Design and Development of a Web-Based Extension Services Management Information System for State Universities and Colleges

Jude Allan A. Urmeneta, Rustom D. Clemente, Catherine Faith D. Polinio, Giovanni Hanz Guino, Harold Ian C. Sablawon, Lyndon D. Alberca

Information Technology Department Eastern Visayas State University - Main CampusTacloban City, Philippines

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ABSTRACT

This research was specifically planned and built for enhancing the management of extension services in State University and Colleges through the Web-Based Extension Services Management Information System. The web-based platform designed to improve the efficiency and effectiveness of managing extension activities. By addressing the inefficiencies associated with traditional manual methods, the system centralizes and streamlines the process of submitting, reviewing, and approving proposals. It connects faculty members, staff, students, and the director of extension, offering key features such as real-time document sharing, automated data collection, and enhanced communication. Developed using a qualitative and developmental research approach with the Agile methodology, meets both user and institutional requirements. Technologies such as XAMPP, Bootstrap, and Visual Studio Code (VSCode) were utilized to ensure a secure and reliable system. Early results indicate that the system significantly reduces proposal processing times, improves data accuracy, and increases stakeholder satisfaction by improving accessibility and communication. As part of State College and Universities in Eastern Visayas, Philippines, digital transformation, the application offers a strategic solution for managing extension services more effectively, improving collaboration, and better serving the community through its extension programs.

Keywords— Document Sharing, Extension Services, Web-based Management System, Integrated Extension Services Management System

INTRODUCTION

Educational institutions face a pressing challenge in the digital age, where efficiency and accessibility are crucial for organizational success. Managing document submissions and interdepartmental communications seamlessly is essential. The process of handling and submitting documents across various departments and campuses within academic institutions often requires significant time and resources. The imperative to enhance operational efficiency and responsiveness to societal needs has been highlighted in the landscape of Philippine higher education Commission on Higher Education. This directive underscores the mission of educational institutions to improve the quality of life for Filipinos, adapt to evolving societal demands, and provide innovative solutions at local, regional, and national levels. Central to achieving these objectives is the modernization of administrative practices, particularly in document management and interdepartmental communication.

Managing the statuses of diverse programs, projects, and activities within universities presents a significant challenge for coordinators and administrators. The current practices rely on manual methodologies. This fragmented approach causes inefficiencies, delays updates, and creates opportunities for miscommunication. Sending proposals, reviewing them, and obtaining approval is a time-consuming and inefficient process, often reliant on manual, paper-based methods or multiple separate digital systems [11]. These challenges slow down decision-making, increase the risk of document loss, and potentially introduce discrepancies in evaluation criteria. Furthermore, the physical submission of proposals, such as project designs, activity plans, and program

proposals, introduces additional complexities. Individuals involved in extension activities frequently have to travel to confirm the approval status of their proposals, leading to wasted time and inconvenience [4].

Inconsistent reporting formats across different programs further complicate comparisons of intervention effectiveness and the identification of best practices. This limitation hinders the university's ability to replicate successful strategies and optimize its approach to community development.

Limited access to documents and the challenges of document sharing pose significant obstacles to collaboration and knowledge transfer. Manual methods often involve physical copies or separate digital files stored on individual computers, making it difficult for faculty and staff to access the latest versions of essential documents. This issue hinders collaboration across departments and programs [22]. The time-consuming process of sharing updates or revised documents further obstructs knowledge transfer, making it difficult for new team members and participants in similar programs to benefit from past experiences and existing resources. The absence of a centralized and accessible document management system restricts the university's ability to leverage its collective expertise and ensure consistency in implementing various initiatives [24].

The use of manual methods often leads to errors, delays, and inefficiencies. Studies indicate that using manual tools in project management results in misunderstandings, increased likelihood of errors, and communication breakdowns, ultimately hindering project completion and reducing team productivity [13]. Additionally, submitting, reviewing, and obtaining approvals for proposals through paper-based methods is time-consuming and inefficient. Manual procedures can impede decision-making processes, lead to misplaced records, and result in disparities in assessment criteria.

