

# Implementing the Scrum Method for Developing a 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. 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. 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. Thus, it is expected that the implementation of Scrum will bring significant changes in improving the effectiveness and transparency in the development of population information systems.

**Keywords**—Population Information System, Scrum Method, System Design, Team Management

## I. INTRODUCTION

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 Population Administration Information System is a collection of all data from all regions of Indonesia in a network that is interconnected between regions [2]. The Population Administration Information System 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 population information 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.

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 Population Administration Information 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.

## II. METHODOLOGY

The research procedures conducted can be seen in Figure 1. The research methodology employed utilizes a solution-oriented and adaptive approach. This means that the methodology involves interaction between the application development team and end-users. Additionally, the research methodology used can also be applied to the design of other systems that utilize Scrum, as the framework in the research methodology accommodates the implementation of Scrum.

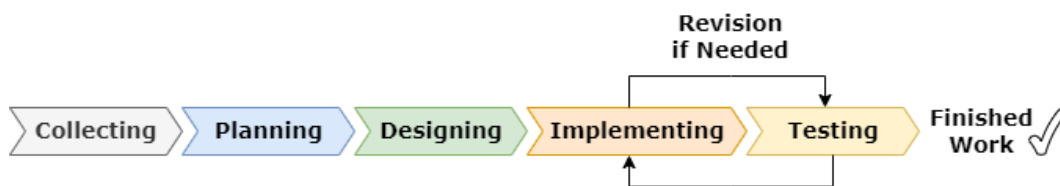


Figure 1. Research Methodology

### A. Collecting

The data collection stage in this research was obtained through two methods: interviews with end-users and observation [5]. The interview stage was conducted face-to-face with end-users and relevant stakeholders. The end-users referred to here are the village device staff who will use this system. The interviews conducted with village staff involved questions related to the system requirements to be developed and aspects related to administrative processes, such as population registration, correspondence sections, village documents, and so on. In addition to interviewing village staff, the researcher also observed the supporting facilities that will be used to run the population information system. The relevant facilities are referred to including computers and internet networks. Overall, from this stage, the researcher will obtain input and output data, especially regarding the format of letters needed as the final output of data storage from the system.

### B. 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 [6]. In this stage, the Scrum Master will form the development team that will later develop the Population Information System (SIK). 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.

### C. Designing

Design is a stage for designing the system to be created. Design involves creating mock-ups of the system, designing the database, and use cases. This stage involves the entire development team. The design of SIK will be presented to end-users. The development team will be represented by the Scrum Master to present the system design and its usage flow. The system design must adhere to user requirements and be easily usable by end-users [7].

### D. Implementing

The implementation stage is the phase for creating the system that has been previously planned and designed [8]. In this stage, the Scrum Master will oversee each task performed by the development team. During the implementation period, end-users may provide input if needed [9]. Constraints experienced by each development team during the implementation period will be documented. If necessary, the Scrum Master will communicate with end-users in case of issues or improvements.

### E. Testing

The final stage in developing this Population Information System (SIK) is the testing phase. In the Scrum method, testing is conducted when the system has been completed and meets the requirements specified by the users [10]. This testing is performed by end-users, the Scrum Master, and all involved development team members. This stage still allows for adjustments and additional features to be made to the system. However, any system improvements made at this stage are not usually significant.

## III. RESULT AND DISCUSSION

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 [11]. The principles in the Scrum method must align with the agile manifesto, which serves as a guide for development activities within a process [12].

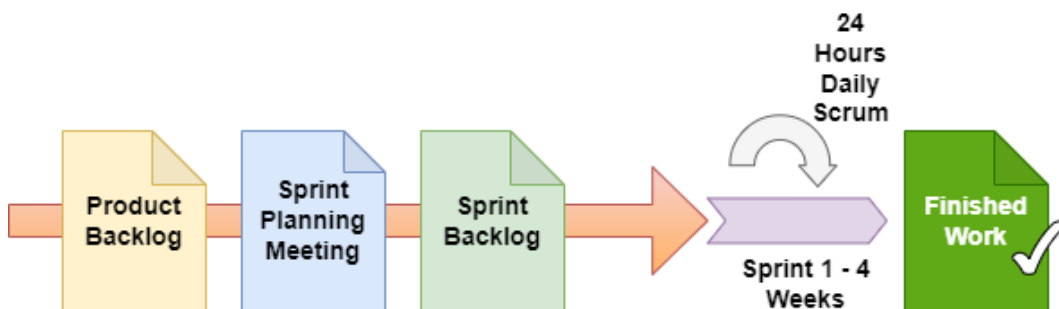


Figure 2. Phases of Scrum Method

### A. Product Backlog

The Product Backlog consists of several backlog items designed/created based on user requirements [13]. These items are obtained through data collection (interviews, observations, and literature studies). 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 [14]. In the product backlog, researchers prioritize the essential requirements for the development of this information system, as seen in Table 1.

Table 1. 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

Sprint Planning involves planning the execution of the product backlog during the sprint [15]. This stage includes designing the system, mapping functional requirements that have been analyzed into a diagram, and explaining the database design. Additionally, Sprint Planning estimates the time required for features in each sprint [16]. 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 3. 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 [17]. 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 2. 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 [18] also in this stage each team member demonstrates tasks completed during the one-sprint period [19]. 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 [20]. 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 4. 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 [21]. 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 5. Sprint Retrospective 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.

#### IV. CONCLUSION

The adoption of the Scrum methodology in developing the Population Information System serves as a solution to the challenges arising both before and after the system is created. Through the Scrum method, the team works in periods known as "Sprints." These periods enable developers and end-users to collaborate regularly and purposefully in evaluating the project. Time estimation for the tasks is determined during the Sprint Backlog period. After each Sprint, a more detailed analysis of the system's features is conducted to determine the estimated time required for menu feature development. Each Sprint involves a Scrum Master as the project/system overseer, a Product Owner representing end-users, and the Development Team serving as the technical team in system development. The three collaborate to ensure the quality of the system. Quality assurance is conducted through the Sprint Review phase, ensuring that all system features are operational and gathering feedback from the Product Owner. Meanwhile, the Sprint Retrospective involves obtaining information from the Development Team regarding issues and solutions encountered during each task. The Scrum methodology, with its systematic processes, can effectively address challenges in the creation of the Population Information System.

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