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Digital transformation of grades-related technologies at Dr. Jose P. Rizal Senior High School (2020–2024): A case study on usability and impact

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Abstract

This participatory case study examines the digital transformation of grades-related enabling technologies at Dr. Jose P. Rizal Senior High School from 2020 to 2024. Grounded in principles of sociotechnical theory and the Technology Acceptance Model (TAM), the study defines enabling technologies as digital solutions that enhance educational processes. It traces the institution's transition from manual procedures to a macro-enabled MS Excel eTool, and finally to the centralized Students Enrollment and Records Management System (SERMS). Using a mixed-methods approach that integrated historical document analysis, stakeholder feedback, and usability assessments, the research documented a four-phase progression from individual initiatives to institution-wide adoption. Findings indicate that strategic leadership, stakeholder collaboration, and user-centered design were pivotal to successful integration. Usability evaluation, based on the System Usability Scale and qualitative feedback from 31 faculty members, showed a statistically significant improvement from "Marginal" for the eTool to "Good" for SERMS, confirming strong user acceptance and improved administrative efficiency. Key success factors included sustained leadership and structured training, while primary challenges involved connectivity and interface navigation. This study contributes to understanding technology adoption patterns within the Southeast Asian public school context, offering a replicable framework for similar educational institutions pursuing digital transformation.

Keywords: *Educational technology; innovation adoption; records management; secondary education; system usability*

INTRODUCTION

The need for school-based systems to help teachers create Department of Education (DepEd) School Forms highlights major shortcomings in the technology infrastructure of Philippine public schools. In the educational context, enabling technologies represent knowledge-intensive digital solutions that transform administrative processes through

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student information systems and digital platforms supporting educational management workflows (Waßenhoven et al., 2023; OECD, 2023). Conceptually, these enabling technologies are grounded in sociotechnical theory, which posits that successful adoption requires the harmonious integration of technical systems with social practices and organizational structures to foster innovation (Becker et al., 2025), and the Technology Acceptance Model (TAM), which underscores perceived usefulness and ease of use as pivotal drivers of user intention and behavior in educational settings (Granić, 2022).

Recent systematic reviews confirm that TAM remains a robust framework for understanding educational technology adoption across diverse institutional contexts, with perceived usefulness and ease of use consistently predicting user acceptance (Granić & Marangunić, 2019). Building on this theoretical foundation, recent research in Southeast Asian educational contexts provides important regional perspectives. Studies of electronic records management systems in Indonesian senior high schools demonstrate how such systems can significantly enhance administrative accountability and efficiency when properly integrated with organizational workflows (Oktarina et al., 2025). Comparative evidence from Iranian educational contexts further demonstrates that technology acceptance in educational settings depends heavily on institutional support structures and user training, particularly in resource-constrained environments (Mastour et al., 2025). Furthermore, examining the specific Philippine context reveals that institutional readiness for information systems faces particular challenges in human resources and technological facilities (Espero, 2024), while research on technology adoption among Filipino users highlights the critical importance of facilitating conditions in technology acceptance decisions (Belmonte et al., 2024).

Consequently, teachers encounter considerable administrative burdens from manually consolidating data using basic templates. This is because the DepEd Learner Information System (LIS) primarily operates as a data collection tool rather than a workflow-supportive platform for form generation (Inquirer.net, 2025). Furthermore, continuing challenges such as LIS service interruptions, system bottlenecks, and complicated escalation procedures for unresolved issues highlight the pressing need for complementary institutional solutions (DepEd, 2021; DepEd Palawan, 2024).

Within this context, teacher-advisers and subject teachers engage with administrative systems through distinctly different workflows and responsibilities. Specifically, as outlined in DepEd Order No. 11, s. 2018, advisers bear primary responsibility for preparing critical official school forms, including SF-1 (School Register), SF-2 (Daily Attendance Report of Learners), SF-5 (Report on Promotion and Level of Proficiency), SF-9 (Learner Progress Report Card), and SF-10 (Permanent Record). In effect, these school forms create specific technological needs that general systems often fail to address effectively. This case study examines the digital transformation of Dr. Jose P. Rizal Senior High School (DJPRSHS) between 2020 and 2024. The transformation was characterized by a shift from manual administrative practices to digital systems despite systemic challenges and limited technological resources. Additionally, it shows how individual initiatives, particularly the Adviser's eTool and later the Students Enrollment and Records Management System (SERMS), evolved into school-wide change.

Looking to address this limitation, the SERMS initiative was born. The school partnered with Mr. Zaldy Ronquillo, Jr. of Technological University of the Philippines Cavite (TUPC) to adapt the School Record and Forms–Online Management System (SRF-OMaS) successfully used by Paliparan III Senior High School (Pal3SHS), a similarly situated stand-

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alone senior high school in the city. Based on a previous study, SRF-OMaS showed high user acceptance at said school (Ronquillo et al., 2022). This localized evidence reinforces why adapting a proven system was a practical option for the school. Broadening the lens, this decision also aligns with trends in educational technology research. For instance, Goldhaber (2021) observed that ICT integration can enhance how teachers deliver instruction, suggesting that context-aware adaptations like SERMS can support effective classroom practices. In Southeast Asia, extended models of TAM further emphasize the influence of facilitating conditions, such as infrastructure and support, on EdTech adoption in resource-constrained environments (Fariz & Winarsih, 2025). This regional perspective highlights conditions that also apply to Philippine public schools.

