Investigating How Digital Competency Mediates the Relationship between Administrative Competencies and Professionalism among Nurse Managers

Boshra Mostafa Younes [1], Ayman Mohamed El-Ashry[2] , Ahmed Abdelwahab Ibrahim[3], Sally Mohamed Farghaly[4], Sameer A. Alkubati[5], Mennat-Allah G. Abou Zeid[6]

1. Lecturer of Nursing administration, faculty of nursing, Aswan University, Aswan, Egypt.
2. Lecturer of Psychiatric and Mental Health Nursing, Faculty of Nursing, Alexandria University, Alexandria.
3. Lecturer of Nursing Administration Department, Faculty of Nursing, Alexandria University, Alexandria,
4. Assistant Professor, Nursing Administration Department, Faculty of Nursing, Alexandria University.
5. Department of Medical Surgical Nursing, College of Nursing, University of Hail, Hail, Saudi Arabia.
6. Assistant Professor, Nursing Administration Department, Faculty of Nursing, Ain Shams University, Cairo.

Abstract

Background: Digital transformation in healthcare is reshaping the managerial role of nurse leaders. Beyond traditional administrative competencies, digital competency has emerged as an essential determinant of professional behavior, influencing leadership effectiveness and the quality of care. However, little is known about its mediating role between administrative skills and professionalism. **Aim:** To examine whether digital competency mediates the relationship between administrative competencies and professionalism among nurse managers in governmental hospitals. **Methods:** A descriptive, cross-sectional correlational design was used. The study was conducted in three governmental hospitals in Aswan Governorate, Egypt, with a convenience sample of 120 head nurses. Data were collected using three validated tools: the Digital Competence Scale, the Administrative Competence Scale, and the Nurses' Professionalism Inventory. Statistical analysis included Pearson's correlation and Hayes' PROCESS macro (Model 4) with 5,000 bootstrap samples to assess mediation effects. **Results:** Nurse Managers reported moderate digital competency (46.7%), high administrative competency (39.2%), and high professionalism (52.5%). Significant positive correlations were observed among all three variables. Mediation analysis confirmed that administrative competencies directly predicted professionalism ($\beta = .345$, $p < .001$) and indirectly influenced it through digital competency ($\beta = .154$, $p < .01$), indicating partial mediation. **Conclusion:** Administrative competencies significantly influence professionalism among nurse managers, and digital competency strengthens this relationship, confirming its central role in modern nursing leadership. **Implications for Nursing and Health Policy:** Policymakers should integrate digital competency development into leadership training frameworks for nurse managers. Embedding digital literacy and leadership skills within professional standards and continuing education policies will improve managerial effectiveness, enhance nursing professionalism, and contribute to higher quality patient care and organizational outcomes.

Keywords: Nurse managers; Administrative competencies; Digital competency; Professionalism; Healthcare leadership; Health policy

Introduction

Change and progress through digitalization are also becoming increasingly important in the field of professional care and associated increasing demands on the skills of nursing manager **(Liebl et, al, 2024)**. Rapidly digitalizing in healthcare, nursing managers need to be technologically prepared for the evolving demands of healthcare to improve clinical performance as well as support lifelong learning, allowing them to stay updated on advancements in the field **(Noeman, et al., 2025).**

Digital competence the ability to use technology through actualizing digital knowledge, attitudes and skills in information management, problems solving, tasks completion, communication, collaboration and content creation and sharing in efficient, critical, secure, independent, creative, appropriate and ethical manner **(Mbandje et al., 2024**). Moreover, **Ibrahim & Aldawsari, (2023)** specified it as the degree to which nursing manager can effectively employ problem-solving and critical thinking skills when dealing with digital tools and resources.

