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A Centralized Digital System for Instructional Material Management in Higher Education: Development and Evaluation of the IMMS at the Polytechnic University of the Philippines

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Abstract

Instructional material management at the Polytechnic University of the Philippines (PUP) remains decentralized, with faculty relying on cloud storage, learning management systems, email, and informal channels. This decentralization produces fragmentation, version inconsistency, and limited institutional oversight. This study designed, developed, and evaluated the Instructional Material Management System (IMMS), a centralized digital platform incorporating role-based access, version control, structured approval workflows, and a QR code-enabled Certificate of Submission for content verification. Guided by Socio-Technical Systems Theory and an Input-Process-Output framework, the study followed a developmental research design implemented through the SDLC Waterfall methodology. Data were gathered from 120 respondents (faculty, students, administrators, and program chairpersons) who rated both existing practices and the IMMS, and acceptability of the IMMS was evaluated using ISO/IEC 25010 quality characteristics. The IMMS achieved a grand mean acceptability rating of 4.56 (Highly Acceptable), with Security rated highest (4.70), followed by Functional Suitability (4.53) and Usability (4.45). A paired-samples t-test, conducted on the same 120 respondents who rated both existing practices and the IMMS, confirmed a statistically significant difference favoring the proposed system ($t(119) = 22.20$, $p < .001$, Cohen's $d = 2.03$). Findings indicate that a centralized, policy-aligned platform with verifiable submission tracking substantially improves on fragmented, informal instructional material practices and offers a viable model for similar higher education institutions.

Keywords: instructional material management, centralized repository, ISO/IEC 25010, QR code authentication, higher education, role-based access control

INTRODUCTION

The shift toward digital and flexible learning modalities has made instructional materials – syllabi, modules, lecture presentations, and learning activities – central to teaching continuity in higher education. Yet many institutions, including large multi-campus state universities, struggle to keep these materials organized, accessible, and current. At PUP, instructional material management is largely decentralized: faculty distribute materials through a patchwork of cloud storage, learning management systems (LMS), email, and informal channels. This fragmentation produces duplicated content, inconsistent versions, delayed access, and weak institutional oversight, ultimately complicating compliance with Commission on Higher Education (CHED) and university policy requirements.

Prior research documents that ad hoc, decentralized storage of instructional content produces version ambiguity and weak institutional oversight (Bates, 2019; Selwyn, 2016), and that generic platforms – LMS and institutional repositories alike – leave governance functions such as role-based access, version control, and audit tracking largely unaddressed (Dron & Anderson, 2014; Hilton, 2016; McGreal, 2017). However, existing solutions in the literature, such as generic LMS platforms, institutional repositories, learning object repositories, and cloud file-sharing tools,

each address only part of the problem: LMS platforms are course-bound and time-limited; repositories are research-oriented and underused for teaching content; cloud tools lack governance features altogether. This gap motivated the development of the Instructional Material Management System (IMMS), a system purpose-built for PUP's institutional context and policy environment (Polytechnic University of the Philippines [PUP] Memorandum No. 28, s. 2020; Commission on Higher Education [CHED] CMO No. 4, s. 2020; Commission on Higher Education [CHED] CMO No. 9, s. 2022).

The study is grounded in Socio-Technical Systems (STS) Theory (Trist & Bamforth, 1951), which holds that effective institutional systems require alignment between social structures (faculty, students, administrators, and governing policy) and technical components (the platform itself). The Input-Process-Output (IPO) model (Figure 1) operationalizes this alignment: existing practices, user needs, and institutional/regulatory policy serve as inputs; requirements analysis, design, development, testing, and refinement constitute the process; and a functional, centralized, policy-compliant system constitutes the output.