Similarly, Bahçekapılı (2023), using the Technology Acceptance Model, confirmed what many educators recognize: if teachers do not perceive value, they are unlikely to use a tool. Related to this, when assessing user satisfaction, studies have shown that tools like the System Usability Scale provide concrete insights into what works and what doesn't (Vlachogianni & Τσέλιος, 2023). Contemporary research on usability evaluation in educational settings further emphasizes that the System Usability Scale remains a reliable and efficient instrument for measuring user experience, particularly when combined with qualitative feedback mechanisms (Vlachogianni & Tselios, 2022). Moreover, other researchers have found that teacher confidence, strong leadership, and adequate training are key to successfully adopting new technology (Rudhumbu et al., 2021; Lyanda et al., 2023; Mastul et al., 2023). These enabling technologies represent critical infrastructure for modern educational institutions.

To understand successful tech adoption, it's crucial to see how systems are used in practice. Simply having good intentions is not enough; teacher involvement in decision-making improves both adoption and effectiveness (Eze et al., 2023). In a similar vein, early engagement with all stakeholders helps address resource limitations and fosters positive attitudes toward technology (Njoka et al., 2020). Building on this, research on educational technology implementation in higher education institutions confirms that multi-stakeholder engagement and comprehensive frameworks considering technological, pedagogical, and organizational dimensions are essential for sustainable adoption (Chugh et al., 2023). Equally important, focusing on practical user needs is also critical, as complex or difficult interfaces reduce adoption—an issue that was clear as the school integrated new tools into its improvement plans (Alqurni, 2023). Further supporting this perspective, empirical studies of technology integration in educational contexts demonstrate that sustainability requires not only technical infrastructure but also systematic approaches to capacity building and institutional support (Angelaki et al., 2024).

The experience at DJPRSHS demonstrates the importance of examining both system design and user interaction. The school's locally developed or adopted solutions, such as the Adviser's eTool and SERMS, were designed to meet immediate requirements while supporting national initiatives in data management and administrative workflows. Ultimately, tracking the transition from manual processes, to intermediate technologies, and finally to comprehensive systems like SERMS offers insight into how public schools adapt their infrastructure to evolving demands, improve efficiency, and balance local and institutional priorities (Schumacher, 1975; Leonard, 2018).

Despite growing scholarly attention to educational technology adoption, limited research documents the complete evolutionary trajectory through which schools transition from manual administrative systems to integrated digital solutions, particularly in

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resource-constrained Southeast Asian contexts. While recent studies have examined technology acceptance factors (Mastour et al., 2025) and mapped research on student engagement with educational technology (Bond & Bedenlier, 2020), few have traced the full developmental arc from grassroots teacher innovation to institutionalized practice with empirical usability assessment. This study addresses this gap by providing a longitudinal case analysis spanning four years (2020-2024), documenting how teacher-driven innovation evolved into institution-wide adoption despite infrastructure limitations characteristic of Philippine public education. The novelty of this research lies in its comprehensive mixed-methods approach combining historical document analysis, standardized usability measurement, and stakeholder perspectives to reveal adoption patterns, success factors, and persistent challenges relevant to similarly situated educational institutions pursuing digital transformation. These observations directly informed the research questions, motivating an investigation into developmental timelines, usability outcomes, user perceptions, functionality, and key features of grades-related enabling technologies.

Research questions

As an institutional case study, this research aimed to document and analyze the digital transformation process at DJPRSHS from 2020 to 2024, examining stakeholder perspectives and implementation strategies to generate insights transferable to similar educational contexts. The study specifically addressed the following research questions:

1. What is the developmental timeline of grades-related enabling technologies implemented at DJPRSHS from 2020 to 2024?
2. How do the system usability ratings compare between the Adviser's eTool and SERMS Suite, and what are the significant differences in user experience metrics?
3. How do different educational roles (advisers and non-advisers) perceive, experience, and assess the functionality of grades-related enabling technologies at DJPRSHS?
4. What are the most valued system features and implementation challenges identified in the grades management system at DJPRSHS?

METHOD

To achieve the foregoing, this research employed a participatory case study approach (Yin, 2018) to provide an in-depth examination of technology adoption within its natural organizational context. This approach was particularly appropriate for investigating this contemporary phenomenon where the researchers were also participants, and the boundaries between the phenomenon and context were not clearly evident. The digital transformation at DJPRSHS represents such a phenomenon, where technological, organizational, and human factors interact in complex ways that require contextual understanding beyond what experimental or survey methods alone could provide. Specifically, the institutional case study design was adopted because it provides a practical way to explore the "how" and "why" questions that often define technology adoption. Focusing on one school provided clear boundaries for data collection and analysis, which allowed for a close examination of daily practices and the organizational factors that influenced implementation. The lessons learned here may also inform other schools in similar stages of digital transition.

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The study used a mixed-methods case study design, combining Yin's (2018) case study methodology with Creswell and Creswell's (2018) mixed-methods framework. Evidence came from three main sources: school records detailing system development, survey-based usability scores, and key stakeholder input. This combination captured both the technical evolution of the systems and the users' experiences, while also enabling the research to track how different stakeholders interacted with the systems over time, by combining contemporary observations with a review of historical records. Complementing this approach, historical analysis followed the principles of Bloch (1953). The study examined official institutional records, such as concept papers, approval sheets, accomplishment reports, and certification documents from November 2020 to August 2024, to trace the implementation process. This review produced a timeline showing how individual innovations gradually led to wider institutional changes. The documents highlighted administrative decisions, the roles of different stakeholders, and the support systems that sustained the transformation.

