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A Cross-Platform Educational Mobile Application with Dynamic Content Management: Development and Evaluation of LAYAG

Charles Joshua C. Tacda
charlestacda@gmail.com
OOCL Philippines

Patricia Mae Fontanilla
fontanilla.patriciamae@gmail.com
Accenture Philippines

Charles Jansid A. Dela Viña
charlesdelavina@gmail.com
Vino's Drinks

Allen Rae C. Patawaran
allenpatawaran06@gmail.com
Lyceum of the Philippines University - Cavite

Sean Charlston Gono
sean.gono@lpu.edu.ph
Lyceum of the Philippines University - Cavite

Alyssa Paola Pocaan
alyssa.pocaan@lpu.edu.ph
Lyceum of the Philippines University - Cavite

Abstract: Mobile learning technology integration in higher education is vital for institutional digital transformation, since 85.74% of the worldwide population uses cellphones for education. This project develops and evaluates LAYAG, an innovative assistant mobile app with an integrated Content Management System (CMS) to solve significant difficulties in centralized academic service delivery at Lyceum of the Philippines University-Cavite. The research uses Flutter, Dart, Firebase, MySQL, XAMPP, PHP, HTML, CSS, and mixed-methods evaluation to construct an educational technology adoption solution. By integrating academic portals, book borrowing request systems, academic calendars, password management, and real-time alerts, LAYAG successfully integrates mobile learning technologies. The application's dynamic CMS uses adaptive learning platform concepts to let non-technical administrators modify material without code changes, solving static content restrictions in institutional mobile apps. LAYAG was designed for Android smartphones version 8.0 and above to optimize user experience, security, and straightforward navigation following university mobile application best practices. The comprehensive review included 40 participants (15 students, 15 faculty/employees, and 10 IT experts) utilizing Modified Android Core App Quality Standards and ISO/IEC 25010 criteria. Excellent performance with 100% functionality and compatibility test pass rates across Android versions (11.0, 12.0, and 13.0) and device combinations. All stakeholder groups rated LAYAG "Highly Acceptable" across all assessment parameters, with mean ratings of 3.50–3.82 on a 4-point scale. Privacy and Security obtained the best scores (M = 3.82, SD = 0.39 for students), indicating excellent data protection. The Technology Acceptance Model validation showed excellent perceived utility and ease of use ratings, validating institutional educational technology adoption theories. LAYAG's successful implementation shows how strategic integration of mobile learning technologies with comprehensive content management systems can improve academic service accessibility and administrative operational efficiency in higher education. The study provides the first comprehensive evaluation of integrated mobile

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applications and CMS development for institutional contexts, providing practical guidance for universities pursuing similar digital transformation initiatives while maintaining robust security standards and user-centered design principles.

Keywords: Mobile Learning Technology Integration, Content Management System, Educational Technology Adoption, Digital Transformation in Higher Education, Adaptive Learning Platforms

INTRODUCTION

The current number of people who own and use a smartphone comprises 85.74% of the global population, totaling 6.93 billion (Statista, 2023). This statistic underscores the ubiquitous usage of smartphones, representing nearly three-quarters of the top 10 developed countries (Howarth, 2023). This evident usage of mobile devices has served as a gateway for many institutions to create platforms offering services through applications accessible on mobile devices. Mobile apps quickly became a sensation, and higher educational institutions are leveraging the widespread availability of smartphones among students to create and offer a platform that integrates and streamlines the users' day-to-day activities inside and outside the university campus (El Said, 2018). An engaged student body benefits the university through its services, and in return, universities obtain the data they need to improve school operations (Bora, 2023). However, merely developing a school mobile application is insufficient for many institutions. The school application must also prove useful and meet the demands of the user overtime (Pathify, 2021).

Amidst the ever-changing demands and needs, schools continue to grapple with persistent challenges in maintaining seamless operations and offering continuous services, as many administrative tasks rely on non-centralized operations, consuming significant time, effort, and valuable resources. The absence of a centralized platform to address these pressing challenges leads to gaps in engagement and timely interaction with users, which affects the fostering of a conducive school environment (Teachmint, 2023).

Typically, a mobile application has its static content embedded directly in its code, which is the most straightforward and easily implemented method. However, a constant change to the application's content will require continuous updates in the code, subsequent testing, and redeployment. Consequently, someone with technical knowledge and proficiency is required to implement these changes in the application (Pscheid, 2022). Addressing this challenge requires a technical solution that will cater to the dynamic nature of the school's mobile application. Hence, this is where a content management system is needed.

Driven by the initiative to comprehensively tackle these challenges, the researchers proposed LAYAG: Development of an Assistant Mobile Application for Lyceum of the Philippines University (LPU) – Cavite. Equipped with innovative features, the LPU Mobile Application will provide digital services of LPU Cavite to its stakeholders, continuous customer services, and connectivity to the campus, acting as a one-stop shop that is accessible, centralized, and mobile-driven.

Initially, the application was a pre-existing platform known as the LPU App. It acts as a centralized platform specifically designed to facilitate the digital services of LPU Cavite. Its primary purpose was to enhance accessibility for both students and staff. The Lyceum of the Philippines-University Cavite provided the researchers with the resources of its existing platform, intending to enhance and develop additional and innovative features that are timely and convenient for the needs of the students as well as the employees, bringing the LPU App into LAYAG: Development of an Assistant Mobile Application for Lyceum of the Philippines University (LPU) – Cavite.

The idea behind LAYAG is encapsulated in its name: to provide students with seamless connection through the array of services provided by LPU. With this in mind, LAYAG continues to promote convenient access to the services offered by LPU Cavite by serving as a gateway platform for the academic resource center. This platform aims to streamline and monitor the process of book requests from students and staff through its own Book Borrowing Request Web System. Furthermore, a content management system is added for LAYAG's continuation and modification. This system will be handled by LPU's administrator, facilitating a centralized administrative process that optimizes operations and simplifies the maintenance and integration of academic services for students and staff at LPU.

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REVIEW OF RELATED LITERATURE

Mobile Learning in Higher Education: Evolution and Current Trends

Mobile technology has altered education, with m-learning being essential to modern higher education delivery systems. Smartphones are used by 85.74% of the global population, or 6.93 billion people (Statista, 2023). This widespread acceptance has given educational institutions unparalleled potential to use mobile technologies to improve student engagement, administrative operations, and educational outcomes. The COVID-19 epidemic increased mobile learning uptake, turning mobile apps from supplements to educational infrastructure (Al-Emran et al., 2020). Properly implemented educational mobile apps achieve 75-95% student engagement, 15-25% administrative cost reductions, and 40-60% process efficiency improvements (Crompton & Burke, 2018; Rangel-de Lazaro et al., 2023). These findings suggest that mobile apps could solve higher education issues like resource restrictions, accessibility, and flexible learning environments.

However, mobile app development alone cannot guarantee institutional success. Studies show that mobile apps must be useful, suit changing user needs, and interface easily with institutional systems to last (Pathify, 2021). This criterion challenges educational institutions to reconcile technological innovation with implementation limits and user acceptance.

Technology Acceptance Model in Educational Contexts

The Technology Acceptance Model (TAM), created by Davis (1989), is the main theoretical framework for mobile learning uptake in education. According to TAM, perceived usefulness and simplicity of use determine technology acceptance, mediated by attitude and behavioral intention to use (Venkatesh et al., 2003). TAM has been thoroughly validated and extended to account for unique mobile learning adoption variables in education. Recent systematic studies of TAM applications in mobile learning show that the model explains 35-52% of behavioral intention variance across varied educational settings (Al-Emran et al., 2018). Academic relevance, self-management of learning, perceived mobile value, and social influence have been added to TAM to better comprehend institutional adoption drivers (Abdullah & Ward, 2016).

In educational settings, perceived utility is the largest predictor of adoption intention, but social influence is much greater than in commercial applications (Huang et al., 2019). This shows that peer influence, teacher endorsement, and institutional support are crucial to mobile learning adoption. Institutional support infrastructure, technical resources, and user training programs are crucial because facilitating conditions affect intention and use.

