

Assessing the Acceptance and Challenges of Picture Archiving and Communication System (PACS) Among Radiologic Technologists in Selected Private Hospitals in Laguna

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Abstract. The Picture Archiving and Communication System (PACS) is a digital technology used for the electronic storage, management, retrieval, and distribution of medical images in radiology departments. In regional healthcare settings in the Philippines, the transition from conventional to digital imaging systems is often affected by technical and organizational barriers that may influence professional performance and workflow efficiency. This study aimed to determine the level of acceptance and identify the perceived challenges of PACS among 67 radiologic technologists in selected level 2 private hospitals in Laguna as a basis for a proposed action plan. The researchers employed a quantitative descriptive research design and gathered data through a validated survey questionnaire adapted from the Technology Acceptance Model (TAM) and the Information Systems Success Model (ISSM). Findings revealed a very high level of PACS acceptance (WM = 3.54), particularly in Perceived Usefulness (WM = 3.66), Behavioral Intention (WM = 3.64), Attitude Toward Use (WM = 3.54), and Perceived Ease of Use (WM = 3.33). In terms of perceived challenges (WM = 2.19), System Quality was identified as a moderate challenge (WM = 2.87), while Information Quality (WM = 2.23) and Training Quality (WM = 1.93) were considered minor challenges, and Support Quality (WM = 1.73) was identified as not a challenge. These findings suggest that radiologic technologists demonstrate high readiness and acceptance toward PACS; however, digital workflows remain affected by infrastructure instability and dependence on informal training practices. Therefore, the proposed action plan focuses on technical system improvements and standardized vendor-facilitated training programs to address these challenges and sustain the high level of PACS acceptance among radiologic technologists.

Introduction

The rapid digitization of healthcare services has made the adoption of advanced information systems a fundamental requirement for hospitals seeking to improve clinical efficiency and patient care quality. Among the most consequential of these systems is the Picture Archiving and Communication System (PACS), a digital infrastructure that has progressively replaced traditional film-based imaging across radiology departments worldwide, accounting for 83% of the imaging software market share as of 2024 (Pandey, 2025). In the Philippines, this shift mirrors broader national health informatics initiatives aimed at strengthening digital health infrastructure across hospital settings (Ongkeko, 2024).

PACS offers established operational benefits: faster image retrieval, reduced storage costs, improved diagnostic accuracy, and enhanced interoperability with hospital systems such as the Radiology Information System and Electronic Health

Records (Blaj, 2025; RamSoft, 2023). However, persistent implementation challenges, including network instability, hardware failures, insufficient training, and limited technical support, continue to undermine its full utilization across diverse clinical contexts. Critically, the success of PACS implementation depends heavily on user acceptance, as the willingness of clinical staff to adopt and sustain system use determines whether its benefits are realized in practice (Muzanima & Singh, 2023).

To understand these dynamics, this study is anchored on two complementary theoretical models. The Technology Acceptance Model (TAM), introduced by Davis (Marikyan & Papagiannidis, 2024), posits that adoption is shaped by two core perceptions: Perceived Usefulness (PU), the belief that a system enhances job performance, and Perceived Ease of Use (PEOU), the degree to which use is free of effort. These perceptions form Attitude Toward Use (ATU), which in turn drives Behavioral Intention (BI) to sustain adoption. The Information Systems Success Model (ISSM), introduced by DeLone and McLean (Fiati et al., 2024), complements TAM by evaluating system performance through System Quality, Information Quality, and Support Quality, dimensions that shape user satisfaction and determine whether a system succeeds in its intended clinical setting. Training Quality was added as a researcher-developed construct to capture instructional gaps specific to the radiologic technology context. Together, these frameworks provide a dual lens connecting system-level conditions to user-level perceptions, enabling a more complete understanding of PACS adoption outcomes.

Despite the growing body of international literature on PACS usability and satisfaction, empirical evidence from the Philippine context—particularly among radiologic technologists who serve as the system's primary operators—remains scarce. Most existing studies have focused on radiologists or administrative perspectives, leaving user attitudes, demographic influences, and system-specific challenges among technologists largely underexplored in regional settings. This gap is significant because local infrastructure constraints and training availability differ markedly from the international contexts from which most evidence is drawn.