A central platform allows faculty and staff to submit and track documents electronically, eliminating the need for physical transportation [10]. By leveraging digital technology, reduce administrative burdens, minimize environmental impact, and enhance transparency and accountability in document management. Moreover, the implementation aligns with the institution's broader objectives of digital transformation and operational excellence, reinforcing commitment to fulfilling the mandates established by the Commission on Higher Education in 2012.

The establishment and execution within higher education institutions are essential for enhancing the efficiency and effectiveness of extension services. Underscores that a properly implemented Quality Management System (QMS) significantly improves communication and collaboration among stakeholders [1]. This improvement is vital for the successful planning, monitoring, evaluation, and reporting of projects, ultimately leading to better resource allocation and more impactful community engagement initiatives.

The application is rooted in technological advancement and aligns with the institution's commitment to operational excellence and responsiveness. By facilitating electronic document submission, providing standardized forms and templates, enabling online reviewing, and allowing the printing of approved PPA, aims to minimize administrative burdens, improve data accuracy, and enhance transparency and accountability in document management practices. Furthermore, the adoption of the application demonstrates commitment to embracing digital transformation in educational administration, fostering a more adaptable and responsive organizational culture.

METHODS

A qualitative and descriptive research design was employed to evaluate the impact, focusing on collecting data to assess key metrics, including efficiency, accuracy, and user satisfaction.

The qualitative approach involved gathering information from research respondents through interviews and focus group discussions. Meanwhile, the descriptive component provided a detailed overview of the existing processes before and after the project's implementation [33]. This examination focused on factors such as processing times, error rates, and system performance.

The project utilizes descriptive analysis to provide insights into participation in extension services by summarizing and interpreting key statistics such as counts and distributions. Utilizing a count algorithm, bar graphs employing frequency analysis display the distribution of students and faculty involved in extension services across various programs and colleges, highlighting areas with higher engagement [11]. Pie charts use proportional analysis to illustrate the percentage distribution of staff involvement by offices, showcasing each office's contribution to extension initiatives. For these visualizations, implementing ApexCharts.js enhances the overall data presentation. These visualizations facilitate informed decision-making, enabling administrators to monitor engagement levels and identify areas that may require increased involvement or resources.

Agile model to align the project, ensuring flexibility, iterative progress, and continuous improvement throughout the development. This approach allows for frequent feedback, enabling the proponents to make necessary adjustments and improvements promptly.

