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Web-Based Tracer Study Information System Development Using Rapid Application Development for Alumni Data Management in FMIPA UNSRAT

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Abstract: Tracer studies are essential tools for evaluating the relevance and quality of higher education curricula, as they facilitate the tracking of alumni career outcomes. However, the conventional utilization of Google Forms for data collection in the Information Systems Study Program at FMIPA UNSRAT has led to fragmented and inefficient alumni data management. The objective of this research is to develop a web-based tracer study information system to enhance the efficiency and accuracy of alumni data management. The system's development employed the Rapid Application Development (RAD) method, which prioritizes iterative prototyping and active stakeholder involvement. The research process entailed a multifaceted approach, encompassing a needs analysis, system design, implementation, and black-box testing to ensure system reliability. The resulting web-based system enables alumni to complete dynamic questionnaires according to their employment status, while administrators can efficiently manage and visualize alumni data through interactive dashboards. The system's structured data collection and visualization features support program evaluation and accreditation processes. Preliminary testing results indicate that the system functions as intended and significantly enhances the management and utilization of alumni data. In this system, it has been proven that the system that has been developed is easier to manage data by displaying visualizations of alumni data as a whole and can also be filtered per year using the RAD method.
Keywords: tracer study, information system, web-based system, alumni, Rapid Application Development

1. INTRODUCING

The continuous enhancement of graduate quality represents a foundational objective for higher education institutions, as alumni outcomes serve as a pivotal indicator of institutional success and accreditation achievement[1]. The effective tracking of alumni can facilitate a process of introspection and enhancement by academic institutions, particularly with regard to the quality of their academic programs and learning processes. Tracer studies, also referred to as alumni surveys or follow-up surveys, are systematic approaches to tracking graduates to assess their integration into the workforce and the relevance of their competencies to their fields of study[2]. The regular implementation of tracer

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studies is imperative for the evaluation of academic curricula, the accreditation of educational institutions, and the formulation of strategic educational plans[3].

Despite its acknowledged importance, the implementation of tracer studies in many universities still faces significant challenges. Conventional data collection methods, such as Google Forms, frequently yield fragmented and unintegrated data[4]. These methods also necessitate laborious manual processing, which can be both time-consuming and inefficient. The aforementioned limitations impede the capacity of academic personnel to furnish organized and prompt information regarding alumni career trajectories. Consequently, this diminishes the efficacy of tracer studies in serving as a decision-support instrument[5].

Recent studies have emphasized the merits of establishing web-based tracer study information systems to address these issues[6]. The implementation of such systems has been demonstrated to facilitate the streamlining of data collection, integration, and analysis processes. Consequently, this enables stakeholders to access comprehensive alumni data in real time[7]. The implementation of agile and iterative development methodologies, including Rapid Application Development (RAD), has been demonstrated to expedite the creation of user-centered information systems that are responsive to stakeholder needs and adaptable to evolving requirements[8].

In the Information Systems Study Program at FMIPA Universitas Sam Ratulangi, tracer studies have historically relied on Google Forms, resulting in inefficiencies in the management of alumni data. To address these challenges, the present research focuses on the development of a web-based tracer study information system using the RAD method. The system's objective is to enable the effective, organized, and readily available management of alumni data, thereby facilitating support for the processes of program evaluation and accreditation.

2. RESEARCH METHODOLOGY

2.1. Research Design

This research project uses the Rapid Application Development (RAD) methodology, which emphasizes iterative prototyping, user involvement, and the accelerated delivery of functional systems. RAD is suitable for projects requiring rapid development and frequent stakeholder feedback. This ensures the resulting system aligns closely with user needs and institutional objectives[9].

Figure 1. RAD Method

The key is to emphasize that several phases-especially user design and construction-are revisited multiple times based on feedback and refinement, rather than following a strictly linear path.

2.2. Research Stages

The methodology consists of the following main phases, which are adapted from the RAD framework[10]:

1. Requirement Analysis

   The initial data collection was conducted through interviews and discussions with academic staff and alumni coordinators. These interviews and discussions were conducted to identify user needs, system requirements, and current challenges in managing alumni data. This stage resulted in a thorough list of functional and non-functional requirements for the tracer study system.

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2. System Design

We performed system modeling using Unified Modeling Language (UML) tools, including use case, activity, and class diagrams, to specify the system's architecture, user interactions, and data flows. The design phase also involved creating wireframes and user interface prototypes to visualize system features and layout.

