

Implementation of an Integrated Information System for Construction Services Development to Support Infrastructure Projects at the Public Works Department of Tarakan City

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Abstract

Efficient infrastructure development requires effective management, particularly in developing construction services. The Public Works (PU) Department of Tarakan City faces challenges in overseeing and guiding construction service providers to ensure smooth execution and project quality. This study aims to design and implement an integrated information system using the Scrum method, which supports construction service development, project progress monitoring, contractor data management, and budget supervision. Scrum was chosen to enhance flexibility and collaboration among development teams by allowing the system to be built iteratively and incrementally. The system is designed to improve transparency, efficiency, and accuracy in managing construction projects. The implementation results show that applying the Scrum method in developing the integrated information system has successfully accelerated the verification process, reduced administrative errors, and improved budget control. Additionally, the system has increased project management efficiency, expedited decision-making, and facilitated monitoring and evaluation processes. This study recommends further development and expansion of the system to support more effective construction service development in the future.

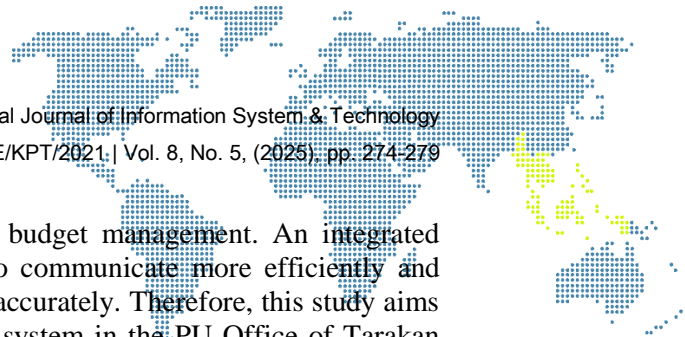
Keywords: Integrated information system, Scrum method, construction service development, infrastructure projects, project management, PU Department of Tarakan City.

1. Introduction

Infrastructure development is one of the main pillars of a region's progress because good infrastructure can support economic growth, improve the quality of life of the community, and facilitate the distribution of goods and services. In this context, the construction sector plays a very important role in implementing various infrastructure projects. At the local government level, the Public Works Department (PU) is responsible for managing and supervising construction projects, from planning to completion.

However, the Tarakan City PU Agency faces various challenges managing infrastructure projects, especially regarding coaching construction services. The lack of an integrated system often hogs the coaching process, which involves many parties, such as contractors, supervisors, and various units within the PU Agency. The main obstacles that reduce work effectiveness and efficiency are the fragmented project supervision process, difficulty in monitoring work progress, and constraints in managing contractor data and budgets. In addition, the contractor's performance verification and evaluation process is still often done manually, which affects the speed and accuracy of decision-making.

In dealing with these problems, information technology is a very relevant solution. Implementing an integrated information system can improve the quality and speed of project data management, facilitate the supervision and monitoring of contractor



performance, and increase transparency in project budget management. An integrated information system will allow all related parties to communicate more efficiently and access and manipulate project data more easily and accurately. Therefore, this study aims to design and implement an integrated information system in the PU Office of Tarakan City that can support the development of construction services and increase effectiveness in managing infrastructure projects.

The Scrum method was chosen in developing this system [1] because of its ability to accommodate rapid changes and support team collaboration iteratively and incrementally. This approach allows the development of a more flexible, responsive system that is responsive to user needs and improves optimal results relatively quickly. Thus, implementing this integrated information system is expected to positively impact the management of infrastructure projects in Tarakan City and contribute to improving the performance and quality of construction service development in the area.

