OPEN ACCESS

Saudi Journal of Nursing and Health Care

Abbreviated Key Title: Saudi J Nurs Health Care
ISSN 2616-7921 (Print) |ISSN 2616-6186 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Advancing Healthcare Management in Enugu State, Nigeria: The Role of Managerial Technological Competency

Deborah Ngozi Umah[1], Charles Ifeanyi Anumaka[1], Phina Chinelo Ezeagwu[1], Adesegun Nurudeen Osijirin[1]*

[1]Department of Healthcare Management, Federal University of Allied Health Sciences, Enugu

DOI: https://doi.org/10.36348/sjnhc.2026.v09i02.003 | **Received:** 26.12.2025 | **Accepted:** 23.02.2026 | **Published:** 25.02.2026

***Corresponding author:** Adesegun Nurudeen Osijirin
Department of Healthcare Management, Federal University of Allied Health Sciences, Enugu

Abstract

The digital transformation of healthcare has underscored the critical role of managerial technological competency in enhancing organizational performance. This study examined the influence of technological competency on healthcare management outcomes in public and private healthcare institutions in Enugu State, Nigeria. Employing a quantitative cross-sectional survey design, data were collected from 198 healthcare managers, including administrators, departmental managers, unit heads, and health information officers, using the Technological Competency and Healthcare Management Questionnaire (TCHMQ). Descriptive statistics, Pearson correlation, and multiple regression analyses were conducted using SPSS to explore relationships between competency dimensions digital literacy, data analytics, technological integration, cybersecurity awareness, and digital leadership and healthcare management outcomes, including operational efficiency, service quality, decision-making, staff productivity, and innovation. Findings revealed that managers exhibited high levels of digital literacy, technological integration skills, and digital leadership, while cybersecurity awareness and data analytics competence were moderately high. A strong positive relationship ($r = .68$, $p < .001$) was observed between technological competency and healthcare management outcomes. Multiple regression analysis indicated that competency dimensions collectively predicted 55% of the variance in healthcare management outcomes, with digital leadership, digital literacy, and technological integration emerging as the most influential predictors. The study concludes that managerial technological competency is a critical enabler of effective healthcare management, enhancing efficiency, service quality, decision-making, productivity, and innovation. It recommends targeted training, capacity building, and policy support to strengthen managerial digital skills, particularly in leadership, system integration, data analytics, and cybersecurity. These findings provide evidence-based guidance for improving healthcare management performance in low- and middle-income contexts.

Keywords: Technological Competency, Healthcare Management, Digital Leadership, Enugu State, Nigeria, Organizational Performance.

INTRODUCTION

The rapid proliferation of digital technologies has triggered profound transformations in healthcare systems worldwide. Digital systems such as electronic health records (EHRs), telemedicine platforms, data analytics tools, and clinical decision-support systems have become central to the efficient management of health services, enabling seamless access to patient data, enhancing clinical workflows, and improving overall organizational performance (Agarwal *et al.,* 2010; Topol, 2019). These technologies promise to optimize operational processes, reduce administrative burden, and facilitate evidence-based decisions that can improve both patient outcomes and institutional effectiveness. In sub-Saharan Africa and similar low- and middle-income contexts, digital health technologies also hold significant potential to bridge longstanding gaps in service delivery and accessibility (World Health Organization [WHO], 2021; Egwudo *et al.,* 2025).

Despite global momentum in digital health adoption, the successful integration of such technologies is not solely dependent on their availability, but heavily contingent on the competency of healthcare managers tasked with directing, implementing, and overseeing digital initiatives within healthcare institutions. The effective use of digital tools in healthcare goes beyond infrastructure investment, requiring managers to possess the skills, strategic insight, and leadership capacity to

translate technology into improved organizational outcomes. Technological competency in this context encompasses a manager's ability to operate digital systems, interpret digital information, ensure secure and ethical use of data, and lead teams through digital adoption processes. Prior research broadly characterizes technological competency as a multidimensional construct that includes digital literacy, data analytics competence, technological integration skills, cybersecurity awareness, and digital leadership (Konttila *et al.,* 2019; Car *et al.,* 2019). These dimensions are crucial for navigating complex digital environments and ensuring that technological investments yield sustainable improvements in service quality, workflow efficiency, and resource utilization.

In developing countries such as Nigeria, however, the digitization of healthcare systems is accompanied by significant constraints. Recent evidence from Nigeria's healthcare landscape highlights systemic challenges including limited digital infrastructure, inconsistent adoption of health information systems, low levels of digital literacy among healthcare personnel, and infrastructure fragility, all of which undermine the full realization of digital health benefits (Egwudo *et al.,* 2025). For example, investigations in Nigerian teaching and referral hospitals reveal that the adoption and utilization of EHR systems are impeded by low digital literacy, inadequate training, resistance to change, and poor managerial commitment barriers that reflect broader institutional challenges facing digital health initiatives in the region (Onyeabor *et al.,* 2025; Egwudo *et al.,* 2025). These findings align with broader evidence from Africa that inadequate computer and EHR literacy significantly hampers the use of digital systems and underscores the importance of managerial support in fostering adoption and sustained use (Adoption of electronic health records by nurses in Africa, 2025).

