

Using the Scrum Method to Develop Population Information System

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Abstract—The adoption of Population Information System is crucial to enhance work effectiveness and serves as a manifestation of transparency in population data management. The complexity from design to implementation of such a population information system poses its own challenges. There are at least three main issues in system design, namely time estimation, team management, and ensuring the quality of system being developed. These issues must be addressed early on to prevent potential team management problems during the design and development stages of the application. One suitable method that can be employed for the design of the population information system is the Scrum methodology. Scrum is a software development framework that emphasizes a collaborative and adaptive approach. It falls under the Agile methodology, aiming to produce products that are more responsive to changes and enabling teams to adapt quickly in a dynamic environment. While the Waterfall method tends to follow predefined in linear steps. The novelty of this research lies in the proactive approach to addressing the complexity of designing population information systems by implementing Agile methodologies such as Scrum. The use of the Scrum method in designing this system can elucidate the complexity in design from each task performed to the implementation stage compared to the use of the Waterfall method.

Index Terms—Population Information System; Scrum Method; System Design

I. INTRODUCTION

The development of a Population Information System (PIS) using the Scrum method faces several challenges that need to be addressed. First, the complexity of user requirements is a critical factor that requires a deep understanding to integrate various needs from the government, private institutions, and the general public into a product backlog that can be managed within Scrum sprints. Effective priority management is also crucial to ensure the development of the most valuable features for users, yet determining priorities among various features and requirements of the PIS can be a significant challenge. Furthermore, the

availability of consistent and accurate data is key in PIS development, requiring extra efforts to ensure that adequate and reliable data is available. Effective communication with stakeholders, including local governments, administrative officers, and the general public, is also necessary to ensure good collaboration and a clear understanding of the needs and expectations from various related parties. Lastly, the ability to adapt to changing requirements and regulations is an important aspect of PIS development with Scrum, requiring flexibility and adaptability from the entire development team. With careful management and effective collaboration, these challenges can be overcome to achieve success in PIS development using the Scrum method.

The rapid advancement of information systems demands every institution or organization to digitize their work. Information systems are organized ways to collect, input, process, and store data, as well as to manage, control, and report information in such a way that an organization can achieve its set goals [1]. In the modern era, with its rapid development, the handling of information has started to utilize sophisticated technological tools such as computers and other supporting devices, for example, the Population Administration Information System, which facilitates the handling of information used in government activities, one of which is the management of information throughout Indonesia. It is well-known that the birth rate is faster than the death rate.

The PIS is a collection of all data from all regions of Indonesia in a network that is interconnected between regions [2]. The PIS comprises population data from all regions of Indonesia in an integral network where all population data in various regions are interconnected [3]. The Population Administration Information System is a crucial foundation in managing population data, identification, administration, and various other related information.

The development of this system is a complex one that involves a development team and substantial financial support. Thorough planning for the design of

this application is crucial to prevent failures in the design and implementation of the system. One suitable method for designing this system is to use the Scrum method. This is because the flow present in Scrum can foster close collaboration between the team and users, ensuring that the resulting solution meets the requirements.

The Scrum method follows the Agile approach in software development. Scrum is defined as a framework of stages/processes applied to manage and execute the development of computer applications, whether simple or complex. Scrum is beneficial in producing a product with maximum value in a productive and creative manner and can be developed incrementally in information system development [4]. This is because Scrum provides a framework that is responsive to changes through repeated development cycles, allowing quick adjustments if there are changes in the environment or requirements. Scrum also promotes transparency in the development process, aiding in monitoring system progress and information accuracy. Compared to the commonly used Waterfall method, the Scrum approach offers greater flexibility in dealing with changes in requirements or needs that may arise during the development process.

Features that are most important or urgent for operations or policies can be given higher priority in development. Scrum encourages transparency throughout the development process. This is beneficial in managing the system as it allows better oversight of system progress, data changes, and information accuracy. The Scrum method can bring about real progress in the system and provide benefits to users earlier in the development process.

