Jurnal Ilmiah Edutic : Pendidikan dan Informatika /Vol.12, No.2 : 2025

ISSN 2407-4489
pp. 104-112

Development of a Web-Based Research and Community Service Management System Using ISO 25010 Quality Standards

Rizal Efendi[a], Nuru Aini[b], Etistika Yuni Wijaya[c], Fadli Maghfirli[d]

[a,b,c,d] *Informatic Education, Universitas Trunojoyo Madura, Bangkalan, Indonesia*
email: [a] 210631100120 @student.trunojoyo.ac.id, [b]nuru.aini@trunojoyo.ac.id, cetistika.wijaya@trunojoyo.ac.id, [d]230631100012@student.trunojoyo.ac.id

Abstract

Research and community service data management is a vital component of higher education accreditation and strategic planning. However, the Informatics Education Study Program currently relies on manual documentation, resulting in data fragmentation and difficulties in mapping lecturers' research roadmaps. This study aims to develop a research management information system to digitize and integrate these processes, and to evaluate its technical feasibility. Using the Research and Development (R&D) method with the Waterfall development model, software quality was tested based on the ISO 25010 standard, focusing on functional suitability, performance efficiency, and usability. The test results showed that the system had 100% functional suitability, a usability level of 92% (Very Good category), and performance efficiency with an average load time of 0.9 seconds. These findings confirm that the proposed system not only addresses the limitations of manual archiving but also significantly improves the effectiveness of academic data governance. This study contributes to providing a validated information system framework for intellectual asset management at the study program level.

Keywords: Research Information System, ISO 25010, Academic Data Management, Waterfall Model, Higher Education Governance.

ISSN 2407-4489
pp. 104-112

INTRODUCTION

Information and communication technology has developed rapidly and become an integral part of higher education management to ensure sustainability and quality governance (Abad-Segura et al., 2020). In the context of the Tridharma Perguruan Tinggi, research data management is crucial. However, studies indicate that manual or decentralized data management often leads to data inaccessibility and redundancy, hindering institutions from effectively mapping research productivity (Chiware & Mathe, 2016) and (Vines et al., 2014).

The Informatics Education Study Program at Trunojoyo University Madura faces similar challenges. Based on interviews with the research coordinators, Dr. Sigit Dwi Saputro and Mrs. Luluk Mauli Diana, the current documentation process is manual and fragmented across various files . This lack of integration makes it difficult for the study program to identify research trends or evaluate whether lecturers' activities align with the program's strategic roadmap.

Existing research has attempted to address similar issues. For instance (Agustino et al., 2020) developed a Research and Community Service Information System to record lecturer activities. Similarly (Hidayatulloh et al., 2023) built an integrated school information system for administrative purposes. However, these previous studies focused primarily on data repository functions and lacked specific features for dynamic roadmap mapping to align lecturer expertise with study program goals. This research aims to fill this gap by developing a system that not only archives data but also provides analytical mapping of research groups.

To ensure the system's quality, technical evaluation is essential. This study adopts the ISO 25010 standard, which is an enhancement of ISO 9126 (Mulyawan et al., 2021). Previous research by (Lamada et al., 2020) and (Puspaningrum et al., 2017) demonstrated that using ISO 25010 specifically the aspects of functional suitability, performance efficiency, and usability is critical for ensuring academic systems are accepted by users and technically robust.

Therefore, this study aims to: 1) Develop a web-based research and community service information system tailored to the needs of the Informatics Education Study Program using the Waterfall model, and 2) Evaluate the system's feasibility based on ISO 25010 standards to ensure it effectively addresses the limitations of manual documentation..

METHOD

Research Design This research applies the Research and Development (R&D) method (Sugiyono, 2022) using the Waterfall software development model. The Waterfall model was selected specifically for this study because the system requirements for the Informatics Education Study Program are well defined, linear, and stable (unlikely to change drastically during development). This structured approach ensures that every phase from requirement analysis to deployment is documented systematically, which is crucial for academic administrative systems. The waterfall model has sequential stages, starting with requirements, design, implementation, verification, and maintenance (Wahid, 2020).