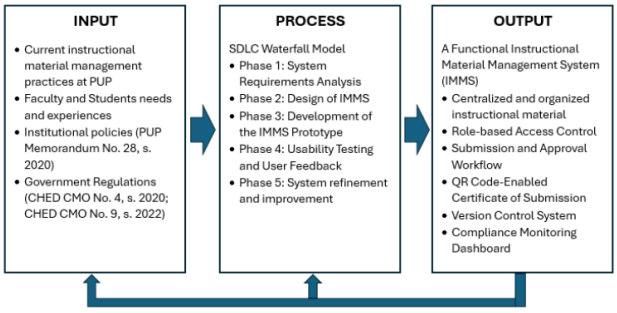

Figure 1
Input-Process-Output framework guiding the development and evaluation of the IMMS

This study therefore aimed to (1) identify the challenges faculty, students, administrators, and program chairpersons currently experience in instructional material management at PUP; (2) document the development stages of the IMMS; (3) determine the instructional material management tools currently used by PUP stakeholders and the limitations they report in these tools; (4) evaluate the acceptability of the IMMS using ISO/IEC 25010 criteria (Functional Suitability, Usability, Security); and (5) determine whether a statistically significant difference exists between the IMMS and existing practices.

LITERATURE REVIEW

Instructional Material Management in Higher Education. The shift toward flexible and digital learning modalities has elevated instructional materials from static teaching aids to critical infrastructure for institutional continuity. Bates (2019) argues that effective digital-age teaching depends on deliberate content design and management practices, not merely on the availability of technology. Similarly, Selwyn (2016) cautions that institutions often adopt digital tools without addressing the underlying organizational structures needed to sustain them, resulting in fragmented and inconsistently governed content ecosystems. These observations align with the challenges documented at PUP, where decentralized storage across cloud platforms, learning management systems, and email produces version ambiguity and weak institutional oversight.

Limitations of Existing Digital Solutions. Prior literature identifies a persistent gap between generic digital platforms and the specific governance needs of instructional content management. Dron and Anderson (2014) note that learning management systems are inherently course-bound and time-limited, making them poorly suited to serve as long-term institutional repositories. Hilton (2016) and McGreal (2017), writing on open educational resources, similarly observe that institutional repositories tend to be research-oriented and underutilized for teaching materials, leaving faculty to rely on informal cloud-based workarounds that lack version control, approval workflows, or authenticity verification. This body of work supports the rationale for a purpose-built system such as the IMMS, designed specifically to address governance gaps that generic platforms leave unresolved.

Comparable System Development Studies. A smaller body of empirical work has directly built and evaluated centralized repository and submission-management systems in Philippine higher education, offering closer points of comparison than the theoretical literature above. Javier et al., (2022) developed and evaluated an institutional research repository using the SCRUM methodology and ISO/IEC 25010 quality characteristics, finding high user acceptability across functional suitability, usability, and security dimensions, though the system was limited to archiving completed research outputs rather than managing an active submission-and-approval workflow. Laguador et al., (2016) built an institutional research repository on a content-management platform and evaluated it against ISO 9126 criteria, reporting high functionality, usability, and reliability ratings from both student and employee respondents, with no significant difference between the two groups' evaluations.

Canlas et al., (2021) took a step closer to a workflow-based system, developing a faculty research productivity monitoring and prediction system with built-in proposal submission, review, and approval features, evaluated using the ISO/IEC 25010 model.

Collectively, these studies confirm that ISO-standard quality evaluation is a well-established method for assessing developed academic repository and submission systems in the Philippine setting, and that such systems reliably achieve high acceptability ratings once built. However, none evaluates a system purpose-built for instructional material management specifically, and none incorporates a tamper-evident verification mechanism comparable to the IMMS's QR code-enabled Certificate of Submission.

While the studies above establish the conceptual gap between generic platforms and instructional-content governance, few empirical studies document the development and evaluation of comparable centralized systems in a Philippine higher education setting. Javier et al., (2022) developed and evaluated the Institutionally Farmed Research Online Repository and Management System (InFORMs) at a Philippine state university using the SCRUM methodology and ISO/IEC 25010 criteria, reporting favorable usability and access outcomes but noting that a repository limited to a single content type does not by itself resolve governance concerns such as approval workflows or authenticity verification. Palmer, Teffeau, and Newton (2008), examining institutional repository development across three university libraries in the United States, found that repository initiatives frequently succeed at content acquisition but struggle to formalize service policies and workflow ownership, an observation consistent with this study's finding that PUP faculty default to informal cloud tools despite institutional policy requiring centralized submission. These studies support the IMMS's approach of pairing a centralized repository with an explicit, policy-mapped approval and certification workflow, rather than treating storage and governance as separable concerns.