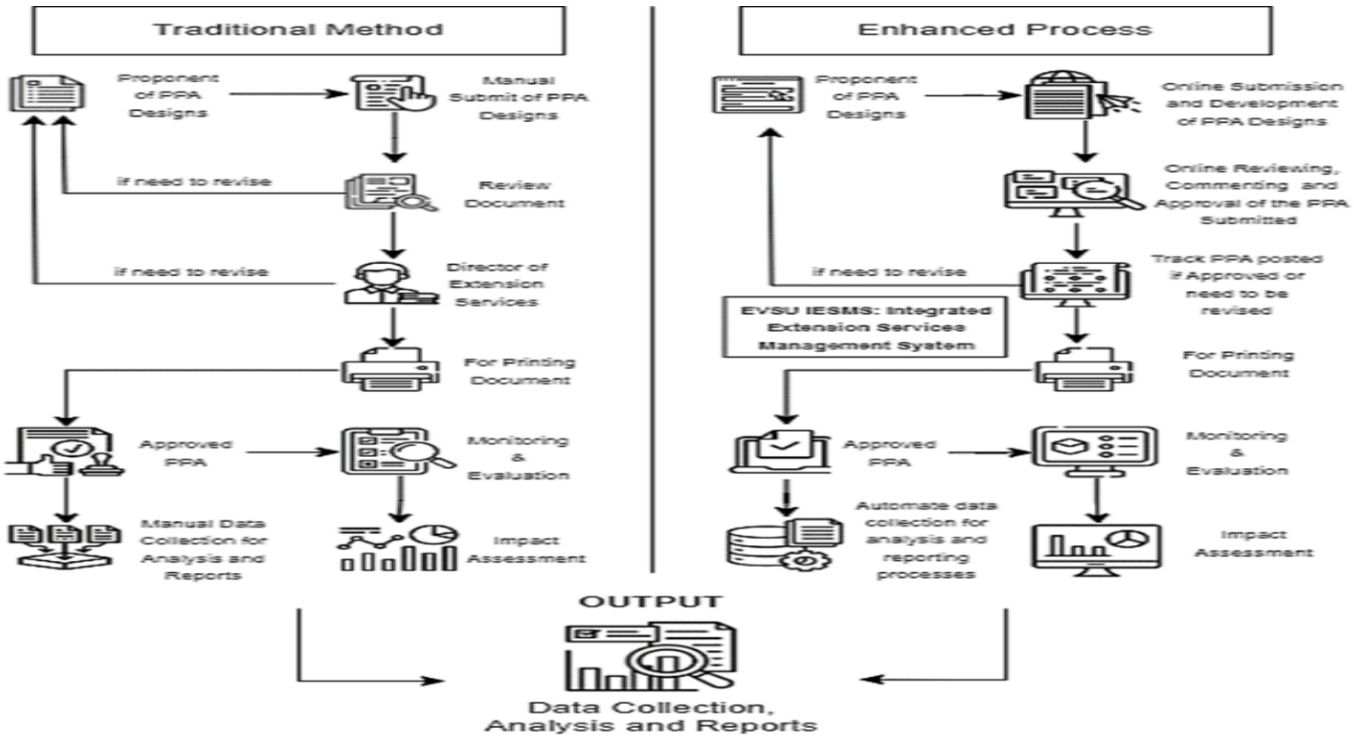

Fig. 1. Concept of the Study

Fig. 1 Conceptual Framework visually represents the interconnections and influences among various system components. Aligning purpose and structure clarifies system functionality and helps identify necessary research methods and statistical approaches. The framework supports effective data management, decision-making, and stakeholder collaboration in managing extension services.

The traditional method involves manually submitting program, project, and activity designs for review. Documents are handed to the reviewing authority, initially assessed by the Head of Extension Services or College Coordinator, and then forwarded to the Head of Program Development. Approved documents are printed and marked as such, with data manually collected for analysis and reporting. If revisions are needed, documents are returned for changes.

In contrast, the enhanced process begins with the submission of program, project, and activity designs using provided forms within the system. These designs are submitted online for review, where comments and digital approvals are provided. The system allows easy tracking of document status, indicating whether it is approved or needs revision. Approved documents are printed and marked accordingly and can be shared online for discussions. It automates data collection for analysis and reporting, improving efficiency and accuracy. If revisions are needed, documents can be sent back for modifications online, making the process faster compared to traditional methods.

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The traditional method, which relies on manual submission and review, typically takes five working days to evaluate PPA, with the process often slowed down by the need for physical handovers and manual data collection. It takes seven working days for approval. The enhanced method simplifies this workflow through automation, online submission, digital comments, and approvals, reducing the approval time dramatically. With just one click from the admins, it takes two working days to evaluate PPA, and documents can be approved in four working days or sent back for revision, significantly speeding up the process and allowing for easier tracking and sharing of information. This modernization enhances data accuracy, facilitates collaboration, and ultimately leads to a more efficient operation overall.

