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Enhancing field project management with agile-based digital tracking and reporting system

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ABSTRACT

This study introduces the Project On-site Tracker, a digital solution designed to enhance the efficiency and accuracy of recording and reporting project activities in the field. The research problem addressed the inefficiencies of traditional methods in construction project management, such as delayed data collection and manual reporting processes. The objective was to develop an integrated web and mobile application using Agile methodology, enabling real-time data recording, automatic report generation, and data analysis for informed decision-making. The system design utilized web technologies for backend operations and an Android framework for mobile accessibility, ensuring seamless data management across diverse project environments. Evaluation results demonstrated improved operational efficiency, faster decision-making capabilities, and enhanced transparency in project management processes. The implications suggest that adopting agile development methodologies in information systems can significantly improve responsiveness to user needs and project adaptability. This digital solution not only streamlines project management workflows but also lays groundwork for future enhancements in integrating advanced analytics and expanding compatibility with existing management systems.

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Introduction

Project management in the field is an integral part of the construction industry that requires efficient and timely management of efficient and timely management of various project activities (Atout, 2020; Datta et al., 2023; Martínez-Rojas et al., 2016). Accurate recording and accurate recording and reporting from the field is essential to ensure the project is on track, meeting deadlines and managing budgets with on track, meet deadlines, and manage budgets effectively. Effectively (Monoarfa & Amaliah, 2021). However, traditional manual processes are often prone to human error and time-consuming. and time-consuming. The use of digital solutions, such as mobile apps, has become a trend in an effort to improve efficiency and accuracy in construction project management (La'a & Pramarta, 2023; Simarmata & Situmorang, 2023; Wibawa, 2017).

Mobile applications in the context of project management management context offer advantages in terms of mobility and affordability, allowing field teams to record activities directly from

the project site from the project site (Darma et al., 2021; Herlambang & Zukhri, 2023; Mustari, 2023). This reduces delays in reporting and allows project managers to monitor project progress in real-time. Previous studies have shown that the use of information technology in project management can result in significant improvements in productivity and efficiency, as well as reducing overall administrative costs (Basri et al., 2023; Firdaus, 2024; Kharismaputra et al., 2022; Prihandono & Amir, 2024).

Project On-site Tracker is one of the one of the latest innovations in this domain. This application is designed to provide an integrated solution that facilitates the recording of daily activities, collection of field data, and automatic generation of project reports. field data collection, and automatic generation of project reports. By using web-based platform and Android app, Project On-site Tracker enables field workers to access project information easily from any various mobile devices. Users can record work progress, manage inventory and expenses, and report problems encountered directly from the field (Ratnawati et al., 2019; Ria, 2018; Saragih & Manurung, 2024).

The main objective of this research is to test the effectiveness of the On-site Tracker Project in improving the process of recording and reporting project activities in the field. recording and reporting project activities in the field. This research aims to evaluate how the application of mobile technology can affect data accuracy, field team responsiveness, and project manager's ability to make timely decisions. in making timely decisions. The study by Zhang et al. (2022) showed that mobile applications can improve the accuracy of project data by reducing recording errors that often occur in manual systems. reducing recording errors that often occur in manual systems. In addition to In addition, research by Lee et al. (2021) found that information technology in information technology in project management can improve the responsiveness of field teams by providing better access to information and faster reporting.

By implementing Project On-site Tracker, it is expected to improve data accuracy and enable project managers to make more timely decisions based on the real-time information available (Behzadan et al., 2008; Cheng & Teizer, 2013; Manurung et al., 2017; Martínez-Rojas et al., 2016). This evaluation aims to provide a better understanding of the impact of digital technology on construction project management and assist in the improvement of project management processes in the field. This study not only aims to technically develop the Project On-site Tracker application, but also to evaluate its impact on operational efficiency and overall project management. An in-depth analysis of the results of this study is expected to provide new insights into the potential of information technology applications in improving project management performance in the field.

On-site management of construction projects is a crucial aspect of the industry, requiring accurate record-keeping and timely reporting to ensure projects are on track, meet deadlines, and manage budgets effectively. Traditionally, the recording and reporting process is done manually, which is prone to human error and often time-consuming. In an effort to improve efficiency and accuracy in construction project management, the use of digital solutions, especially mobile applications, has been the focus of research and development (Manurung et al., 2023; Purba et al., 2020; Sulartopo et al., 2023).

Hadi et al. (2022) in their research reviewed the importance of using digital technology in construction project management in Indonesia. They showed that mobile applications can change the way construction projects in the field are managed by enabling real-time recording from the project site and reducing delays in reporting. This not only improves operational efficiency but also facilitates faster and more informed decision-making by project managers. In addition, Pratama et al. (2021) found that the use of mobile applications in project management increases transparency and facilitates direct access to real-time project data, thereby assisting in monitoring and managing projects more efficiently, as well as reducing administrative costs and increasing productivity.