3. Development (Construction)

The system was developed iteratively. Each prototype version was reviewed and refined based on stakeholder feedback. The website was built using PHP as the primary programming language, MySQL for database management, and XAMPP as the local server environment. Each iteration focused on implementing core modules such as user authentication, alumni questionnaire management, data visualization, and administrative dashboards.

4. Implementation and Testing

The completed system was deployed in a test environment for validation. Black box testing was conducted to verify system functionality and ensure that all features operated according to the specified requirements. User acceptance testing (UAT) involved academic staff and selected alumni to evaluate the system's usability and performance.

2.3. Data Collection Techniques

Data collection techniques are systematic methods of gathering information from various sources, such as interviews, observations, questionnaires, and document analysis, to support research, analysis, and decision-making.

Table 1. Data Collection Techniques

No.	Techniques	Goal
1	Interviews and Stakeholder Discussions	To capture user requirements and validate system features
2	Observation	To understand existing tracer study workflows and paint points
3	Documentation Review	Analysis of previous tracer study reports and data management practices

These interviews were conducted with academic staff, alumni coordinators, and system users to gather detailed requirements, understand user needs, and identify current challenges in managing alumni data. These interviews helped formulate functional and non-functional requirements for the system. Direct observation of the existing tracer study process, including the use of Google Forms and manual data handling. This technique provides insight into workflow inefficiencies, data fragmentation, and user pain points that must be addressed in the new system. Analysis of previous tracer study reports, alumni data, and related administrative documents. This review helps us understand the structure of the required data, reporting standards, and historical issues with data integration and analysis.

2.4. Tools and Technologies

The development and evaluation of the web-based tracer study information system utilized a set of integrated tools and techniques to ensure robust functionality, usability, and data integrity.

Table 2. Tools and Technologies

No.	Stages	Tools and Technologies
1	Development	PHP, MySQL, XAMPP, CodeIgniter (CI) Framework

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2	Modelling	Unified Modelling Language (UML): Use Case, Activity, Class diagrams
3	Testing	BlackBox Testing, User Acceptance Testing (UAT)

The Development Environment is hereby defined as the space or environment within which the development of a particular system or process occurs.

PHP functioned as the primary server-side scripting language, thereby facilitating dynamic content generation and seamless database interaction. The CodeIgniter (CI) Framework was employed to optimize the development process. CI is a lightweight, open-source PHP framework that facilitates rapid application development with a modular structure, MVC (model-view-controller) architecture, and built-in security features. The utilization of this approach enabled the effective organization of code, ensured the maintainability of the system, and facilitated its scalability. MySQL functioned as the relational database management system, supporting structured storage, retrieval, and management of alumni and questionnaire data. XAMPP furnished a local development environment, integrating Apache, PHP, and MySQL, thereby enabling efficient development, testing, and deployment.

Unified Modelling Language (UML) diagrams were utilized to visually represent and systematically document the system requirements and design. The application of Use Case Diagrams entails the delineation of user interactions and system functionalities. Activity diagrams are a tool that can be used to illustrate workflow processes for administrators and alumni. Class diagrams are a tool used to depict the structural relationships between system entities.

Black Box Testing was conducted to verify that each system function performed according to the specified requirements, without consideration of internal code structure. This ensured that user-facing features and workflows operated as intended. User Acceptance Testing (UAT) involved academic staff and alumni as end users to evaluate the system's usability, functionality, and satisfaction level. The UAT process was conducted using a structured questionnaire based on the Likert scale.

2.5. Likert Scale Equation for UAT Analysis

The Likert scale is a quantitative tool that gauges user perceptions regarding system attributes, including ease of use, interface clarity, and data accuracy[11]. The analysis utilizes the following equation:

$$Likert\ Score_{Qj} = \frac{\sum_{i=1}^{n} X_{ij}}{n} \quad (1)$$

Where:

X_{ij} = score given by respondent i (e.g., 1 = strongly disagree, 5 = strongly agree) from question j

n = total number of respondents

Therefore, to count overall Likert score aggregates all responses, providing a holistic measure of system acceptance:

$$Overall\ Likert\ Score = \frac{\sum_{i=1}^{n} \sum_{j=1}^{m} X_{ij}}{m} \quad (2)$$

Where:

X_{ij} = score given by respondent i (e.g., 1 = strongly disagree, 5 = strongly agree) from question j

m = total number of questions

Table 3. Likert Scale Interpretation

Score Range	User Acceptance Level	Interpretation
4.21 – 5.00	Very High	Excellent acceptance and satisfaction
3.41 – 4.20	High	Good acceptance, minor improvements possible
2.61 – 3.40	Moderate	Moderate acceptance, several improvements needed
1.81 – 2.60	Low	Low acceptance, major improvements needed

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1.00 – 1.80	Very Low	System rejected by users

2.6. Methodological Rationale

The Rapid Application Development (RAD) approach was selected for its ability to deliver a user-centered, adaptable, and efficient information system within a limited timeframe. Through iterative prototyping and continuous stakeholder feedback, the system was designed to address real-world needs and adjust promptly in response to user input.