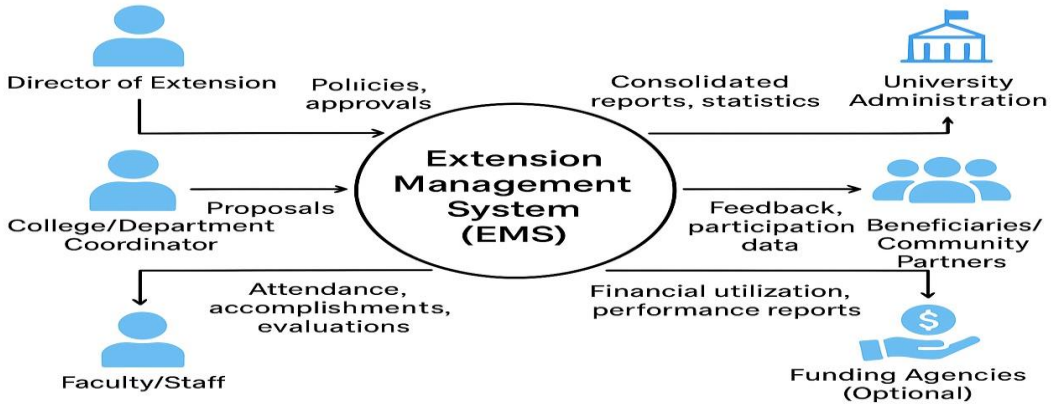


Fig. 2. Context Diagram

Fig 2. Context Diagram depicts how a system interacts with external entities, defining its boundary and illustrating interactions with users, other systems, and data sources. It clarifies the system's scope and integration within its environment, guiding effective design and development. The application interacts with several key entities, including faculty members, extension coordinators, administrators, and external stakeholders.

It ensures seamless data exchange between these entities by providing a centralized platform for document submission, tracking, and approval. By modernizing document handling and approval processes, the system significantly improves workflow efficiency and transparency within State University and College's extension services in Eastern Visayas, Philippines.

Figure 2. Context Diagram provides a comprehensive visualization of how the proposed Extension Services Management Information System (ESMIS) interacts with various external entities, clearly defining the system's boundaries and illustrating its relationships with users, other systems, and data sources. The diagram serves as a blueprint for understanding the flow of information in and out of the system, guiding developers, administrators, and stakeholders in aligning the system's design with its intended objectives.

By mapping these interactions, the diagram ensures that all functional requirements are addressed while maintaining clarity on the system's scope and integration within its operational environment.

The system establishes interactions with several key entities that represent the primary users and stakeholders of extension services in State Universities and Colleges (SUCs). These include faculty members, who prepare and submit program, project, and activity (PPA) proposals; extension coordinators, who serve as intermediaries in evaluating submissions and ensuring alignment with institutional policies; administrators, who provide approvals, monitor implementation, and oversee reporting processes; and external stakeholders, such as partner communities or organizations, who benefit from the extension programs and provide feedback for continuous improvement. Each of these entities is connected to the system through distinct yet complementary roles, ensuring that responsibilities are clearly delineated and that collaboration is seamless across different levels of the institution.

At the core of the diagram is the centralized application, which functions as the main hub for document submission, review, tracking, and approval. Faculty members can upload proposals through standardized forms, ensuring consistency across submissions. Extension coordinators can access and review these proposals digitally, provide feedback or request revisions, and forward approved submissions to higher administrative levels. Administrators, in turn, are able to validate, approve, and store final versions of proposals, making them accessible for future reference and reporting. External stakeholders may also interact with the system indirectly through generated reports and documented outcomes, ensuring accountability and transparency in extension service initiatives.

This centralized exchange of data effectively eliminates the fragmentation and inefficiencies associated with traditional manual processes, such as physical submission, handwritten feedback, and delayed communication. By consolidating all interactions into a single platform, the system reduces redundancy, minimizes the risk of lost documents, and shortens the turnaround time for approvals. Furthermore, the integration of automated notifications and status tracking enhances transparency, allowing all involved parties to monitor progress in real time and stay updated on the status of their proposals.