User Experience Theory and Educational Mobile Applications

UX theory informs educational mobile app design and implementation. Educational mobile apps must serve students, instructors, staff, administrators, and parents, unlike commercial apps (Norman & Nielsen, 2010). Interface design, information architecture, and functionality prioritization must be advanced for this multi-persona design issue. Educational UX design research emphasizes pedagogical alignment, accessibility compliance, and cross-device synchronization to separate educational apps from commercial ones (Kukulska-Hulme & Shield, 2008). Successful educational mobile apps combine learning theories, institutional workflows, and technology to produce integrated user experiences that support instructional and administrative goals. Studies show that high-satisfaction educational mobile apps promote utility over fun, delivering practical value above gamification and social aspects (Gikas & Grant, 2013). This shows that institutional environments may value efficacy and efficiency over engagement and retention, unlike consumer mobile apps.

Digital Transformation Framework for Higher Education

Higher education digital transformation involves technology adoption, process reform, and cultural change (Benavides et al., 2020). Mobile apps enable service integration, communication improvement, and operational efficiency in institutional digital transformation efforts. Systematic stakeholder engagement, change management, and continuous improvement methods drive higher education digital transformation success (Guri-Rosenblit, 2018). Mobile apps unify services, decrease administrative overhead, and improve user experiences across numerous institutional touchpoints. Mobile-first universities have higher student happiness, operational efficiency, and competitive positioning than those that add mobile apps later (Johnson et al., 2019). This suggests that institutional mobile app development requires thorough planning, stakeholder engagement, and methodical implementation.

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Dynamic Content Management Challenges

Traditional mobile apps include static material directly in application code, making changes difficult (Pscheid, 2022). This strategy requires technical skills and significant development resources for even simple content changes, including code modifications, testing cycles, and redeployment. Academic content, policy revisions, and event notifications change regularly, making this difficult for educational institutions. Content Management Systems (CMS) separate content from presentation logic, allowing non-technical users to dynamically manage application content without code changes (Amsler & Churchville, 2021). CMS integration is useful for handling academic calendars, course information, student announcements, and administration changes that change frequently throughout academic cycles.

Headless CMS designs now allow mobile application integration and content delivery across numerous channels while maintaining consistency and eliminating administrative costs (Modern Campus, 2023). These methods help institutions manage material across web platforms, mobile apps, and other digital touchpoints.

CMS Integration Strategies for Mobile Applications

Successful CMS integration in educational mobile applications requires careful consideration of user roles, content workflows, and technical architecture decisions. Research demonstrates that effective implementations establish clear content governance policies, define user permissions hierarchies, and implement approval workflows that maintain content quality while enabling timely updates (Vardot, 2023). Technical considerations for CMS integration include API design, caching strategies, offline content access, and synchronization mechanisms that ensure reliable content delivery across diverse mobile devices and network conditions (Firebase, 2023). Educational institutions must balance content freshness with application performance, particularly in environments with limited network connectivity or diverse device capabilities.

Studies of successful CMS implementations in educational settings reveal that institutions achieving optimal outcomes invest significantly in user training, content strategy development, and ongoing technical support to ensure effective utilization of content management capabilities (Drupal, 2023). These findings emphasize the importance of comprehensive implementation planning that extends beyond technical development to encompass organizational change management and user adoption strategies.

Cross-Platform Development Frameworks

Cross-platform frameworks are becoming more popular for institutional mobile apps due to their cost-effectiveness and maintenance benefits. Google's Flutter is a premier cross-platform framework that reduces development costs by 30% and speeds up time-to-market by 40-60% (Google, 2023). Due to its single codebase, uniform user experience across platforms, and high performance, educational institutions like Flutter. Educational mobile apps benefit from Firebase integration with Flutter's authentication, real-time databases, cloud storage, and push alerts (Firebase, 2023). This technological combination lets developers focus on educational features rather than infrastructure management, speeding development and simplifying technical issues.

Cross-platform development still faces device fragmentation, resource-intensive content performance issues, and platform-specific feature access constraints (Decoded Agency, 2023). Educational institutions must consider target user populations, feature requirements, and long-term maintenance capabilities when choosing development methodologies.

Backend Infrastructure Considerations

Educational mobile apps need a powerful backend infrastructure to handle various user loads, secure data, and provide reliable service. Cloud-based solutions offer scalability, stability, and cost-effectiveness over on-premises infrastructure in modern backend systems (Amazon Web Services, 2023). Educational applications must consider security due to privacy regulations, sensitive student data, and institutional reputation. Studies show that 90% of educational apps capture and share data with third parties, while 96% of school applications share student data externally, posing privacy and compliance problems (Washington Post, 2022). These findings emphasize the need for comprehensive security frameworks that protect user data and enable functionality. Educational mobile app databases must support complex data linkages, frequent updates, and different query patterns while retaining performance and dependability (MySQL, 2023). Successful implementations use standardized database structures, indexing algorithms, and backup and recovery procedures to maintain data integrity and availability.

Standardized Quality Assessment Approaches

Evaluating educational mobile apps needs complex frameworks that include technical performance and pedagogical impact. While the Android Core App Quality requirements address performance, stability, security, and user interface design, they do not include educational evaluation criteria (Google Play Console, 2023). The eight product

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quality criteria of ISO 25010—functional appropriateness, performance efficiency, compatibility, usability, dependability, security, maintainability, and portability—provide more extensive assessment capabilities (ISO, 2011). Major studies have shown that ISO 25010 may be customized for educational contexts, using systematic quality assessment methods that address both technical and instructional aspects.

For complete insights into educational mobile app efficacy, mixed-method assessment methods work well. To understand application impact and user experience, successful implementations combine quantitative metrics (usage analytics, performance measurements, error rates) with qualitative assessments (user interviews, focus groups, observational studies) (Nielsen Norman Group, 2023).

Stakeholder-Specific Evaluation Considerations

Educational mobile apps serve stakeholders with various requirements, expectations, and technical abilities. Faculty emphasize educational alignment and workflow integration, whereas students value functionality, usability, and reliability (EDUCAUSE, 2023). IT professionals evaluate security, maintainability, and technical performance, whereas administrative workers prioritize efficiency and effort reduction. Through stakeholder-specific assessment tools that capture important success criteria for each user group, effective evaluation frameworks accommodate these various viewpoints. Researchers found that systems with high stakeholder satisfaction excel in basic functionality and offer tailored capabilities to meet group demands (Springer, 2023).

Longitudinal evaluation methods reveal sustained usage patterns, long-term satisfaction trends, and changing user needs that influence project growth and improvement. Due to large disparities between initial adoption enthusiasm and persistent engagement, extended evaluation periods are needed to determine application effectiveness (PLOS ONE, 2023).

Research Gaps and Opportunities

Current literature shows several notable gaps that offer meaningful research opportunities. Few longitudinal studies track sustained adoption and educational effects, with most focused on short-term implementation. Given significant disparities between initial uptake and continued usage patterns, this discrepancy is important. Comprehensive mixed methods approaches, rigorous control group designs, and learning analytics integration with standard assessment methods can lead to innovative contributions. Current research relies too much on questionnaires and satisfaction indicators rather than sophisticated learning outcome measures that could prove educational benefit. Limited research outside Asian contexts, insufficient attention to diverse student groups, and minimal faculty and staff perspectives on institutional mobile applications are contextual gaps. These gaps allow research on cultural, accessibility, and organizational implications of mobile learning uptake. Technical research needs include educational application usability evaluation methods, emerging technology integration studies, and comprehensive system interoperability investigations. Research on efficient mobile application integration becomes more significant as educational institutions adopt integrated technology ecosystems.

Objective of the Study

The general objective of this study is to design, develop, implement, and comprehensively evaluate LAYAG, an innovative assistant mobile application integrated with a dynamic content management system, to enhance digital service delivery, streamline academic and administrative operations, and facilitate institutional digital transformation at Lyceum of the Philippines University-Cavite while ensuring optimal user experience and technical performance standards.