3. RESULT AND DISCUSSIONS

3.1. Stakeholder Needs Analysis

The preliminary phase of system development centered on methodically identifying and examining the requirements of the stakeholders involved in the tracer study process. The primary stakeholders in this context are the Study Program Coordinator, who oversees academic quality and accreditation, and two PIC (Persons in Charge) Tracer Study, who are responsible for data collection, management, and reporting.

Table 4 presents the set of interview questions that were developed to systematically capture the needs, pain points, and expectations of the three primary stakeholders involved in the tracer study process. These stakeholders include the Study Program Coordinator and the two PIC Tracer Study. The formulation of these inquiries was informed by prevailing best practices in requirements elicitation and adapted to the paradigm of tracer study system development, thereby ensuring comprehensive coverage of functional, technical, and operational dimensions.

Table 4. Interview Questions

No.	Interview Question
1	What are the main challenges in the current alumni data collection process?
2	How does the current system impact accreditation efforts?
3	What features are most needed in a new tracer study system?
4	How important is data security and privacy in the system?
5	What difficulties are faced when following up with alumni?
6	How should the system support different types of alumni (employed, entrepreneur, further study, job seeking)?
7	What reporting capabilities are required?
8	How should the system handle user management?
9	What are the expectations regarding system usability?
10	How will success be measured after system implementation?

The subsequent table on Table 5 offers a synopsis of the responses from each stakeholder group, showcasing their viewpoints and operational realities. The responses indicate both alignment and divergence in stakeholder priorities, thereby providing a data-driven foundation for system requirements and design decisions.

Table 5. Stakeholder and PIC Answers

No.	Study Program Coordinator	PIC Tracer Study 1	PIC Tracer Study 2
1	Data is scattered and not easily accessible for program evaluation.	Manual processing is time-consuming and error-prone.	Difficult to ensure data completeness and consistency.
2	Lack of structured data complicates the preparation of accreditation documents.	Reporting is slow and often requires manual compilation.	Data quality issues can affect the credibility of accreditation submissions.

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No.	Study Program Coordinator	PIC Tracer Study 1	PIC Tracer Study 2
3	Centralized database, real-time reporting, and easy access for stakeholders.	Automated data collection and dashboard visualization.	Dynamic questionnaires tailored to alumni status.
4	Extremely important, especially for protecting alumni personal data.	The system must have secure authentication and access control.	Data should be encrypted and only accessible to authorized users.
5	Alumni are often unresponsive due to lack of engagement.	Contact information is outdated or incomplete.	No integrated mechanism for reminders or follow-ups.
6	The system should adapt questionnaires based on alumni status.	Each status should have its own relevant set of questions.	The interface should guide alumni to the correct questionnaire automatically.
7	Ability to generate comprehensive, exportable reports for accreditation.	Visual dashboards for quick analysis.	Customizable reports for different stakeholder needs.
8	Admins should be able to manage alumni and PIC accounts.	Role-based access is necessary for security.	The system should log all user activities for audit purposes.
9	The interface should be intuitive and require minimal training.	The system should be accessible on multiple devices.	Clear instructions and help features are essential.
10	Improved data quality and faster reporting for accreditation.	Reduced manual workload and higher response rates.	Positive feedback from users and stakeholders.

A comprehensive analysis was conducted through the implementation of structured interviews, observational studies, and document analysis. This analysis yielded the identification of several fundamental challenges and requirements, which are outlined on Table 6

Table 6. Core Challenges and Requirements Identification

No.	Core Challenges and Requirements
1	The existing alumni data collection process, previously managed via Google Forms, resulted in fragmented datasets, inconsistencies, and significant manual processing effort.
2	Stakeholders expressed the necessity for a centralized, integrated information system that would streamline data collection, ensure data integrity, and facilitate real-time access to alumni career information.
3	There was a strong demand for advanced reporting and visualization features to support accreditation processes and facilitate evidence-based decision-making.