Smith et al. (2022) conducted a systematic review of the impact of mobile apps in construction project management. They found that these apps have been consistently shown to improve operational efficiency, reduce human error in record keeping, and provide greater visibility of project progress to all stakeholders. This review highlights the importance of information technology in improving project management performance in the field.

Overall, these studies show that the use of mobile applications in construction project management is a significant step forward in overcoming traditional challenges in the industry. The On-site Tracker project, proposed in this research, aims to expand the knowledge and application of this

technology by providing an integrated solution for the recording and reporting of project activities in the field, with the hope of improving efficiency and transparency in construction project management.

Methods and Materials

This study adopts a development research approach to design and implement the Project On-site Tracker as a digital solution for recording and reporting project activities in the field. The system development method utilizes an Agile approach to ensure adaptability to changing project needs and responsiveness to feedback from users. The Agile approach has proven effective in developing information systems because of its ability to adapt to changing needs dynamically and increase user involvement in the development process (Wahyudi et al., 2022). In addition, research by Prasetyo and Yuniarti (2021) shows that the application of Agile methodology in software development projects in Indonesia can accelerate the development process and improve the quality of the final product by allowing faster iterations and being responsive to user feedback.

System Design

The On-site Tracker project is designed as an integrated web-based application and mobile application (Android). This application allows users to record field activities directly, manage project inventory, send project reports automatically, and perform data analysis for better decision making.

Technology Implementation

The implementation of the application involves the use of web technology for the backend and database, so that real-time recorded data can be stored and accessed securely. The Android application was developed using a framework that can be accessed from various mobile devices, ensuring optimal mobility and accessibility in the field.

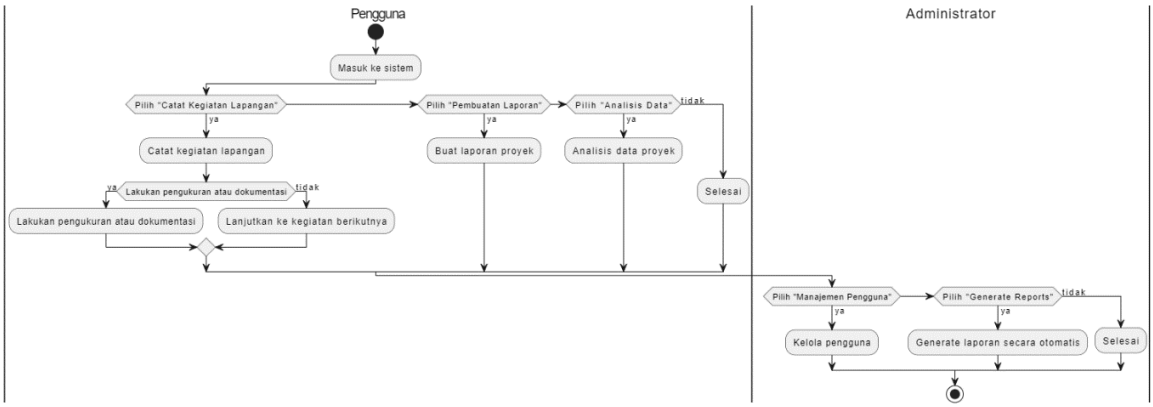

Figure 1. Activity diagram

The activity diagram above shows the main workflow of the Project On-site Tracker, starting from the recording of field activities by users to the generation of reports and data analysis by project managers. This diagram helps visualize how the application integrates various functions to improve efficiency and accuracy in on-site project management.

Results and Discussions

The development of Project On-site Tracker as a digital solution for recording and reporting project activities in the field has involved a design, implementation, and evaluation process to ensure this application meets user needs and provides significant added value in construction project management.

Application Design and Implementation

Project On-site Tracker is designed as an integrated application that combines web platform and mobile application (Android) to facilitate the recording of live field activities and efficient management of project data. The system design uses an Agile approach, allowing the development team to quickly adapt the application to changing project needs and user feedback. According to Yuliana et al. (2021), the application of the Agile approach in mobile application development enables rapid adaptation to changing needs and increases user involvement in the development process. This is in line with the findings of Satriawan and Handayani (2022) who showed that the Agile approach can accelerate the development cycle and increase the responsiveness of the system to end-user feedback and needs.

The technology implementation involves the use of web technologies for the backend and database, ensuring the recorded data can be stored securely and accessed in real-time from various locations. An Android app was developed using technology that can be easily accessed by field users, enabling them to easily record and report on projects without being constrained by time and space limitations.

Performance and Effectiveness Evaluation

A performance evaluation of the Project On-site Tracker was conducted by collecting feedback from field users and project managers regarding their experience in using the app. The evaluation results show that the app has improved efficiency in the process of recording daily activities, collecting field data, and generating project reports.