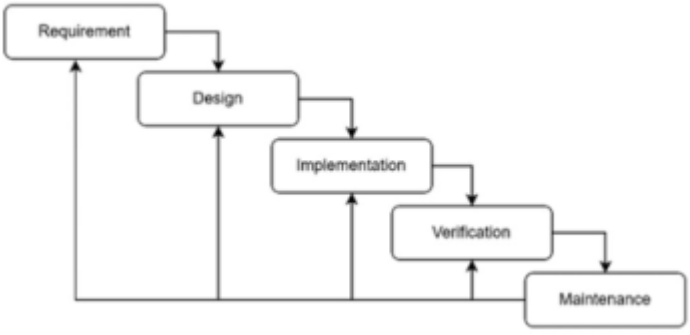


Fig 1. Waterfall Model Stages

Development Procedures The development follows the five standard stages of Waterfall:

a. Requirement Analysis: Data collection was conducted through in-depth interviews with the study program coordinators to identify business processes and through documentation studies of existing manual forms (research roadmaps and community service logs) to define system specifications .
b. System Design: Designing the Unified Modeling Language (UML) diagrams (Use Case, Activity, Sequence), database structure (ERD, CDM, PDM), and user interface prototypes.
c. Implementation: Translating the design into code using PHP (Laravel Framework version 11) and MySQL for database management.
d. Verification (Testing): This is the critical phase where the system is evaluated against ISO 25010 quality standards.
e. Maintenance: Deploying the system to the study program server and performing minor updates based on user feedback.

Instruments and Data Analysis To ensure the system's quality, testing was conducted on three specific characteristics of ISO 25010:

a. Functional Suitability: Measured using a Black-box testing checklist to verify if all features function as intended. This aspect was validated by two system experts (Senior Lecturers in Software Engineering) to ensure technical rigor.
b. Usability: Measured using a questionnaire distributed to 21 respondents (lecturers and students). The instrument used a Likert scale to assess user satisfaction, learnability, and efficiency. The raw data was analyzed to determine the feasibility percentage.
c. Performance Efficiency: Measured using the automated tool GTMetrix to analyze page load time (speed) and server response time, ensuring the system remains responsive under standard network conditions.

RESULTS AND DISCUSSION

3.1 Needs Analysis

Needs Analysis and System Design The analysis phase identified critical data requirements for the study program, specifically: lecturer expertise data, research group categorization, and historical records of community service. Based on these needs, the system was built using Laravel Framework version 11 to ensure robust security and scalability. The system architecture was modeled using UML diagrams (Use Case, Activity) and database designs (ERD, CDM, PDM) to ensure data integrity before coding commenced .

System Testing and Discussion The system underwent rigorous testing based on ISO 25010 standards. The results and in-depth discussion are as follows:

a. Functional Suitability and Roadmap Alignment The functional testing by two system experts yielded a 100% success rate. This perfect score indicates that all logic features specifically the mapping between lecturer activities and the study program’s research roadmap function correctly. Unlike the previous manual system where data verification took days, the new system validates input logic instantly. This finding outperforms the limitations found in (Agustino et al., 2020), where their system focused only on storage without logical mapping validation.
b. Usability and User Acceptance The user acceptance test involving 21 respondents (lecturers and students) resulted in a 92% score (Excellent Category). Qualitatively, this high score suggests that the user interface is intuitive enough to be used by senior lecturers who may be less tech savvy. This confirms (Puspaningrum et al., 2017)'s theory that high usability is the primary factor in reducing resistance to new academic systems.
c. Performance Efficiency Performance testing using GTMetrix recorded an average page load time of 0.9 seconds. This speed is well below the standard tolerance limit (10 seconds), ensuring that administrative workflows are not hindered by system lag.
d. Improvement of Academic Workflow The most significant impact of this system is the transformation of the business process. Previously, the study program had difficulties identifying which research groups were inactive due to scattered data. With this system, the "Research Group Mapping" feature allows the coordinator to visualize productivity distribution in real-time. This supports data driven decision making for accreditation accreditation purposes.