Alongside the documentary review, data was gathered through two survey instruments designed to capture teachers' usability experiences. The first was a Retrospective Usability Survey of the Adviser's eTool, which covered the period 2020–2022. A total of 42 faculty members responded: 20 advisers with direct experience using the eTool, 8 non-advisers, 2 advisers who had not actually used the system, and 12 faculty members who joined the institution after its use had ended. For analytical purposes, the focus was narrowed to the 20 advisers with hands-on experience, since their feedback was most relevant. The responses of the remaining 22 participants (those without direct use of the system) were excluded from the retrospective analysis. Subsequently, the second instrument, the Usability Survey of the SERMS Suite of Tools, targeted current users of the newer system. Thirty-one teachers participated, including 21 advisers and 10 subject teachers. All respondents had direct experience with SERMS, which ensured that their perspectives reflected authentic engagement with the system. This approach captured both role-specific and institution-wide patterns of use, producing a more comprehensive picture of how the system functioned in practice.

Table 1. Study participants

Survey	Total Respondents	Advisers	Non-advisers	Others	Analyzed Sample
Retrospective Usability Survey of Adviser's eTool (2020-2022)	42	20 (users)	8 non-advisers	2 advisers (non-users); 12 not yet employed	20 adviser users
Usability Survey of SERMS Suite	31	21	10 subject teachers	-	31 current users

To ensure comparability, both survey instruments followed the same structural format. Each consisted of two main parts: (1) the standardized System Usability Scale (SUS) with ten items that measured perceived usability (Brooke, 1996), and (2) a broader Usability Feedback section, which combined Likert-scale questions, multiple-response items, and open-ended questions. The latter encouraged teachers to describe their perceptions, identify challenges during implementation, and suggest possible improvements.

For analysis, the study integrated both quantitative and qualitative techniques, aligning each with specific research questions. Quantitative data were treated with descriptive statistics, followed by independent samples t-tests (adjusted for unequal variances where needed). Effect sizes were also calculated using Cohen's d to provide a

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sense of practical significance. Qualitative feedback underwent thematic analysis following Braun & Clarke (2006), which helped identify recurring patterns in user experience, success factors, and implementation challenges. At the same time, institutional documents from November 2020 to August 2024 were reviewed chronologically, using historiographical methods to reconstruct the implementation timeline and pinpoint key transformation milestones.

These different approaches worked together, reflecting what makes case study research valuable. The digital transformation could be understood from multiple angles without losing the depth that context provides. Historical documentation, standardized usability metrics, and teacher insights created a solid foundation for understanding both the process and outcomes of technology adoption at the school, allowing a comprehensive view of institutional change.

Ethical compliance, positionality and institutional review

This study employs a participatory case study design, where the researchers were also the primary architects and implementers of the digital transformation being examined. This insider position provided deep contextual access and understanding. To mitigate potential biases and ensure objectivity, the study design incorporated several safeguards: formal approval was secured from an external authority (the Public Schools District Supervisor), all participant data (from faculty) was collected anonymously and analyzed systematically, and the findings were presented for validation in a school-wide Learning Action Cell (LAC) session.

RESULTS AND DISCUSSION

This section presents the study's findings and provides a detailed analysis and interpretation of how the school's technology adoption unfolded. The findings are organized to address the research questions directly, showing both data presentation and analytical insights. Using documents, survey data, and input from teachers and staff, the study examined what it takes to manage innovation in public schools and how local projects can grow into school-wide solutions.

Developmental timeline of grades-related enabling technologies

The document analysis revealed four main phases as the school moved from individual innovation to school-wide adoption of grades-related enabling technologies (see Appendix, Table A for detailed timeline). This historical analysis, reconstructed through official documentation (Bloch, 1953), reveals how sustainable technology integration progresses within educational institutions. The findings demonstrate a successful model of technology integration, which empirically reflects the principles of enabling technologies outlined in the introduction (Waßenhoven et al., 2023; OECD, 2023), showing how strategic leadership and institutional support are critical for enhancing educational quality. The transformation across the four key phases—Innovation Genesis, Enhancement, Planning, and Implementation—illustrates the institution's methodical progression from individual technological innovation to comprehensive system-wide adoption.

The **Innovation Genesis phase (Nov-Dec 2020)** shows how the school maintained openness to new ideas. Discussions between P.C. Casas (Teacher III) and R.F. Dinampo (Master Teacher I)—a senior role responsible for curriculum and teacher mentoring—were promptly elevated to the administration. Dinampo's decision to have Casas present directly to J.B. Paleracio (School Head) demonstrates how middle-level leaders can bridge

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organizational levels, giving teachers a viable pathway for their ideas to be officially reviewed. This support illustrates how hierarchical structures can help advance educational innovations (Rudhumbu et al., 2021). At this stage, the enabling technology was adviser-focused, with data stored individually on their devices, highlighting the eTool's limitations as a spreadsheet-based solution lacking a centralized repository.

When Paleracio approved the concept paper on November 23, 2020, he recognized that the proposal addressed real educational challenges rather than simply introducing technology. The subsequent launch of the eTool with "The Power of Excel" training helped teachers build practical skills and demonstrated the school's commitment to developing teacher capacity beyond merely using a familiar tool (Eze et al., 2023). This phase also featured a partnership with New Era Senior High School (NESHS). Staff from NESHS helped their school use the eTool, proving its transferability and providing useful feedback. This collaboration showed that a system used in one school can become a model for others, consistent with Ronquillo et al. (2022) regarding SRF-OMaS in another stand-alone senior high school. It also aligns with Njoka et al. (2020), who found that inter-school collaboration helps fill resource gaps and improves teacher attitudes toward technology.