Socio-Technical Systems and the IPO Framework. The theoretical grounding of the IMMS draws on Socio-Technical Systems (STS) Theory, originally articulated by Trist and Bamforth (1951), which holds that institutional technology adoption succeeds only when technical design is aligned with existing social structures, policies, and user behaviors. A related pattern is observed in Popenici and Kerr's (2017) analysis of artificial intelligence adoption in higher education, which finds that technologies imposed without regard for institutional workflow tend to be circumvented in favor of familiar informal practices – a finding consistent with, though distinct from, the socio-technical alignment principle above. The Input-Process-Output (IPO) model used to structure IMMS development operationalizes this alignment by treating institutional policy (PUP Memorandum No. 28, s. 2020; CHED CMO No. 4, s. 2020; CHED CMO No. 9, s. 2022) as a direct input into system requirements, rather than a compliance afterthought.

Technology Acceptance and Usability. User acceptance research offers a lens through

which to interpret system evaluation outcomes of this kind. Scherer et al., (2019) meta-analytic work on the Technology Acceptance Model (TAM) finds that perceived usefulness and ease of use are the strongest predictors of teacher adoption of digital tools. Nielsen (2012) further emphasizes that usability must be evaluated through direct user interaction rather than assumed from feature lists, supporting the use of think-aloud protocols during system development and testing. Zaharias and Poylymenakou (2009) extend this further, arguing that e-learning usability evaluation must move beyond functional usability alone to account for engagement and institutional fit.

Quality Evaluation and Security Verification. The study's use of ISO/IEC 25010 (2011) as an evaluation framework situates it within established software quality engineering practice, which defines standardized characteristics – including Functional Suitability, Usability, and Security – for systematic system assessment. Within this literature, informal digital tools are widely noted to lack tamper-evident verification of authorship or submission timestamps, a limitation Selwyn (2016) attributes to the convenience-over-governance design bias of consumer-grade platforms repurposed for institutional use.

Synthesis. Collectively, this literature substantiates two claims underlying the present study. First, the instructional material management challenges reported at PUP mirror well-documented patterns of fragmentation in decentralized academic technology use, as described in both the theoretical and governance-focused literature reviewed above. Second, prior Philippine studies confirm that centralized, ISO-evaluated repository and submission systems reliably achieve high user acceptability once built, but none of these prior systems addresses instructional materials specifically or incorporates a verification mechanism comparable to the IMMS's QR code-enabled Certificate of Submission. The IMMS is therefore positioned to close two related gaps at once: it extends a validated system-development and evaluation methodology to a content type – instructional materials – that existing comparable systems do not address, and it adds an authenticity-verification layer that neither the theoretical literature nor the empirical comparator studies have evaluated.

METHODS

Research Design. The study used a multi-design developmental research approach (Richey & Klein, 2007) combining descriptive, evaluative, and comparative components. The descriptive component characterized existing instructional material practices and challenges. The evaluative component assessed IMMS acceptability against ISO/IEC 25010 criteria. The comparative component statistically tested whether the IMMS differed significantly from existing practices.

Ethical Considerations. Prior to participation, all respondents were presented with a statement describing the study's purpose, the voluntary nature of participation, and the confidentiality of their responses. Respondents were required to affirmatively indicate that they had read this statement and voluntarily agreed to participate before the survey instrument became accessible; all 120 respondents provided this consent. No personally identifying information beyond email address was collected, and email addresses were used solely to prevent duplicate submissions and were not linked to individual responses in analysis.

System Development. The IMMS was built following the SDLC Waterfall methodology, selected because requirements were well-understood at the outset and the institutional environment required documentation at each stage for audit purposes. Development proceeded through five sequential stages: (1) requirements analysis (Weeks 1–4): policy review and stakeholder consultation; (2) system design (Weeks 5–8): architecture, database schema, UI mockups, and QR code module design; (3) implementation (Weeks 9–16): backend/frontend coding and cloud deployment;

(4) testing (Weeks 17–20): usability testing with 20 users (10 faculty, 5 students, 3 program chairs, 2 administrators) using a think-aloud protocol; and (5) maintenance/refinement (Weeks 21–24): bug fixes and interface improvements based on user feedback, including a redesigned QR code placement and batch-download functionality.