ISSN 2407-4489
pp. 104-112

Implementation Challenges Despite the successful deployment, the study faced challenges during the data migration phase. Migrating historical data from heterogeneous formats (Word, Excel, PDF) into the structured MySQL database required significant manual validation to ensure accuracy. This limitation suggests that future developments should include an "import feature" with an intelligent parser to handle legacy data automatically.

3.2 Design

3.2.1 Use Case Diagram

At this stage, the use case diagram is designed with 4 website users, namely

a. Admin

The use case diagram used for admin can be seen in Figure 2.

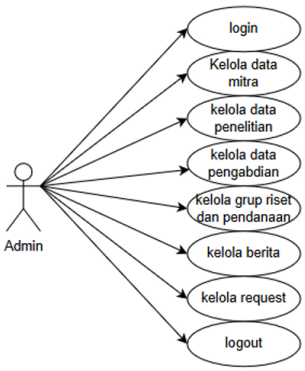


Fig 2. Admin use case

b. Dosen dan Mahasiswa

Use case diagram used for admin can be seen in Figure 3.



Fig 3. Use Case for Lecturers and Students

c. Mitra

The use case diagram used for admin can be seen in Figure 4.

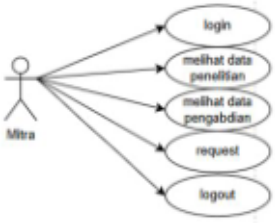


Fig 4. Partner Use Case

ISSN 2407-4489
pp. 104-112

3.2.2 Entity Relationship Diagram (ERD)

The ERD used in the system can be seen in Figure 5.



Fig 5. ERD system

3.2.3 Conceptual Data Model (CDM)

The CDM used in this system can be seen in Figure 6.

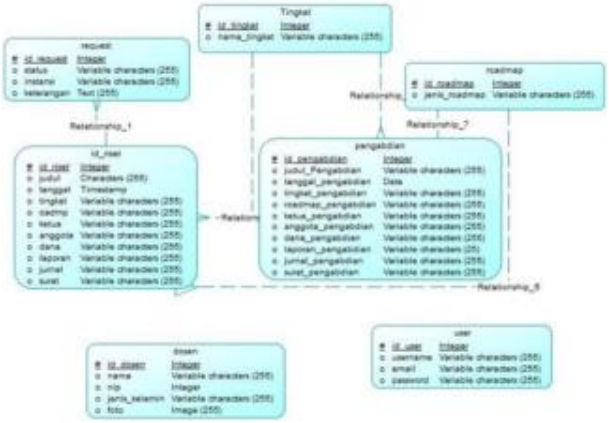


Fig 6. CDM system

3.2.4 Physical Data Model (PDM)

The PDM used for the system can be seen in Figure 7.

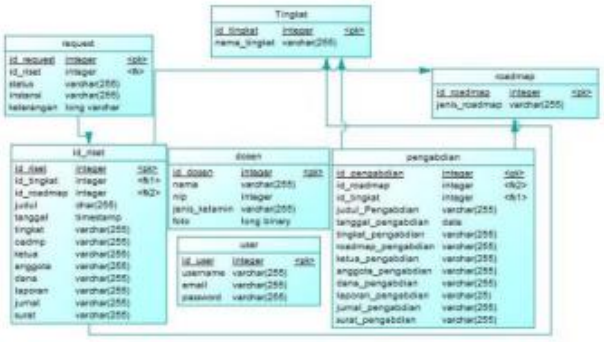


Fig 7. PDM system

3.1 Implementation

3.3.1 Database Implementation

The implementation of the database in the research and community service information system program of the informatics education study program consists of several tables which can be seen in Figure 8.

ISSN 2407-4489
pp. 104-112

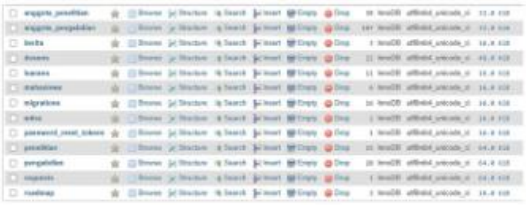


Fig 8. Database Implementation

3.3.2 Website Interface

The interface on this website will have several features, so here are the following: are some of the design pad features that will be used on this website:

a. Home Design

The homepage on this website can be seen in Figure 9.