The **Enhancement phase (2021-2022)** focused on aligning the Adviser's eTool with DepEd rules. This alignment was critical given DepEd Order No. 11, s. 2018, which outlines advisers' primary responsibility for preparing critical official school forms. The LIS Coordinator, Teacher Registrar, and Assistant Registrar—key roles in managing the DepEd Learner Information System and student records—worked together to fit the tool into the existing workflow, especially for generating SF-5 and SF-10 forms. Their teamwork shows the importance of integrating new technology with current practices. Instead of replacing old procedures, the team gradually integrated the eTool into daily operations, maintaining workflow continuity while resolving issues. Casas also assumed new roles (Grade 11 Coordinator, EduTech Focal Person), combining technical skills with authority—a key element of strategic ICT leadership in enhancing instructional delivery (Goldhaber, 2021). By July 2022, Paleracio formally certified the successful implementation of the Adviser's eTool, recognizing its significant enhancement of student records management and reporting efficiency. This formal validation gave the eTool credibility as an approved practice and laid the foundation for further development.

The **Planning phase (mid-2022)** expanded the system to support broader school goals. Meetings led by Paleracio, Casas, and the Records and Registration Office (RRO) team positioned the technology for overall institutional efficiency. During this phase, the school prepared for the SERMS Suite, seeking guidance from Mr. Zaldy Ronquillo, Jr. of the Technological University of the Philippines Cavite (TUPC). This collaboration was based on the successful implementation of the School Record and Forms–Online Management System (SRF-OMaS) at Pal3SHS, which reported high user acceptance (Ronquillo et al., 2022). This plan positioned SERMS as the eTool's replacement, ensuring the system's impact would extend beyond technical use to improve governance.

The **Implementation phase (2023-2024)** introduced the SERMS Suite alongside a leadership transition from Paleracio to M.M. Barrameda (School Head). Under Barrameda's guidance, SERMS continued to streamline DepEd school forms processing, showing the system had become embedded in daily operations and was not dependent on a single leader's advocacy. Sustainable adoption relied on the involvement of multiple groups, similar to the experience of Pal3SHS during its transition to SRF-OMaS (Ronquillo, 2022). This aligns with research showing that teacher involvement in decision-making improves

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both adoption and effectiveness (Eze et al., 2023). During the pilot, selected stakeholders engaged actively, with technical coordinators guided by Master Teachers providing oversight. After a successful pilot, SERMS expanded to all grade levels in 2024, featuring centralized data accessible to all teachers—a significant advancement over the adviser-based eTool with individual storage.

After focused interventions and process adjustments, SERMS achieved full operational status. In August 2024, formal recognition from the Public Schools District Supervisor (PSDS)—the DepEd official overseeing a cluster of schools—confirmed SERMS's effectiveness within the school context. The four-phase timeline illustrates how teacher-driven initiatives, combined with leadership support, stakeholder collaboration, and official validation, became integrated into regular school operations.

The successful institutionalization of this four-phase model at DJPRSHS presents a notable contrast to broader Philippine patterns where institutional readiness for information systems often faces significant challenges (Espero, 2024). The strategic leadership and stakeholder collaboration at DJPRSHS demonstrates how these barriers can be overcome through systematic, phased implementation, aligning with sociotechnical principles where the integration of technical systems with organizational structures proves critical for success (Becker et al., 2025).

System usability scale comparison

For Research Question 2, the usability comparison between the two systems revealed notable differences, with SERMS showing stronger results in several aspects of user experience. Advisers who had used both platforms rated SERMS higher, pointing to greater ease of use and improved efficiency. Quantitative results supported these reports. As shown in Table 2, the eTool scored an average of 67.63 on the System Usability Scale (SUS), placing it in the "OK/Fair" range (Bangor et al., 2009), while the SERMS Suite scored 77.14, reaching the "Good" category. This significant increase reflects a clear usability improvement, with SERMS moving from marginal territory into a strong usability range.

Table 2. SUS Descriptive Statistics

System	n	Mean	Std. Deviation	Minimum	Maximum
Adviser's eTool	20	67.625	15.630	45.000	90.000
SERMS Suite	21	77.143	13.400	60.000	95.000

The significant usability improvement from eTool to SERMS offers important insights into technology adoption in Philippine educational contexts. Although the TAM framework effectively explains how perceived usefulness and ease of use influence adoption (Granić, 2022), the DJPRSHS case highlights additional contextual nuances. This observation aligns with broader systematic reviews of technology acceptance in educational settings, which consistently identify these two constructs as critical determinants across diverse institutional environments (Granić & Marangunić, 2019). Moreover, the statistically significant increase in SUS scores (from 67.63 to 77.14) illustrates how iterative, user-centered design can substantially strengthen technology acceptance—echoing findings on sustainable educational technology implementation (Angelaki et al., 2024). Interestingly, whereas Filipino consumer technology adoption often shows that perceived trust can outweigh perceived value (Belmonte et al., 2024), the SERMS implementation diverged from this pattern, with tangible efficiency gains emerging as the primary driver.

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In comparison, Ronquillo et al. (2022) reported a "very acceptable" rating for SRF-OMaS in Pal3SHS, the precursor to SERMS. This aligns with Bahçekapılı's (2023) application of the Technology Acceptance Model, which underscores that teachers are unlikely to adopt a system unless they perceive clear value in it. Advisers who had used both platforms rated SERMS significantly higher than the Adviser's eTool (see Table 3), *t*(39) = −2.10, *p* = .043, with a moderate to large effect size (Cohen's *d* = −0.655).

Table 3. Independent samples t-test comparing SUS scores of adviser's eTool and SERMS

Variable	t	df	p	Cohen's d	SE Cohen's d	95% CI for Cohen's d
SUS_Total	-2.096	39	0.043	-0.655	0.329	[-1.280, -0.022]

These results indicate that the transition from the Adviser's eTool to the SERMS Suite represents a meaningful improvement in usability, consistent with prior evidence on the importance of perceived usefulness in educational technology adoption. The findings show that usability improvements directly impact adoption and satisfaction. Systems that faculty find efficient, reliable, and aligned with their work are more likely to become embedded in daily practice, as observed during SERMS implementation. Improved usability fostered higher adoption and reduced reliance on workarounds, indicating the system could displace older, less efficient routines.