2. Research Methodology

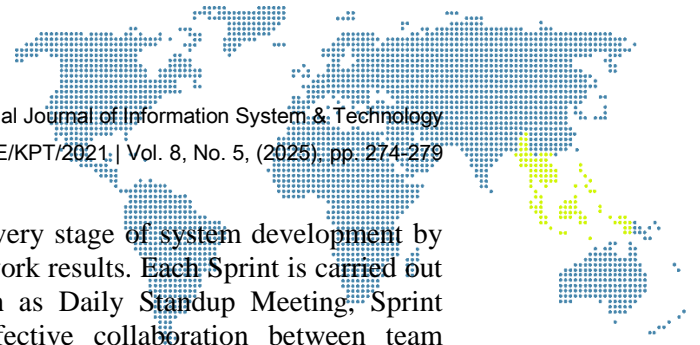
This type of research is applied research, which focuses on applying integrated information systems to solve real problems faced by the Tarakan City PU Service regarding construction service development and infrastructure project management. This study also uses a descriptive approach to describe the application of integrated information systems in construction project management. The approach used in this study is the system development methodology with the Scrum approach. The Scrum method was chosen because it allows iterative and incremental system development, with the active involvement of stakeholders in each development phase. This method also supports flexibility and adaptation to changes during the system development process. This research was carried out through several stages: needs analysis, system design, implementation, and system evaluation. The following is an explanation of each stage of the research:

- a) Interviews: In-depth interviews were conducted with various stakeholders, such as the Tarakan City PU Agency, contractors, and project supervisors, to gather information related to the challenges faced in project management and the system requirements needed.
- b) Observations: Researchers conducted direct observations of the implementation of infrastructure projects at the Tarakan City PU Agency to understand the existing work processes and identify areas that could be improved with the use of information systems.
- c) Questionnaires: After the system was implemented, questionnaires were given to end users to collect feedback on the system's quality and effectiveness and its impact on construction project management.
- d) Documentation Analysis: Data were also collected from project documents at the PU Agency, such as project progress reports, budgets, and contracts with construction service providers.

Data obtained through interviews, observations, questionnaires, and documentation are analyzed using qualitative analysis and quantitative analysis:

- a) Qualitative Analysis is used to analyze the results of interviews and observations that focus on an in-depth understanding of user problems and needs. This technique is also used to evaluate system implementation based on user experience.
- b) Quantitative Analysis is used to analyze data obtained through questionnaires, such as measuring the system's effectiveness in improving project management efficiency, reducing administrative errors, and increasing transparency.

In the final stage, the implemented system will be validated through further trials to ensure that the system can function well in the long term. This system sustainability test is carried out by measuring the use of the system in ongoing infrastructure projects and evaluating whether the system can continue to be adapted and updated according to



evolving needs. The Scrum method is applied in every stage of system development by using Sprint as a unit of time to plan and evaluate work results. Each Sprint is carried out in a 2-4 week cycle, with regular meetings such as Daily Standup Meeting, Sprint Review, and Sprint Retrospective to ensure effective collaboration between team members and stakeholders. This iterative process allows developers to receive direct feedback from end users (PU Department) and make improvements quickly.

2.1. Information System

An integrated information system combines various information resources within an organization to produce more accurate and easily accessible data. An integrated information system connects various departments or functions within an organization to increase operational efficiency and effectiveness[2]. In the context of the PU Service, this system will help integrate various project data, from planning and implementation to budget monitoring and contractor performance. Integrated information systems provide many benefits, including transparency, ease of access to information, increased collaboration between departments, and faster, data-based decision-making. Therefore, implementing an integrated information system in the PU Service of Tarakan City can help minimize the risk of errors in project management and accelerate the monitoring and evaluation process.

2.2. Construction services development

Construction service guidance manages and supervises construction service providers to ensure construction projects run according to established standards. This guidance includes planning, implementation, and supervision to ensure that construction projects are completed on time, within budget, and meet predetermined technical specifications[3].

