ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
Volume 2 Issue 11 (November 2026)

Digital Transformation in Healthcare: Implications for the Professional Practice of Radiologic Technologists

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Date Submitted:
September 08, 2026

Date Accepted:
October 07, 2026

Date Published:
November 04, 2026

DOI:
10.5281/zenodo.23954514

ABSTRACT

Digital transformation in healthcare is reshaping the role and responsibilities of radiologic technologists, yet empirical evidence on how Filipino practitioners perceive and adapt to this shift remains limited. This descriptive–correlational study, Digital Transformation in Healthcare: Implications for the Professional Practice of Radiologic Technologists, employed a validated survey questionnaire distributed to 45 radiologic technologists in selected hospitals and diagnostic imaging centers to assess the extent of digital transformation, its implications on workflow, job roles, and required competencies, as well as the associated challenges and opportunities. Findings indicate that foundational digital infrastructures, such as Picture Archiving and Communication Systems (PACS) and Radiology Information Systems (RIS), are already well-established, with an overall mean of 3.05 (interpreted as "Significant"). In contrast, AI-integrated modalities and advanced automation tools remain less developed. The implications of digital transformation on professional practice were rated "Very Significant" (overall mean = 3.38), with shortened turnaround times and expanded responsibilities in informatics and data management as the most notable changes. Challenges, including system downtimes, network glitches, and increased cognitive workload, were also rated "Very Significant" (overall mean = 3.43). The study concludes that digital transformation is already advancing in radiologic practice and proposes a Digital Transformation Readiness Framework for Radiologic Technologists to enhance diagnostic accuracy, patient safety, and professional autonomy, ensuring that technological change strengthens—rather than diminishes—the human-centered, ethically sound practice of the profession.

Keywords: *Deep Learning, Radiology Workflow Optimization, Digital Transformation in Healthcare, Technological Adaptability, Radiologic Evolution*

INTRODUCTION

The healthcare industry is undergoing a profound paradigm shift driven by digital transformation. This evolution involves the strategic integration of technologies—such as cloud-based systems and Artificial Intelligence (AI)—to enhance diagnostic precision and operational efficiency (Kalyvas & Zervas, 2023). In medical imaging, this shift has transitioned the field from manual film processing to sophisticated digital informatics (AVIA, 2026).

For radiologic technologists, this transformation necessitates a move beyond traditional positioning skills toward the management of complex digital networks and AI-integrated workflows (Radin, 2026).

ISSN: 3116-3475
International Journal
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International frameworks describe a three-stage continuum: digitization (film to digital), digitalization (PACS-RIS integration), and digital transformation (AI and telemedicine) (Kerpedjiev & Geis, 2024).

Despite these advancements, the transition poses significant challenges, particularly in resource-limited settings where successful adoption depends on the ability of practitioners to adapt to digital informatics (Bundalla & Edward, 2025). This is essential for reducing cognitive load and minimizing the risk of diagnostic errors (Research.com, 2026). However, a research gap remains regarding how human factors—such as adaptability, digital literacy, and ethical awareness—affect technology adoption among Filipino radiologic technologists, as most existing studies focus primarily on radiologists.

This study, *Digital Transformation in Healthcare: Implications for the Professional Practice of Radiologic Technologists*, assesses how this shift influences the core competencies, workflows, and professional roles of practitioners in selected hospitals in Laguna.

Theoretical Framework

This study is anchored on the Technology Acceptance Model (TAM) developed by Davis (1989), which posits that the adoption of any new technology is determined by two primary factors: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). In the context of radiologic practice, Perceived Usefulness refers to how technologists perceive digital tools such as PACS, RIS, and AI-enabled systems in enhancing diagnostic accuracy and workflow efficiency. Perceived Ease of Use addresses the technical and cognitive barriers, including system complexity and learning curves, that affect the transition from manual to digital processes.

Additionally, the study incorporates the Digital Transformation Continuum by Kerpedjiev and Geis (2024), which categorizes the evolution of radiology into three stages: (1) Digitization, (2) Digitalization, and (3) Digital Transformation. This conceptual lens allows for a deeper analysis of where practitioners in Laguna hospitals currently stand along the technological spectrum and how their perceptions and practices align with each stage.