A preparatory phase preceded development to select the technology stack: Laravel 11 (PHP) backend, Bootstrap 5/JavaScript frontend, MySQL 8.0 database, AWS EC2/S3 cloud infrastructure with encryption at rest, an Endroid QR code library generating SHA-256 hash-embedded codes, and PUP Single Sign-On (SSO) via SAML 2.0 for authentication.

System Architecture. As shown in the use case diagram (Figure 2), the IMMS organizes access around four actor roles – Student, Faculty, PIMEC (PUP Instructional Materials Evaluation Committee), and Admin – interacting through SSO with role-specific dashboards. The submission workflow proceeds sequentially: faculty upload materials, PIMEC evaluates them against a structured rubric (the Instructional Material Evaluation and Review form, or IMER), UTLDO (University Teaching and Learning Development Office) certifies approved materials, and the system generates a QR code-enabled Certificate of Submission before publishing the material for student access.

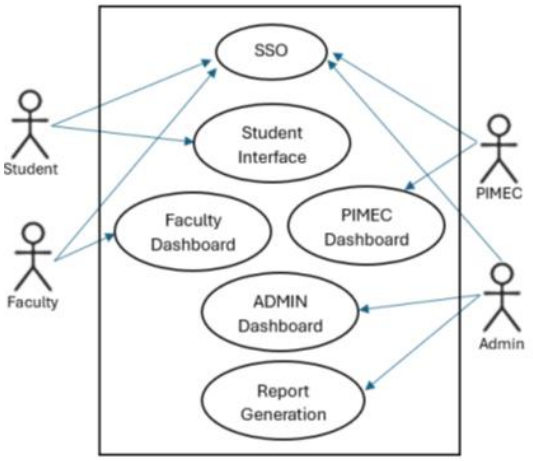

Figure 2
IMMS use case diagram showing actor roles and major system functions

The QR code-enabled Certificate of Submission is the system's principal security innovation. Each certificate embeds a server-generated, cryptographically encoded QR code that, when scanned, verifies submission timestamp, authorship, and content integrity; any post-issuance alteration of the underlying material is detectable because the embedded hash will no longer match.

System Workflow in Practice. Figure 3 shows the IMMS login interface, authenticated through PUP's institutional SSO. Figure 4 illustrates the Assign Instructional Material interface used by PIMEC coordinators and UTLDO administrators to route specific materials to designated faculty authors, with automated email reminders issued daily for seven days before the deadline. Following PIMEC evaluation against the IMER rubric and UTLDO certification, the system generates a QR code-enabled Certificate of Submission (Figure 5), which is automatically emailed to authors.

Figure 3
IMMS login page, authenticated via PUP Single Sign-On

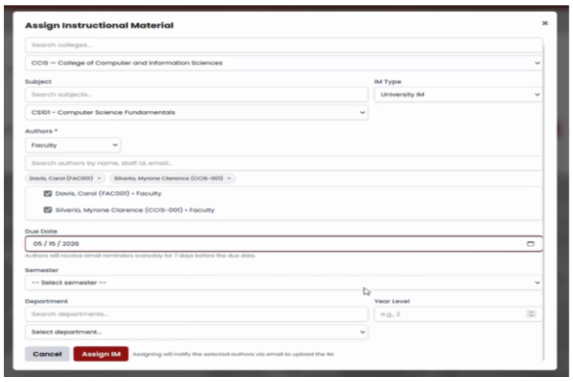

Figure 4
Assign Instructional Material interface, used by PIMEC coordinators and UTLDO administrators to route submissions to designated authors with tag-based author selection and automated deadline reminders

CERTIFICATE OF SUBMISSSION

This is to certify that the **College of Computer and Information Sciences**, submitted the learning module (LM) titled, ***"CS101: Computer Science Fundamentals"*** developed by **Professor Myrone Clarence Zerrudo Silverio** for the program **Bachelor of Science in Computer Science.** The learning shall be used during the **1st Semester of Academic Year 2026-2027**.

The learning module is granted **one academic year for utilization**. Afterwhich, the writer is tasked to review and revise his submitted module.