Analysis of the current state of tracer study data management reveals that the current manual and fragmented approach is inadequate for meeting institutional needs for accreditation and continuous improvement. It is evident that a consensus has been reached among the relevant parties regarding the necessity of a robust, web-based information system that possesses the capacity to seamlessly integrate data collection, management, and reporting processes. new system is expected to be secure, user-friendly, and adaptable to the evolving requirements of both alumni and administrative users. The findings derived from the interviews have directly influenced the formulation of the system requirements, thereby guiding the design of features such as secure authentication, dynamic questionnaires, real-time dashboards, and comprehensive reporting modules.

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3.2. System Architecture and Modelling

The system architecture and design phase built upon the comprehensive needs analysis outlined in section 3.1, translating stakeholder requirements into a structured blueprint for the tracer study information system. The design process prioritized modularity, scalability, and usability to address the challenges identified, such as fragmented data management, manual processing inefficiencies, and the necessity for dynamic questionnaire adaptation.

1. Use Case Diagram

Use case diagram delineated primary actors-administrators and alumni-and their interactions with key system functions, including registration, questionnaire management, data submission, and report generation[12]. This diagram established functional boundaries and clarified user roles, ensuring alignment with stakeholder expectations.

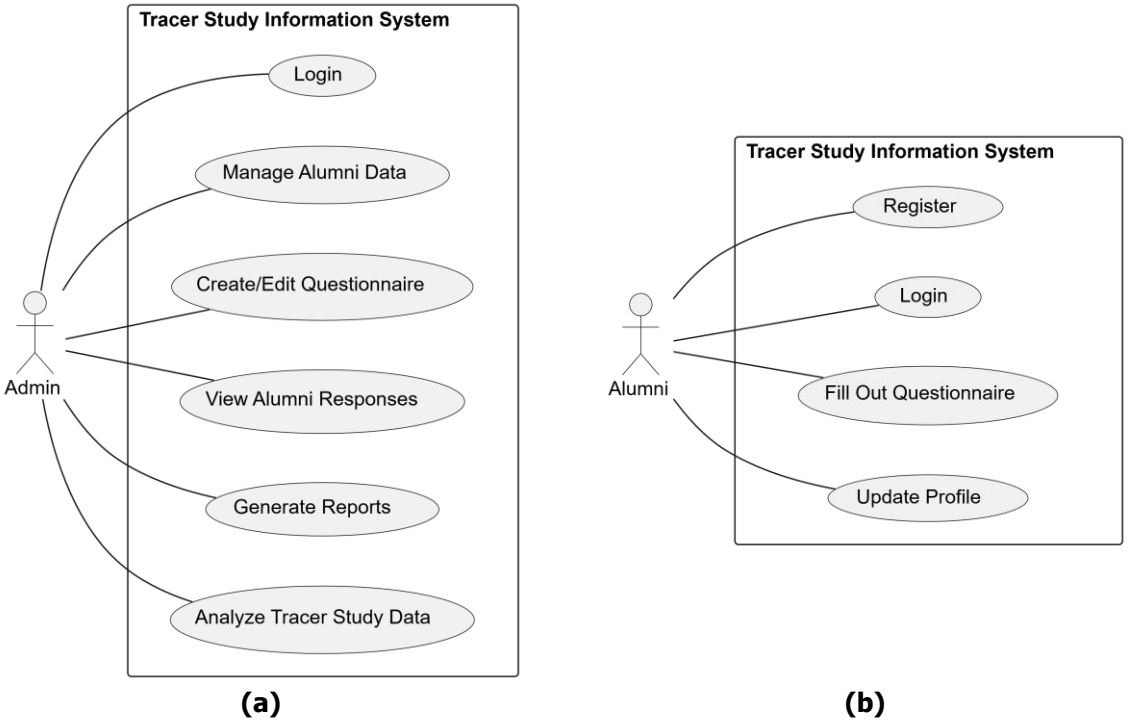

Figure 2. Use Case Diagram of (a) Admin and (b) Alumni.

First diagram on Figure 2 (a) illustrates the admin's use cases, detailing system functions such as login, alumni data management, questionnaire creation, response review, report generation, and tracer study data analysis. Second diagram on Figure 2 (b) presents alumni use cases, showing their interactions with the system: registration, login, completing questionnaires, and updating personal profiles, reflecting essential user functionalities.

2. Activity Diagram

Activity diagrams further detailed the procedural workflows for each actor. The administrator's activity diagram mapped processes such as authentication, questionnaire creation, response review, and report generation, emphasizing sequential and conditional flows to capture operational logic[13]. The alumni activity diagram illustrated the user journey from registration through dynamic questionnaire completion, incorporating decision points based on employment status to ensure relevant data capture.