The comparison between the two systems shows that evidence-informed adjustments helped improve SERMS design. Teachers reported smoother workflows and fewer difficulties while grading and processing student forms. The increase in SUS scores, confirmed by statistical testing and a moderate-to-large effect size, supports this improvement. Percentile rankings also show that SERMS performed better than most previously rated systems (Bangor et al., 2009).

Table 4. SUS score interpretation (Bangor et al., 2009)

SUS Score Range	Adjective Rating	Percentile Estimate
85 – 100	Excellent	Top 10%
70 – 84	Good	~70th–90th
50 – 69	OK / Marginal	~30th–69th
25 – 49	Poor	~10th–29th
0 – 24	Awful	Bottom 10%

These usability improvements resulted from close involvement of teachers and administrative staff, together with careful design adjustments that made the system more practical for everyday use. The combination of quantitative usability metrics with qualitative stakeholder feedback offered insights into system effectiveness (Yin, 2018). Additionally, institutional support further reinforced its effectiveness. Overall, the usability results suggest that assessing usability is essential for effective technology adoption. Targeted redesign helped the system move from adequate to genuinely effective, demonstrating that schools can use usability metrics to guide improvements and ensure technology fits the actual needs of teachers and staff.

Role-based usability differences

SERMS usability analysis across different educational roles showed notable patterns in user perceptions and system adoption, directly addressing Research Question 3. In particular,

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subject teachers reported higher average SUS scores than their adviser colleagues, suggesting role-specific differences in system interaction and satisfaction. Although this difference did not reach statistical significance (*p* = .086), a moderate effect size (*d* = -0.683) indicated meaningful trends in role-based user experiences, which warrant attention in future system development and training initiatives.

The analysis of user perceptions by educational role adds nuance to the overall usability findings. This approach aligns with the mixed-methods case study design that enabled examination of how different stakeholders interacted with the systems over time (Creswell & Creswell, 2018). While the System Usability Scale and overall averages demonstrated meaningful improvement in SERMS, disaggregating the results revealed how different responsibilities shaped the way faculty engaged with the system. As shown in Table 5, non-adviser teachers reported higher average SUS scores (M = 85.25, SD = 7.40), rated "Excellent," compared to advisers (M = 77.14, SD = 13.14), rated "Good." The combined SUS mean of 79.76 (SD = 12.29) falls within the upper band of the "Good" category (Bangor et al., 2009).

Table 5. SUS descriptive statistics by role

User Role	n	Mean SUS	Standard Deviation	Usability Rating
Subject Teachers	10	85.25	7.40	Excellent
Advisers	21	77.14	13.14	Good
Combined (All)	31	79.92	12.10	Good to Excellent

This parallels the "very acceptable" rating (M = 4.71, SD = 0.50) reported by Ronquillo et al. (2022) for SRF-OMaS, the precursor system. However, that study did not distinguish between advisers and non-advisers, which may explain their higher combined rating. In contrast, disaggregated results here show that advisers—who manage more complex tasks such as grade encoding and report generation—rated the system lower. This pattern reflects the distinct technological needs that general systems often fail to address effectively, as different educational roles engage with administrative systems through distinctly different workflows and responsibilities. On the other hand, Welch's t-test (Table 6) found the adviser vs. non-adviser difference not statistically significant (*t*(29) = −1.778, *p* = .086), but the moderate effect size (Cohen's *d* = −0.683) suggests a meaningful usability gap.

Table 6: Welch's t-test: SUS scores by role

Comparison	t(df)	p	Cohen's d	95% CI for d
Subject Teachers vs. Advisers	-1.778 (29)	.086	-0.683	[-1.451, 0.096]

This contrast likely reflects the differing nature of system use across roles. Non-advisers primarily engage with SERMS for routine tasks such as grade encoding and accessing class lists—functions that are already streamlined and optimized. Advisers, in contrast, manage more complex workflows linked to official forms (SF-1, SF-2, SF-5, SF-9, SF-10), several of which still require manual validation even within SERMS. This distinction underscores how advisers shoulder the primary responsibility for preparing critical official school forms, as mandated in DepEd Order No. 11, s. 2018, thereby encountering more demanding system requirements than subject teachers. Consistent with this, recent research on educational technology implementation shows that role-differentiated user

Vol. 2 No. 3 (2025), pp. 224-243

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experiences commonly arise when systems serve multiple stakeholder groups, reinforcing the need to account for varied user requirements in both system design and training strategies (Chugh et al., 2023).

For subject teachers, the most immediate benefit of the SERMS Suite lay in the streamlining of grade encoding. Their system interactions were typically narrow in scope, focused on entering subject-level grades quickly and accurately. In this respect, SERMS addressed their core functional requirement directly. By reducing errors, accelerating the process, and presenting a clear interface, the system aligned with typical grade reporting tasks. As a result, subject teachers tended to report highly positive experiences. Advisers, on the other hand, encountered the system differently. Their responsibilities extended beyond grade entry to include learner information management, class records, and the generation of reports for school administration. These functions required them to interact with a broader set of system features, which often involved more complex navigation. While they also benefited from the improvements introduced in SERMS, their evaluations necessarily reflected a wider set of considerations.