Project managers reported that they could access real-time project information and make faster decisions based on accurate and up-to-date data. Field users appreciate the app's ease of use and mobility that allows them to record project activities directly from the field without having to return to the office.

UML or Use Case Diagram

To further clarify the workflow and interaction between users and Project On-site Tracker, here is an example of a Use Case Diagram:

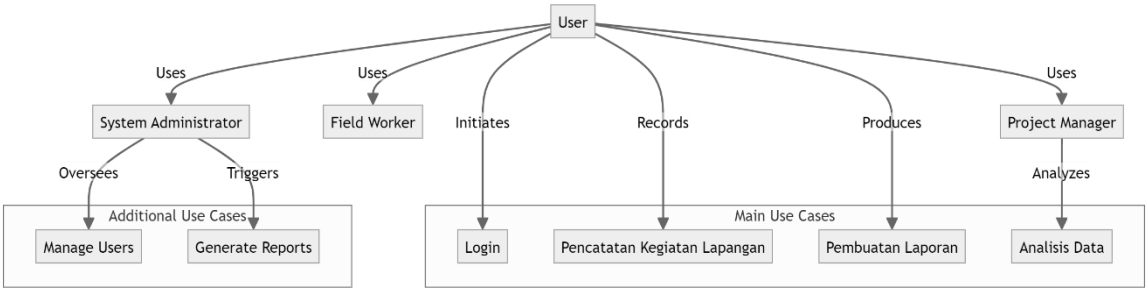

Figure 2. Use Case Diagram

Use Case Diagram Explanation:

User : Application users can be project managers, field workers, and system administrators.

Main Use Case :

- Login : Users log into the system using their credentials.
- Field Activity Logging : Users can log field activities such as project progress, resource usage, and issues encountered.
- Report Generation : Users can generate project reports based on the recorded data.
- Data Analysis : Project managers can perform data analysis for better decision-making.

Additional Use Cases:

- Manage Users : System administrators can manage users and their access rights.

Generate Reports : The system can generate reports automatically based on the collected data.

The development study of Project On-site Tracker as a digital solution for recording and reporting project activities in the field produced some significant results in improving the efficiency and effectiveness of construction project management. The following are the results obtained from the implementation of this application:

1. Improved Efficiency of Recording Field Activities: App users, including field teams and project managers, reported significant improvements in the efficiency of recording daily activities in the field. By using Project On-site Tracker, they are able to record project progress, resource usage, and issues found directly from the project site without having to return to the office. This reduces the time required for administration and allows greater focus on the actual field work.
2. Automatic Report Generation: The app enables automatic generation of project reports based on recorded data. Project managers can generate reports on project progress, expenses, and field team performance quickly and efficiently. This process not only saves time but also improves report accuracy as the data used is recorded directly from the field.
3. Data Analysis for Decision Making: The data analysis feature provided by Project On-site Tracker enables project managers to conduct an in-depth evaluation of project performance. By analyzing the collected historical data, they can identify trends, predict possible problems, and make better decisions to optimize the use of resources and meet project targets.
4. Improved Responsiveness and Transparency: The implementation of the app also resulted in an improvement in the field team's responsiveness and transparency in project management. Every step or change recorded in the Project On-site Tracker can be easily monitored by all stakeholders, ensuring that all necessary information is available in real-time and no information is lost or missed.

The results of using Project On-site Tracker show that the application not only improves the operational efficiency of construction projects, but also reduces administrative costs associated with traditional recording and reporting processes. This use of information technology in project management also opens up opportunities for further development in integration with existing project management systems and the implementation of more advanced analytic features to support strategic decision-making.

Conclusions

This study presents Project On-site Tracker as an effective digital solution to improve efficiency and accuracy in recording and reporting construction project activities in the field. The implementation of this application has shown positive results in simplifying the project management process, from recording daily activities to analyzing data for better decision-making. By utilizing information technology, Project On-site Tracker is able to reduce administrative costs, speed up workflow, and increase transparency among all project stakeholders. Based on the results of this research, several suggestions can be put forward for the further development and implementation of the Project On-site Tracker: Develop more advanced analytics features to analyze historical project data. This will help project managers identify trends, predict risks, and optimize the use of project resources more effectively. Expand Project On-site Tracker's integration with the company's existing project management system. This will enable smoother data transfer and maximize the application's usefulness in a broader operational context. Provide adequate training and technical support to users to enable them to take full advantage of the application's features. This will help ensure good adoption from the entire project team. Ensure the security and privacy of data recorded in the Project On-site Tracker by implementing high information security standards. These measures are essential to protect sensitive project information from unauthorized access or potential data leakage. Conduct regular evaluations of performance and user satisfaction to continuously improve and develop the application according to the needs and challenges that arise in the field. By implementing these suggestions, it is expected that Project On-site Tracker can continue to be an effective and reliable tool in supporting construction project

management in the field, strengthening the company's position in the face of increasingly fierce industry competition.

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