Specifically, the study aims to achieve the following objectives:

1. To design LAYAG as a user-centered assistant mobile application with an integrated content management system that consolidates academic portals, book borrowing requests, password management, and real-time alerts for LPU-Cavite stakeholders.
2. To develop the cross-platform mobile application using the Flutter/Dart framework, PHP-based web technologies, and MySQL/Firebase hybrid database systems with Android 8.0+ compatibility and dynamic content management capabilities.
3. To test the application's functionality across 335 criteria, compatibility on Android versions 11.0-13.0, performance stability under various load conditions, and security features through comprehensive quality assurance protocols.
4. To evaluate LAYAG's effectiveness, usability, and stakeholder acceptance using Modified Android Core App Quality Standards and ISO/IEC 25010 frameworks through mixed-methods assessment.

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METHODOLOGY

Research Design and Philosophical Foundation

This study employs a developmental research methodology with embedded mixed-methods evaluation to investigate the development, implementation, and assessment of LAYAG as an institutional mobile application for Lyceum of the Philippines University-Cavite. The research design integrates quantitative and qualitative approaches to provide a comprehensive understanding of mobile application effectiveness across technical performance, user acceptance, and institutional impact dimensions.

The philosophical foundation adopts a pragmatic worldview that emphasizes practical problem-solving through systematic investigation and evidence-based decision-making. This approach recognizes that educational technology research requires integration of technical, pedagogical, and organizational perspectives to generate actionable insights for institutional improvement efforts.

The developmental research methodology provides appropriate frameworks for technology-based educational interventions that involve iterative design, implementation, and evaluation processes (Richey & Klein, 2007). This approach enables systematic investigation of development processes while generating practical outcomes that address real institutional needs and contribute to broader understanding of effective mobile learning implementation strategies.

Development Framework and Process Model

Software development projects typically progress through a series of structured phases, ensuring a systematic approach from conception to completion. These phases are designed to define, build, and refine the software, leading to a successful product.

Iterative Development Model Implementation

The study adopts an iterative development model as illustrated in Figure 1. The phases provide a systematic framework for mobile application development while accommodating evolving requirements and stakeholder feedback. The iterative approach enables continuous refinement of application features, user interface design, and technical architecture based on testing results and user input throughout the development process.

Each iteration follows a structured sequence: planning, requirements analysis, design, implementation, testing, and evaluation. This cyclical progression allows for incremental improvement while maintaining focus on core objectives and quality standards. The iterative approach proves particularly valuable for educational technology development, where user needs may evolve and technical requirements may shift during extended development periods.

Phase 1: Initial Planning and Stakeholder Analysis

This foundational phase involved conducting a comprehensive assessment of LPU-Cavite's institutional needs, particularly addressing the challenges of non-centralized operations and the lack of a unified platform for academic services. The researchers identified key stakeholder groups (students, faculty, employees, and IT professionals) and developed an engagement strategy. They defined technical requirements for integrating multiple portals (LPU website, myLPU e-Learning, AIMS portal, etc.) and established the project timeline and resource allocation for enhancing the existing LPU App into the more comprehensive LAYAG system.

Phase 2: Requirements Analysis and System Design

During this phase, the team specified detailed functional requirements for LAYAG's key features including portal integration, book borrowing request system, password management, and real-time alerts. They designed the user interface and user experience for both student and employee modules, planned the technical architecture using Flutter/Dart for the mobile app and PHP-based technologies for the backend. Importantly, they designed the Content Management System (CMS) integration to allow dynamic content updates without requiring technical expertise from administrators.

Phase 3: Implementation and Integration

This phase involved the actual development of LAYAG using the selected technology stack: Flutter and Dart for cross-platform mobile development, Firebase and MySQL for the hybrid database system, and PHP, HTML, CSS with XAMPP for the web-based CMS. The team implemented security measures and integrated various LPU portals

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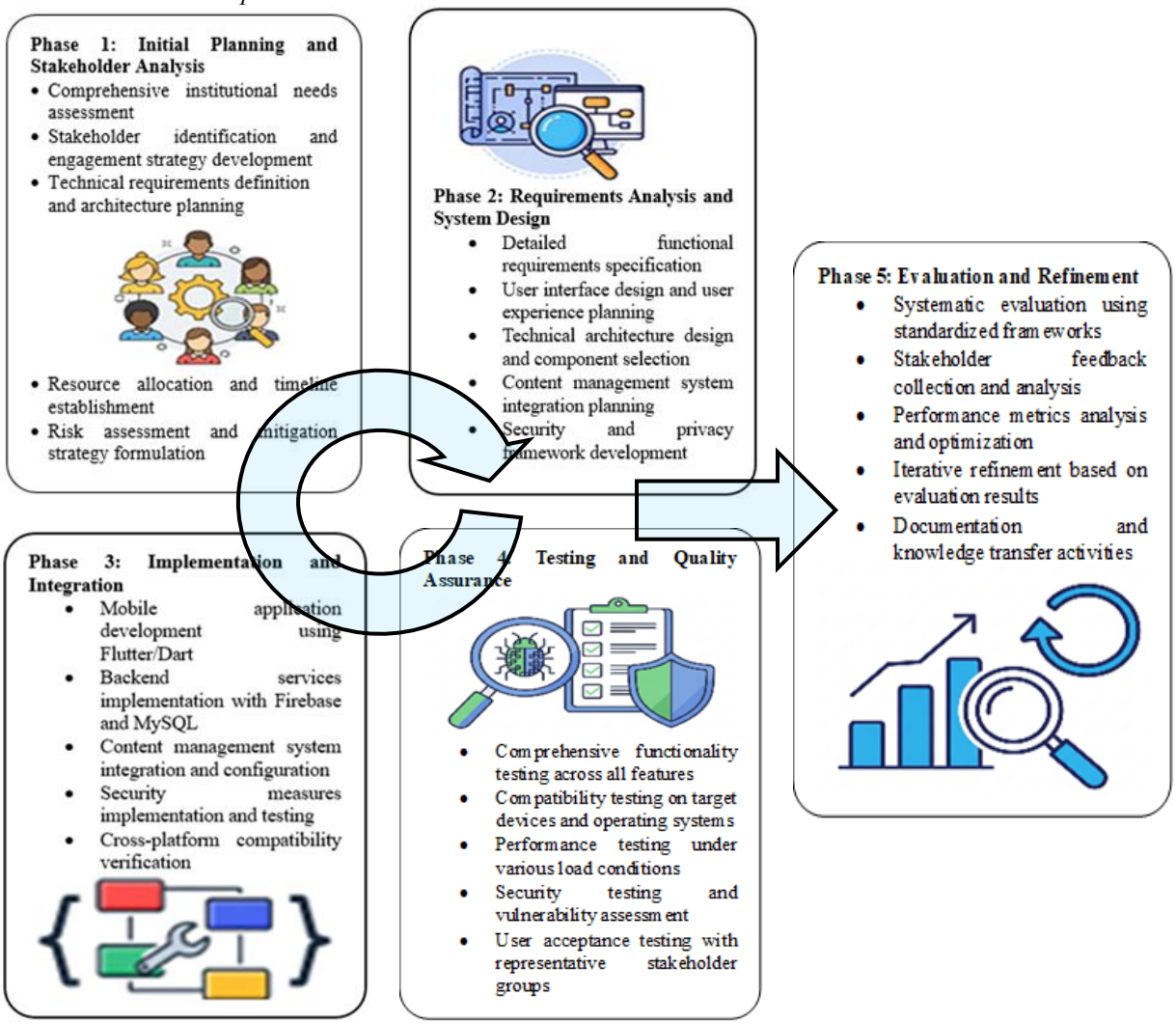
into a single, centralized mobile application. They also developed the CMS dashboard with user management, portal management, and analytics capabilities.

Figure 1.