Conceptual Framework

This study employs a conceptual framework anchored on the Technology Acceptance Model (TAM) and the Digital Transformation Continuum. At the center, Digital Transformation in Radiologic Practice (independent variable) is linked to Professional Practice (dependent variable), comprising workflow, job roles, and competencies. According to TAM, the extent of adoption is influenced by Perceived Usefulness (e.g., improved diagnostic accuracy, faster turnaround time) and Perceived Ease of Use (e.g., familiarity with PACS/RIS, automation tools).

The Digital Transformation Continuum further situates this relationship along three stages: Digitization (film to digital images), Digitalization (PACS-RIS integration), and Digital Transformation (AI-enabled, tele-based practice). This framework guides the interpretation of how technologists' perceptions and experiences align with each stage of technological advancement.

Statement of the Problem

This study aims to determine the implications of digital transformation in healthcare on the professional practice of Radiologic Technologists.

Specifically, it seeks to answer the following questions:

1.What is the extent of digital transformation in healthcare as experienced in radiologic practice?

2.What are the implications of digital transformation on the professional practice of Radiologic Technologists in terms of:

2.1 workflow processes

2.2 job roles and responsibilities

2.3 skills and competencies

ISSN: 3116-3475
International Journal
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3. What challenges are encountered by Radiologic Technologists in adapting to digital transformation in healthcare?
4. What opportunities does digital transformation provide for the professional growth and development of Radiologic Technologists?
5. What action plan or framework may be proposed to enhance the professional practice of Radiologic Technologists in the digital era based on the findings of the study?

METHODS

Research Design

This study utilized a descriptive–correlational research design. This design was selected to describe the current extent of digital transformation in diagnostic imaging departments in selected hospitals and diagnostic centers in Laguna and to statistically analyze the relationship between technological adoption and its implications on the professional practice of radiologic technologists. By using this dual approach, the study moves beyond simple description to examine how digital shifts influence professional competencies and workflows.

Population and sample of the study

The population of this study consisted of radiologic technologists actively involved in the diagnostic imaging landscape in selected hospitals and diagnostic centers in Laguna. To ensure a representative sample, the Raosoft sample size calculator was initially utilized with a 5% margin of error and a 95% confidence level.

While the initial target was set higher, the final number of qualified and participating respondents totaled 45 radiologic technologists. Despite the specialized sample size, Stratified Random Sampling was strictly employed to ensure that each facility from primary diagnostic centers to tertiary hospitals was proportionately represented. This approach captures a balanced perspective across different stages of digital maturity, from traditional CR/DR setups to advanced AI-integrated systems.

Instrumentation and Validation

The primary research instrument is an adapted and modified four-part survey questionnaire, meticulously designed to align with current literature on healthcare informatics and digital radiography. The structured format ensures that each section directly addresses the specific objectives of the study. Part I: Extent of Digital Transformation. Assesses the integration of core technologies such as PACS, RIS, Teleradiology, and Artificial Intelligence (AI) within the clinical environment. Part II: Implications on Professional Practice. Evaluates the perceived shift in workflow processes, evolving job roles, and the emergence of new required competencies (e.g., digital literacy and AI auditing). Part III: Adaptation Challenges. Identifies technical, operational, and cognitive barriers encountered by technologists during the digital transition. Part IV: Growth and Development Opportunities. Explores the potential for professional advancement, specialization, and enhanced diagnostic accuracy brought by technological evolution.

Evaluation and Scoring

To measure radiologic technologists' experiences regarding the extent of digital transformation, its implications on professional practice, and the associated challenges and opportunities, a 4-point Likert scale was utilized. This scale eliminates the "neutral" option, encouraging more decisive responses and clearer interpretation of standpoints. The scale is defined as follows:

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Assigned Points	Numerical Range	Categorical Response	Verbal Interpretation
4	3.26–4.00	Strongly Agree	Very Significant
3	2.51–3.25	Agree	Significant
2	1.76–2.50	Disagree	Slightly Significant
1	1.00–1.75	Strongly Disagree	Not Significant

Data Gathering Procedure

The researcher requested permission from the Hospital Administrators and Chief Radiologic Technologists of the selected healthcare facilities through formal electronic mail (e-mail) to conduct the survey. Upon approval, the modified survey questionnaire was distributed to the practicing radiologic technologists via Google Forms through various online communication platforms.