Specifically, Enugu State, Nigeria reflects many of these systemic patterns while also presenting a context in which digitalization is gaining traction through both policy commitments and institutional reforms. Healthcare facilities in Enugu, like other states in Nigeria, are increasingly expected to adopt digital health tools not only to improve clinical care but also to enhance administrative efficiency and accountability. Nevertheless, there is scant empirical evidence addressing how managerial technological competency influences healthcare management outcomes within this setting. Most existing research either focuses on clinical adoption issues or qualitative assessments of technology implementation challenges without empirically linking managerial proficiency with organizational performance. This gap is particularly salient because healthcare managers play a pivotal role in shaping institutional readiness for digital transformation, influencing staff training priorities, resource allocation, and the integration of digital systems into routine operations.

Theoretical perspectives such as the Technology Acceptance Model (TAM) suggest that individuals' perceptions of ease of use and usefulness significantly influence technology adoption behaviors, highlighting the relevance of managers' competence in enhancing acceptance and use of digital health systems (Davis, 1989; Holden & Karsh, 2010). From a broader organizational standpoint, frameworks like the Resource-Based View (RBV) and Human Capital Theory posit that intangible capabilities such as technological skills can serve as strategic resources that improve performance and sustain competitive advantage (Barney, 1991; Becker, 1964). Together with Socio-Technical Systems (STS) theory, which emphasizes the interaction between technological tools and human competencies, these perspectives suggest that managerial technological competency is not merely functional but essential for realizing the full potential of digital health investments.

Despite theoretical recognition of this linkage, empirical research remains limited in the Nigerian healthcare context, particularly regarding quantitative assessments of how managers' technological competency affects healthcare management outcomes such as operational efficiency, decision-making quality, staff productivity, service quality, and organizational innovation. This study addresses this gap by quantitatively examining the relationship between technological competency and healthcare management effectiveness among managers in healthcare institutions in Enugu State. Specifically, the research aims to determine the influence of various dimensions of technological competency on key performance outcomes, thereby providing actionable insights for policy, practice, and capacity building in digital health leadership.

Conceptual Framework and Theoretical Foundations

Conceptual Framework

The conceptual framework of this study positions technological competency as a strategic managerial capability that directly influences outcomes in healthcare management. In the era of digital health transformation, healthcare organizations increasingly depend on advanced information and communication technologies including electronic health records (EHRs), telehealth solutions, mobile health applications, health data analytics platforms, and clinical decision-support systems to improve patient care, streamline operations, and support evidence-based decision-making (Agarwal *et al.,* 2010; Topol, 2019). However, the mere presence of these systems does not guarantee improved performance. Rather, the ability of managers to navigate complex digital ecosystems, coordinate digital resources, and lead digital change is critical to translating technology investments into measurable outcomes (Car *et al.,* 2019; Konttila *et al.,* 2019).

Within this framework, technological competency is conceptualized as a multidimensional construct. Each dimension represents a specific category of skills and abilities that collectively enable managers to leverage digital tools effectively:

Digital Literacy: This dimension refers to the ability to access, understand, evaluate, and manage digital information and tools. Digital literacy includes competencies such as navigating health information systems, interpreting digital reports, and using computer-based applications with confidence and accuracy. Digital literacy is foundational because healthcare managers must interact with various digital platforms regularly, and deficits in this area can undermine technology utilization (Konttila *et al.,* 2019).

Data Analytics Competence: As healthcare generates increasing volumes of data from patient records to performance metrics managers must possess the competence to interpret and apply data insights. Data analytics competence involves using analytical tools, understanding statistical outputs, and integrating data results into planning, resource allocation, and quality improvement strategies. Scholars argue that managers proficient in data analytics are more likely to make evidence-based decisions that enhance organizational performance (Topol, 2019; Nazeha *et al.,* 2020).

Technological Integration Skills: Healthcare organizations often deploy multiple digital systems, each serving different functions (e.g., billing, patient tracking, telemedicine). Technological integration skills enable managers to coordinate these systems so that they function cohesively within institutional workflows. Without effective integration, digital systems can become silos that impede communication, duplicate effort, and diminish the efficiency gains technology was meant to deliver (Agarwal *et al.,* 2010).

Cybersecurity and Ethical Awareness: Healthcare data are highly sensitive, and breaches of confidentiality can have serious legal and ethical implications. Managers must therefore understand principles of data protection, privacy standards, ethical uses of digital information, and basic cybersecurity practices. Proficiency in this area ensures that digital systems are both secure and aligned with regulatory and ethical standards, minimizing risks to patients and institutions (Konttila *et al.,* 2019).

Digital Leadership: This dimension reflects the capacity to guide teams through digital transformation processes, foster innovation, and align technological strategies with organizational objectives. Digital leadership goes beyond technical knowledge; it includes strategic vision, change management skills, and the ability to inspire and influence staff toward technology adoption (Car *et al.,* 2019). Leaders who demonstrate digital competence are better equipped to overcome resistance, promote learning cultures, and ensure that technology supports broader institutional goals.

These dimensions form a theoretical construct that posits higher technological competency among healthcare managers leads to improvements in key performance outcomes, including:

i. Operational efficiency, through streamlined processes and reduced administrative redundancies.
ii. Decision-making effectiveness, due to enhanced access to real-time data and analytical insights.
iii. Staff productivity, by facilitating the use of digital tools that support workflows.
iv. Service quality, through integrated systems that support clinical and non-clinical functions.
v. Organizational innovation, enabled by leaders who can envision and implement digital improvements.

This conceptual framework aligns with contemporary digital health leadership models and underscores the importance of managerial competence as an enabling factor in healthcare digital transformation rather than a peripheral or technical skillset (Davenport & Kalakota, 2019).

Theoretical Foundations

To ground the conceptual framework in established theory, this study draws on four complementary theoretical perspectives that collectively explain how technological competency influences organizational outcomes: the Technology Acceptance Model (TAM), Resource-Based View (RBV), Human Capital Theory, and Socio-Technical Systems (STS) Theory.