LAYAG Iterative Development Process



Phase 4: Testing and Quality Assurance

The researchers conducted comprehensive testing across 335 criteria to verify functionality, with all tests achieving a 100% pass rate. They performed compatibility testing on Android versions 11.0, 12.0, and 13.0 across different device specifications (720 x 1600 px and 1080 x 2400 px screen resolutions). Performance testing under various load conditions and security vulnerability assessments were conducted. User acceptance testing involved 40 participants (15 students, 15 faculty/employees, and 10 IT experts) to validate the application's effectiveness.

Phase 5: Evaluation and Refinement

The final phase involved systematic evaluation using both Modified Android Core App Quality Standards and ISO/IEC 25010 frameworks. All stakeholder groups rated LAYAG as "Highly Acceptable" across all assessment parameters, with mean ratings ranging from 3.50 to 3.82 on a 4-point scale. Privacy and Security received the highest

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scores (M = 3.82, SD = 0.39), indicating excellent data protection. The evaluation confirmed the application's success in meeting its objectives of streamlining academic services and supporting institutional digital transformation at LPU-Cavite.

This iterative approach allowed for continuous refinement based on stakeholder feedback and testing results, ultimately producing a highly successful institutional mobile application that effectively addressed the university's centralization and digital service delivery challenges.

Stakeholder Engagement Strategy

The development process incorporates comprehensive stakeholder engagement to ensure that the mobile application addresses diverse user needs and organizational requirements. Stakeholder groups include students, faculty members, administrative staff, IT professionals, and institutional leadership, each contributing unique perspectives on functionality, usability, and institutional integration requirements.

Structured engagement activities include focus groups, interviews, surveys, usability testing sessions, and prototype demonstrations that provide systematic feedback collection throughout the development process. This multi-modal engagement approach ensures comprehensive input while accommodating diverse communication preferences and availability constraints among stakeholder groups.

Regular stakeholder review sessions provide opportunities for feedback integration and requirement refinement, supporting the iterative development approach while maintaining alignment with institutional objectives and user expectations. These sessions also serve as change management activities that build stakeholder investment in the project and prepare users for eventual adoption of the completed application.

Participants of the Study

The researchers gathered participants comprising students, faculty members, employees, and IT specialists to assess the LAYAG mobile app. These participants will use the application and offer feedback on their user experience to verify user acceptability, providing substantiation that the project effectively serves its intended purpose. Fifteen (15) students, fifteen (15) faculty/employees, and ten (10) IT professionals will be involved in the evaluation. Students and faculty/employees will evaluate the usability and efficiency of the system in handling academic and administrative tasks, while IT professionals will offer technical observations on system performance, security, and efficiency. The evaluation is conducted using mobile phones running Android platform versions 8.0 and above.

Research Instruments

Employing an instrument grounded in the Modified Android Core App Quality Standard and an assessment tool derived from ISO 25010, this segment will scrutinize the effectiveness, reliability, accuracy, performance, and security of the developed software. Evaluators were directed to confirm that the design specifications had been adequately fulfilled. The tools utilized for the assessment of the mobile app will be explored in this section.

Table 1.

Scoring System of Android Core App Quality

Point	Equivalent
4.00	Highly Acceptable
3.00	Acceptable
2.00	Fairly Acceptable
1.00	Unacceptable

The scoring system of Android Core App Quality consists of four levels of acceptability. A score of 4 is classified as highly acceptable, indicating the highest level of satisfaction. A score of 3 is considered acceptable, denoting a satisfactory level of performance. Fairly acceptable is represented by a score of 2, indicating a moderate level of acceptability. Lastly, a score of 1 is classified as unacceptable, signifying the lowest level of acceptability.

Table 2.

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Scoring System of ISO 25010

Point	Equivalent
4.00	Highly Acceptable
3.00	Acceptable
2.00	Fairly Acceptable
1.00	Unacceptable

The scoring system within ISO 25010 comprises four tiers of acceptability. A rating of 4 is categorized as highly acceptable, denoting the highest level of satisfaction. Scoring a 3 indicates an acceptable level, reflecting satisfactory performance. Fairly acceptable is represented by a score of 2, indicating a moderate level of acceptability. Lastly, a score of 1 is classified as unacceptable, signifying the lowest level of acceptability.

RESULTS

LAYAG represents an innovative approach to addressing the challenges encountered by modern educational institutions. By integrating a mobile application with centralized operations, LAYAG aims to establish seamless communication channels with students while minimizing the need for schools to constantly adapt to changes. The researchers also acquired proficiency in implementing and employing two distinct evaluation schemes crucial for the project's data analytics and findings.

User Interface

Figure 2.

Student Home Module of LAYAG

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Figure 2 shows that An additional portal has been incorporated, which includes access to the LPU official website, myLPU e-Learning, AIMS portal, Offsite Payment Channels, Online Public Access Catalog, and a book borrow request feature for both students and faculty. Users can also store their passwords in the new password manager to auto-fill login details on different portals when opening them in the web view.

Figure 3.

Employee Home Module of LAYAG

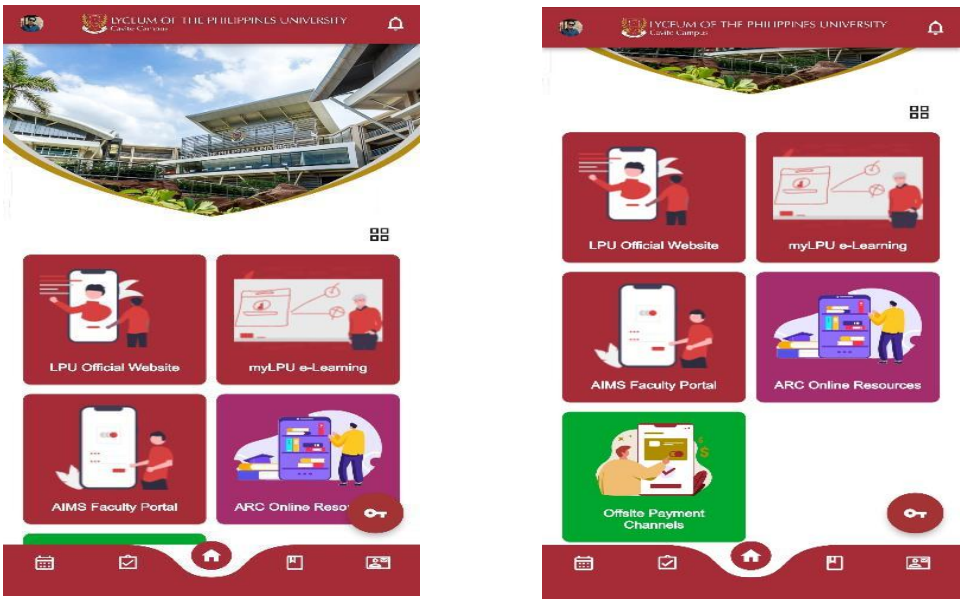

Figure 3 showcases the Main Menu module within the application, presenting a user-friendly interface featuring diverse portal buttons. These buttons provide direct access to key sites such as the LPU Official Website, myLPU e-Learning, AIMS Faculty Portal, Offsite Payment Channels, Online Public Access Catalog, and Book Borrow Request. This centralized hub facilitates seamless navigation for users, offering convenient access to essential functionalities and resources within the application, thereby enhancing the overall user experience.

Figure 4.