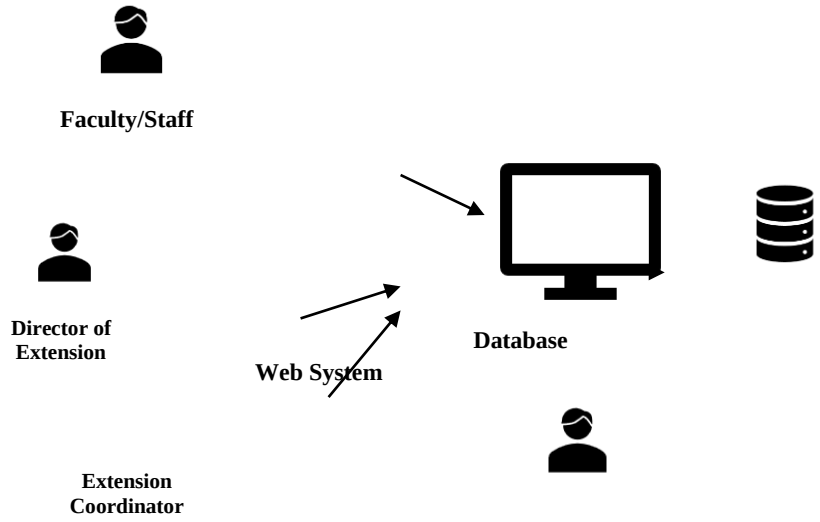


Fig. 3. System Architecture

Figure 3, the System Architecture enables seamless communication and efficient data management among users, including the Director of Extension, Head College Coordinator, and Faculty/Staff. Through a web-based system, users can input and retrieve research extension data, which is processed by the Extension Management System. The system ensures secure storage and structured access to information in a centralized database, enhancing efficiency, collaboration, and data integrity within academic institutions.

RESULT

The system underwent a series of comprehensive testing procedures to validate its adherence to the established requirements and to evaluate its efficiency, reliability, and overall functionality. The testing process was carefully designed to assess how well the system addressed the common challenges associated with managing extension services in State Universities and Colleges (SUCs).

As shown in Figure 4, the system begins with a secure login page where registered users are required to enter their username and password before gaining access to the platform. This feature was evaluated for accuracy in authentication and protection against unauthorized access, ensuring that only legitimate users could navigate the system's functionalities. Figure 5 illustrates the system's capability to present a visual representation of institutional engagement in extension services, which enables administrators to monitor participation and contributions across colleges and departments. This visualization component was tested for accuracy and responsiveness, confirming that data inputted into the system was properly reflected in the generated reports. Similarly, Figure 6 demonstrates the proposal approval interface, which provides administrators with options

for directly approving proposals, requesting revisions, or adding detailed comments as constructive feedback. This feature was specifically tested for its responsiveness, ease of use, and ability to streamline what was previously a slow and manual process.

The testing process not only verified that these features were functioning as intended but also assessed the system's performance across different user roles—such as the Super Admin, Admin, faculty, and general users. By simulating real-world usage, the researchers ensured that the system was capable of meeting the diverse needs of its stakeholders, from administrators overseeing extension services to faculty members submitting proposals. Particular attention was given to usability, accuracy of data processing, and speed of transactions, as these are critical factors in determining whether the system could replace the traditional manual approach effectively.

During the testing phase, stakeholders were actively involved in providing feedback. These included coordinators, administrators, and faculty members who engaged with the system in its trial stage. They were encouraged to identify any flaws, errors, or areas for improvement. Their feedback was then documented, analyzed, and integrated into the refinement process, ensuring that the final product was responsive to the actual needs of its intended users. This participatory testing process not only strengthened the reliability of the system but also enhanced user ownership and acceptance, as stakeholders saw their suggestions incorporated into the final design.

The results of these tests were highly encouraging. The system achieved a 100% execution rate across all tested functionalities, which confirmed that critical features such as login authentication, proposal creation and submission, review and approval, feedback integration, and report generation all performed without errors. This high success rate validated the stability and robustness of the platform. Moreover, the evaluation process revealed that the system significantly reduced the time required for proposal evaluation and approval, minimized risks of miscommunication, and provided a more transparent and efficient workflow compared to the traditional manual approach.