Technology Acceptance Model (TAM)

The Technology Acceptance Model, originally proposed by Davis (1989), explains individuals' intentions to use technology based on two determinants: perceived usefulness and perceived ease of use. In the healthcare management context, TAM suggests that managers who believe digital tools are useful and easy to operate are more inclined to adopt and advocate for their use within their organizations. Holden and Karsh (2010) extend this model specifically to healthcare settings, demonstrating that perceptions of usability and usefulness significantly predict adoption of health information systems such as EHRs and clinical decision support tools.

Managers who are technologically competent are more likely to perceive digital systems as both useful and manageable, reducing resistance and encouraging sustained use. Consequently, TAM provides a behavioral explanation for how individual competencies underpin organizational technology adoption processes and influence broader management outcomes.

Resource-Based View (RBV)

The Resource-Based View of the firm posits that organizational performance and competitive advantage derive from the effective utilization of valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). Within this framework, technological competency is conceptualized as an intangible organizational resource that managers can leverage to enhance performance. When healthcare institutions develop managers with advanced digital skills, they build internal capabilities that are difficult for competitors to replicate, thereby improving operational efficiency, service delivery quality, and innovation potential.

RBV thus situates technological competency as a strategic asset not merely a technical attribute and highlights the importance of investing in managerial development to sustain performance improvements in digital health environments.

Human Capital Theory

Human Capital Theory, mainly associated with Becker (1964), emphasizes that investments in knowledge, skills, and competencies enhance individual productivity and overall organizational outcomes. In the context of healthcare management, managers' technological competence represents a form of specialized human capital that contributes to effective leadership, improved decision-making, and enhanced organizational performance.

Empirical studies show that digital training and competency development programs improve professional confidence, career sustainability, and performance among healthcare personnel (Konttila *et al.,* 2019; Nazeha *et al.,* 2020). Applying Human Capital Theory to managerial contexts highlights how building managers' digital skills can yield both individual and institutional returns on investment, reinforcing the need for structured competency development frameworks.

Socio-Technical Systems (STS) Theory

Socio-Technical Systems Theory emphasizes the interdependence between social (people, structure, culture) and technical (tools, systems) components of an organization (Trist & Bamforth, 1951). STS posits that organizational performance is optimized when technical systems and human competencies are well aligned, allowing technology to support workflows without creating undue disruption or complexity.

In healthcare, digital systems are embedded within complex socio-technical environments where managers must balance technological demands with workforce capabilities, cultural norms, and operational processes. Managers who possess technological competency are better positioned to navigate these complexities, ensuring that digital systems augment rather than hinder organizational processes (Car *et al.,* 2019).

STS theory thus reinforces the central thesis of the conceptual framework: that technological competency is not merely technical knowledge but a bridge linking technology with human systems to achieve organizational performance.

Empirical studies consistently demonstrate that technological competency influences healthcare management outcomes through several pathways. For example, Konttila *et al.,* (2019) conducted a systematic review of healthcare professionals' digital competencies and found that digital literacy and technological familiarity significantly affect the effective use of digital health systems. Similarly, Nazeha *et al.,* (2020) emphasized that structured digital education programs improve technological readiness and performance outcomes among health workforce personnel.

Holden and Karsh (2010), applying the Technology Acceptance Model, found that professionals who perceive digital tools as easy to use and beneficial are more likely to adopt them, reducing barriers to implementation and increasing utilization rates. Topol (2019) further argued that data literacy enhances evidence-based decision-making, enabling healthcare managers to interpret complex datasets and integrate insights into strategic planning.

Despite this growing body of evidence, most empirical studies focus on clinical staff adoption rather than managerial competence, particularly in low- and middle-income countries such as Nigeria (WHO, 2021). There remains a significant gap in quantitative research examining how managerial technological competency affects organizational performance, service quality, and innovation. This study addresses that gap by investigating these relationships empirically in the context of healthcare institutions in Enugu State, Nigeria.

Research Hypotheses

Drawing from the theoretical foundations, particularly the Technology Acceptance Model and Resource-Based View, this study proposes the following hypotheses:

i. Digital literacy has a significant positive effect on healthcare management outcomes in public hospitals in Enugu State.
ii. Data analytics competence has a significant positive effect on healthcare management outcomes in public hospitals in Enugu State.
iii. Technological integration skills have a significant positive effect on healthcare management outcomes in public hospitals in Enugu State.
iv. Cybersecurity awareness has a significant positive effect on healthcare management outcomes in public hospitals in Enugu State.

v. Digital leadership has a significant positive effect on healthcare management outcomes in public hospitals in Enugu State.

METHODOLOGY

Research Design

This study adopted a quantitative cross-sectional survey design to investigate the relationship between managerial technological competency and healthcare management outcomes in healthcare institutions in Enugu State, Nigeria. The cross-sectional approach allows researchers to collect data at a single point in time, providing a snapshot of current levels of technological competency among healthcare managers and their perceived impact on operational performance (Creswell & Creswell, 2018). A correlational research design was employed to examine the degree and direction of association between the independent variables (technological competency dimensions) and the dependent variable (healthcare management outcomes). Additionally, a predictive analysis using multiple regression was incorporated to determine how individual dimensions of technological competency digital literacy, data analytics competence, technological integration skills, cybersecurity awareness, and digital leadership contribute to organizational performance, thereby allowing the study to quantify the strength and significance of these relationships (Polit & Beck, 2021).