The quantitative evidence further reinforces these role-based distinctions. Among advisers who had experience with both systems, the proportion rating grade encoding as "very easy" increased from 30% with the eTool to 81% with SERMS. Such pronounced improvements in perceived ease of use align with technology acceptance research showing that when educational systems adequately address functional requirements, user satisfaction and adoption tend to rise substantially (Mastour et al., 2025). A comparable pattern emerged for learner information encoding, where "very easy" ratings climbed from 40% to 81%. Taken together, these figures illustrate the magnitude of improvement in core functionalities and demonstrate that even advisers—who manage the most complex, form-intensive tasks—experienced significant and meaningful usability gains.

This differentiation between user groups echoes themes found in the literature. Alqurni (2023) emphasizes that improvements in user interface design and usability strategies are important for successful system adoption. SERMS put these principles into practice, especially by refining grade encoding until it was consistently described as easy to use. The system's impact on advisers shows that to support users with broader responsibilities, usability must extend beyond a single feature to cover multiple workflows.

These findings also align with Eze et al. (2023), who noted that involving teachers in technology decisions strengthens system adoption. This pattern was evident throughout the transformation process, as early engagement with all stakeholders helped address resource limitations and promoted positive attitudes toward technology (Njoka et al., 2020). In this case, the system was adjusted based on feedback from both advisers and subject teachers. Additionally, these role-focused improvements further supported adoption. Subject teachers, facing fewer barriers in grade encoding, were more likely to use the system regularly. Advisers, seeing real gains in handling learner information and reports, developed confidence that the system could manage complex administrative duties. This approach helped maintain daily use across both classroom and administrative users.

These role-based challenges reflect broader institutional readiness issues documented in Philippine schools, where varying levels of technological proficiency and differentiated responsibilities create complex adoption landscapes (Espero, 2024). The need for role-specific interface design and training approaches at DJPRSHS mirrors regional findings where successful educational technology implementations require careful attention to diverse user needs and organizational hierarchies (Oktarina et al., 2025).

Indonesian Journal of Education and Pedagogy
Vol. 2 No. 3 (2025), pp. 224-243

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The analysis highlights the importance of considering usability across different user roles. The SERMS Suite successfully raised SUS scores and offered practical benefits to distinct user groups. Teachers didn't adopt the new system just because it was new; they embraced it because of deliberate enhancements that made the technology both usable and credible.

User experience and functionality assessment

This comprehensive comparison of user experiences between systems directly addresses Research Question 3, revealing how different educational roles perceive and assess the functionality of the grades-related technologies. Building on the role-based analysis presented above, the data clearly shows that the transition to SERMS represented a substantial functional improvement over the eTool. The dramatic increase in "very easy" ratings for core tasks like grade and learner information encoding, as previously detailed in Table B, confirms that SERMS successfully met user needs where the eTool had limitations.

Furthermore, the positive functionality assessments from both user groups (Table C) confirm that SERMS effectively streamlined administrative workflows across roles. This successful addressing of key challenges highlights the importance of user-centered design principles noted in the literature, where improvements in interface and usability are critical for adoption (Alqurni, 2023), and where involving teachers in the process strengthens both adoption and effectiveness (Eze et al., 2023; Njoka et al., 2020).

The transition from localized data storage to a centralized architecture proved most significant, removing workflow bottlenecks and minimizing record-keeping inconsistencies. Previously, data was scattered across different sources, which made coordination slow and increased the risk of errors. Centralizing the data provided a single, reliable source of information for all users. Role-based access controls also proved useful. Subject teachers could access the grade encoding interface directly, without seeing features they did not require. Advisers and administrators, by contrast, had access to broader reporting and oversight functions. This setup allowed each group to use a system suited to their responsibilities. Both groups reported better functionality, although non-advisers were slightly more satisfied, likely because their tasks focused on core features.

Stakeholder feedback played a crucial role throughout the system's development. This approach aligns with the principle that addressing practical user needs is essential, as complex or unintuitive interfaces can hinder adoption (Alqurni, 2023). Building on the improvements reflected in the role-based analysis, many of the concerns teachers raised about the eTool—such as interface clarity and processing speed—were directly resolved in SERMS. Consistent with this, systematic reviews of usability evaluation in educational technology emphasize that combining standardized measures like the System Usability Scale with qualitative user feedback offers a more complete understanding of both technical performance and user experience (Vlachogianni & Tselios, 2022). This multi-method strategy allowed the development team to identify specific usability barriers and implement targeted refinements. As Eze et al. (2023) observe, when teachers see their feedback integrated into system design, their willingness to adopt and sustain system use increases significantly.

Findings indicate that successful implementation depends on usability, structural innovation, and institutional support. SERMS met these conditions by addressing persistent frustrations, aligning functions with varied user roles, and integrating teacher feedback with administrative validation. These elements generated momentum for adoption and

Indonesian Journal of Education and Pedagogy
Vol. 2 No. 3 (2025), pp. 224-243

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sustained use, suggesting that SERMS can serve as a reference model for future educational technology initiatives.

Most valued features and implementation challenges

Looking at what features users preferred and what challenges they faced showed important patterns, directly addressing Research Question 4. One feature consistently stood out: letting subject teachers enter grades directly. Almost everyone supported this capability—20 of 21 advisers and all 10 subject teachers (see Appendix, Table D)—making it the most valued part of the SERMS Suite. This was not just about convenience; it fundamentally transformed workflows, moving away from having intermediaries handle grades to empowering teachers to input their own assessments.

The high valuation of direct grade encoding and automated computations at DJPRSHS aligns with regional patterns where electronic records management systems are most valued for their efficiency and accuracy improvements (Oktarina et al., 2025). However, the persistent navigation difficulties and technical challenges highlight how even successful implementations must contend with the resource constraints common in Philippine educational settings (Espero, 2024). These findings, which we explore further in the following section on comparative regional implications, underscore the dual reality of technological adoption in this context.