This certificate is issued on May 02, 2026 by the University Teaching and Learning Development Office – Center for Instructional Materials Development and Assessment, Polytechnic University of the Philippines, Sta. Mesa, Manila.

Recommended by:

Algem M. De Guzman, MAELT
Chief, CIMDA

Approved by:

Elmer G. De Jose, PhD
Director, UTLDO

Figure 5
QR code-enabled Certificate of Submission, issued upon UTLDO certification, embedding a verifiable record of submission timestamp, authorship, and content integrity.

Participants. Participants were recruited through convenience sampling via a Google Form distributed over the university's official communication channels – institutional faculty and staff email accounts and the student information portal (iskolarngbayan.pup.edu.ph), supplemented by direct email invitations. Eligibility was limited to current PUP faculty, students, administrators, and program chairpersons with direct experience submitting, evaluating, or accessing instructional materials.

Twenty of these individuals (10 faculty, 5 students, 3 program chairs, 2 administrators) had earlier participated in the Stage 4 usability testing described in System Development, where they used the IMMS under a think-aloud protocol; their feedback informed the Stage 5 refinements (redesigned QR code placement, batch-download functionality). Following refinement, the acceptability survey was administered to a broader sample that included these 20 early testers alongside 100 additional respondents recruited independently for this stage. All 120 respondents rated the finalized version of the system under the same survey instrument and conditions, and their responses were analyzed together without differential weighting.

All respondents provided informed consent via a mandatory consent item at the start of the form before continuing to the survey; no response was recorded without affirmative consent. Data collection ran over a three-day window (August 3–6, 2026).

A total of 120 valid responses were collected: faculty members (n = 45, 37.50%), students (n = 50, 41.67%), academic administrators (n = 15, 12.50%), and program chairpersons (n = 10, 8.33%). Respondents' reported experience with instructional material submission at PUP ranged from less than 1 year (n = 6, 5.00%) to 1–3 years (n = 66, 55.00%) and 4–6 years (n = 48, 40.00%).

Instrumentation and Data Analysis. Data were collected using a structured, researcher-developed survey instrument administered as a single Google Form. The instrument consisted of three parts: (1) respondent profile items (role, years of experience with instructional material submission at PUP); (2) items capturing current instructional material management practices, reported challenges, and tools currently used, analyzed through frequency and percentage distribution; and (3) a 12-item acceptability scale, rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), administered twice – once with reference to existing practices and once with reference to the IMMS – and mapped onto three ISO/IEC 25010 characteristics: Functional Suitability, Usability, and Security (four items each).

Content validity was established through review by a three-member panel comprising a software engineering faculty member with expertise in ISO/IEC 25010 quality standards, a University Teaching and Learning Development Office (UTLDO) representative familiar with PUP's instructional material policies, and an information technology specialist experienced in system usability evaluation. Each panelist independently rated every item for clarity, relevance, and construct alignment using a 4-point content validity rating scale, and items receiving inconsistent or low ratings were revised or reworded accordingly. The revised

instrument was then reviewed for second time by the same panel, who assessed each item for clarity and alignment with the ISO/IEC 25010 construct it was intended to measure, to confirm that the changes have adequately addressed their concerns before the survey was finalized and deployed. Items were revised based on second feedback before the instrument was finalized. Internal-consistency reliability was assessed using Cronbach's alpha for each dimension on the IMMS-rating responses: Functional Suitability (α = 0.89), Usability (α = 0.87), and Security (α = 0.88), with an overall alpha of 0.94 across all twelve acceptability items, indicating good to excellent reliability.

Acceptability ratings were summarized using weighted means and standard deviations, interpreted through a five-tier descriptive scale ranging from Not Acceptable to Highly Acceptable. Because the same 120 respondents rated both existing practices and the IMMS on identical items, the two conditions constitute paired, within-subjects measurements rather than independent samples. Accordingly, a paired-samples t-test was used to compare overall ratings between the IMMS and existing practices, both overall and separately for each ISO/IEC 25010 characteristic, to test the study's null hypothesis of no significant difference. Effect sizes were calculated as Cohen's dz (mean paired difference divided by the standard deviation of the differences), the appropriate effect-size formula for a paired design. All analyses were conducted at α = .05.