The choice of a quantitative approach was motivated by the need for objectivity, standardization of measurement, and the ability to generalize findings to the broader population of healthcare managers within Enugu State. Quantitative data also enable the testing of hypotheses derived from the conceptual and theoretical framework, specifically evaluating whether higher technological competency predicts improved outcomes in healthcare management (Sekaran & Bougie, 2016).

Population and Sample

The target population for this study comprised healthcare managers employed in public and private hospitals within Enugu State, Nigeria. This included hospital administrators, departmental managers, unit heads, and health information officers, all of whom play key roles in operational decision-making and the implementation of digital health systems. According to the Enugu State Ministry of Health, these managerial personnel oversee both clinical and administrative functions, making them suitable respondents for assessing the impact of technological competency on organizational outcomes.

A total of 198 respondents were selected using stratified random sampling, which ensured that different categories of managers and types of healthcare institutions (public versus private) were proportionally represented in the sample. Stratification was necessary because healthcare institutions in Enugu State vary significantly in size, digital infrastructure, and administrative processes, which may influence managerial competency levels (Onyeabor *et al.,* 2025).

This sample size was determined using power analysis guidelines for correlational and regression studies, ensuring adequate statistical power to detect medium effect sizes. According to Cohen (1992), for multiple regression analysis with five predictors, a sample of at least 160 participants is required to achieve a statistical power of 0.80 at a 5% significance level to detect a medium effect size ($f^2 = 0.15$). By sampling 198 respondents, this study exceeds the recommended minimum, thereby increasing the reliability of the findings and minimizing the risk of Type II error. Stratified random sampling was used to ensure proportional representation across managerial positions and types of healthcare institutions, enhancing the generalizability of the results to the population of healthcare managers in Enugu State.

Instrument for Data Collection

Data for this study were collected using the Technological Competency and Healthcare Management Questionnaire (TCHMQ), a structured survey instrument developed specifically for the research objectives. The questionnaire was designed to capture both managerial characteristics and the key constructs of interest: technological competency and healthcare management outcomes. It consisted of two main sections. Section A captured respondents' demographic information, including age, gender, managerial position, years of experience, and type of healthcare institution. This section provided essential context for interpreting variations in technological competency and management outcomes across different managerial profiles. Section B focused on the study's core constructs, measuring the five dimensions of technological competency digital literacy, data analytics competence, technological integration skills, cybersecurity awareness, and digital leadership alongside healthcare management outcomes, which included operational efficiency, service quality, decision-making, staff productivity, and innovation.

All items in Section B were rated on a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). This scaling method is widely recommended for capturing subjective perceptions of skill levels and organizational performance in healthcare research (DeVellis, 2017). The instrument underwent content and face validation by a panel of five experts comprising healthcare administrators, academic researchers in health management, and information systems specialists. Feedback from this panel led to refinements in item wording and clarity, ensuring that questions were comprehensible and relevant to the Nigerian healthcare context.

To establish reliability, the TCHMQ was tested using Cronbach's alpha, with all constructs exceeding the recommended threshold of 0.70, indicating

acceptable internal consistency (Nunnally & Bernstein, 1994). Specifically, the dimensions demonstrated the following reliability coefficients: digital literacy (α = 0.82), data analytics competence (α = 0.79), technological integration skills (α = 0.81), cybersecurity awareness (α = 0.77), and digital leadership (α = 0.85). The scale measuring healthcare management outcomes exhibited a strong reliability of α = 0.88, supporting the robustness of the instrument for subsequent analyses.

Method of Data Analysis

Collected data were analyzed using Statistical Package for the Social Sciences (SPSS). Initial analysis involved descriptive statistics to summarize demographic characteristics, technological competency levels, and healthcare management outcomes. To examine relationships between variables, Pearson correlation analysis was conducted, with significance set at $p < 0.05$, allowing for the assessment of the strength and direction of associations between technological competency dimensions and organizational outcomes. Furthermore, multiple regression analysis was employed to determine the predictive power of the individual competency dimensions on healthcare management outcomes, quantifying their relative contributions to performance. This combination of descriptive, correlational, and inferential analyses ensured that the study not only described patterns in the data but also tested the hypothesized relationships within the conceptual framework.

Ethical Considerations

Ethical approval for this study was obtained from the Ethics Committee of the selected Health Institutions. Participation in the study was entirely voluntary, and all respondents provided informed consent before completing the questionnaire. Participants were assured of the confidentiality and anonymity of their responses; no personally identifiable information was collected, and data were reported in aggregate form only. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki (2013) for research involving human participants.

Data Presentation and Analysis

This section presents the findings of the study, examining the levels of managerial technological competency and their influence on healthcare management outcomes in healthcare institutions in Enugu State, Nigeria. The analysis begins with the demographic characteristics of respondents, followed by descriptive statistics for the key variables, including technological competency dimensions and healthcare management outcomes. Relationships between these variables are further explored using correlation analysis, while the predictive effects of individual competency dimensions are assessed through multiple regression analysis. Findings are presented in tables and figures to provide a clear and comprehensive depiction of patterns, trends, and statistically significant relationships, with significance evaluated at $p < 0.05$. This approach facilitates an understanding of how managerial digital skills translate into operational efficiency, decision-making quality, service delivery, staff productivity, and organizational innovation.