This study directly addresses that gap by producing the first empirical data on PACS acceptance and perceived challenges specifically among radiologic technologists in selected level 2 private hospitals in Laguna. Its significance is threefold. For clinical practice, the findings provide actionable evidence for hospital administrators and chief radiologic technologists to design targeted infrastructure upgrades and training interventions that are grounded in the lived experiences of primary system users. For policy, the results contribute a Philippine-specific evidence base that healthcare policymakers can draw upon when developing or refining guidelines for PACS implementation in private hospital settings. For the academic community, this study expands the existing literature on health informatics adoption in developing countries and offers a validated methodological model—integrating TAM and ISSM with a locally developed Training Quality construct—that future researchers can replicate and build upon across broader institutional and regional contexts.

Methodology

Research Design

This study employed a descriptive, non-experimental quantitative research design. This approach enabled the systematic examination of user perceptions and experiences as they naturally occurred in clinical settings, without manipulation of variables. A quantitative framework facilitated the use of standardized metrics through TAM and ISSM, converting subjective user experiences into measurable data to support the reliability and replicability of findings.

Participants

The participants were 67 radiologic technologists currently employed across five DOH-accredited Level 2 private hospitals in Laguna confirmed to have active PACS integration: Calamba Doctors' Hospital (n = 15), Healthway Qualimed Hospital Sta. Rosa (n = 12), New Sinai MDI Hospital (n = 11), Unihealth-Southwoods Hospital and Medical Center, Inc. (n = 18), and Westlake Medical Center (n = 11). The sample size was determined from a total population of 71 using the Raosoft sample size calculator. Proportionate stratified sampling ensured that each institution's representation was proportional to its share of the total population. The sole inclusion criterion was a minimum of one year of professional experience with PACS.

Research Instrument

A structured questionnaire served as the primary data collection tool. The first section comprised 20 items measuring PACS acceptance across the four TAM constructs—PU, PEOU, ATU, and BI—adapted from Herman (2025) and Goodarzi et al. (2016). The second section assessed perceived challenges across four ISSM constructs: System Quality, Information Quality, and Support Quality (adapted from Ojo, 2017), alongside Training Quality, a researcher-developed construct designed to capture instructional gaps specific to the clinical context. The first section used a four-point Likert scale and a reversed Likert scale for section 2, deliberately excluding a neutral midpoint to elicit more decisive responses.

Validation and Reliability

The instrument underwent expert content validation by a panel of five specialists in research, statistics, and radiologic technology, who evaluated items for content validity, construct alignment, and clarity. Their feedback was integrated into the final questionnaire. A pilot test was subsequently conducted among radiologic technologists in participating pilot hospitals, and internal consistency was assessed via Cronbach's Alpha. The PACS acceptance construct yielded $\alpha = 0.87$ and the PACS challenges construct yielded $\alpha = 0.82$, both indicating good internal consistency according to standard conventions.

Data Gathering Procedure

Following the institutional approval, the finalized questionnaire was distributed via Google Forms through chief radiologic technologists at each participating institution via email and Messenger. An informed consent form was embedded within the survey, emphasizing the voluntary and confidential nature of participation. Completed responses were retrieved from the Google Forms database, screened for accuracy and completeness, and systematically organized for statistical processing.

Statistical Treatment

Weighted mean was the primary statistical tool for determining the average level of PACS acceptance and extent of perceived challenges across all constructs. Frequency and percentage distribution described respondent demographic profiles. Two interpretive scales were applied, as presented in Tables 1 and 2.

For PACS acceptance, a standard four-point Likert scale was used, where higher scores indicate greater acceptance. This scale measures how strongly radiologic technologists embrace digital workflows, with Very High indicating strong belief in the system's benefits and Very Low indicating significant resistance.

Scale	Numerical Range	Categorical Response	Verbal Interpretation
4	3.26 – 4.00	Strongly Agree	Very High
3	2.51 – 3.25	Agree	High
2	1.76 – 2.50	Disagree	Low
1	1.00 – 1.75	Strongly Disagree	Very Low

Table 1. Likert Scale for Level of PACS Acceptance

For PACS challenges, the scale was reversed because all challenge indicators were positively framed, meaning agreement with a positive statement indicates the absence of challenge. This reversal ensures that higher mean scores reflect greater operational difficulty, while lower means reflect satisfactory system functioning.