Fig 9. Home Page

Displays a summary of research activities, providing the study program coordinator with an immediate overview of active research groups

b. Login Page

The homepage on this website can be seen in Figure 10.



Fig 10. Login Page

c. Research Page

The homepage on this website can be seen in Figure 11.

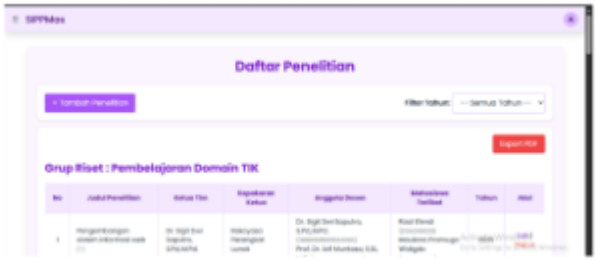


Fig 11. Research Page

Research Data Management: Allows lecturers to input and filter research data by year and topic. This feature directly addresses the previous issue of fragmented files by centralizing data into a single queryable database.

ISSN 2407-4489
pp. 104-112

d. Devotion Page

The homepage on this website can be seen in Figure 12.



Fig 12. Devotion Page

e. Partner Request Page

The homepage on this website can be seen in Figure 13.

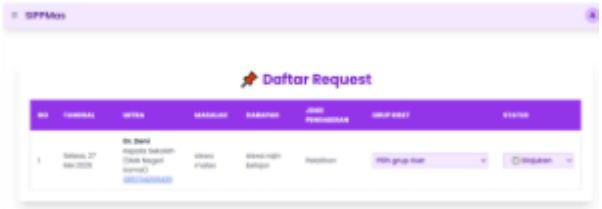


Fig 13. Partner Request Page

Partner Request Page: A novel feature that facilitates external partners in proposing collaboration topics, which are then matched with the relevant research group.

3.2 Testing

System Testing and Discussion The system underwent rigorous testing based on ISO 25010 standards. The results and in-depth discussion are as follows:

a. Functional Suitability and Roadmap Alignment The functional testing by two system experts yielded a 100% success rate. This perfect score indicates that all logic features—specifically the mapping between lecturer activities and the study program's research roadmap—function correctly. Unlike the previous manual system where data verification took days, the new system validates input logic instantly. This finding outperforms the limitations found in (Agustino et al., 2020), where their system focused only on storage without logical mapping validation.

b. Usability and User Acceptance The user acceptance test involving 21 respondents (lecturers and students) resulted in a 92% score (Excellent Category). Qualitatively, this high score suggests that the user interface is intuitive enough to be used by senior lecturers who may be less tech-savvy. This confirms (Puspaningrum et al., 2017)'s theory that high usability is the primary factor in reducing resistance to new academic systems.

c. Performance Efficiency Performance testing using GTMetrix recorded an average page load time of 0.9 seconds. This speed is well below the standard tolerance limit (10 seconds), ensuring that administrative workflows are not hindered by system lag.

d. Improvement of Academic Workflow The most significant impact of this system is the transformation of the business process. Previously, the study program had difficulties identifying which research groups were inactive due to scattered data . With this system, the "Research Group Mapping" feature allows the coordinator to visualize productivity distribution in real-time. This supports data-driven decision-making for accreditation accreditation purposes.

Implementation Challenges Despite the successful deployment, the study faced challenges during the data migration phase. Migrating historical data from heterogeneous formats (Word, Excel, PDF) into the structured MySQL database required significant manual validation to ensure accuracy. This limitation suggests that future developments should include an "import feature" with an intelligent parser to handle legacy data automatically.