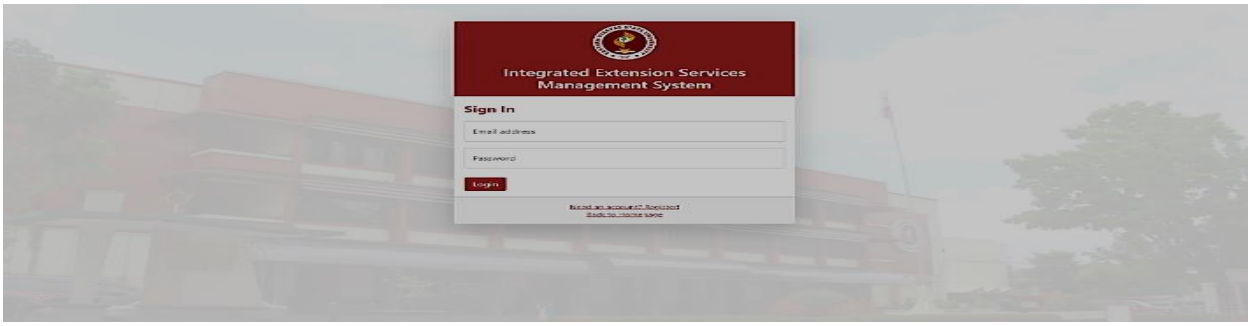
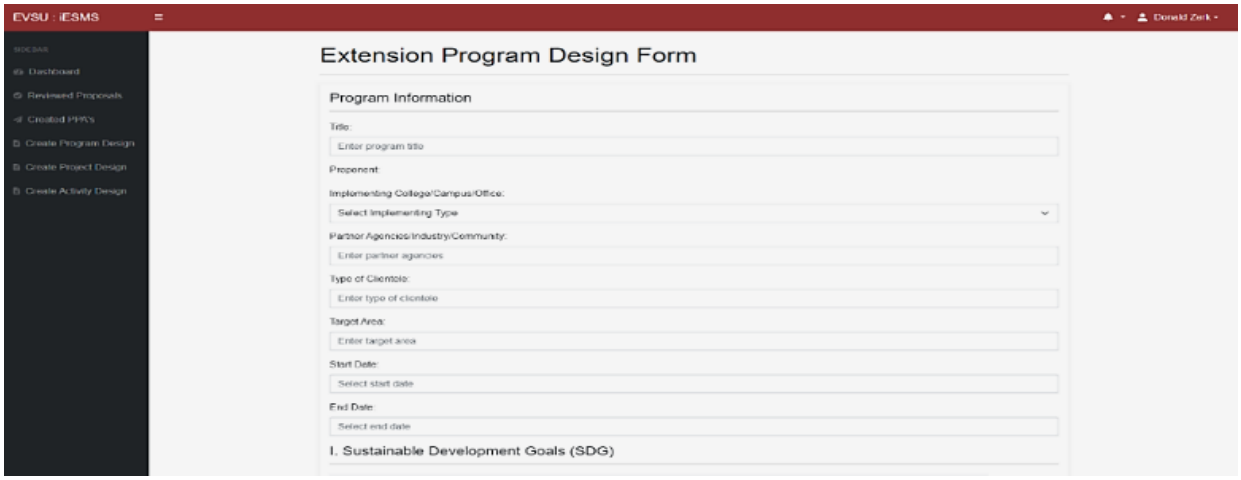
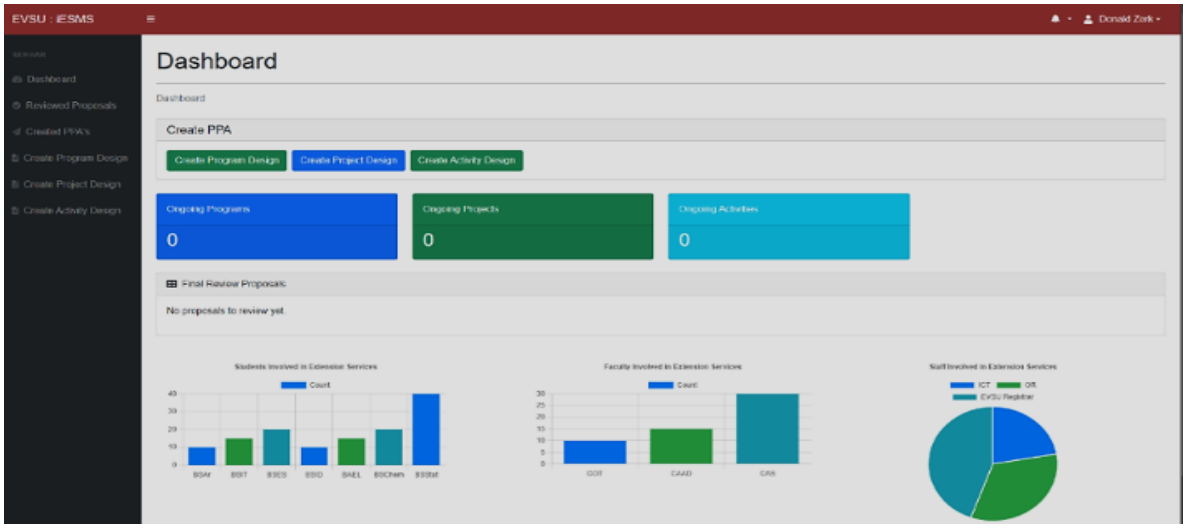