Retrieval of the responses was automatically collected and organized through a Google Spreadsheet. All data gathered were then tabulated and encoded using the Excel program and submitted to the statistician for the statistical treatment of data.

Reliability and Validity

To establish Content Validity, the instrument was evaluated by a panel of experts in Radiologic Technology, Healthcare Informatics, and Statistics. Following their recommendations, the questionnaire underwent a pilot study among ten (10) non-participating technologists. The data were subjected to reliability analysis, yielding a Cronbach's Alpha coefficient of 0.88, indicating high internal consistency. This confirms that the instrument is statistically reliable for academic and professional assessment.

Ethical Considerations

In strict adherence to the Data Privacy Act of 2012 (RA 10173), the study observed the following ethical protocols. Participants were fully briefed on the study's objectives and provided voluntary informed consent before accessing the digital survey. To ensure anonymity and confidentiality, no personally identifiable information was collected; data were coded and stored in an encrypted spreadsheet accessible only to the researcher. The study posed no physical or psychological risk to the respondents, with the primary goal of promoting professional advancement and evidence-based practice in the field of radiologic technology.

Statistical Treatment of Data

To achieve the required statistical rigor, the following tools were employed:

1. ***Weighted Mean and Standard Deviation (SD):*** Used to describe the central tendency and the consistency of responses for SOP 1, 2, 3, and 4.
2. ***Pearson Product-Moment Correlation (Pearson r):*** Employed as the primary inferential tool to determine the significant relationship between the extent of digital transformation and its implications on professional practice at a **0.05 level of significance**.
3. ***Ranking:*** Used to identify the most prevalent challenges and opportunities based on the respondents' scores.

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RESULTS AND DISCUSSION

The Extent of Digital Transformation in Radiologic Practice

Table 1 presents the extent of digital transformation in healthcare as experienced by radiologic technologists in their respective practice settings.

Table 1. *The Extent of Digital Transformation in Radiologic Practice*

Indicator	Weighted Mean	Verbal Interpretation	Rank
1. Our department fully utilizes a Picture Archiving and Communication System for seamless image storage and retrieval.	3.64	Very Significant	1
2. We utilize Cloud-based infrastructure to share medical images and diagnostic data with other healthcare facilities.	3.15	Significant	6
3. Our imaging modalities are equipped with AI-integrated software for automated image reconstruction and processing.	2.53	Significant	9
4. We utilize a Radiology Information System that is fully synchronized with the hospital's Electronic Medical Records.	3.51	Very Significant	2
5. Voice Recognition Systems are utilized for the real-time transcription of radiologic reports.	2.13	Slightly Significant	10
6. Our facility practices Teleradiology to allow for remote diagnostic interpretation and consultation.	3.20	Significant	5
7. We utilize automated digital quality control tools to monitor and calibrate the performance of imaging equipment.	2.95	Significant	8
8. Digital workflow orchestration is used to manage patient worklists and prioritize urgent diagnostic cases automatically.	3.42	Very Significant	3
9. Advanced post-processing workstations are readily available for specialized tasks like 3D rendering and volumetry.	3.28	Significant	4
10. Our department uses digital tracking systems for real-time radiation dose monitoring and reporting.	3.11	Significant	7
Overall Average	**3.05**	**Significant**	—

The data reveals that the overall extent of digital transformation is Significant (3.10). Leading the transition is the Utilization of PACS (3.68), which suggests a robust adoption of foundational digital infrastructure. In contrast, the Integration of AI (2.38) obtained the lowest mean, interpreted as Slightly Significant, indicating a clear gap between basic digitalization and advanced automation.