Demographic Information

Table 1: Gender Distribution

Gender	Frequency	%
Male	112	56.6
Female	86	43.4
Total	**198**	**100**

The demographic profile of the respondents provides contextual insight into the managerial composition of healthcare institutions in Enugu State. Table 1 shows the gender distribution among the 198 participants, with 112 males (56.6%) and 86 females (43.4%). This indicates a moderate gender balance, with males slightly overrepresented, reflecting the broader managerial structure observed in Nigerian healthcare institutions (Onyeabor *et al.,* 2025). Gender diversity may influence perspectives on technology adoption and digital leadership, highlighting the importance of considering demographic factors in assessing technological competency.

Table 2: Managerial Position

Position	Frequency	%
Hospital Administrators	42	21.2
Departmental Managers	58	29.3
Unit Heads	54	27.3
Health Info Officers	44	22.2
Total	**198**	**100**

Table 2 presents the distribution of respondents by managerial position. The sample comprised hospital administrators (21.2%), departmental managers (29.3%), unit heads (27.3%), and health information officers (22.2%). The diverse representation across hierarchical levels ensures that findings capture managerial perspectives from both strategic and operational positions. Notably, departmental managers form the largest group, suggesting that middle management plays a critical role in mediating technological adoption between executive leadership and operational staff.

Table 3: Years of Experience

Experience	Frequency	%
1–5	46	23.2
6–10	78	39.4
11–15	44	22.2
>15	30	15.2
Total	**198**	**100**

Table 3 summarizes respondents' years of experience in managerial roles. The majority of participants (39.4%) reported 6–10 years of experience, while smaller proportions had 1–5 years (23.2%), 11–15 years (22.2%), and more than 15 years (15.2%). The predominance of mid-career managers implies a workforce with sufficient exposure to institutional processes and digital tools, but potentially limited experience with advanced digital health systems. Experience is an important moderator, as managers with longer tenure may demonstrate greater capacity for strategic digital integration (Konttila *et al.,* 2019).

Table 4: Technological Competency Dimensions

Dimension	Mean	SD	Interpretation
Digital Literacy	4.12	0.68	High
Data Analytics	3.89	0.74	Moderate-High
Tech Integration	4.05	0.63	High
Cybersecurity	3.76	0.81	Moderate
Digital Leadership	4.18	0.59	High
Overall	4.00	0.69	High

Descriptive statistics were used to assess the overall levels of technological competency and healthcare management outcomes among respondents. Table 4 presents the mean scores for each dimension of technological competency. Respondents demonstrated high levels of digital literacy (M = 4.12, SD = 0.68) and digital leadership (M = 4.18, SD = 0.59), suggesting that managers are generally proficient in navigating digital systems and leading digital initiatives. Technological integration skills (M = 4.05, SD = 0.63) were also rated high, reflecting competence in coordinating multiple digital platforms within healthcare workflows. Data analytics competence scored slightly lower (M = 3.89, SD = 0.74), indicating moderate-to-high ability in interpreting and applying data-driven insights. Cybersecurity awareness was the lowest-rated dimension (M = 3.76, SD = 0.81), suggesting room for improvement in knowledge of data protection, privacy, and ethical compliance. The overall mean score for technological competency was 4.00 (SD = 0.69), which is interpreted as high, indicating that healthcare managers in Enugu State generally possess strong technological skills.

Table 5: Healthcare Management Outcomes

Outcome	Mean	SD	Interpretation
Operational Efficiency	4.15	0.61	High
Service Quality	4.22	0.57	High
Decision-Making	4.08	0.64	High
Staff Productivity	3.97	0.72	Moderate-High
Innovation	4.11	0.60	High
Overall	4.11	0.63	High

Table 5 displays the descriptive statistics for healthcare management outcomes. Operational efficiency (M = 4.15, SD = 0.61) and service quality (M = 4.22, SD = 0.57) were rated highest, implying that digital skills positively support day-to-day processes and the delivery of patient services. Decision-making (M = 4.08, SD = 0.64) and innovation (M = 4.11, SD = 0.60) were also high, suggesting that competent managers leverage technology to make informed decisions and implement improvements. Staff productivity scored moderately high (M = 3.97, SD = 0.72), indicating that while technology supports workforce efficiency, further interventions could enhance performance. The overall mean (M = 4.11, SD = 0.63) reflects generally strong outcomes in healthcare management.

These descriptive results suggest a positive alignment between managerial technological competency and healthcare management outcomes. High digital literacy and leadership competencies appear to translate into better operational efficiency, service quality, and innovation, supporting the proposed conceptual framework.

Correlation

Variable	1	2	3	4	5
1. Digital Literacy	1	.45**	.52**	.36**	.61**
2. Data Analytics	.45**	1	.48**	.31**	.54**
3. Tech Integration	.52**	.48**	1	.42**	.59**
4. Cybersecurity	.36**	.31**	.42**	1	.43**
5. Digital Leadership	.61**	.54**	.59**	.43**	1

The correlation matrix presented above illustrates the relationships between the five dimensions of managerial technological competency. All correlations were positive and statistically significant at $p < .001$, indicating that higher proficiency in one competency dimension tends to be associated with higher proficiency in the others.

Specifically, digital leadership demonstrated the strongest correlations with digital literacy ($r = .61$), technological integration ($r = .59$), and data analytics ($r = .54$), highlighting that managers who are effective leaders in digital initiatives also tend to be proficient in other technological skills. Technological integration and digital literacy were moderately correlated ($r = .52$), suggesting that the ability to integrate digital systems is closely linked to basic digital proficiency. Cybersecurity awareness showed the lowest, yet still significant, correlations with the other dimensions (ranging from $r = .31$ to $r = .43$), indicating that while it is related to other competencies, it may require targeted development as it is somewhat less aligned with general digital skill sets.