Scale	Numerical Range	Categorical Response	Verbal Interpretation
4	3.26 – 4.00	Strongly Disagree	Major Challenge
3	2.51 – 3.25	Disagree	Moderate Challenge
2	1.76 – 2.50	Agree	Minor Challenge
1	1.00 – 1.75	Strongly Agree	Not a Challenge

Table 2. Likert Scale for PACS Perceived Challenges

Results and Discussion

Table 3 presents the composite weighted means for all four TAM constructs. Radiologic technologists demonstrated a very high overall level of PACS acceptance across all constructs, yielding a composite weighted mean of 3.54.

Construct	Weighted Mean	Verbal Interpretation	Rank
Perceived Usefulness (PU)	3.66	Very High	1
Perceived Ease of Use (PEOU)	3.33	Very High	4
Attitude Toward Use (ATU)	3.54	Very High	3
Behavioral Intention (BI)	3.64	Very High	2
Overall Weighted Mean	3.54	Very High	

Table 3. Composite Level of PACS Acceptance among Radiologic Technologists

Perceived Usefulness (WM = 3.66) ranked highest among the four constructs. Respondents most strongly agreed that PACS assisted in managing workload more efficiently and contributed to the delivery of high-quality radiologic services (both WM = 3.69), while support for increased productivity received the lowest rating within this construct (WM = 3.63). This pattern aligns with Abbasi et al. (2020), who established that satisfaction and acceptance were significantly elevated when a system was perceived to outperform traditional film-based workflows in clinical functionality. The slightly more conservative rating for productivity suggests that, while the system's intrinsic value was strongly recognized, its impact on total output may have been constrained by hospital-level operational factors, a trend similarly observed by Alhur (2024), who noted that actual system utilization was often dictated by infrastructure conditions rather than software utility alone. Behavioral Intention (WM = 3.64) ranked second. The intention to use PACS regularly in future professional practice received the highest rating (WM = 3.72), while willingness to pursue further formal training was the lowest within this construct (WM = 3.55). This finding is consistent with Munzanima and Singh (2023), who observed that once users achieve baseline proficiency, motivation for structured retraining tends to decline as informal peer-based learning becomes the dominant mode of skill acquisition. Kelkay et al. (2024) identified high behavioral intention as a reliable predictor of long-term system sustainability within institutions, suggesting that PACS has effectively transitioned into a permanent professional expectation in the selected hospitals.

Attitude Toward Use (WM = 3.54) reflected strongly favorable professional sentiment. The belief that PACS was a valuable tool in radiologic technology received the highest agreement (WM = 3.85), while perceived impact on individual clinical performance was rated more conservatively (WM = 3.37). This balanced perspective aligns with Herman (2025), who found that radiologic technologists in Laguna increasingly view digital integration as a hallmark of professional modernization. The more reserved rating for individual performance impact resonates with Manuel III and Capistrano (2024), who noted that clinicians consistently center human expertise in diagnostic quality, viewing technology as a supportive infrastructure rather than a substitute for clinical skill.

Perceived Ease of Use (WM = 3.33), while the lowest-rated construct, remained firmly within the very high range. The straightforward nature of learning to operate the system was rated highest (WM = 3.49), and the user-friendly navigation of features ranked second (WM = 3.36). The need for frequent external assistance received the lowest rating within this construct (WM = 3.12), suggesting that recurring technical barriers—rather than software design limitations—occasionally impeded users' operational independence. As Tadayon et al. (2023) and Alhur (2024) observed, connectivity failures and hardware instability diminish ease-of-use perceptions regardless of how intuitive the interface design may be, and this infrastructure-dependent limitation is consistent with the system quality challenges identified in the second research question.

Perceived Challenges in PACS Use

Table 4 presents the composite weighted means for perceived challenges. The overall mean of 2.19, interpreted as a minor challenge, indicates that significant variation existed across constructs.