Digital competence significantly impacts the ability of nursing manager to meet career needs, bridging the gap between academic preparation and professional expectations in a technology-driven healthcare environment. This competence aligns closely with the demands of the modern job market, where digital literacy is often a prerequisite for employment **(Tischendorf et al., 2024).**

The responsibilities of nurse managers in hospitals have become increasingly intricate due to the current complexities of the healthcare delivery system. To enhance the managerial skills of nurse managers, top executives and human resource leaders have intensified their efforts through succession planning, training, rewards, and career development initiatives. These initiatives are driven by the necessity to ensure high-quality care within units, aligning with the hospital's vision and mission **(Gunawan et al., 2020)**. Core competencies involve a blend of skills, knowledge, attitudes, and behaviors that equip nurse managers to handle the complexities of the healthcare system, adapt to evolving situations, and guarantee the provision of high-quality care, contributing to the success of healthcare organizations **(Gunawan et al., 2023).**

Nurse managers are tasked with translating the organization's culture and strategy into operational actions, managing resources, coordinating nursing care, planning, and evaluating services, as well as fostering teamwork and implementing innovative practices within their units (**García, and Carral, 2021).** Managerial competence is defined as the application of knowledge, attitudes, and skills by nurse managers in specific management roles, which is observed and measured through behavior. High managerial competence is crucial for nurse managers as it is a vital component in delivering healthcare (**Drew & Pandit, 2020**). Nurse managers should be aware of the essential professionalism, behaviors, and attitudes that help develop their identity as key healthcare providers. Nursing professionalism involves providing the highest possible care to patients while adhering to accountability, empathy, and fairness codes (**Ichikawa et al., 2020**). This professionalism can be enhanced by improving service education, increasing responsiveness, raising professional and social standards for future generations, and modifying working conditions for nurses (**Bakar et al., 2022**).

Professionalism is generally understood as the conduct, attributes, and objectives that define a profession and establish the expected practices of its members (**Fitzgerald, 2020**). Within nursing leadership, Nurse Managers strive to uphold professionalism by identifying career growth opportunities, advocating for health policies, advancing patient care, integrating culturally competent practices, and addressing social determinants of health **(AONE, 2022; Hughes et al., 2022).**

To achieve this, nurse managers are expected to demonstrate professionalism consistently in their daily responsibilities, as it directly shapes patient satisfaction, supports positive health outcomes, and fosters both individual and collective growth among nurses. Higher professionalism has been linked to enhanced recognition, improved autonomy and empowerment, stronger organizational citizenship behaviors, and elevated standards of care (**Ageiz et al., 2021**). Additionally, those who display greater professionalism are often more academically prepared, actively engaged in research and scholarly initiatives, and report higher levels of job satisfaction (**Ageiz et al., 2021).**

In clinical practice, professionalism is indispensable. Evidence suggests that it enhances nurses' expertise and competencies while mitigating declines in institutional performance and care quality. Elevated professionalism in nurse management not only strengthens empowerment and recognition but also sets benchmarks for nursing standards, encourages organizational citizenship, and improves overall service delivery (**Cao et al., 2023)**. Despite this, nurse managers face ongoing challenges, including rapid changes in nursing practices, growing professional demands, communication barriers, cultural diversity, insufficient autonomy and leadership skills, occupational risks, extended workloads, emotional strain, societal underrecognition, workforce shortages, and limited professional

advancement (**Ageiz et al., 2021**). Furthermore, issues such as educational preparation, work conditions, organizational culture, and societal expectations continue to complicate the pursuit of professionalism (**Ageiz et al., 2021**).

Significance of the Study

Assuming the role of a professional nurse manager has become increasingly complex due to the continuous transformation of healthcare values, technological innovations, and evolving care models. These shifts have given rise to significant ethical and philosophical dilemmas while simultaneously creating new care environments that require professional nurse leaders. As a result, it has become necessary to redefine the framework of professionalism and strengthen professional identity among nurse managers. Understanding how nurse managers perceive professionalism and its defining attributes is vital to developing a holistic model that can guide them toward greater professional effectiveness. Globally, nurse managers are expected to adapt their organizations to dynamic challenges and policy objectives, requiring a broad set of leadership competencies. With the constant evolution of healthcare systems, technological advances, and innovative care protocols, the expectations of nurse managers are more demanding than ever, underscoring the urgent need for highly skilled and professional nursing leadership.