Supporting these regional observations, evidence gathered through survey instruments revealed distinct patterns in feature preference. The strong preference for automated computations (14 advisers, 7 subject teachers) and structured grade sheets (13 advisers, 5 subject teachers) suggests that users value features that minimize errors and support clear workflows, consistent with the importance of effective UI and usability (Alqurni, 2023). Complementing this analysis of valued features, navigation difficulties emerged as the most cited challenge (6 advisers, 1 subject teacher; Table 7), with "too many steps to generate reports" also noted by several users. These indicate areas for interface refinement. However, the low frequency of concerns about core functions suggests that while usability can improve, system capabilities already meet user needs.

Table 7. Implementation challenges and success factors

Category	Challenges	Success Factors
Technical	- Internet connectivity issues (6) - Slow download speeds (6) - Inefficient grade harvesting (3)	- Comprehensive training sessions - Personalized technical assistance
Interface/Process	- Navigation difficulties (7) - Too many report generation steps (5) - Tedious verification (1)	- Phased implementation approach - Pilot testing and refinement
Organizational	—	- Leadership support - Multi-level stakeholder collaboration

Despite these challenges, the identified implementation success factors (Table 7)—including comprehensive training, personalized support, and phased rollout—underscore the importance of supportive change management strategies. These elements align with research showing that teacher confidence, strong leadership, and sufficient training are central to effective technology adoption (Lyanda et al., 2023), while teacher involvement in decision-making further strengthens adoption outcomes (Eze et al., 2023; Njoka et al., 2020). Together, these findings reinforce that a combination of technical and organizational support is essential for both adoption and sustained use.

Indonesian Journal of Education and Pedagogy
Vol. 2 No. 3 (2025), pp. 224-243

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Contemporary research on educational technology implementation similarly emphasizes that sustainable adoption depends on coordinated attention to multiple dimensions: technological infrastructure, pedagogical integration, and organizational support. Within this framework, multi-stakeholder engagement consistently emerges as a critical success factor (Chugh et al., 2023; Bond & Bedenlier, 2020). The DJPRSHS experience reflects these insights, showing how phased implementation paired with comprehensive training can meet these multidimensional requirements, even within resource-constrained settings.

Comparative regional implications

The DJPRSHS digital transformation offers valuable insights when situated within broader educational technology adoption patterns. The successful navigation of resource constraints at DJPRSHS, achieved through strategic leadership and phased implementation, demonstrates approaches that may be applicable across similar institutional contexts. Systematic reviews of educational technology in higher education identify stakeholder engagement, institutional support frameworks, and attention to diverse user needs as consistent success factors across varied settings (Chugh et al., 2023; Bond & Bedenlier, 2020). The grassroots, teacher-driven initiation at DJPRSHS represents an important variation from more common top-down implementations, suggesting that scalable educational technology solutions may benefit from hybrid approaches that combine institutional support with local innovation capacity. Moreover, the significant usability improvements documented through standardized assessment align with broader evidence that user-centered design and iterative refinement are essential for sustainable technology adoption in educational contexts (Angelaki et al., 2024; Vlachogianni & Tselios, 2022). While the single-school scope limits generalizability, the documented patterns of technology acceptance (Granić & Marangunić, 2019; Mastour et al., 2025) and role-based user experiences provide a foundation for understanding digital transformation processes in resource-constrained educational environments.

CONCLUSION

This case study traced the four-phase digital transformation at DJPRSHS from 2020 to 2024, revealing a successful model of teacher-driven innovation scaling into institutional practice. The evolution from the Adviser's eTool to the SERMS Suite resulted in a statistically significant usability improvement, moving from a "Marginal" to a "Good" rating on the System Usability Scale. This achievement demonstrates how strategic implementation combining user-centered design, phased rollout, and multi-stakeholder engagement can overcome institutional readiness challenges common in resource-constrained educational settings. The grassroots, teacher-led approach offers an alternative to traditional top-down technology implementations, suggesting that hybrid models may effectively balance local innovation capacity with institutional support structures. While the system achieved high effectiveness for subject teachers, the persistent role-based satisfaction gap for advisers underscores ongoing challenges in designing for complex administrative workflows. The most valued feature—direct grade encoding by subject teachers—highlights a critical shift towards distributed, empowered use. Ultimately, the transformation was sustained through the interplay of strategic leadership, comprehensive training, iterative refinement based on user feedback, and sustained stakeholder collaboration. The study's single-school, four-year scope limits generalizability but provides a detailed examination of digital transformation processes that may inform similar initiatives in comparable educational contexts.

Vol. 2 No. 3 (2025), pp. 224-243

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Based on the evidence gathered through this four-year transformation, the following recommendations are offered: Findings suggest that institutions in similar contexts should continue step-by-step approaches to technology improvement while addressing role-based usability gaps. Schools are advised to collect regular user feedback and develop role-specific training modules, particularly for users managing complex administrative workflows. Documenting innovation journeys is recommended to create institutional memory and transferable knowledge for other schools facing similar resource constraints. The successful grassroots model documented in this study offers valuable lessons for national education policy. Education authorities should explore developing support frameworks that encourage localized innovation while maintaining data standards, recognizing the effectiveness of hybrid approaches that combine institutional support with teacher-led initiatives. National policy could benefit from supporting context-aware adaptations rather than one-size-fits-all solutions, particularly for addressing institutional readiness challenges in resource-constrained public education settings. This case study provides a roadmap for similar technology projects in resource-constrained educational environments. Other institutions should consider adopting comparable tools while participating in coordinated research that extends beyond individual cases. The documented patterns of technology acceptance, role-based user experiences, and implementation strategies offer a foundation for understanding digital transformation processes, though testing across multiple institutional contexts remains essential to establish broader applicability.