RESULTS

Challenges in Current Practice. Respondents could select more than one challenge, so percentages do not sum to 100% (N = 120). Difficulty locating updated materials was the most cited challenge (85.00%), followed closely by inconsistent format and quality (84.17%), fragmented storage across multiple platforms (70.83%), and lack of version control (65.00%). Limited institutional oversight (45.83%) and time-consuming manual organization (29.17%) were moderately reported. Difficulty ensuring CHED/PUP policy compliance (10.83%) and security concerns (5.00%) were the least cited, though the latter remains notable given its direct relevance to the proposed QR code verification feature.

Existing Solutions and Limitations. Google Drive and similar cloud storage tools were the most widely used workaround (93.33%), followed by LMS platforms (90.83%). Email attachments (18.33%) and institutional repositories (7.50%) were used far less frequently. The dominant limitations of these informal tools were the absence of a centralized location (76.67%), difficulty tracking versions (70.00%), absence of a quality-assurance workflow (63.33%), and lack of any mechanism to verify authenticity (48.33%) or provide proof of submission (39.17%). These gaps directly motivated the IMMS's certificate and version-control features.

Acceptability (ISO/IEC 25010). The IMMS received an overall grand mean of 4.73 (Highly Acceptable). Table 1 summarizes the three evaluated characteristics.

Table 1
Summary of ISO/IEC 25010 Acceptability Ratings

Quality Characteristic	Items	N	Mean	SD	Interpretation
Functional Suitability	4	120	4.68	0.46	Highly Acceptable
Usability	4	120	4.76	0.41	Highly Acceptable
Security	4	120	4.75	0.42	Highly Acceptable
Grand Mean	12	120	4.73	0.39	Highly Acceptable

Mean and SD for each characteristic are computed from the four items comprising that dimension; the Grand Mean is computed from each respondent's overall average across all twelve items.

Security and Usability received the highest ratings, with Functional Suitability close behind. All three dimensions fell within the Highly Acceptable range, and the narrow spread between them (4.68–4.76) suggests the IMMS performed consistently well across functional, usability, and security-related expectations rather than excelling in one dimension at the expense of others.

Comparative Difference. The largest raw mean difference was in Usability (+0.94), followed closely by Functional Suitability (+0.89) and Security (+0.87). The paired-samples t-test on overall ratings ($t(119) = 22.20$, $p < .001$, Cohen's $dz = 2.03$) led to rejection of the null hypothesis, indicating a statistically significant and substantively large difference favoring the IMMS.

Table 2

Comparison of IMMS and Existing Practices (Paired-Samples t-test, N = 120)

Criterion	Existing Practices Mean (SD)	IMMS Mean (SD)	Mean Difference	t	df	p	Cohen's dz
Functional Suitability	3.79 (0.45)	4.68 (0.46)	+0.89	19.30	119	<.001	1.76
Usability	3.83 (0.47)	4.76 (0.41)	+0.94	19.49	119	<.001	1.78
Security	3.88 (0.47)	4.75 (0.42)	+0.87	18.07	119	<.001	1.65
Overall	3.83 (0.43)	4.73 (0.39)	+0.90	22.20	119	<.001	2.03

Note. N = 120 respondents rated both conditions on identical items; test is paired samples (repeated measures). Cohen's dz = mean paired difference ÷ SD of the differences, the appropriate effect-size formula for a paired design.

Qualitative Feedback. Open-ended feedback was sparse: only 10–12 of 120 respondents (8–10%) provided a substantive comment per question, with most others leaving the field blank or entering "none." Among substantive responses, the most common theme was ease of access and retrieval – respondents described the system as "easy to access," "easy to retrieve," and "user friendly." The most frequently cited concern was internet connectivity, followed by isolated comments about incomplete content and a preference for PDF-formatted files. One respondent noted that the system's value would depend on faculty consistently uploading complete materials rather than partial slide decks and raised a secondary concern about mobile data usage for large files. Given the low response rate to these optional fields, this feedback should be interpreted as illustrative of respondent sentiment rather than as representative of the full sample.

DISCUSSION

The findings affirm that PUP's instructional material management challenges – fragmentation, version ambiguity, weak oversight – mirror patterns reported elsewhere in the literature on decentralized academic content management, and that these are organizational and policy problems as much as technical ones. Existing tools (cloud storage, LMS, email) address convenience but not governance; their popularity despite known limitations reflects a familiar pattern in which users' default to informal tools when institutional systems are perceived as burdensome.