Construct	Weighted Mean	Verbal Interpretation	Rank
System Quality	2.87	Moderate Challenge	1
Information Quality	2.23	Minor Challenge	2
Training Quality	1.93	Minor Challenge	3
Support Quality	1.73	Not a Challenge	4
Overall Weighted Mean	2.19	Minor Challenge	

Table 4. Composite Perceived Challenges in PACS Use among Radiologic Technologists

System Quality (WM = 2.87) emerged as the most prominent challenge and the only construct reaching the moderate challenge threshold. Network instability and power-related disruptions were the most frequently cited concern (WM = 3.04), followed by periods of system unavailability (WM = 2.97) and workstation connection failures (WM = 2.88). The PACS interface itself was rated least challenging within this construct (WM = 2.66), suggesting that the software performed adequately but that the supporting physical infrastructure created the most consistent operational hurdles. This finding corroborates Abbas and Singh (2020), who identified infrastructure as a primary weakness in health institutions, and Acacio-Claro et al. (2024), who noted that environmental factors such as power instability disproportionately affect the success of digital health tools in the Philippine context. Eichelberg et al. (2020) further emphasized that the success of digital archiving depends entirely on technical stability and hardware quality.

Information Quality (WM = 2.23) was a minor challenge overall, though the misregistration or incorrect entry of patient demographic data was the only indicator reaching the moderate challenge threshold (WM = 2.61). In contrast, inaccuracies in stored patient records received the lowest rating within the construct (WM = 1.85), indicating that once data was correctly indexed, the system's internal storage was reliable. This localization of data integrity issues to the manual input phase is consistent with Lobi et al. (2025) and Rosales (2018), who identified manual demographic entry as the primary point of failure in digital archiving, particularly in facilities where a seamless automated link between the HIS and PACS modality worklist is absent, forcing technologists to enter patient data manually and elevating the risk of clerical error. As Canguit and Sison (2025) noted, addressing information quality therefore requires a focus on the reliability of the data entry process rather than the system's archival capabilities.

Training Quality (WM = 1.93) was a minor challenge. The availability of refresher or follow-up training was the most prominent concern (WM = 2.25), followed by the delivery of training through structured or certified programs (WM = 2.21) and the clarity of training materials (WM = 2.01). Conversely, practical hands-on initial training (WM = 1.64) and peer-led instruction (WM = 1.54) were not rated as challenges, reflecting the social learning patterns documented by Munzanima and Singh (2023), wherein users prefer coworker-derived guidance for its context-specific relevance. However, while peer learning facilitates rapid adoption, Lobi et al. (2025) warned that it lacks the standardized updates necessary for long-term data security and advanced feature mastery. Kuek and Hakkennes (2020) similarly established that structured training programs serve as a necessary intervention to reduce professional resistance and ensure that system adoption is perceived as a functional benefit rather than an administrative burden.

Support Quality (WM = 1.73) was not a challenge, reflecting that technical assistance in the selected hospitals was generally accessible, competent, and effective. The accessibility of technical support received the most favorable rating (WM = 1.57), alongside effective resolutions (WM = 1.63) and troubleshooting competence of support personnel (WM = 1.64). The only indicators reaching the minor challenge threshold were the timeliness of issue resolution (WM = 1.91) and the reduction of downtime during system errors (WM = 1.88), suggesting a gap between support accessibility and the speed of resolution. Ahmed et al. (2020) noted that technical teams are frequently dependent on external vendor resources for specialized fixes, which creates delays that practitioners find frustrating in time-sensitive clinical environments. Tadayon et al. (2023) further argued that while support personnel may demonstrate sufficient knowledge, their efficacy is often constrained by the complexity of server-level errors or limited localized technical authority.

Proposed Action Plan

In response to the identified challenges, an action plan comprising five strategic areas was developed to sustain and enhance the current high level of PACS acceptance in the selected hospitals.

The most urgent priority is the stabilization of technical infrastructure. Given that network instability and power disruptions were the dominant moderate challenge (WM = 3.04), hospitals should conduct a comprehensive technical audit and upgrade of network servers and Uninterruptible Power Supply (UPS) units. This short-term intervention, accountable

to the IT Department and Administration within one to three months, directly targets the root cause of the most frequent operational disruptions and is expected to result in 100% system uptime during clinical procedures. Without this foundational fix, improvements in other areas will have limited impact on daily operations.