Future research should investigate the transferability of grassroots innovation models to other Southeast Asian educational contexts, particularly examining how hybrid bottom-up/top-down approaches can be adapted across different institutional cultures and resource landscapes. Research priorities should include comparative studies across regions examining how infrastructure variations affect adoption patterns, longitudinal tracking of system sustainability beyond four-year timeframes, investigation of role-based training approaches to address persistent satisfaction gaps among users with complex workflows, and cross-institutional studies examining the effectiveness of multi-stakeholder engagement strategies in diverse educational settings. Such research would strengthen the evidence base for scalable educational technology implementations in resource-constrained contexts.

AUTHOR CONTRIBUTION

Author 1: Methodology, data curation, formal analysis, writing original draft preparation, final manuscript preparation; **Author 2:** Conceptualization, supervision; **Author 3:** Visualization, investigation, project administration; **Author 4:** Validation, resources, instrument distribution; **Author 5:** Instrument distribution, writing reviewing and editing

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Conflict of Interest Statement: The authors declare that they were directly involved in the development, implementation, and/or administration of the enabling technologies (the Adviser's eTool and SERMS Suite) described in this case study. However, all data collection and analysis were conducted in accordance with standard research ethics, employing mixed-methods and external oversight to ensure the validity and objectivity of the reported findings. The authors have no other financial or non-financial conflicts of interest to declare.

Indonesian Journal of Education and Pedagogy
Vol. 2 No. 3 (2025), pp. 224-243

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APPENDIX

The following tables provide supplementary detail to the analysis in the Results and Discussion section.

Table A: Timeline of Technology Implementation at DJPRSHS

Phase	Event/Development	Key Stakeholders
Phase 1: Innovation Genesis (Nov-Dec 2020)	Initial discussions on digital solution for Grade 11 advisory tasks	P.C. Casas (Teacher III), R.F. Dinampo (Master Teacher I)
	Adviser's eTool concept paper approval and institutional support	P.C. Casas, J.B. Paleracio (School Head)
	Training and soft launch of the eTool: "The Power of Excel"	Academic community
	Inter-institutional partnership for eTool validation	R.P. Quezada (Principal), S.C. Maraan (Teacher, New Era SHS)
Phase 2: Enhancement (2021-2022)	Enhanced eTool training with additional features	P.C. Casas, Academic community
	Systematic records office validation and compliance verification	J.C. Elarmo (LIS Coordinator), J.D. Prestado (Teacher Registrar), D.P. Rodriguez (Asst. Registrar)
	Official certification acknowledging eTool effectiveness	J.B. Paleracio (School Head)
Phase 3: Planning (Aug 2022-Jan 2023)	Strategic positioning: Grade 11 Coordinator role assumption	P.C. Casas (Teacher III/Grade 11 Coord.)
	SERMS Suite conceptualization and planning phase	P.C. Casas (EduTech Focal Person)
	Technical consultation for SERMS architecture development	Z. Ronquillo (External Tech Consultant, TUPC)
	Certification for innovation leadership and SERMS development	J.B. Paleracio (School Head)
Phase 4: Implementation (2024)	Leadership transition during SERMS pilot implementation	M.M. Barrameda (New School Head)
	SERMS Suite pilot testing with Grade 11 students	P.C. Casas (Tech Coordinator), R.F. Dinampo, F.R. Oronan (Master Teachers)
	School-wide SERMS deployment with stakeholder integration	Records Office, All faculty, SPTA (financial support)
	District-level recognition and validation	Dr. C.A. Belas (Public Schools District Supervisor)

Key: Inn. = Innovator; Sup. = Supervisor; Coord. = Coordinator; Asst. = Assistant; RRO = Records and Registration Office; SPTA = School Parent-Teachers Association; PSDS = Public Schools District Supervisor; TUPC = Technological University of the Philippines – Cavite

Indonesian Journal of Education and Pedagogy
Vol. 2 No. 3 (2025), pp. 224-243

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Table B: Comparison of Adviser Responses – Old eTool vs. SERMS Suite

Usability Item	Response Option	Adviser's eTool (n = 20)	SERMS Suite (n = 21)
Ease of Encoding Grades	Very easy	6	17
	Somewhat easy	10	3
	Neutral	3	1
	Somewhat difficult	1	0
	Very difficult	0	0
Ease of Encoding Learner Info	Very easy	8	17
	Somewhat easy	9	4
	Neutral	3	0
	Somewhat difficult	0	0
	Very difficult	0	0

Table C: Perceived Ease of Encoding Grades and Learner Information in the SERMS Suite (Current Users)

Response Category	Advisers (n = 21)	Subject Teachers (n = 10)
Encoding Grades		
Very easy – Encoding grades was smooth and efficient	17	8
Somewhat easy – Took effort at first, but I got used to it	3	1
Neutral	1	1
Somewhat/Very difficult	0	0
Encoding Learner Information		
Very easy – Entering learner data was straightforward	17	9
Somewhat easy – Took effort, but not too difficult	4	1
Neutral	0	0
Somewhat/Very difficult	0	0

Table D: Most Useful Features of the SERMS Suite (Multiple Responses Allowed)

Feature	Advisers (n = 21)	Subject Teachers (n = 10)
Subject teachers can encode grades directly	20	10
Structured process for organizing grade sheets	13	5
Automated computations	14	7
Grade review and verification before reports	12	4
Easy generation of reports (SF9, SF10, SF5, Temp Card)	12	6
User-friendly navigation and interface	12	6