The use of the Scrum method offers several significant benefits. First, Scrum provides high flexibility and adaptability, allowing the team to quickly adjust to changing requirements or regulations, which is crucial in the context of PIS. This method also enhances collaboration and communication through daily meetings, sprint planning sessions, sprint reviews, and retrospectives, ensuring all parties are aligned and can provide valuable feedback continuously. Project transparency and visibility are also improved, as stakeholders can directly observe system progress and provide timely feedback. Priority management becomes more effective with an always-updated product backlog, enabling the team to focus on the highest value features first. Product quality is enhanced through testing at the end of each sprint, allowing early identification and correction of issues. Being responsive to user feedback is easier, as end users can provide input at each sprint review, ensuring the final product meets their expectations and needs. Additionally, Scrum allows for more efficient use of resources by focusing on important tasks in short sprint cycles, reducing wasted time and increasing productivity. Overall, implementing Scrum in the development of PIS provides a clear and adaptive structure, enabling the team to effectively address

complex challenges and produce a responsive, high-quality system that meets user needs.

II. METHODOLOGY AND IMPLEMENTATION

The method employed in designing this system is the Scrum method. The Scrum approach is one of the software engineering methods that utilizes the principles of the Agile approach [5]. The principles in the Scrum method must align with the agile manifesto, which serves as a guide for development activities within a process [6].

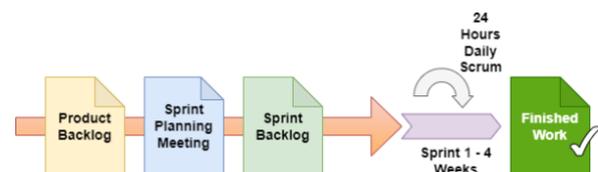


Fig 1. Phases of Scrum Method

A. Product Backlog

The Product Backlog consists of several backlog items designed/created based on user requirements [7]. These items are obtained through data collection (interviews, observations, and literature studies). The data collection stage in this research was obtained through two methods: interviews with end-users and observation [8]. The basic requirement of a product backlog is dynamic so that it can continually evolve as the development team receives input/changes/feedback from the user team during the evaluation and application demo processes [9]. In the product backlog, researchers prioritize the essential requirements for the development of this information system, as seen in Table 1.

TABLE I. PRODUCT BACKLOG

Requirements	Priority Levels
Login page	High
Data Login	High
Village Information System	Moderate
Databases	High
Input data population	High
Administrative documents	Moderate

This priority level is based on essential tasks that must be completed and demonstrated to users. These levels also assist developers in prioritizing work that needs to be addressed first. Each level may not be interconnected with other requirements or menus.

B. Sprint Planning

This process accommodates the use of the Scrum method. Through this process, the system design team

is formed, budgeting is done, and planning for the work duration is carried out [10]. In this stage, the Scrum Master will form the development team that will later develop the PIS. Additionally, the Scrum Master will schedule each Product Backlog item to be worked on. These estimations are determined based on the difficulty level of each Product Backlog item to be worked on and the readiness of the data required by the development team from the end-users.

The Sprint Planning involves planning the execution of the product backlog during the sprint [11]. This stage includes designing the system, mapping functional requirements that have been analyzed into a diagram, and explaining the database design. The system design must adhere to user requirements and be easily usable by end-users [12]. Additionally, Sprint Planning estimates the time required for features in each sprint [13]. In this stage, the backlog will be broken down into several tasks that need to be completed for a backlog item within one sprint. An example of sprint planning for Input Data Population can be seen in Table 3.

TABLE III. TIMELINE SPRINT BACKLOG OF INPUT DATA POPULATION

Requirements	Estimated (Days)
Family card registration data input	2
Marriage registration data input	1
Divorce registration data input	1
Birth registration data input	1
Death registration data input	1
Residential relocation data input	1

C. Sprint Backlog

This stage must be carried out each time a new sprint is executed. In this phase, it is necessary to organize the processes into sub-tasks that need to be completed during the initial period of the sprint. The Sprint Backlog is a product backlog divided into several parts to be worked on in the upcoming sprint phase. The duration of a sprint usually ranges from 1-4 weeks, depending on the agreement with the Scrum Team [14]. Daily stand-up meetings are conducted to review the previous work and discuss the upcoming tasks. The timeline for the sprint backlog can be seen in Table 2.