The IMMS's high acceptability across all three ISO/IEC 25010 dimensions suggests that the QR code-enabled Certificate of Submission filled a previously unmet need: verifiable, tamper-evident proof of submission. This is consistent with Socio-Technical Systems Theory, which predicts that a technical solution gains traction precisely when it closes a recognized gap in existing social/institutional practice rather than simply digitizing an existing workflow. The certificate's value to multiple stakeholder groups – faculty (protection during evaluation), PIMEC (faster verification), administrators (audit clarity), and students (confidence in material currency) – illustrates this alignment in practice.

These results also connect directly to the technology-acceptance and usability literature reviewed earlier. Scherer et al., (2019) meta-analytic finding that perceived usefulness and ease of use most strongly predict teacher adoption is reflected in the IMMS's uniformly high Usability item ratings, led by ease of learning (4.82) and clear error messaging (4.78). Nielsen's (2012) argument that usability should be evaluated through direct user interaction, rather than assumed from a feature list, is reflected in the study's use of think-aloud usability testing during Stage 4 of development, which identified early cross-device rendering issues that were resolved through the Stage 5 interface refinements – consistent with cross-device access rating comparatively well in the final survey (4.73). Zaharias and

Poylymenakou's (2009) caution that e-learning usability evaluation should extend beyond narrow functional usability to account for engagement and institutional fit is better illustrated, in the final dataset, by the two lowest-rated items overall: search and retrieval accuracy (4.66) and certificate generation (4.66), both Functional Suitability items. These, rather than cross-device access, represent the system's clearest remaining area for refinement.

The large effect size (Cohen's dz = 2.03) for the IMMS-versus-existing-practices comparison should be interpreted cautiously. Existing practices in this study are an aggregate of multiple informal tools rather than a single comparator system, and respondents rated the IMMS after a guided pilot rather than extended independent use – conditions under which novelty and social-desirability effects can inflate acceptability ratings relative to what sustained daily use might show.

Limitations. Beyond the pilot-exposure caveat above, several additional limitations qualify how these findings should be read. First, the study was conducted at a single institution (PUP), and the reported acceptability and challenge patterns reflect PUP's specific policy environment, technology stack, and organizational structure; the claim that the IMMS offers "a viable model for similar higher education institutions" should therefore be read as a hypothesis for future testing rather than an established generalization. Second, the evaluation window following the pilot was short, and the study cannot speak to whether acceptability ratings, or actual usage patterns, would hold up over a full academic term or longer once novelty effects fade and the system is used without direct developer involvement. Third, because respondents were introduced to the IMMS through a guided pilot conducted by the development team, self-reported acceptability may be inflated by acquiescence or social-desirability bias relative to an arm's-length, independent evaluation.

Future Directions. Building on these limitations, three directions for future research would strengthen the evidence base for the IMMS as a broader institutional model. First, a multi-institution deployment – testing the system at other CHED-regulated higher education institutions with different governance structures – would clarify how much of its acceptability is PUP-specific versus generalizable. Second, a longitudinal adoption study tracking usage and acceptability over one or more full academic terms, after the guided pilot period ends, would address the novelty-effect concern raised above. Third, given the item-level pattern identified in this dataset, further usability works specifically targeting search and retrieval accuracy – rather than cross-device access, as the original draft assumed – would be a more evidence-grounded next step for interface refinement.

DISCLOSURES

Author contributions. Arlene B. Canlas: Conceptualization, Methodology, Software, Validation, Formal Analysis, Investigation, Resources, Data Curation, Writing – Original Draft, Writing – Review & Editing, Visualization, Supervision, Project Administration.

Conflict of interest. The author declares no conflict of interest.

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Artificial intelligence use. AI-assisted language editing was performed; author reviewed and approved all content.

Ethics approval statement. Ethical approval was obtained from the Polytechnic University of the Philippines-OUS Research Ethics Committee, with reference code 0226-0580.

Data availability statement. All data supporting the findings of this study are included within the manuscript and its supplementary materials.

Acknowledgement. (Not available)

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