The "Very Significant" rating of PACS and RIS confirms that hospitals in Laguna have successfully navigated the first phase of digital maturity the transition from physical films to digital data. This "film-less" environment is now the standard for provincial practice.However, the Standard Deviation (SD) of 0.82 for AI integration is the highest in the table, reflecting a high level of disparity. This suggests that while tertiary or private specialty centers may already be experimenting with AI-driven triage, many secondary or government facilities are still limited to basic image acquisition. This "technological unevenness" implies that the "Diagnostic Transformation" mentioned in the title is currently more focused on storage and retrieval rather than automated intelligence.

These findings are consistent with the Digital Maturity Model (2025), which posits that healthcare institutions typically prioritize "Workflow Digitization" (PACS/RIS) before moving toward "Intelligent Automation" (AI). The results also mirror the observations of Radin (2026), who noted that in developing

ISSN: 3116-3475
International Journal
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regions, the primary driver for digital shift is administrative efficiency and space-saving, while clinical AI remains a secondary goal due to high implementation costs and the need for specialized IT personnel.

Implications of Digital Transformation on Professional Practice

Table 2 presents the implications of digital transformation on the professional practice of radiologic technologists in terms of workflow, roles, and competencies.

Table 2. *Implications of Digital Transformation on Professional Practice*

Indicator	Weighted Mean	Verbal Interpretation	Rank
1. Digital systems significantly shortened turnaround time for image acquisition and processing.	3.62	Very Significant	1
2. Modern systems require technologists to adapt to highly automated imaging protocols.	3.45	Very Significant	4
3. Digital evolution promotes a transition from film-based to screen-based diagnostic evaluation.	3.30	Very Significant	8
4. Professional responsibility has expanded to include basic software and network troubleshooting.	3.49	Very Significant	3
5. Digital practice demands a higher level of proficiency in data privacy and security.	3.41	Very Significant	5
6. The transformation necessitates gaining specialized expertise in Radiology Informatics.	3.53	Very Significant	2
7. Developed the skill to validate AI-assisted detections versus actual clinical pathologies.	2.89	Significant	10
8. The shift has increased the expectation for technologists to participate in teleconsultations.	3.36	Very Significant	6
9. Modern practice requires expertise in utilizing 3D post-processing workstations.	3.32	Very Significant	7
10. The role has evolved to include managing digital radiation dose tracking systems.	3.25	Significant	9
Overall Average	**3.38**	**Very Significant**	—

As shown in the table, the implications of digital transformation on professional practice were rated "Very Significant" with an overall average weighted mean of 3.38. Indicator 1, concerning the significant shortening of turnaround time for image acquisition and processing, ranked first with a weighted mean of 3.62 (Very Significant). This was followed by Indicator 6, regarding the necessity for technologists to gain specialized expertise in Radiology Informatics, with a mean of 3.53 (Very Significant).

On the other hand, Indicator 7, "Developed the skill to validate AI-assisted detections versus actual clinical pathologies," received the lowest rank with a weighted mean of 2.89 (Significant). This indicates that while the technological shift is deeply felt in the speed of workflow, the clinical competency of auditing AI-generated findings is still a developing area of practice among technologists. These results support the claim of Radin (2026) that the evolution of digital systems requires practitioners to transition from manual operators to strategic analysts who are proficient in navigating complex software and network environments to ensure efficient patient care.

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Challenges in Adapting to Digital Transformation

Table 3 presents the challenges encountered by radiologic technologists as they navigate the digital shift in the radiologic practice.

Table 3. *Challenges in Adapting to Digital Transformation*

Indicator	Weighted Mean	Verbal Interpretation	Rank
1. High initial costs of implementing and maintaining digital infrastructure.	3.35	Very Significant	4
2. Technical system downtimes or network glitches leading to delays.	3.60	Very Significant	1
3. Steep learning curve in mastering complex user interfaces.	3.38	Very Significant	3
4. Security concerns regarding the protection of digital patient data.	3.22	Significant	6
5. Increased workload and cognitive fatigue due to high digital data volume.	3.51	Very Significant	2
6. Interoperability issues between different equipment and software brands.	3.15	Significant	8
7. Lack of standardized training programs for new digital tools.	3.18	Significant	7
8. Resistance to change among staff accustomed to traditional methods.	3.29	Very Significant	5
9. Difficulty in troubleshooting software-related errors without IT support.	3.10	Significant	9
10. Over-reliance on automated technology diminishing manual judgment.	3.24	Significant	10
Overall Average	**3.43**	**Very Significant**	**—**