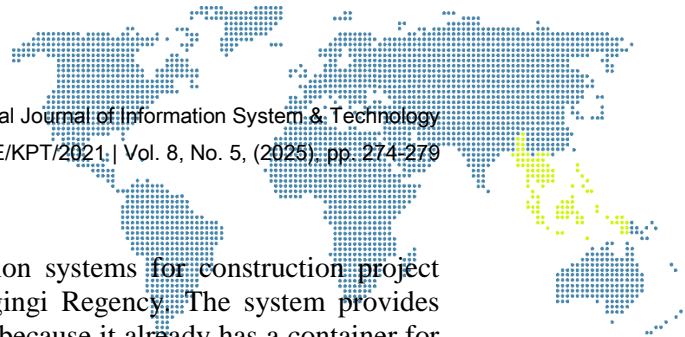
Construction service development requires good coordination between various related parties, such as contractors, supervisors, and project owners. In this case, an integrated information system is important in managing various data related to contractors, work progress, and the budget needed. With a system that can integrate various data, the development process can be carried out more efficiently and transparently. One of the main challenges in developing construction services is ineffective supervision due to fragmented data. With the implementation of an integrated information system, monitoring and evaluating contractor performance can be carried out more accurately and timely, which directly impacts the success of construction projects.

2.3. Infrastructure Project Management

Infrastructure project management is the process of planning, organizing, implementing, and supervising infrastructure projects. It includes various activities ranging from budgeting and resource management to supervising work implementation in the field. Explains that effective project management requires careful planning, proper risk control, and continuous progress monitoring.

One of the main challenges in infrastructure projects is the complex coordination between the various parties involved, such as stakeholders, contractors, and supervisors. Therefore, an integrated information system is important in facilitating this coordination. Using this system, all project-related information, including schedules, budgets, and resources, can be accessed by all parties involved in real-time. This helps improve the accuracy of project management and accelerates decision-making.

In Indonesia, the use of information systems in construction project management has begun to grow rapidly. The implementation of information systems in construction project management in Indonesia has positively impacted the effectiveness of project management, including in terms of time, cost, and quality management.



2.4. Previous research

Nurlisa [4] studied the application of information systems for construction project management at the PUPR Office of Kuantan Singingi Regency. The system provides convenience in monitoring project work in the field because it already has a container for reporting work. In addition, the computerized system shortens the time spent reporting project work, provides a reporting form, and makes it easier to find files related to the project because they are stored in the database.

Using the Waterfall model, Lestari and Setiyadi [5] also studied information systems that can monitor construction projects. Their results indicate that information system-based applications can facilitate monitoring of project implementation and supervision in the field.

Outside Indonesia, research by Liu et al. [6] revealed that applying information technology in construction project management allows for more structured data management and facilitates communication between project stakeholders. This aligns with the basic principles of an integrated information system that allows all parties to access information transparently and accurately.

2.5. Benefits of Implementing Integrated Information Systems in Construction Services Development

Implementing integrated information systems in construction services development can provide various benefits, including:

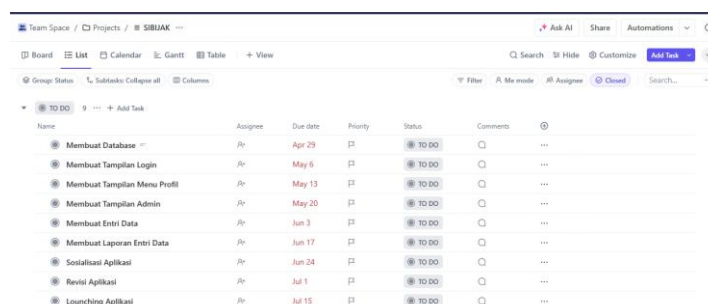
- a) Increasing Efficiency: Faster administrative processes and more accurate data processing.
- b) Transparency and Accountability: Provides real-time data to facilitate project supervision. Fast Decision Making: Reduces decision-making delays because faster and more accurate data is available.
- c) Better Coordination: All parties involved in the project, both internal and external, can access the same information

3. Results and Discussion

At the stage of clearly discussing each stage by carrying out project initialization, execution, and evaluation.

a) Project Initialization

Project initialization is carried out at this stage by creating an initial implementation plan. This plan is carried out by compiling all development plans that will be carried out into the KlikUp Application, as in Figure 1. The plan is compiled into a project to be used as material for each sprint.