3.3 Maintenance

The final stage is the maintenance stage. If changes or improvements are needed, these processes are carried out at this stage. The main goal of this stage is evaluate the system that has been operated to ensure its suitability to needs, while identifying potential improvements that are needed

CONCLUSIONS

This study has successfully developed a Research and Community Service Information System for the Informatics Education Study Program using the Waterfall model. The system effectively digitizes the previously manual documentation process, solving the issues of data fragmentation and redundancy. Based on the evaluation using ISO 25010 standards, the system is declared highly feasible with a Functional Suitability of 100%, validating that the logic for mapping lecturer activities to the research roadmap functions correctly. User acceptance testing yielded a Usability score of 92% (Excellent), indicating that the interface is accessible for lecturers across different age groups. Furthermore, the system demonstrates high Performance Efficiency with an average load time of 0.9 seconds, ensuring smooth administrative workflows.

Limitations and Future Work Despite its successful implementation, this study has limitations. First, the system's scope is currently limited to the internal environment of one study program and has not been integrated with national databases such as SINTA or Google Scholar. Second, the data migration process from legacy files still requires manual validation. For future development, it is recommended to: 1) Develop an API (Application Programming Interface) for automatic synchronization with the University's central system and SINTA, and 2) Develop a mobile application version to provide real-time notifications regarding research grant deadlines and partner requests.

.

ACKNOWLEDGMENT

The authors would like to thank Universitas Trunojoyo Madura, for providing facilities and resources for this research. We also extend our gratitude to all those who have assisted, many of whom cannot be mentioned individually.

REFERENCES

Abad-Segura, E., González-Zamar, M. D., Infante-Moro, J. C., & Ruipérez García, G. (2020). Sustainable management of digital transformation in higher education: Global research trends. Sustainability, 12(5), 2107. https://doi.org/10.3390/su12052107

Agustino, R., Widodo, Y., Saputro, M., & Wiyatno, A. (2020). Sistem informasi penelitian dan pengabdian masyarakat di Universitas Mohammad Husni Thamrin. Jurnal Jaring SainTek, 2(1), 1–12. http://ejurnal.ubharajaya.ac.id/index.php/jaring-saintek

Amalia, N. (2024). Tridharma perguruan tinggi untuk membangun akademik dan masyarakat berpradaban. Jurnal Karimah Tauhid, 3(1), 1–10.

Chiware, E. R. T., & Mathe, Z. (2016). Academic libraries' role in research data management services: A South African perspective. South African Journal of Libraries and Information Science, 81(2), 1–10.

Hidayatulloh, N. W., Dellia, P., & Aini, N. (2023). Analisa dan perancangan sistem informasi sekolah terintegrasi media sosial sebagai media promosi SMK PGRI 1 Bangkalan. Jurnal Manajemen Informatika dan Komputer, 1(1), 15–22. http://ojsamik.amikmitragama.ac.id

Lamada, M. S., Miru, A. S., & Amalia, R. (2020). Pengujian aplikasi sistem monitoring perkuliahan menggunakan standar ISO 25010. Jurnal MediaTIK: Jurnal Media Pendidikan Teknik Informatika dan Komputer, 3(3), 1–8.

Mulyawan, M. D., Kumara, I. N. S., Swamardika, I. B. A., & Saputra, K. O. (2021). Kualitas sistem informasi berdasarkan ISO/IEC 25010: Literature review. Majalah Ilmiah Teknologi Elektro, 20(1), 15–20. https://doi.org/10.24843/MITE.2021.v20i01.P03

Puspaningrum, A. S., Rochimah, S., & Akbar, R. J. (2017). Functional suitability measurement using goal-oriented approach based on ISO/IEC 25010 for academics information system. Journal of Information Systems Engineering and Business Intelligence, 3(2), 68–74. http://dx.doi.org/10.20473/jisebi.3.2.68-74

Sugiyono. (2022). Metode penelitian kuantitatif, kualitatif, dan R&D. Alfabeta.

Vines, T. H., Albert, A. Y., Andrew, R. L., Débarre, F., Bock, D. G., Franklin, M. T., Gilbert, K. J., Moore, J.-S., Renaut, S., & Rennison, D. J. (2014). The availability of research data declines rapidly with article age. Current Biology, 24(1), 94–97. https://doi.org/10.1016/j.cub.2013.11.014

Wahid, A. A. (2020). Analisis metode waterfall untuk pengembangan sistem informasi. Jurnal Ilmu-ilmu Informatika dan Manajemen STMIK, 1(1), 1–5.