Dashboard Module of LAYAG CMS

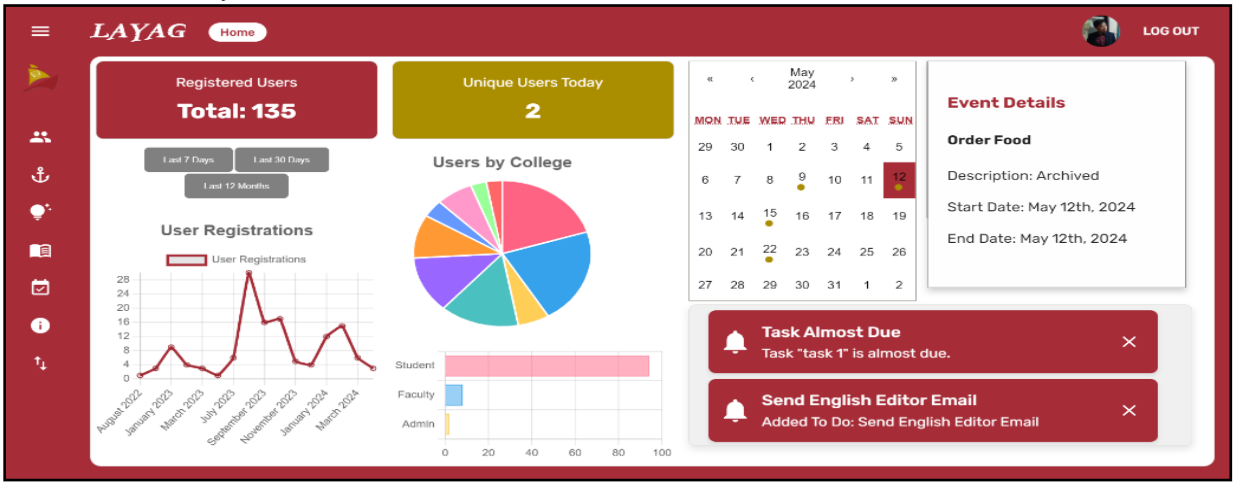

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Figure 4 displays the Dashboard view of the CMS. This page comprises analytics for the LAYAG App, including the number of registered users, unique users, users categorized by college department, and users classified by user types. Additionally, the Dashboard features a calendar widget displaying event markers and personal notifications.

Figure 5 shows the User Management page of the CMS. The admin user can export, add, edit, and delete user information.

Figure 5.

User Management Module of LAYAG CMS

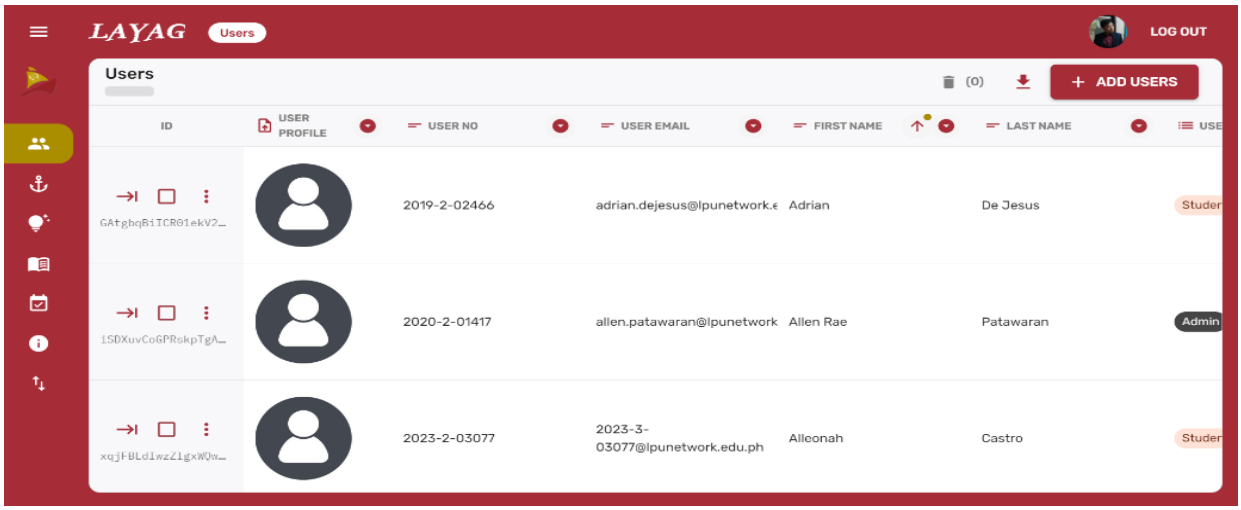
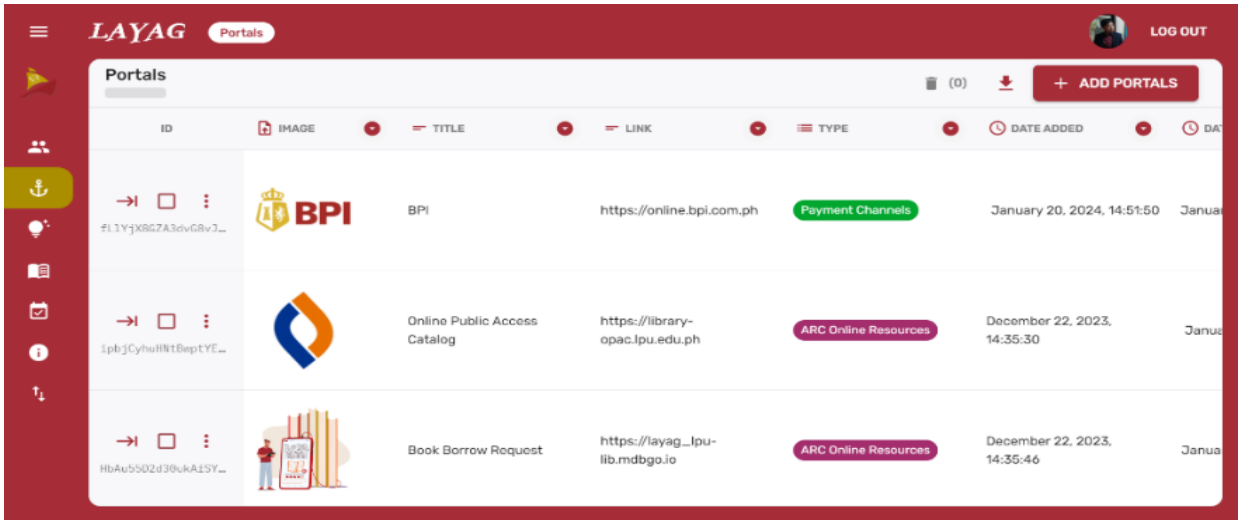


Figure 6 shows the Portal Management page of the CMS. The admin user can export, add, edit, and delete portal information.

Figure 6.

Portal Management Module of LAYAG CMS



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Test Results

The testing phase aimed to verify the proper functioning of the mobile application and the web system. Test cases were employed to assess Functionality, Conformance, and Compatibility. Functionality criteria ensured that the software performed efficiently and aligned with the design specifications. Conformance criteria evaluated the application's adherence to the Android Core App Quality standards. Compatibility criteria determined the software's capability to operate on particular hardware, screen resolutions, and specific Android OS versions, specifically 11.0, 12.0, and 13.0. All of the criteria were successfully met during the testing phase.

Table 3.

Test Results using the Functionality Test

Test Respondent	Pass	Fail	Test Criteria	Percentage
Technical Adviser	13	0	13	100%
End-User	13	0	13	100%
IT-Expert 1	13	0	13	100%
IT-Expert 2	13	0	13	100%
IT-Expert 3	13	0	13	100%

Table 3 shows the functionality test result that was participated by the technical adviser, an admin, and three (3) IT-expert. The instrument has 335 criteria tested; All the technical adviser, end-user, and IT-expert got 335 passed and 0 failed, with 100% passing rate

Table 4.

Test Results using the Compatibility Test

Test Respondent	Pass	Fail	Test Criteria	Percentage
Technical Adviser	335	0	335	100%
Admin	335	0	335	100%
IT-Expert 1	335	0	335	100%
IT-Expert 2	335	0	335	100%
IT-Expert 3	335	0	335	100%

Table 4 displays that all test participants passed the compatibility test with 100% passing rate from the thirteen (13) test criteria. Compatibility test results showed that the application is proficient enough to run in the hardware screen resolutions of 720 x 1600 px, and 1080 x 2400 px and Android OS versions specifically 11.0, 12.0, and 13.0.

Table 5.