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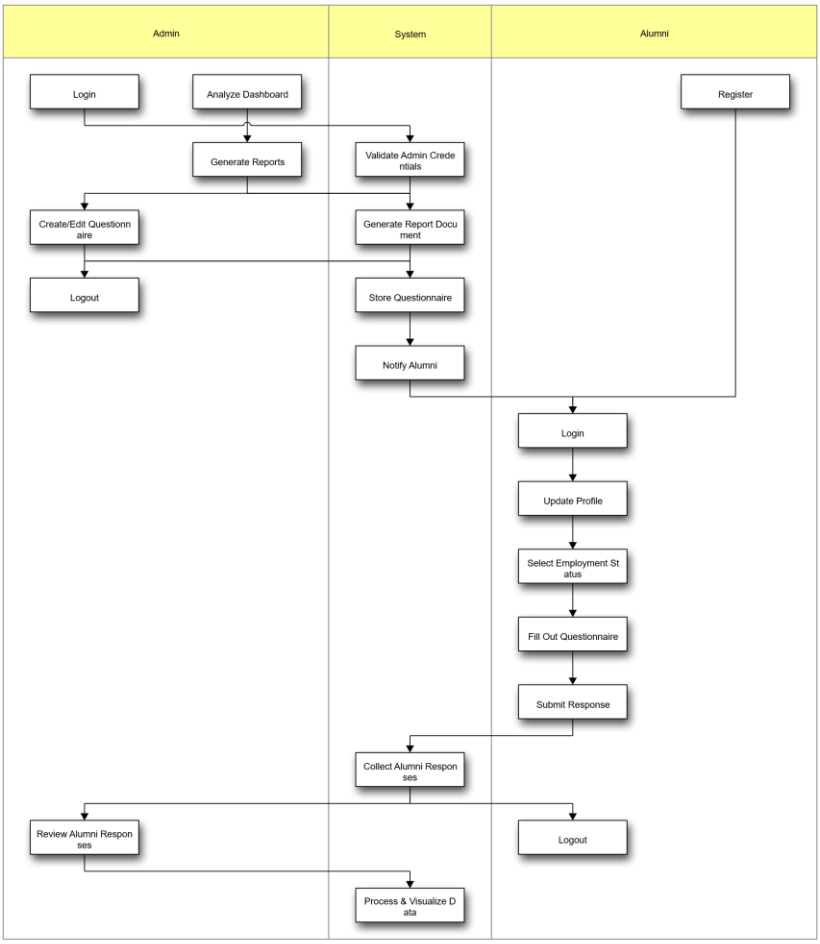

Figure 3. Activity Diagram

3. Class Diagram

The class diagram defined the static structure of the system, identifying essential entities such as Admin, Alumni, Questionnaire, Question, Response, Answer, and Report. Relationships among these classes were explicitly modeled to enforce data integrity and support system scalability[14]. For instance, the association between Questionnaire and Question classes allowed for flexible questionnaire composition, while the linkage between Response and Answer classes facilitated detailed response recording.

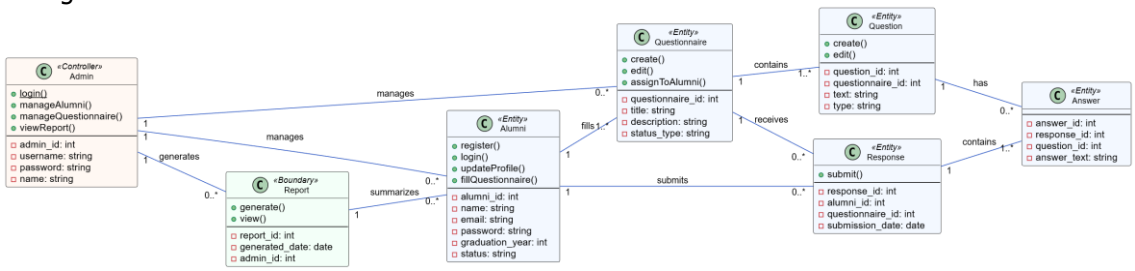

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Figure 4. Class Diagram

System Flowchart

This flowchart diagram on Figure 5 visualizes the end-to-end tracer study process.