Fig. 4. Login



Dashboard



PPA Form

TABLE I. TEST PLAN FOR DIRECTOR OF EXTENSION (SUPER ADMIN)

Receive Notifications	Admin can receive notification from the system	100%	0%	Success
TAEP Report	Admin can generate TAEP reports	100%	0%	Success

TABLE II. TEST PLAN FOR EXTENSION HEAD AND COORDINATOR (ADMIN)

Print	Super Admin can export printable file	100%	0%	Success
Monitor Progress	Super Admin can monitor the progress of PPAs	100%	0%	Success
TAEP Report	Super Admin can generate TAEP reports	100%	0%	Success

Step	Description	Executed	Error	Remarks
Login	Super Admin logins to the system.	100%	0%	Success
Craft PPA	Super Admin can craft PPA	100%	0%	Success
Review & Approval	Super Admin can review and approve PPAs	100%	0%	Success
Feedback	Super Admin can comment feedbacks	100%	0%	Success
Receive Notifications	Super Admin can receive notification form the system	100%	0%	Success
User Management	Super Admin can manage users	100%	0%	Success

TABLE III. TEST PLAN FOR USER

Step	Description	Executed	Error	Remarks
Login	Admin logins to the system.	100%	0%	Success
Craft PPA	Admin can craft PPAs	100%	0%	Success
Review & Approval	Admin can review and approve PPAs	100%	0%	Success
Feedback	Admin can comment feedbacks	100%	0%	Success

As shown in TABLE I. TABLE II. and TABLE III. , the testing results demonstrated a 100% execution rate across all functionalities for different user roles, including the Super Admin, Admin, and general users. Features such as login authentication, proposal creation, review and approval, feedback submission, and report generation all met the expected criteria without errors, confirming the system's stability and reliability.

Following the testing phase, the system underwent evaluation to assess its overall quality and compliance with established standards. User acceptability testing was conducted to ensure that the software effectively addressed real-world tasks. A beta test, a form of acceptance testing, was performed with a selected group of end users to identify any potential issues before full deployment.

Furthermore, Software Quality Assurance (SQA) measures were implemented to enhance efficiency and ensure adherence to quality standards. The project adopted the ISO 9126 standard as a framework for assessing and improving system quality throughout its development lifecycle. This approach ensures that the system aligns with the project's goals and provides a reliable, efficient, and user-friendly platform for managing extension services. The five-point Likert scale, which was used to interpret the system evaluation's mean average into a qualitative description as shown TABLE IV.

TABLE IV. FIVE-POINT LIKERT SCALE

Scale	Rating Scale	Qualitative Description
4.21 – 5.00	5	Strongly Agree
3.4 – 4.20	4	Agree
2.61 – 3.40	3	Neutral
1.81 – 2.60	2	Disagree
1.00 – 1.80	1	Strongly Disagree

Five-point Likert scale, which was used to interpret the system evaluation's mean average into a qualitative description.

