively fast, doesn't take much time, and isn't much integrated or too complex [3].

The same thing was also stated through [4] that the SCRUM method helps in the process of developing the Palembang Poltekpar SMM information system that successfully meets user needs in accordance with the product backlog that has been compiled in the stages of scrum: requirement gathering, product backlog, sprint backlog, sprint, IS development, and delivery & implementation.

Furthermore, the implementation of Scrum and Agile in the LENTERA Information System development process resulted in an increase in the Usability Score of 73, and was included in the "Good" category. This indicates an improvement from the previous usability score of 47 with a "Very Bad" rating. In addition, using the Scrum Framework & Agile mindset can produce several forms of document documentation such as the Product Backlog, Product Backlog details that help in the LENTERA system development process [5]

To achieve the effectiveness of SCRUM in constructing the PELAWONS application, this study adopted a legislation information system (LIS) scheme that puts forward the prioritization of backlog products to be developed [6][7]. The use of SCRUM based on LIS in PELAWONS applications is expected to be able to provide benefits in delivering application with the highest possible value and quality.

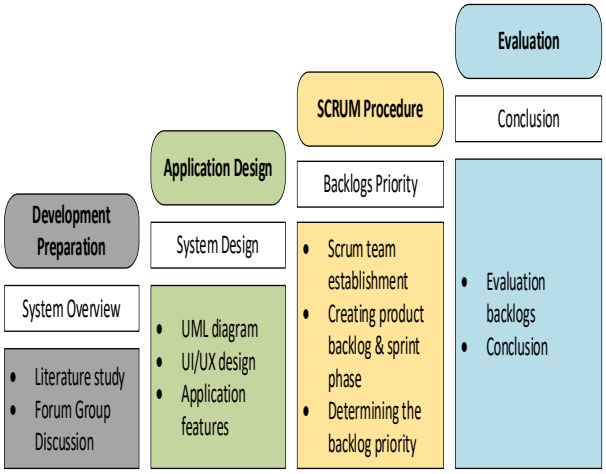

Fig. 1. Research Steps

II. METHODOLOGY

This study begins with development preparation by collecting literature for a deeper comprehension of the SCRUM method. SCRUM is considered to be able to produce good quality software according to user desires, can be used in large and small projects, and easy to adopt changes [8]. Besides this, we also conducted several forum group discussions with relevant stakeholders to dig up detail information related to application development needs [9].

Furthermore, we organized a joint research (between universities and partners) regarding the technology and methods to be used, agreement on application features according to user needs. This document serves as a guide for the next stage, namely system design [10]. This stage produced some blueprints of the application include UML diagram, UI/UX design, and list of the application features.

The next system development mechanism refers to the SCRUM process. The stages include forming a Scrum team, creating a product backlog and the sprint phase. Each product backlog that has been created will be discussed with the team to determine the priority scale of each backlog in achieving time efficiency and product quality.

The final result of all stages of the research is an evaluation and conclusion to determine the suitability of SCRUM in designing the PELAWONS application. We summarize our research steps in Figure 1.