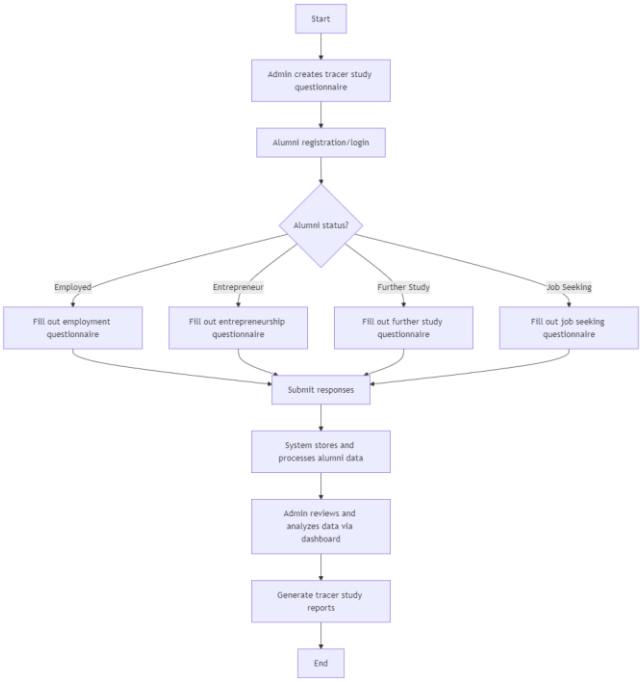

Figure 5. Flowchart System Design

It begins with the admin creating a tracer study questionnaire, followed by alumni registration or login. Alumni are then classified by status-employed, entrepreneur, further study, or job seeking-each directed to a tailored questionnaire. After completing and submitting their responses, the system stores and processes the data. Admins subsequently review and analyze this data using a dashboard, which facilitates the generation of comprehensive tracer study reports. This structured workflow ensures data integrity, targeted data collection, and efficient reporting for academic program evaluation.

3.3. Iterative Development and Technical Implementation

The implementation process was initiated with the creation of initial prototypes, with a focus on core functionalities such as alumni registration, dynamic questionnaire management, and basic reporting. Each iteration entailed close collaboration with the Study Program Coordinator and PIC Tracer Study, who provided feedback on usability, data flow, and feature completeness. This feedback was systematically incorporated into subsequent development cycles, resulting in tangible improvements, including enhanced dashboard analytics, adaptive questionnaire logic based on alumni employment status, and more robust data validation mechanisms.

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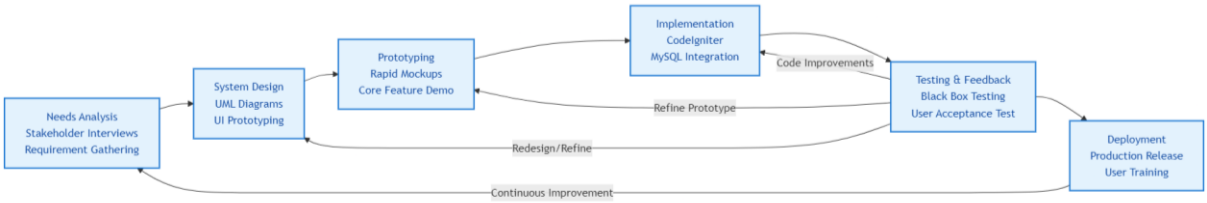
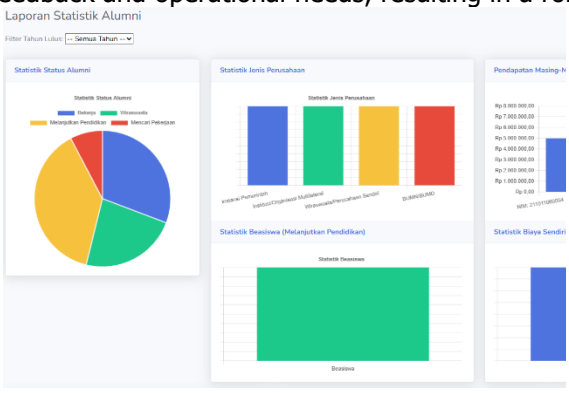
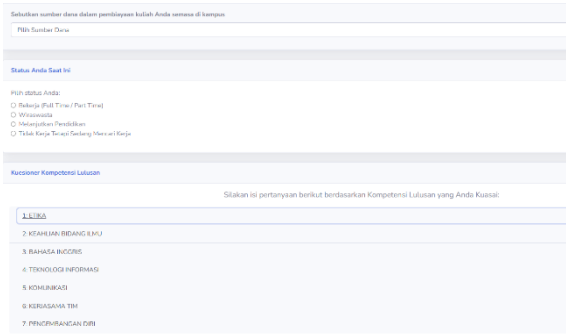
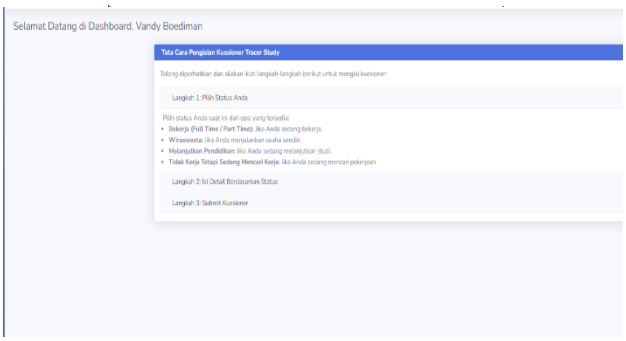