Name	Assignee	Due date	Priority	Status	Comments
Membuat Database	Jr	Apr 29	P1	TO DO	
Membuat Tampilan Login	Jr	May 6	P1	TO DO	
Membuat Tampilan Menu Profil	Jr	May 13	P1	TO DO	
Membuat Tampilan Admin	Jr	May 20	P1	TO DO	
Membuat Entri Data	Jr	Jun 3	P1	TO DO	
Membuat Laporan Entri Data	Jr	Jun 17	P1	TO DO	
Sosialisasi Aplikasi	Jr	Jun 24	P1	TO DO	
Revisi Aplikasi	Jr	Jul 1	P1	TO DO	
Luncurkan Aplikasi	Jr	Jul 15	P1	TO DO	

Figure 1. Project Application

b) Project Execution

The project execution stage explains the initialization of the development process. Development is done in three sprints or three iterations, namely:

1. Creating a home page



2. Creating a detail page
3. Creating an admin login page
4. Creating a data collection section of the web application
5. Creating a landing page as an introduction site for the Sibijak application
6. Hosting in collaboration with the Tarakan city government office sibi-jak.tarakankota.go.id to facilitate the development and presentation of the sibijak application

c) Scrum stages

1. Sprint

Through the discussion that has been done at the Sprint Planning stage is to design UI/UX on the login page, dashboard, profile page, etc. Frontend development using HTML, CSS, Javascript, and CodeIgniter Framework technology and building interactions between elements on the page (forms, inputs, dropdowns, buttons, etc.). Backend development is done by compiling an API to connect the front end with the back end using PHP and Javascript programming languages and creating and managing a database using a MySQL database for storing user data or application information. Integration of user authentication (login, registration, reset password) and data management (CRUD: Create, Read, Update, Delete).

2. Sprint Review

The features completed in the first sprint iteration include user authentication, namely login and register, as shown in Figure 2. The main page (homepage) and detail page of the Sibijak application are in Figure 3. And the landing page in Figure 4.

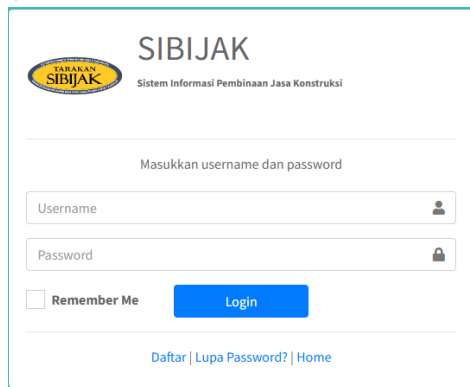


Figure 2. Login Page



Figure 3. Register Page



Figure 3. Landing Page

3. Sprint Retrospective

In Sprint Retrospective, identify what went well during the sprint and provide team achievement operations. Table 1 shows the results of the discussions.

Table 1. Results of The Discussions

No	Result Discussions
1	Collaboration between frontend and backend teams is very smooth, and using the CodeIgniter framework has proven to accelerate development
2	Bugs in this feature were found late due to a lack of testing on various browsers
3	Application performance issues on certain browsers are caused by a lack of cross-browser testing at the beginning of the sprint

4. Conclusion

This study successfully designed and implemented an integrated information system based on the Scrum method in the Public Works (PU) Department of Tarakan City. This system assists in managing construction projects, especially in construction service development, project progress monitoring, contractor data management, and budget supervision. Applying the Scrum method allows for iterative system development and increases flexibility, team collaboration, and adaptation to changing needs. The implementation results show that this information system can accelerate the data verification process and reduce administrative errors, increase the efficiency of project management and real-time data-based decision-making, facilitate coordination between related parties, increase transparency, and improve the quality of infrastructure project supervision.

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