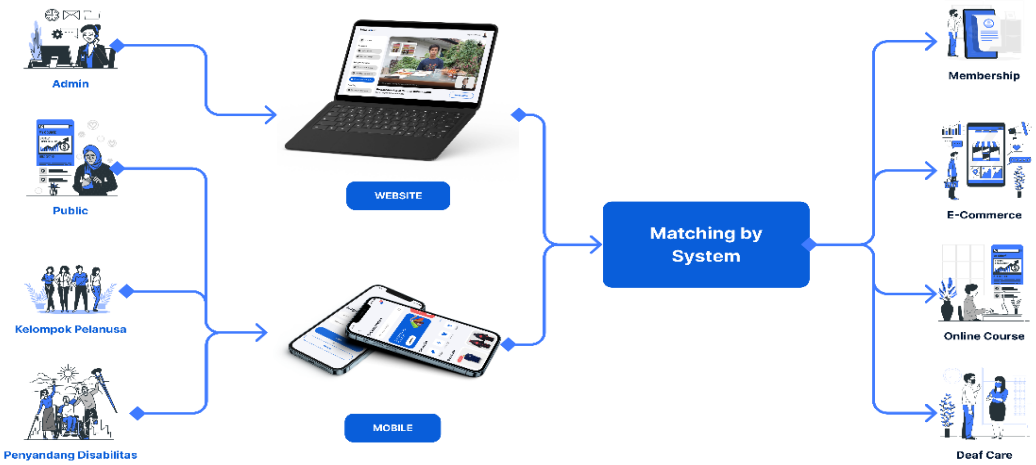

Fig. 2. PELAWONS Application Overview

III. Results and Discussion

A. PELAWONS Overview

The PELAWONS application is the first MSME digitization platform that provides digitally centralized empowerment features, special marketing needs for member handmade products, and has features for users with special needs (deaf and speech impaired) that are not found on other MSME platforms. This feature collaborates with artificial intelligence technology and 3D animation for converting speech-to-text and text-to-vision/animation in sign language. This feature will be available automatically in empowerment activities such as live conferences or video tutorials.

PELAWONS is an integrated web and mobile-based application. The mobile-based application can be accessed by all users, both the public and members of the PELANUSA Foundation community, including persons with disabilities. While desktop-based applications (websites) are specifically intended for admins and mentors, where admin access rights are intended to manage the overall information content displayed on the application, while mentor access rights are given specifically for course features only.

The main features provided in the PELAWONS application include membership features, e-commerce, online courses and special deaf care features for people with hearing impairments. Globally, the system overview of the PELAWONS application is shown in Figure 2.

B. SCRUM-based PELAWONS Development

SCRUM is a one the agile practices, it is an incremental approach and iterative in nature used to manage the complex work means develop the complex software products with the frequently changing business requirements. SCRUM consists of predefined roles and which also has a group of processes. Scrum roles include SCRUM master who keeps up the whole process, Product Owner who is a stakeholder or customers, and SCRUM team. Whole product is divided into small increments which are shippable deliverables that can be checked for each sprint's end [11].

Product Backlog

Product backlog is a crucial part of the SCRUM process which contains a list of prioritized jobs for the development team according to the roadmap and requirements. Generally, a list of the most important will be displayed at the top so the team knows which work to do first [12]. Table 1 shows a list of product backlogs based on the features provided in the PELAWONS application.

Table 1. Product Backlogs Features for PELAWONS

No	Backlogs	Importance Level (1-100)	Estimated Time (days)	Demonstrations
1.	UML design	100	3	Checks whether the UML design meets the application requirements
2.	Administrator login page	100	2	a) Click login button b) User can submit data based on system c) Login successful if data is correct
3.	Manage dashboard (home)	100	2	Admin can view, add and edit data
4.	Manage user access rights	100	2	Admin can manage and add user access based on the level of access rights
5.	Manage user transaction data	80	3	Admin is able to manage all types of transaction data on all application features
6.	Manage report data	80	2	Admin is able to process all types of report data on all application features
7.	Manage membership data	100	3	Admin can manage all application membership data
8.	Manage e-commerce data	90	3	Admin can manage payment transaction activities and reporting
9.	Manage online course data	90	3	Admin can manage course data, video tutorials and transactions
10.	Manage deaf care features	100	4	Admin can manage the deaf care feature on the e-learning feature

Sprint Phase

The heartbeat of Scrum is the Sprint, where in a Sprint, a number of planned work must be completed by the team and prepared for review. A sprint is a work activity that the Scrum team must complete within a predetermined period of time, usually one month or less in duration. The goal of Sprint is to break the project into smaller sized chunks. This allows the team to plan one Sprint at a time and adjust future Sprints based on the results of the completed Sprints [13][14]. We categorized our sprint phase for PELAWONS into three stages, namely sprint planning, daily scrum, and sprint review.

Table 2. Sprint Backlogs for 1st Sprint

No	Backlogs	Story	Task	Est. Time (days)
1.	UML design	-	Functional requirement analysis	1
			Use case diagram	1
			Activity diagram	1
2.	Administrator login page	Admin can enter the system after logging in	Database admin	0.5
			User interface for login page	0.5
			User data management using PHP	0.5
			Login feature test	0.5
3.	Manage dashboard (home)	Admin can view, add and edit data	UI design analysis and implementation using PHP	1.5
			Data management feature analysis in general	0.5
4.	Manage user access rights	Admin can manage and add user access based on the level of access rights	Create database relations and fields	0.5
			UI design based on user access rights	0.5
			User management rights using PHP	1
5.	Manage user transaction data	Admin is able to manage all types of transaction data on all application features	Database transaction scheme	0.5
			UI design for transaction data	0.5
			Transaction data management using PHP	1.5
			Functional test based on data transaction management	0.5
6.	Manage report data	Admin is able to process all types of report data on all application features	Report database scheme	0.5
			UI design based on report data feature	0.5
			Report data using PHP	1

1) Sprint Planning

Sprint planning is an event in SCRUM that kicks off the sprint. The purpose of sprint planning is to define what can be delivered in the sprint and how that work will be achieved. Sprint planning is done in collaboration with the whole SCRUM team.