Figure 6. RAD Implementation and Iteration

In each iteration of RAD, modules deemed essential to the project—namely, user authentication, role-based access control, questionnaire generation, and reporting—were developed and tested in an incremental manner. Initial versions placed significant emphasis on fundamental data collection and management functionalities, while subsequent iterations concentrated on enhancing the user experience, incorporating interactive dashboards, and automating report generation. This methodological approach guaranteed that the system evolved in direct response to stakeholder feedback and operational needs, resulting in a robust, user-centric tracer study platform.







3.4. System Validation and User Acceptance

The validation of the system and the execution of user acceptance testing were foundational elements in ensuring that the developed tracer study information system satisfied its functional requirements and aligned with the expectations of the relevant stakeholders. The validation process was executed in two primary stages. Initially, black box testing was employed to verify functionality. Subsequently, user acceptance testing (UAT) was conducted using a Likert scale questionnaire to evaluate user satisfaction and usability.

1. Blackbox Testing

Black box testing was performed on all major modules of the system, including user, admin, and questionnaire functionalities. Each test case was meticulously engineered to ascertain that specific

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system inputs yielded the anticipated outputs, with no consideration given to the internal code structure[15]. The ensuing tables offer a synopsis of the salient black box test results for both the user and admin modules. These results are thoroughly documented in Table 7 and Table 8, respectively.

Table 7. Blackbox Testing on User Module

No	Test Case	Expected Output	Actual Output	Status
1	User Registration	Success message, user created	Success	Pass
2	User Login	Redirect to dashboard	Redirected	Pass
3	View/Edit Profile	Profile displayed/updated	Displayed/Updated	Pass
4	Fill Questionnaire	Questionnaire saved	Saved	Pass
5	View Questionnaire Status	Status displayed	Displayed	Pass

Table 8. Blackbox Testing on Admin Module

No	Test Case	Expected Output	Actual Output	Status
1	Admin Login	Redirect to admin dashboard	Redirected	Pass
2	Manage Alumni Data	Data displayed/updated	Displayed/Updated	Pass
3	Manage Questionnaires	Questionnaire created/edited	Created/Edited	Pass
4	View Responses	Responses displayed	Displayed	Pass
5	Generate Reports	Report generated/downloadable	Generated	Pass

All critical functions passed black box testing, confirming the system's readiness for user evaluation.

2. User Acceptance Testing with Likert Scale Score

User acceptance testing was conducted with 20 anonymous respondents (R1–R20) comprising academic staff and alumni. The evaluation instrument consisted of 10 Likert-scale questions (Q1–Q10). Respondents rated each item on a scale from 1 (strongly disagree) to 5 (strongly agree).

Table 9. UAT Questions

Code	Question
Q1	The system is easy to access and use.
Q2	The information displayed is clear and easy to understand.
Q3	The system provides complete features as needed.
Q4	The questionnaire is easy to fill out.
Q5	The system processes data accurately.
Q6	The system's response time is fast.
Q7	The system helps in managing alumni data efficiently.
Q8	The dashboard visualization is informative and useful.
Q9	The report generation feature meets the needs of accreditation.
Q10	Overall, I am satisfied with the tracer study information system.

Table 10. UAT Respondant Score

QR	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	2	5	4	5	4	3	4	4	3
2	4	3	4	4	4	4	4	4	4	4
3	5	4	4	4	4	4	4	4	4	4
4	4	5	3	4	3	5	4	5	5	5

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5	3	3	5	3	5	3	5	5	5	5
6	3	5	2	4	4	3	5	3	5	5
7	5	4	4	4	4	4	4	4	4	4
8	4	4	4	4	4	4	4	4	4	4
9	5	5	3	5	5	5	5	5	5	5
10	4	4	4	4	4	4	4	4	4	4
11	5	5	3	5	5	5	5	5	5	5
12	4	4	4	4	4	4	4	4	4	4
13	5	5	3	5	5	5	5	5	5	5
14	4	4	4	4	4	4	4	4	4	4
15	5	5	3	5	5	5	5	5	5	5
16	4	4	4	4	4	4	4	4	4	4
17	5	5	3	5	5	5	5	5	5	5
18	4	4	4	4	4	4	4	4	4	4
19	5	5	3	5	5	5	5	5	5	5
20	4	4	4	4	4	4	4	4	4	4
QAvg	4.2	4.2	3.6	4.3	4.4	4.2	4.4	4.4	4.5	4.5