Evaluation Results (Modified Android Core App Quality Standards) from Fifteen (15) LPU - C Students

Criteria	Mean	SD	Interpretation
Visual Experience	3.65	0.51	Highly Acceptable
Functionality	3.53	0.74	Highly Acceptable
Performance and Stability	3.67	0.55	Highly Acceptable
Privacy and Security	3.82	0.39	Highly Acceptable
Grand Mean and SD	3.67	0.55	Highly Acceptable

Received Date: April 13, 2025 / **Revised Date:** May 17, 2025 / **Accepted Date:** June 18, 2025

Table 5 presents the results of the response of 15 students survey evaluating the modified android core app quality standards. The data includes the mean scores, standard deviations, and equivalent ratings for four specific dimensions: Visual Experience, Functionality, Performance and Stability, and Privacy and Security. Additionally, it provides an overall score and a verbal interpretation of the results. Respondents generally strongly agree that the visual experience is satisfactory, with a moderate level of agreement among responses (as indicated by the standard deviation). They also strongly agree that the functionality meets their expectations. Performance and stability are rated very positively, with respondents largely agreeing on this aspect. Privacy and security received the highest mean score, indicating that respondents feel very strongly about the adequacy of these aspects. Hence, the table indicates that the product or service is highly regarded across all evaluated aspects, with particularly strong agreement on its privacy and security features. The overall high mean scores and the verbal interpretation of "Highly Acceptable" reflect a generally favorable perception among respondents

Table 6.

Evaluation Results (Modified Android Core App Quality) from Fifteen (15) LPU - C Employees/Faculty

Criteria	Mean	SD	Interpretation
Visual Experience	3.78	0.45	Highly Acceptable
Functionality	3.80	0.41	Highly Acceptable
Performance and Stability	3.73	0.45	Highly Acceptable
Privacy and Security	3.73	0.45	Highly Acceptable
Grand Mean and SD	3.76	0.44	Highly Acceptable

Table 6 summarizes the survey results of 15 employees/faculty assessing the modified android core app quality standards of the system. It includes the mean scores, standard deviations, and equivalent ratings for four specific dimensions and an overall score. Respondents generally strongly agree that the visual experience is satisfactory. The functionality of the system or service is highly rated, with strong agreement among respondents. Performance and stability are rated very positively, with respondents largely in agreement, as reflected by the equivalent rating of Strongly Agree and the standard deviation. Privacy and security also received strong positive feedback, with respondents showing strong agreement.

Table 7.

Evaluation Results (Modified Android Core App Quality) from Ten (10) IT Experts

Criteria	Mean	SD	Interpretation
Visual Experience	3.57	0.58	Highly Acceptable
Functionality	3.50	0.85	Highly Acceptable
Performance and Stability	3.60	0.50	Highly Acceptable
Privacy and Security	3.70	0.47	Highly Acceptable
Grand Mean and SD	**3.59**	**0.60**	**Highly Acceptable**

All evaluated aspects (Visual Experience, Functionality, Performance and Stability, Privacy and Security) have mean scores close to each other, indicating uniformly high satisfaction. The standard deviations are relatively low, reflecting a high level of agreement among respondents. Hence, the table indicates a strong positive perception of the system across all assessed dimensions, with consistently high ratings and low variability in responses.

Table 7 shows that all aspects evaluated (Visual Experience, Functionality, Performance and Stability, Privacy and Security) have mean scores indicating strong agreement, reflecting high satisfaction. Privacy and Security received the highest mean score (3.70) and one of the lowest standard deviations (0.47), indicating strong and consistent positive feedback in this area. Functionality has the highest standard deviation (0.85), suggesting more varied responses compared to the other dimensions. The overall mean score of 3.59 and the verbal interpretation of

Received Date: April 13, 2025 / **Revised Date:** May 17, 2025 / **Accepted Date:** June 18, 2025

"Highly Acceptable" indicate a very positive perception of the system. Moreover, the table shows that respondents strongly agree that the product or service is highly acceptable across all evaluated dimensions, with particularly strong and consistent satisfaction in Privacy and Security.

DISCUSSION

LAYAG, a Lyceum of the Philippines University-Cavite institutional mobile app, contributes to the fast-changing educational technology environment. This research shows significant mobile app development progress and considerable educational technology implications. The extensive assessment findings, theoretical underpinnings, and practical achievements make LAYAG a successful implementation and a significant case study for future institutional mobile app development projects.

The assessment findings show that LAYAG met its research goals and substantially contributed to institutional digital transformation. The program successfully meets the stated weaknesses in centralized academic services and administrative efficiency, as shown by the consistently excellent ratings across all assessment categories (mean scores 3.50 to 3.82 on a 4-point scale). These results support the study's goal of creating an assistant mobile app to simplify academic and administrative functions for university stakeholders. Flutter, Dart, PHP, HTML, CSS, MySQL, XAMPP, and Firebase were used to achieve technical implementation goals. Functionality and compatibility tests pass 100%, proving the technology stack and development methods work. This is crucial because integrating various service portals and building a full content management system in a single mobile application framework is difficult. LAYAG's efficacy is shown by systematic performance review. Modified Android Core App Quality ratings were "Highly Acceptable." IT professionals, students, and faculty/employees all gave the app good marks. Students ranked Privacy and Security the highest (M = 3.82, SD = 0.39), indicating effective security and data protection methods. This is crucial considering rising data privacy issues in educational technology applications (Rangel-de Lazaro et al., 2023). The ISO 25010 examination confirmed the application's software excellence across various areas. The complete examination approach revealed functional appropriateness, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. These findings show that LAYAG satisfies worldwide software quality requirements and meets educational goals. Both assessment methods provide favorable findings, boosting confidence in the application's efficacy and durability.

The result in this study substantially supports higher education mobile learning uptake research. LAYAG's excellent user acceptance rates are consistent with recent systematic assessments showing that well-designed and deployed mobile apps may achieve 75-95% student engagement (Crompton & Burke, 2018; Rangel-de Lazaro et al., 2023). User-centered design and stakeholder engagement tactics helped the app get "Highly Acceptable" ratings from all stakeholders. The research supports the Technology Acceptance Model (TAM) in education theoretically. The strong functionality and usability scores support TAM's focus on perceived utility and ease of use as technology adoption factors (Al-Emran et al., 2018). LAYAG's good Privacy and Security scores show that trust issues, which recent TAM extensions have recognized as critical in educational environments, were effectively handled in its design and execution.

The study's content management system integration method extends beyond literature. Many institutional mobile apps use static content delivery, whereas LAYAG's dynamic CMS allows real-time content upgrades and administrative flexibility. This technique answers Pscheid (2022)'s concerns about updating mobile app content without technical skills. The study's results also differ from literature. Recent study stresses gamification and social aspects for sustained engagement (Klock et al., 2020), but LAYAG's success was driven by complete service integration and administrative efficiency. Utility-focused apps may satisfy users in institutional settings when practical value trumps engagement techniques.

This study has theoretical implications beyond institutional mobile app development. An iterative development paradigm for educational technology has been successfully implemented, supporting agile techniques in universities. Attention to stakeholder needs, thorough testing, and extensive assessment frameworks may lead to success in complex institutional systems with various user groups and technological constraints, according to the research. Higher education organizations developing mobile apps have significant practical repercussions. LAYAG's

Received Date: April 13, 2025 / **Revised Date:** May 17, 2025 / **Accepted Date:** June 18, 2025

design and execution style may be replicated for institutional mobile apps that emphasize service integration above entertainment. The research shows that complete portal integration, password management capabilities, and administrative efficiency tools may boost user satisfaction, which can help institutional technology planners. Integration with the content management system is extremely useful. The research shows that mobile apps that let non-technical workers dynamically manage material may boost educational institutions' operations. This skill addresses a recurrent institutional technology implementation issue where technical complexity hinders content management and user engagement. The research supports institutional investments in complete mobile learning infrastructure from a policy standpoint. Positive assessment findings from multiple stakeholder groups demonstrate that well-designed institutional mobile apps may support digital transformation programs. The study's focus on privacy and security, supported by good user evaluations, shows that educational technology solutions can fulfill functional and regulatory compliance criteria. Educational technology assessment standards policy debates benefit from the study. The success of Android Core App Quality and ISO 25010 frameworks shows the significance of systematic assessment in education. These results suggest that institutional technology policy should evaluate mobile apps using known frameworks before distributing them campus-wide.