For all of product backlogs, we divided all tasks into two sprints. Each sprint planning will result sprint backlog, as shown in Table 2 and Table 3.

Table 3. Sprint Backlogs for 2nd Sprint

No	Backlogs	Story	Task	Est. Time (days)
1.	Manage membership data	Admin can manage all application membership data	Database scheme for membership	0.5
			User interface for membership module	1
			Membership module using PHP	1
			Membership feature test case	1
2.	Manage e-commerce data	Admin can manage payment transaction activities and reporting	Database scheme for e-commerce	0.5
			User interface for e-commerce	1
			E-commerce implementation using PHP	1
			E-commerce test case	0.5
3.	Manage online course data	Admin can manage course data, video tutorials and transactions	Database scheme for online course	1.5
			UI design for online course	1
			Online course implementation using PHP	1
			Online course feature test case	0.5
4.	Manage deaf care features	Admin can manage the deaf care feature on the e-learning feature	Deaf care database scheme	0.5
			UI design for deaf care feature	1
			Deaf care feature implementation using PHP	1
			Deaf care feature test case	0.5
			Evaluation and analysis	0.5

Six backlogs with 14 days estimation time for first sprint planning is used to plan and create dashboard views from PELAWONS app. We assumed that if there are two persons in charge with 75% focus factor, this work can be completed within 11 days. This calculation is described as follows.

Sprint length : 10 days
*Man days : 2 persons * 7 days = 14*
Focus factor : 75%
*Estimation speed : 14 * 75% = 10.5 (days)*

The second sprint planning is used to plan and create dashboard features for mobile application. We created four backlogs with 13 days as shown in Table 3. As previously mentioned, we also assumed that if there are two persons in charge with 70% focus factor, this sprint can be completed within 10 days. This calculation is described as follows.

Sprint length : 10 days
*Man days : 2 persons * 7 days = 14*
Focus factor : 70%
*Estimation speed : 14 * 70% = 9.8 (days)*

2) Daily Scrum

Daily Scrum is important to inspect progress toward the Sprint Goal and adapt the Sprint Backlog as necessary, adjusting the upcoming planned work. The Daily Scrum is a 15-minute event for the Developers of the Scrum Team. To reduce complexity, it is held at the same time and place every working day of the Sprint [15].

To monitor and analyze team performance and find out the progress of the ongoing development process, we use burndown chart as visualization. Burndown chart are used to illustrate the relationship between the amount of work remaining at any point in time and the progress of developer team [16].

There are two main parameters we used in burndown chart, that are ideal task remaining and actual task day remaining. Ideal task remaining is a reminder line of story point estimates that must be completed in the working day. Meanwhile, actual task day remaining is a reminder line for remaining story points [17]. In this research, we have two burndown charts for 1st sprint (website dashboard view) at Figure 3 and 2nd sprint (mobile application features) as shown in Figure 4.

For the 1st sprint (Figure 3), the estimated work remaining starts from August 1 to 12, 2022. The orange

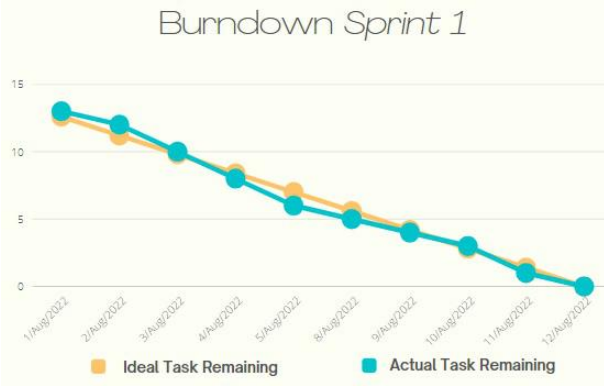

Fig. 3. Burndown Chart for 1st Sprint

line on the chart indicates the ideal task remaining, while the blue line indicates the actual task remaining. In accordance with the previous sprint planning, the estimated time for the first sprint backlog will take about 11 days. It can be seen that the actual bag remaining line at the start of the sprint (August 1-3, 2022) is above the ideal task remaining line, which indicates that the team managed to complete the work faster. However, on day four to nine, the actual task remaining line is below the ideal task remaining line, which indicates that the work is running slower than scheduled. This delay was due to technical problems encountered during the project work process.