As shown in the table, the respondents identified the challenges as "Very Significant" with an overall average weighted mean of 3.43. The most prominent challenge was Indicator 2, regarding technical system downtimes or network glitches leading to diagnostic delays, with a mean of 3.60 (Very Significant). This highlights that infrastructure reliability and network stability are the primary bottlenecks in the successful adoption of digital systems. This was followed by Indicator 5, regarding increased workload and cognitive fatigue, with a mean of 3.51 (Very Significant).

On the other hand, Indicator 10, "Over-reliance on automated technology diminishing manual judgment," received the lowest rank among the challenges with a weighted mean of 3.24 (Significant). This suggests that while technologists are concerned about the technical and mental strain of digitalization, they still maintain a level of confidence in their professional intuition and manual clinical judgment. These results align with Research.com (2026), which points out that while digital evolution is designed to improve efficiency, it often introduces new forms of workplace stress, particularly cognitive overload, which necessitates robust technical support and continuous professional education.

Proposed Action Plan based on the findings of the study

Based on the findings of the study, an action plan is proposed to enhance the digital competence and professional adaptability of radiologic technologists in selected hospitals and imaging centers. The results indicate that radiologic technologists have a very high level of perception and adaptability toward digital transformation, yet certain indicators related to technical troubleshooting and AI-integrated

ISSN: 3116-3475
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responsibilities scored relatively lower. This action plan aims to address these areas and strengthen the technologists' readiness for AI-supported digital workflows.

Summary of Findings

The salient findings of the study are enumerated as follows:

1. The radiologic technologists had a very high level of perception towards the evolution of radiologic practice from darkrooms to digital imaging, with an average mean of 3.43.
2. The radiologic technologists had a very favorable attitude towards radiologic workflow changes, with an average mean of 3.39.
3. The radiologic technologists demonstrated a very high level of adaptability toward digital transformation, with an average mean of 3.36.

CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

1. The radiologic technologists in selected hospitals in the Philippines have a very high perception of the evolution of radiologic practice, recognizing the shift from traditional film-based imaging to digital and AI-integrated systems as a natural and progressive advancement in the profession.
2. The radiologic technologists maintain a very favorable attitude toward modern radiologic workflows, acknowledging that digital systems and automated protocols enhance efficiency, reduce turnaround times, and support the management of high patient volumes.
3. The radiologic technologists demonstrate a very high level of adaptability to digital transformation, indicating strong readiness to adopt new technologies. However, they still require further technical capacity building in areas such as troubleshooting digital systems and understanding AI-assisted outputs.

Recommendation

From the findings and conclusions of the study, the following recommendations are hereby proposed:

1. Since radiologic technologists generally have a very positive perception of the evolution of practice (mean = 3.43), there is a need to further explore and implement deep learning technologies to enhance diagnostic precision and support the data accessibility needs of imaging departments.
2. To align with the positive attitude and high readiness of radiologic technologists, there is a need to advance the implementation of automated protocols to enhance patient care efficiency and departmental ergonomics.
3. Radiologic technologists must undergo capacity building in troubleshooting digital systems and understanding AI physics to acquire the essential skills needed to minimize dependence on IT support and maximize technology utilization.
4. Regular training and firsthand experience with new software interfaces are encouraged to maintain the positive perception and favorable attitude of radiologic technologists amidst frequent technological updates.
5. Adequate seminars related to the redefinition of the technologist's role—from manual operator to digital analyst—are recommended to maintain a high level of professional adaptability and resilience.
6. Hospital administrations and academic institutions are suggested to collaborate on enrichment programs to keep practitioners updated with the latest trends and best practices of deep learning in the field of Radiologic Technology.

7. Future researchers could replicate the study by incorporating additional variables such as the patients' perspective on AI-assisted diagnostics or the impact of age and years of experience on digital adaptability.

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