The second strategic area addresses information quality by eliminating the manual demographic entry process. Implementing a mandatory Demographic Verification Step or establishing a direct automated link between the HIS and the PACS modality worklist would remove the primary source of misregistration errors (WM = 2.61). This is an immediate and ongoing measure accountable to radiologic technologists and IT support, and is expected to reduce misregistration rates and accelerate image retrieval.

Third, transitioning from informal peer-led learning to standardized institutional competency development is essential for long-term system mastery. A PACS Proficiency Workshop, delivered quarterly by chief radiologic technologists in coordination with PACS vendors, with accompanying official system manuals, would formalize the peer-acquired knowledge currently relied upon by most users. This addresses the finding that while initial training was satisfactory (WM = 1.64), refresher training availability remained a concern (WM = 2.25).

Fourth, system sustainability requires a structured feedback mechanism. Establishing a quarterly feedback loop between radiologic technologists and the IT support team, overseen by the Quality Management Office, would enable proactive identification and resolution of technical concerns before they escalate into operational downtime. This ongoing mechanism acknowledges that PACS is a dynamic system requiring continuous calibration to user needs, particularly as system updates and new features are introduced. Annual review cycles would ensure that the feedback loop evolves alongside the system.

Finally, to motivate advanced system mastery and prevent long-term competency stagnation, hospital HR and Administration should provide institutional incentives for radiologic technologists to obtain formal PACS certifications. This long-term strategy directly addresses the finding that willingness to pursue formal training, while not critically low (WM = 3.55), was the weakest behavioral intention indicator, suggesting that motivation for advanced learning may require structural encouragement beyond peer-driven norms. Together, these five strategies form a coherent, phased approach to bridging the gap between current operational challenges and the long-term efficiency and sustainability of PACS in the selected institutions.

Conclusion and Recommendations

This study demonstrated that radiologic technologists in selected level 2 private hospitals in Laguna hold a very high level of PACS acceptance, driven primarily by strong recognition of the system's clinical utility (PU = 3.66) and sustained behavioral commitment to its continued use (BI = 3.64). This acceptance exists despite a moderate challenge in system quality, centered on network instability and power-related disruptions, as it reveals that high user acceptance can coexist with, and be undermined by, inadequate physical infrastructure. Data integrity concerns were concentrated at the manual demographic entry phase rather than within the system's archival functionality, confirming that information quality risks are process-driven rather than system-driven. Technical support was broadly perceived as satisfactory, while the absence of formal refresher training programs represented the most consequential gap for long-term system competency.

These findings advance the theoretical application of TAM and ISSM in a Philippine radiologic technology context, confirming that Perceived Usefulness is the dominant predictor of acceptance in this population while establishing that system quality, rather than ease of use or training, is the primary external constraint on adoption success. Practically, hospital administrators should prioritize investment in dedicated network servers and Uninterruptible Power Supply (UPS) units to eliminate power-related disruptions, and implement automated HIS-to-PACS modality worklist linking to remove the manual data entry risk. Chief radiologic technologists and PACS vendors should collaboratively design quarterly proficiency workshops that formalize peer-acquired knowledge into institutionally standardized competencies. A structured feedback loop between radiologic technologists and IT support teams should be established on a quarterly basis to proactively identify technical friction before it escalates to operational downtime. Finally, institutional incentives for formal PACS certification should be introduced to motivate advanced system mastery beyond informal learning plateaus.

Several limitations should be acknowledged. The study was confined to five level 2 private hospitals in Laguna, restricting generalizability to public institutions, level 3 hospitals, and regions with different infrastructure profiles. The cross-sectional design captures perceptions at a single point in time and cannot account for how acceptance or challenge levels may shift as system versions are updated or institutional conditions change. Future research should expand the sample to include public and level 3 hospitals to examine whether infrastructure and training gaps are systemic across hospital classifications. A correlational or regression analysis examining whether identified challenges significantly predict acceptance levels and behavioral intention would strengthen causal inference and provide a more extensive empirical basis

for targeted interventions. Longitudinal designs tracking competency development following the introduction of formal training programs would also determine whether structured education produces measurable improvements in system mastery and acceptance sustainability.

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Competing Interests Statement

The authors declare no competing interests. This study was conducted independently without financial, personal, or professional connections to any PACS vendor, product, or competing system.

Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study; all data used were obtained from previously published sources as cited in the reference list.

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Appendices

No appendices are attached to this study.