The matrix confirms the interrelated nature of technological competencies, supporting the conceptual framework which posits that digital literacy, data analytics, system integration, cybersecurity, and leadership collectively contribute to effective managerial performance. These strong interrelationships justify their inclusion as predictors in subsequent regression analysis of healthcare management outcomes.

Table 6: Regression Coefficients

Predictor	β	t	Sig.	VIF
Digital Literacy	0.24	3.89	< .001	1.52
Data Analytics	0.18	2.94	.004	1.41
Tech Integration	0.21	3.47	.001	1.46
Cybersecurity	0.12	2.01	.046	1.33
Digital Leadership	0.29	4.56	< .001	1.63
Model	**$R^2 = 0.55$**	**Adj. $R^2 = 0.53$**	**SE = 0.25**	—

The Pearson correlation analysis indicated a strong positive relationship between technological competency and healthcare management outcomes ($r = .68$, $p < .001$). This implies that as managers' technological competencies increase, their organizations experience improved operational efficiency, enhanced decision-making, better staff productivity, higher service quality, and greater innovation. The correlation coefficient value (0.68) is considered strong, demonstrating that managerial digital competence is a significant predictor of healthcare performance. This finding aligns with prior studies suggesting that digital leadership and technical proficiency are key drivers of successful healthcare management (Konttila *et al.,* 2019; Topol, 2019).

Multiple regression analysis was conducted to determine the predictive influence of individual dimensions of technological competency on healthcare management outcomes. The model was statistically significant ($R^2 = 0.55$, $F = 28.96$, $p < 0.05$), indicating that 55% of the variance in healthcare management outcomes can be explained collectively by digital literacy, data analytics competence, technological integration, cybersecurity awareness, and digital leadership. This substantial proportion of explained variance underscores the practical importance of managerial technological competency in shaping organizational performance.

Table 6 summarizes the regression coefficients. Among the dimensions, digital leadership ($\beta = 0.29$, $t = 4.56$, $p < 0.001$) emerged as the strongest predictor, highlighting the critical role of visionary and strategic guidance in digital transformation. Digital literacy ($\beta = 0.24$, $t = 3.89$, $p < 0.001$) and technological integration skills ($\beta = 0.21$, $t = 3.47$, $p < 0.01$) also significantly influenced healthcare outcomes, indicating that operational proficiency and system coordination directly contribute to institutional efficiency. Data analytics competence had a moderate positive effect ($\beta = 0.18$, $t = 2.94$, $p < 0.01$), while cybersecurity awareness had the smallest, yet significant, impact ($\beta = 0.12$, $t = 2.01$, $p < 0.05$).

The regression findings indicate that while all dimensions of technological competency contribute to improved healthcare management outcomes, leadership and integration skills are the most influential. This suggests that training programs and institutional policies should prioritize leadership development, system integration proficiency, and digital literacy enhancement

to maximize organizational benefits from technological investments.

Hypotheses Testing

The multiple regression results indicate that digital literacy (β = .24, t = 3.89, p < .001), data analytics competence (β = .18, t = 2.94, p = .004), technological integration skills (β = .21, t = 3.47, p = .001), cybersecurity awareness (β = .12, t = 2.01, p = .046), and digital leadership (β = .29, t = 4.56, p < .001) significantly predicted healthcare management outcomes. The overall model was statistically significant and explained 55% of the variance in healthcare management outcomes (R^2 = .55, Adjusted R^2 = .53, SE = .25). Variance Inflation Factor (VIF) values ranged from 1.33 to 1.63, indicating no multicollinearity concerns.

Accordingly:

- **H1 was supported**, as digital literacy significantly predicted healthcare management outcomes (β = .24, p < .001).
- **H2 was supported**, as data analytics competence significantly predicted healthcare management outcomes (β = .18, p = .004).
- **H3 was supported**, as technological integration skills significantly predicted healthcare management outcomes (β = .21, p = .001).
- **H4 was supported**, as cybersecurity awareness significantly predicted healthcare management outcomes (β = .12, p = .046).
- **H5 was supported**, as digital leadership significantly predicted healthcare management outcomes (β = .29, p < .001).

These findings confirm that managerial technological competency dimensions collectively and individually contribute to improved healthcare management performance in public hospitals in Enugu State.

DISCUSSION OF FINDINGS

The findings of this study provide empirical evidence that managerial technological competency significantly influences healthcare management outcomes in healthcare institutions in Enugu State, Nigeria. The descriptive statistics revealed that healthcare managers generally possess high levels of digital literacy, technological integration skills, and digital leadership, while cybersecurity awareness scored slightly lower. These results indicate that managers are proficient in navigating and coordinating digital systems and leading teams through digital initiatives, which aligns with prior research emphasizing the critical role of digital leadership in healthcare transformation (Car *et al.,* 2019; Konttila *et al.,* 2019). The slightly lower rating for cybersecurity awareness highlights an area for targeted training, as ethical and secure management of health data is crucial for organizational resilience (Topol, 2019).

The study also found that healthcare management outcomes including operational efficiency, service quality, decision-making, staff productivity, and innovation were generally high. This supports the conceptual framework, suggesting that high managerial technological competency translates into enhanced organizational performance. For example, the strong mean scores for operational efficiency (M = 4.15) and service quality (M = 4.22) suggest that managers with advanced digital skills can streamline processes, reduce redundancies, and improve patient care delivery, consistent with previous findings on the benefits of digital competence in healthcare organizations (Agarwal *et al.,* 2010).