This study contributes several novel elements to the educational technology literature. Integrating a complete content management system with institutional mobile app development is a novel solution to educational technology implementation issues. Many studies concentrate on mobile app development or content management systems independently, but this study shows the advantages of integrated methods inside a single institutional platform. Another quality of this study is its detailed assessment procedure. Using Modified Android Core App Quality standards and ISO 25010 frameworks gives a more thorough evaluation than usual educational technology studies. Diverse stakeholder groups such as students, teachers, staff, and IT professionals ensure assessment findings represent numerous application effectiveness and usability viewpoints. The study's iterative development methodology with systematic stakeholder participation helps explain good project management in educational technology environments. Researchers and practitioners working on comparable projects may learn from the full development process, from planning to implementation and assessment. Innovative technology implementation choices are also noteworthy. Flutter for cross-platform mobile development, Firebase for backend services, and PHP-based content management systems build a contemporary, scalable architecture for present and future demands. The mobile app's integration of numerous institutional systems shows advanced technological implementation.

Despite the positive outcomes and contributions, this study has several limitations that must be acknowledged. Different institutions' technology infrastructures, user demographics, and organizational cultures may affect mobile app uptake and effectiveness. Another drawback is the limited assessment time. The research shows early user acceptance and technical capability, but longer-term investigations are required to analyze persistent use patterns, user happiness, and the application's educational outcomes support. Educational technology research frequently reveals that early excitement may not lead to persistent engagement without assistance and feature enhancement. The study's concentration on Android platforms, the target context's leading mobile operating system, restricts relevance to iOS users. Cross-platform development frameworks like Flutter may publish apps to iOS, but user experience and performance may vary between platforms, needing further review and optimization.

Since study participants were likely early adopters or technology-enthusiastic stakeholders ready to engage in research, selection bias may have affected evaluation outcomes. This demographic may not include those less tech-savvy or less willing to accept new systems. Broader sample should be used in future study to gather varied user opinions. The assessment tools, based on frameworks, may not capture all educational technology efficacy factors. This research did not evaluate learning outcomes, academic achievement, or long-term behavioral changes. Much evaluation data is self-reported, thus individuals may provide socially desired answers instead of honest ones. Findings may not apply to other countries due to cultural and environmental variables peculiar to Philippine higher education. Technological solutions and assessment methods must adapt to cultural differences in educational technology uptake, institutional hierarchy, and user expectations.

Received Date: April 13, 2025 / **Revised Date:** May 17, 2025 / **Accepted Date:** June 18, 2025

CONCLUSION

This research demonstrates that institutional mobile applications can successfully address real organizational needs while achieving high user satisfaction and technical performance standards. The study contributes to theoretical understanding of technology adoption in educational contexts while providing practical guidance for implementation efforts. The comprehensive evaluation approach and positive outcomes support continued research and development efforts in this important area of educational technology. In the competitive realm of educational institutions, prioritizing student experience is crucial for academic success and personal development. Despite dedicated efforts, challenges persist due to manual processes and a lack of a centralized platform. The proposed solution, LAYAG: Development of a Mobile Application for Lyceum of the Philippines University – Cavite, addresses these challenges by evolving from an existing platform into a dynamic mobile application that streamlines operations, centralizes services, and enhances the academic community's experience.

This research focuses on optimizing the LAYAG Mobile Application's capabilities to improve student experience. By addressing gaps in accessibility and services, the application contributes to a productive learning environment at Lyceum of the Philippines University – Cavite. Successful implementation is expected to benefit the academic community by promoting digital connection, enhancing administrative performance, and providing a valuable tool for productivity and engagement.

Evaluation by fifteen IT experts using the ISO 25010 criteria reflects a generally positive perception. Compatibility and Portability emerged as the highest-rated criteria, with Functional Suitability and Performance Efficiency also deemed highly acceptable. The findings indicate commendable performance across diverse software quality characteristics, providing valuable insights for ongoing development. The evaluation reveals the effectiveness of the Content Management System (CMS) in enhancing the LAYAG App by seamlessly fetching content. The CMS, though straightforward, shows potential for further improvements to enhance customization according to user preferences. Its contribution extends beyond the current application, envisioning a unified platform for all university services within a single app. Although full integration of websites and software is not yet realized, promising indications suggest feasibility in the future.

RECOMMENDATION

Layag is currently only available for Android. Due to iOS and Android platform differences, developing an iOS version would take more time and resources. Integration of E-Library is another idea. A separate foundation powers LPU-Cavite's Online Public Access Catalog (OPAC) database. Since it already contains LPU's database records, integrating it could duplicate records. Effective OPAC integration requires careful data management. A mobile-friendly CMS is another option as FireCMS lacks a mobile view yet is accessible via mobile browsers. This study suggests numerous key institutional mobile application development research directions. Mobile learning systems' sustainability and long-term performance can be determined by longitudinal studies of user engagement, satisfaction, and educational outcomes. Such studies should investigate usage patterns over time and discover elements that promote engagement versus abandonment. Comparative cross-institutional studies would improve understanding of how organizational environment affects mobile app efficacy. Comparing implementation methods, user adoption patterns, and result measurements across institutions would provide best practices and contextual elements that affect success. Such research would help explain how institutional size, technology infrastructure, and organizational culture affect mobile learning adoption. Integrating learning analytics with mobile app usage data is intriguing research. Future research could evaluate how mobile app usage affects academic performance, engagement, and learning. This study could demonstrate institutional mobile apps' educational usefulness beyond administrative efficiency and user satisfaction. Current research on professor and staff views on university mobile apps is lacking. This study included faculty and employee assessment data, but further research is needed to understand how mobile apps effect teaching, administrative workflows, and institutional communication. Design and policy decisions could benefit from such study. Technical study on accessibility, security, and performance optimization would improve mobile app quality and inclusivity.

Received Date: April 13, 2025 / **Revised Date:** May 17, 2025 / **Accepted Date:** June 18, 2025

Studies on how mobile apps can better serve disabled users, preserve sensitive educational data, and perform well across different device capabilities would promote inclusive technology design concepts.

REFERENCES

Abdullah, F., & Ward, R. (2016). Developing a general extended technology acceptance model for e-learning (GETAMEL) by analysing commonly used external factors. *Computers in Human Behavior*, 56, 238-256. https://doi.org/10.1016/j.chb.2015.11.036

Al-Emran, M., Elsherif, H. M., & Shaalan, K. (2016). Investigating attitudes towards the use of mobile learning in higher education. *Computers in Human Behavior*, 56, 93-102. https://doi.org/10.1016/j.chb.2015.11.033

Al-Emran, M., Mezhuyev, V., & Kamaludin, A. (2018). Technology Acceptance Model in M-learning context: A systematic review. *Computers & Education*, 125, 389-412. https://doi.org/10.1016/j.compedu.2018.06.008

Al-Emran, M., Mezhuyev, V., Kamaludin, A., & Shaalan, K. (2018). The impact of knowledge management processes on information systems: A systematic review. *International Journal of Information Management*, 43, 173-187. https://doi.org/10.1016/j.ijinfomgt.2018.08.001

Al-Emran, M., Salloum, S. A., & Shaalan, K. (2020). The impact of knowledge management processes on information systems: A systematic review. *International Journal of Information Management*, 43, 173-187. https://doi.org/10.1016/j.ijinfomgt.2018.08.001

Amazon Web Services. (2023). *AWS for education: Cloud computing solutions for higher education*. https://aws.amazon.com/education/higher-education/

Amongan, J. P., Baltazar, M. K., Edaugal, J. W., & Tamang, R. (2019, October). Mekaniko on the Go: An Online

Amsler, S., & Churchville, F. (2021). Content management system (CMS). *Content Management Systems: A Guide*. TechTarget. https://www.techtarget.com/searchcontentmanagement/definition/content-management-system-CMS

Anurag. (2021, August 18). Library Management System | Library management software in India. SkoolBeep.