TABLE II. PRODUCT BACKLOG

Requirements	Sprint Backlog	Estimated (Days)
Login page	1	2
Data Login	2	3
Village Information System	3	6
Databases	4	7
Input data population	5	7
Administrative documents	6	5

D. Sprint Review

A Sprint is a unit of work required to meet the defined needs in the backlog within a predetermined time-box [15] also in this stage each team member demonstrates tasks completed during the one-sprint period [16]. This stage will describe whether the implementation of the features has been completed or not. The demonstration of completed work is carried out to provide information to users about the software produced and to gather user feedback for evaluation. At the end of each sprint, a sprint review is conducted, attended by the Scrum team: Scrum Master, Product Owner, and the Development Team [17]. During the sprint review, the Scrum Master presents features that have been completed. If there are no issues with the features, the system can be handed over to the users.

TABLE IV. SPRINT REVIEW OF INPUT DATA POPULATION

Requirements	Sprint Backlog	Status (Completed/Not Completed)	Feedback
Family card registration data input	5	Completed	-
Marriage registration data input	5	Completed	-
Divorce registration data input	5	Completed	-
Birth registration data input	5	Not Completed	This requirement needs to include the time of birth and the name of the assisting personnel involved in the birthing process
Death registration data input	5	Completed	-
Residential relocation data input	5	Completed	-

Table 4 simulates that there are 6 requirements being worked on. All of these requirements are included in the sprint backlog (Input Data Population) as stated in Table 2. Based on these requirements, one requirement remains incomplete, namely "Birth Registration Data." The user has provided feedback that this requirement has not yet recorded the time of birth and the personnel who assisted in the birthing process.

E. Sprint Retrospective

The next stage in the Scrum implementation is the sprint retrospective, conducted at the end of each sprint [18]. At this stage, all team members have the opportunity to express their opinions and evaluations regarding the performance during the implementation of the Scrum method. Table 5 displays a simulation of the Sprint Retrospective in the Population Information System.

TABLE V. SPRINT RESTROSPECTIVE OF INPUT DATA POPULATION

Requirements	Challenges	Solutions
Birth registration data input	Difficult to integrating Family Head's National Identification Number (NIK)	The National Identification Number (NIK) table for family heads is created as the parent table and integrated with a table containing infant data.
Residential relocation data input	Difficult in transferring the NIK for the head of the family. The data was deleted or just changed status but the data is still available.	The data for family heads who relocate is not deleted but is assigned the status "Moved."

The challenges faced during the development of this population information system can be both technical and non-technical in nature. Both technical and non-technical challenges still require guidance from users.

III. CONCLUSION

In the development of PIS, the use of the Scrum method has proven effective in improving efficiency and transparency in the development process. This method allows for the formation of a responsive and adaptive development team to changes in user requirements. The stages in Scrum, from planning, design, implementation, to testing, are collaboratively conducted between the development team and end-users. This enables rapid iterations and feedback to rectify errors or deficiencies early in the development process. However, the use of the Scrum method also requires effective communication among all parties involved, especially in ensuring user needs are met and addressing issues that arise during development. Thus, implementing the Scrum method in the development of Population Information Systems brings significant benefits in achieving the goals of effectiveness and transparency in system development.

Furthermore, for future research, it is recommended to continue the analysis of effective development strategies to address the challenges faced in the development of PIS. This may include further research on the use of specific software development

methodologies, such as Scrum, as well as exploration of key factors influencing the success or failure of PIS implementation. Thus, future research can provide deeper insights and more precise solutions in overcoming the challenges in PIS development.

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