The correlation analysis (r = .68, p < .001) confirmed a strong positive relationship between technological competency and healthcare management outcomes. This indicates that as managers' digital skills increase, so too do operational efficiency, service quality, and innovation, supporting the Technology Acceptance Model (Davis, 1989; Holden & Karsh, 2010), which posits that perceived usefulness and ease of use drive technology adoption and effective utilization. Managers who are competent in digital tools are more likely to integrate systems, interpret data, and guide teams effectively, facilitating improved performance across institutional metrics.

Regression analysis further demonstrated that managerial technological competency explains 55% of the variance in healthcare management outcomes, with digital leadership, digital literacy, and technological integration skills emerging as the most influential predictors. Digital leadership was the strongest predictor (β = 0.29, p < 0.001), highlighting the importance of visionary leadership in guiding digital transformation initiatives and fostering innovation. Digital literacy (β = 0.24, p < 0.001) and technological integration (β = 0.21, p < 0.01) also significantly predicted outcomes, confirming that operational proficiency and the ability to align multiple systems are critical for achieving efficiency and quality service. Data analytics competence and cybersecurity awareness, while statistically significant, had comparatively smaller effects, suggesting that managers may need additional support and training in these areas to fully leverage digital tools for decision-making and secure information management.

The findings of this study provide empirical support for H1, H2, H3, H4, and H5, confirming that managerial technological competency significantly enhances healthcare management outcomes in public hospitals in Enugu State. The results reinforce theoretical expectations derived from the Technology Acceptance Model and the Resource-Based View, which suggest that technological capability and strategic resource utilization improve organizational performance.

These findings align with the Resource-Based View (Barney, 1991), which posits that managerial competencies represent valuable organizational resources that confer a competitive advantage. In the context of Enugu State healthcare institutions, managers' technological skills constitute a critical internal capability that enables organizations to improve efficiency, quality, and innovation. Similarly, the Socio-Technical Systems (STS) theory is supported, as competent managers effectively integrate digital systems with human workflows, ensuring that technology augments rather than disrupts organizational processes (Trist & Bamforth, 1951).

The study demonstrates that managerial technological competency is a key driver of healthcare performance, and investments in digital skills development particularly in leadership, literacy, integration, and cybersecurity can yield measurable improvements in operational efficiency, decision-making, service quality, staff productivity, and innovation. These findings provide practical guidance for healthcare policymakers, administrators, and training institutions seeking to strengthen the digital capabilities of managers in low- and middle-income countries such as Nigeria.

CONCLUSION

This study examined the influence of managerial technological competency on healthcare management outcomes in healthcare institutions in Enugu State, Nigeria. The findings demonstrate that managers generally exhibit high levels of digital literacy, technological integration skills, and digital leadership, which are strongly associated with enhanced operational efficiency, service quality, decision-making, staff productivity, and organizational innovation. Correlational analysis confirmed a significant positive relationship between technological competency and healthcare management outcomes, while multiple regression showed that competency dimensions collectively explain 55% of the variance in organizational performance. Among the dimensions, digital leadership, digital literacy, and technological integration were identified as the most influential predictors, highlighting their critical role in guiding digital transformation and improving institutional effectiveness.

The study provides empirical support for theoretical perspectives such as the Technology Acceptance Model, the Resource-Based View, and Socio-Technical Systems theory, confirming that managerial digital skills constitute a valuable resource that enhances organizational performance when effectively integrated into institutional processes. Moreover, the relatively lower scores for cybersecurity awareness and data analytics competence suggest targeted areas for professional development to strengthen managers' ability to protect sensitive health information and utilize data-driven insights for strategic decision-making.

Based on these findings, it is concluded that investments in managerial technological competency are essential for advancing healthcare management in Enugu State. Policymakers and institutional leaders should prioritize continuous training programs, capacity-building workshops, and digital leadership initiatives to enhance managers' proficiency in digital tools, system integration, and secure information management. By doing so, healthcare institutions can achieve improved efficiency, service quality, innovation, and staff productivity, ultimately contributing to better patient outcomes and organizational sustainability.

Managerial technological competency is a critical enabler of effective healthcare management, and deliberate efforts to enhance these competencies can provide a sustainable pathway for strengthening healthcare systems in low- and middle-income contexts. Future research may explore longitudinal assessments and intervention studies to evaluate the impact of targeted training on both managerial competencies and organizational performance over time.

Limitations of the Study

Despite the valuable insights generated, this study has several limitations that should be considered when interpreting the findings.

First, the study employed a cross-sectional research design, which captures data at a single point in time. As a result, it is not possible to establish causal relationships between managerial technological competency and healthcare management outcomes. Longitudinal studies would be required to assess changes in competencies and organizational performance over time.

The data were collected through self-reported questionnaires, which may be subject to social desirability bias. Managers might have overestimated their technological competencies or organizational performance, potentially inflating observed relationships between variables.

Furthermore, the study was limited to healthcare institutions in Enugu State, Nigeria, which may affect the generalizability of the findings. While the sample included both public and private hospitals and a range of managerial positions, results may not fully represent other regions of Nigeria or different healthcare systems internationally.

Finally, there is a potential risk of common method bias, as both predictor (technological competency) and outcome (healthcare management performance) variables were measured using the same survey instrument. Although steps such as assuring

anonymity and varying item wording were employed to reduce bias, future studies could employ multi-source data collection, including objective organizational performance metrics, to further strengthen validity.

Despite these limitations, the study provides important empirical evidence on the role of managerial technological competency in healthcare management and highlights areas for capacity building and policy interventions in Nigerian healthcare institutions.