To validate the effectiveness of the Web-Based Extension Services Management Information System, both system testing and user evaluation were conducted with 50 respondents composed of administrators, coordinators, faculty, and staff. The following quantitative results were obtained:

Processing Time Reduction

- Traditional method: 5 working days (evaluation) + 7 working days (approval) = 12 days total.
- Application method: 2 working days (evaluation) + 4 working days (approval) = 6 days total.
- Time saved:

$$\frac{12-6}{12} \times 100 = 50\%$$

12

The system reduced the overall processing and approval time by **50%.**

Error Rate Reduction

- Manual method: prone to document loss, inconsistent reporting, and miscommunication. Pre-implementation review indicated an estimated 12% error rate in handling and reporting.
- Application: Automated validation and centralized document storage reduced the error rate to 2%.
- Error reduction:

$$\frac{12-2}{12} \times 100 = 83.3\%$$

The system achieved an 83% reduction in document handling and reporting errors.

DISCUSSIONS

The review process allows the director or head to Approve, Request Revision, or View Profile for more information, enhancing decision-making, transparency, and feedback accuracy. Reviewer access to author details ensures well-informed evaluations.

The system automates data collection, analysis, and reporting, streamlining decision-making. Visual tools like bar and pie charts present participation metrics by campus and department, with detailed insights available. Quarterly reports summarize key trends. Real-time updates reduce manual effort and errors, while automated reporting enhances clarity in tracking student, faculty, and staff involvement. Additionally, the system allows users to export reports into Excel format, enabling further analysis and easy sharing.

The system was evaluated using ISO/IEC 9126, assessing its functionality, dependability, usefulness, efficiency, maintainability, and portability. Beta Testing was conducted to examine usability, functionality, and reliability, with end users testing the system in real-world scenarios. Usability ensured intuitiveness, functionality confirmed all features worked as intended, and reliability verified consistent operation. Feedback from Beta Testing enabled refinements before deployment.

The research involved 50 respondents selected through stratified sampling, ensuring representation across various academic disciplines. This method minimized sampling bias and provided a comprehensive assessment of the system's performance, enhancing the reliability and validity of the findings.

TABLE V. ISO/IEC 9126 EVALUATION RESULT

ISO Characteristics	Mean	Qualitative Description
Functionality	4.49	Strongly Agree
Reliability	4.37	Strongly Agree
Usability	4.53	Strongly Agree
Efficiency	4.49	Strongly Agree
Maintainability	4.40	Strongly Agree
Portability	4.65	Strongly Agree
OVERALL GRAND MEAN:	4.45	Strongly Agree

The system will be handling sensitive institutional data, including project proposals, staff credentials, and administrative approvals. To mitigate risks, the research adopting data privacy protocols aligned with the

Philippine Data Privacy Act of 2012 (RA 10173). This includes implementing role-based access controls, two-factor authentication, and end-to-end encryption for data transmission. Moreover, a regular system audit and vulnerability assessment will ensure that potential threats are proactively identified and addressed. Establishing a clear data backup and disaster recovery plan also minimizes risks of data loss from cyberattacks or system failures.

While strong cybersecurity measures are essential, they should not overly complicate system access. The solution is to implement security protocols that integrate seamlessly into the user experience, such as single sign-on (SSO) for faculty using institutional accounts. This ensures that while data is protected, the system remains efficient and user-friendly.

Data privacy and cybersecurity considerations should also be embedded in the system's long-term design. As the system scales to handle larger volumes of data and potentially integrates with other SUC systems, it must maintain compliance with international cybersecurity standards (ISO/IEC 27001).

CONCLUSIONS

The successfully developed a web-based system that enhances the efficiency and functionality of extension services. The application streamlines document submission, facilitates collaboration, and automates reporting. By improving transparency, communication, and data accuracy, the system significantly optimizes administrative operations and contributes to institutional efficiency. The successful implementation underscores its potential as a model for modernizing academic extension management systems.

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