Using the formula (1) we can find each Questions score, after that, using the formula (2) we can conclude the score of the system

$$LSQ1 = \frac{423 + 4 + 5 + 4 + 3 + 3 + 5 + 4 + 5 + 4 + 5 + 4 + 5 + 4 + 5 + 4 + 5 + 4 + 5 + 4}{20} = 4.27$$

$$OLS = \frac{44.2 + 4.2 + 3.6 + 4.3 + 4.4 + 4.2 + 4.4 + 4.4 + 4.5 + 4.5}{10} = 4.27$$

The overall Likert score of 4.27 places the system in the "Very High" acceptance range, indicating that users are highly satisfied with the system's usability, features, and reporting. High scores in Q9 and Q10 (reporting and overall satisfaction) confirm the system meets its primary objectives for accreditation and user experience. The slightly lower score in Q3 highlights actionable feedback for future feature enhancements.

3.5. System Capabilities and Impact Evaluation

The developed web-based tracer study information system embodies a comprehensive suite of capabilities designed to address the core challenges identified during the needs analysis and to optimize tracer study processes effectively. These capabilities include secure registration and authentication of alumni, dynamic questionnaire management tailored to alumni employment status, centralized data storage, interactive dashboards for real-time data visualization, and automated report generation to support accreditation and program evaluation.

1. System Capabilities

The system integrates secure access, adaptive questionnaires, centralized data management, real-time dashboards, and automated reporting to enhance data accuracy, usability, and administrative efficiency as seen on Table 7.

Table 11. System Capability

System Capability	Description
Secure Alumni Registration and Login	Ensures authorized access with robust authentication, protecting data privacy and integrity.
Dynamic Questionnaires	Adapts questions based on alumni status to increase relevance and response accuracy.

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Centralized Data Storage and Management	Stores all data centrally for efficient retrieval, validation, and processing.
Interactive Dashboards	Provides real-time visualizations for administrators to monitor trends and key metrics.
Automated Reporting	Automatically generates reports to support accreditation and program evaluation.

2. Impact Evaluation

The system's implementation has resulted in substantial advancements in data integrity, accessibility, and administrative efficiency. The replacement of fragmented manual processes with an integrated platform has been demonstrated to minimize data redundancy and errors, streamline alumni engagement, and accelerate data analysis. The results of user acceptance testing have been demonstrated to support the enhancement of usability and satisfaction. Furthermore, the incorporation of a dynamic questionnaire feature has been shown to increase the relevance and completeness of the collected data.

Table 12. Impact Evaluation

Aspect	Data & Metrics
Efficiency	Participation rose from 30% to 85% Average response time: 381.7 ms (0.38 s)
Accuracy	Data completeness: 90% Functional suitability: 1.0 (ISO/IEC 25010) Reliability: 100%
Accessibility	95% users found UI easy to use Responsive across browsers and devices

Based on the results of the interview questions that have been distributed to users, stakeholders and also the PIC Tracer Study at the FMIPA Sam Ratulangi University, the score obtained is at a satisfactory level, meaning that this website can be used, starting from system capability to Impact Evaluation.

4. CONCLUSION

The web-based tracer study information system developed for the Information Systems Study Program at FMIPA Universitas Sam Ratulangi successfully addresses previous inefficiencies, such as fragmented data and manual processing inherent in Google Forms. The adoption of the Rapid Application Development (RAD) methodology resulted in a substantial enhancement of the system's efficiency. This was evidenced by a notable increase in alumni participation, which rose from 30% to 85%. Additionally, there was a reduction in administrative workload, and the system demonstrated an average response time of 381.7 milliseconds. The accuracy of the data was enhanced, with a completeness rate of 90% and a reliability rate of 100% being achieved. The accessibility of the system was further enhanced, as evidenced by an overall Likert score of 4.27 from user acceptance testing, with 95% of users finding the interface easy to use. The system's dynamic questionnaires, centralized data management, interactive dashboards, and automated reporting directly support accreditation and continuous quality improvement, providing a robust, scalable solution for alumni data management and program evaluation.

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