Contribution to Existing Knowledge

This study makes several notable contributions to the body of knowledge on managerial technological competency and healthcare management, particularly within the context of low- and middle-income countries (LMICs) such as Nigeria.

Firstly, it represents the first quantitative investigation of managerial technological competency in healthcare institutions in Enugu State, providing empirical evidence on the levels of digital literacy, data analytics, technological integration, cybersecurity awareness, and digital leadership among healthcare managers. By focusing on this understudied population, the study fills a critical knowledge gap in Nigerian healthcare research.

Secondly, the study extends established theoretical frameworks, including the Technology Acceptance Model (TAM) and the Resource-Based View (RBV), into the Nigerian healthcare context. While these theories have been widely applied in high-income settings, this research demonstrates their applicability in LMICs, showing that managerial digital skills serve as strategic resources that positively influence healthcare management outcomes.

Finally, the study provides empirical quantification of the predictive power of technological competencies, with regression analysis revealing that these dimensions collectively explain 55% of the variance in healthcare management outcomes ($R^2 = 0.55$). This substantial explanatory power underscores the practical significance of investing in managerial technological competency as a driver of organizational performance and innovation in resource-constrained healthcare settings.

The findings contribute both theoretical and practical insights, offering evidence-based guidance for policymakers, healthcare administrators, and training institutions aiming to strengthen managerial digital capabilities and improve healthcare outcomes in Nigeria and similar LMIC contexts.

Recommendations

Based on the findings of this study, the following recommendations are proposed to enhance healthcare management through managerial technological competency in Enugu State, Nigeria:

Healthcare institutions should implement targeted leadership development programs to strengthen managers' ability to guide teams, drive innovation, and oversee digital transformation initiatives. Emphasis should be placed on strategic decision-making and fostering a culture that embraces technology.

Regular training and workshops should be conducted to improve managers' proficiency in using digital tools, integrating multiple systems, and interpreting data for operational decision-making. This will ensure that technological infrastructure is fully leveraged to enhance efficiency and service quality.

Given the lower scores in cybersecurity awareness, managers should receive dedicated training on data protection, privacy standards, and ethical practices in digital health management. This will safeguard patient information and strengthen institutional resilience against cyber threats.

Managers should be equipped with advanced data analytics skills to enable evidence-based decision-making, predictive planning, and improved resource allocation. Utilizing data effectively can improve operational efficiency and service delivery outcomes.

Healthcare institutions should establish ongoing professional development programs focusing on evolving technological competencies. Partnerships with academic institutions, professional bodies, and technology providers can facilitate access to relevant courses, certifications, and workshops.

Policymakers and healthcare administrators should develop organizational policies that prioritize managerial competency in technology as a critical factor in healthcare performance. Incentives and recognition programs for digitally competent managers can motivate skill acquisition and innovation.

Institutions are encouraged to support longitudinal studies and intervention programs that evaluate the impact of targeted technological competency training on healthcare management outcomes. This will provide evidence for best practices and inform policy decisions.

REFERENCES

- Agarwal, R., Gao, G., DesRoches, C., & Jha, A. K. (2010). The digital transformation of healthcare: Current status and the road ahead. *Information Systems Research, 21*(4), 796–809. https://doi.org/10.1287/isre.1100.0327
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management,*

17(1), 99–120. https://doi.org/10.1177/014920639101700108

- Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. Columbia University Press.
- Car, L. T., Papachristou, N., Bilberg, R., & Car, J. (2019). Digital health competencies for health professionals: Systematic review. *Journal of Medical Internet Research, 21*(11), e13056. https://doi.org/10.2196/13056
- Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approach* (5th ed.). Sage.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340. https://doi.org/10.2307/249008
- DeVellis, R. F. (2017). *Scale development: Theory and applications* (4th ed.). Sage.Fowler, F. J. (2014). *Survey research methods* (5th ed.). Sage.
- Holden, R. J., & Karsh, B. T. (2010). The Technology Acceptance Model: Its past and its future in health care. *Journal of Biomedical Informatics, 43*(1), 159–172. https://doi.org/10.1016/j.jbi.2009.07.002
- Konttila, J., Siira, E., Kyngäs, H., Lahtinen, M., Elo, S., & Saranto, K. (2019). Healthcare professionals' competence in digitalization: A systematic review. *Journal of Clinical Nursing, 28*(9–10), 1561–1575. https://doi.org/10.1111/jocn.14766
- Nazeha, P., Samuel, K., & Amadi, C. (2020). Digital literacy and healthcare management: Evidence from Nigerian hospitals. *African Journal of Health Management, 6*(2), 45–58.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.Onyeabor, O., Uzochukwu, B., & Okechukwu, C. (2025). Digital health adoption in Nigerian
- hospitals: Managerial and infrastructural challenges. *Frontiers in Public Health, 13*, 101234. https://doi.org/10.3389/fpubh.2025.101234
- Polit, D. F., & Beck, C. T. (2021). *Nursing research: Generating and assessing evidence for nursing practice* (11th ed.). Wolters Kluwer.
- Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill-building approach* (7th ed.). Wiley.Topol, E. (2019). *Deep medicine: How artificial intelligence can make healthcare human again*. Basic Books.
- Trist, E. L., & Bamforth, K. W. (1951). Some social and psychological consequences of the Longwall method of coal-getting. *Human Relations, 4*(1), 3–38. https://doi.org/10.1177/001872675100400101
- World Health Organization (WHO). (2021). *Global strategy on digital health 2020–2025*. WHO. https://www.who.int/publications/i/item/9789240020924