For the 2nd sprint (Figure 4), project work will begin on August 15 to 26, 2022, with an estimated work time of 10 days (based on sprint planning calculations). When the job starts, the actual task remaining line appears below the ideal task remaining line (15-24 August). Even if you experience delays at the beginning of the sprint, at the end of the sprint it appears that the work can be completed more quickly (the actual task remaining line is above the ideal task remaining line on August 25-26).

Based on the burndown chart in both sprints, it can be

Fig. 4. Burndown Chart for 2nd Sprint

seen that the team was able to complete the dashboard design and application feature creation for the administrator (website) and mobile (users) of the PELAWONS application within the allotted time.

3) Sprint Review

Sprint review is conducted after the sprint duration has been completed. A sprint is considered complete if it has reached the previously defined and agreed definition of done (DoD). At the sprint review stage, the team will demonstrate what has been done during the sprint that has taken place to stakeholders. The product owner will also explain what work has been and has not

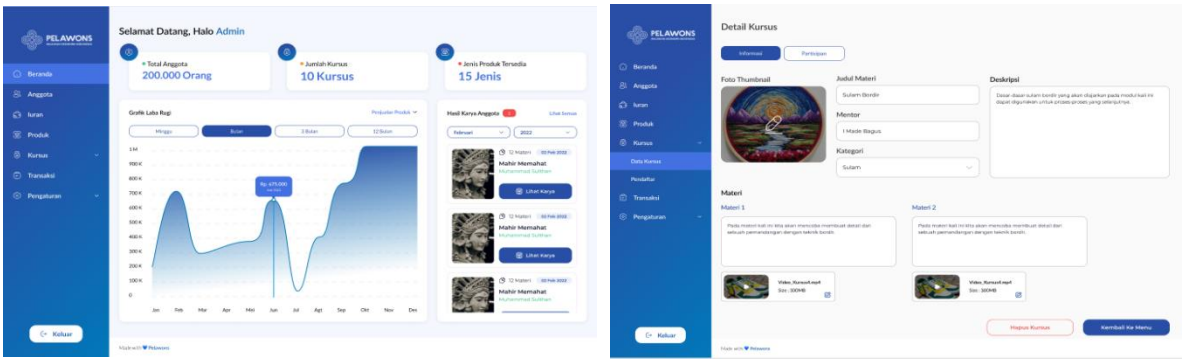

Fig. 5. Application Results for Sprint Review

been completed. In a sprint review, the entire team collaborates to determine work for the next sprint planning [18].

The results of the sprint review in both sprint phases in creating the PELAWONS application are shown in Figure 5. There are some menus in the dashboard such as Home, Members, Products, Online Courses, E-Commerce, and so on. In addition, we can see the total membership, the number of online courses, and the types of products offered.

IV. CONCLUSION

At the daily scrum backlog sprint 1 on 1-3 August 2022 and sprint 2 backlog on 25-26 August 2022, it shows that the actual task remaining is able to be above the ideal task remaining, this explains that the team is able to work on the project faster than the set time. Therefore, Scrum method is very suitable in overcoming changing requirements in the system change phase. The Scrum method has iterative stages where if the features in the first sprint are not sufficient to meet user needs, then in the next sprint a system can be developed that is in accordance with user evaluations for PELAWONS application.

Each task in the sprint must be well defined because it will have an impact on the estimated cost and time of the project. It takes experienced team members to be able to carry out each task in a sprint to keep the project running on time. Furthermore, the SCRUM method can work well if it is led by a SCRUM Master who manages team members and work (analytical and technically) wisely so as not to demoralize and fail the project.

ACKNOWLEDGMENT

This study is collaboration program between Institut Asia Malang, PT. Ina Gata Persada and Yayasan Pelangi Nusantara Singhasari. Thank to the Ministry of Education, Culture, Research, and Technology (KEMDIKBUDRISTEK) for providing financial support through the KEDAIREKA Matching Fund Program 2022.

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