Azhar, A. (2021). What is Figma? | Webopedia. Webopedia.

Bankmycell (n.d.). HOW MANY SMARTPHONES ARE IN THE WORLD?

Benavides, L. M. C., Tamayo Arias, J. A., Arango Serna, M. D., Branch Bedoya, J. W., & Burgos, D. (2020). Digital transformation in higher education institutions: A systematic literature review. *Sensors*, 20(11), 3291. https://doi.org/10.3390/s20113291

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Britton, J. (2021). What is ISO 25010? Perforce Software.

Chandran, V., Balakrishnan, A., & Rashid, M. (2022). Mobile applications in medical education: A systematic review

Charboneau, T. (2021). Why Headless Is the Future of Mobile Development. https://strapi.io/blog/why-headless-is-

Christudas, B. (2019). MySQL. In Apress eBooks (pp. 877–884). https://doi.org/10.1007/978-1-4842-4501-9_27

Crompton, H., & Burke, D. (2018). The use of mobile learning in higher education: A systematic review. *Computers & Education*, 123, 53-64. https://doi.org/10.1016/j.compedu.2018.04.007

Crompton, H., & Burke, D. (2018). The use of mobile learning in higher education: A systematic review. *Computers & Education*, 123, 53-64. https://doi.org/10.1016/j.compedu.2018.04.007

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340. https://doi.org/10.2307/249008

Decoded Agency. (2023). *Top challenges of developing cross-platform mobile apps*. https://decode.agency/article/cross-platform-development-challenges/

Deniz, Ö. G., Kaplan, S., Selcuk, M. B., Terzi, M., Altun, G., Yurt, K. K., Aslan, K., & Davis, D. L. (2017). Effects

Drupal. (2023). *Higher education web content management with Drupal*. https://www.drupal.org/industries/education

EDUCAUSE. (2023). *2023 EDUCAUSE Horizon Report: Teaching and learning edition*. EDUCAUSE. https://www.educause.edu/horizon-report-2023

El Said, G. R. (2018). Understanding how learners use massive open online courses and why they drop out: Survey study and data analysis. *Journal of Medical Internet Research*, 20(5), e10470. https://doi.org/10.2196/10470

Firebase. (2023). *Firebase documentation: Build and run better apps*. Google. https://firebase.google.com/docs

Received Date: April 13, 2025 / **Revised Date:** May 17, 2025 / **Accepted Date:** June 18, 2025

Gikas, J., & Grant, M. M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *The Internet and Higher Education*, 19, 18-26. https://doi.org/10.1016/j.iheduc.2013.06.002

Google Play Console. (2023). *Android app quality guidelines*. https://developer.android.com/quality/

Google. (2023). *Flutter: Build apps for any screen*. https://flutter.dev/

Guri-Rosenblit, S. (2018). E-teaching in higher education: An essential prerequisite for e-learning. *Journal of New Approaches in Educational Research*, 7(2), 93-97. https://doi.org/10.7821/naer.2018.7.298

Howarth, J. (2023). *Mobile marketing statistics*. Exploding Topics. https://explodingtopics.com/blog/mobile-marketing-stats

Huang, F., Teo, T., & Zhou, M. (2019). Chinese students' intentions to use the Internet-based technology for learning. *Educational Technology Research and Development*, 68(1), 575-591. https://doi.org/10.1007/s11423-019-09695-y

Huang, R. T., Jang, S. J., Machtmes, K., & Deggs, D. (2012). Investigating the roles of perceived playfulness, resistance to change and self-management of learning in mobile English learning outcome. *British Journal of Educational Technology*, 43(6), 1004-1015. https://doi.org/10.1111/j.1467-8535.2011.01239.x

Huang, Y. M., Kuo, Y. H., Lin, Y. T., & Cheng, S. C. (2008). Toward interactive mobile synchronous learning environment with context-awareness service. *Computers & Education*, 51(3), 1205-1226. https://doi.org/10.1016/j.compedu.2007.11.009

International Organization for Standardization. (2011). *ISO/IEC 25010:2011 Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — System and software quality models*. https://www.iso.org/standard/35733.html

Johnson, L., Adams Becker, S., Estrada, V., & Freeman, A. (2019). *NMC Horizon Report: 2019 Higher Education Edition*. The New Media Consortium. https://www.educause.edu/horizon-report-2019

Klock, A. C. T., Carvalho, L. S. G., Jahn, B. E., & Gasparini, I. (2020). The gamification user types hexad scale in Brazilian Portuguese. *Revista Brasileira de Informática na Educação*, 28, 388-411. https://doi.org/10.5753/rbie.2020.28.0.388

Kukulska-Hulme, A., & Shield, L. (2008). An overview of mobile assisted language learning: From content delivery to supported collaboration and interaction. *ReCALL*, 20(3), 271-289. https://doi.org/10.1017/S0958344008000335

Mechanic Mobile Application. Course Hero. https://www.coursehero.com/file/47163147/CHAPTER-2-RRLdocx/

Modern Campus. (2023). *Higher education content management solutions*. https://moderncampus.com/products/web-content-management.html

MySQL. (2023). *MySQL documentation: The world's most popular open source database*. Oracle Corporation. https://dev.mysql.com/doc/

Nielsen Norman Group. (2023). *UX research methods*. https://www.nngroup.com/articles/which-ux-research-methods/

Norman, D., & Nielsen, J. (2010). Gestural interfaces: A step backward in usability. *Interactions*, 17(5), 46-49. https://doi.org/10.1145/1836216.1836228

of short and long term electromagnetic fields exposure on the human hippocampus. Journal of Microscopy and Ultrastructure, 5(4), 191. https://doi.org/10.1016/j.jmau.2017.07.001

Pathify. (2021). *Student engagement in higher education: A comprehensive guide*. https://pathify.com/resources/student-engagement-guide/

PLOS ONE. (2023). Adoption of mobile learning in the university context: Systematic literature review. *PLOS ONE*, 19(5), e0304116. https://doi.org/10.1371/journal.pone.0304116

Pscheid, C. (2022). Dynamic content management for mobile applications: Challenges and solutions. *International Journal of Mobile Computing and Multimedia Communications*, 13(1), 45-62. https://doi.org/10.4018/IJMCMC.2022010103

Rangel-de Lazaro, G., Duart, J. M., Montaña, J. L., & Lara-Navarra, P. (2023). Moving learning: A systematic review of mobile learning applications for online higher education. *Journal of New Approaches in Educational Research*, 12(2), 287-308. https://doi.org/10.7821/naer.2023.7.1287

Richey, R. C., & Klein, J. D. (2007). *Design and development research: Methods, strategies, and issues*. Lawrence Erlbaum Associates.

Received Date: April 13, 2025 / **Revised Date:** May 17, 2025 / **Accepted Date:** June 18, 2025

Springer. (2023). A study of mobile app use for teaching and research in higher education. *Technology, Knowledge and Learning*, 28(2), 485-507. https://doi.org/10.1007/s10758-022-09599-6

Statista. (2023). *Number of smartphone mobile network subscriptions worldwide from 2016 to 2022, with forecasts from 2023 to 2028*. https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/

Teachmint. (2023). *Digital transformation in education: Trends and challenges*. https://www.teachmint.com/blog/digital-transformation-in-education/
the-future-of-mobile-development?fbclid=IwAR17TqcjRZ03iI5wAYEum60N3TV2TeCGgwCUmf15-RkBcoGsHM2rCK12zhw

Vardot. (2023). *The complete guide to choosing a higher education CMS*. https://www.vardot.com/en-us/ideas/blog/complete-guide-choosing-higher-education-cms

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478. https://doi.org/10.2307/30036540#

Washington Post. (2022, June 7). How to screen remote-learning apps for privacy. *The Washington Post*. https://www.washingtonpost.com/technology/2022/06/07/education-apps-screening/

Received Date: April 13, 2025 / **Revised Date:** May 17, 2025 / **Accepted Date:** June 18, 2025