Aim of the Study

This study aimed to assess the levels of digital competency, administrative competencies, and professionalism among nurse managers. It further sought to examine the impact of digital competency on both administrative competencies and professionalism, and to explore whether digital competency mediates the relationship between administrative competencies and professionalism among this population.

Hypotheses

The study was guided by the following hypotheses: (1) nurse managers' digital competency is positively associated with their administrative competencies; (2) digital competency is positively associated with their level of professionalism; and (3) digital competency functions as a mediating variable in the relationship between administrative competencies and professionalism among nurse managers.

Research Design

A descriptive, cross-sectional correlational research design was utilized to analyze the associations between digital competency, administrative competencies, and professionalism, and to test the mediation effect of digital competency. This design was chosen due to its appropriateness for examining relationships between multiple variables simultaneously within a defined timeframe.

Setting

The study was conducted in three governmental hospitals located in Aswan Governorate, Egypt. These included Aswan University Hospital, a tertiary care facility with 500 beds serving the entire governorate; Sadaka General Hospital with a capacity of 250 beds; and Draw General Hospital, which has 300 beds. These settings were selected due to their high patient volumes, managerial complexity, and the presence of qualified nurse managers across different units.

Sampling and Sample Size Calculation

A convenience sampling technique was employed to recruit a total of 120 head nurses who were available during the data collection period and met the study's inclusion criteria. To ensure sufficient statistical power for mediation analysis, the required sample size was estimated using G*Power version 3.1.9.7. The analysis was based on a linear multiple regression model with three predictors (digital competency, administrative competencies, and the mediator effect), aiming to detect a medium effect size ($f^2 = 0.15$) at a statistical power of 0.80 and a significance level of 0.05. Based on these parameters, the minimum required sample size was calculated to be 77 participants. However, to account for potential non-response, missing data,

or incomplete responses, the sample size increased by approximately 50%, resulting in a final target of 120 participants. This sample was considered both statistically adequate and practically representative of the population of nurse managers employed in tertiary and secondary hospitals within Aswan Governorate, thereby ensuring the generalizability of the study findings within this regional context.

Inclusion and Exclusion Criteria

Participants were eligible for inclusion if they were currently employed as head nurses at one of the selected hospitals, had a minimum of one year of experience in a nursing management role, and expressed willingness to participate voluntarily by providing informed consent. Exclusion criteria included being on extended leave during the data collection period, refusal to participate in the study, or failure to complete the research instruments in full. These criteria were applied to maintain the integrity and consistency of the sample and to ensure reliable comparisons across all study variables.

Study Tools

The first part of the data collection tool gathered demographic information about the participants.

This part included gender, age group, and marital status. Participants were also asked to indicate their current work unit. It also included educational qualifications, years of experience in the nursing field, as well as years of experience in their current unit and participants identified their primary work shift.

Second part: Three validated instruments were utilized for data collection.

Tool I: the Digital Competence Scale

It was adapted from Tzafilkou et al. (2022), which consisted of 26 items divided into three domains: knowledge (4 items), skills (8 items), and attitudes (14 items). This tool also included demographic data such as age, unit, and years of experience.

Tool II: the Administrative Competence Scale

It was originally developed by Gunawan et al., (2019) and adapted for the nursing management context. It contained 43 items distributed across seven domains: leadership (14 items), facilitating spiritual nursing care (7 items), self-management (6 items), staffing and professional development (4 items), utilizing informatics (4 items), financial management (4 items), and quality care improvement (4 items). A principal component analysis yielded seven domains comprised in the final 43-item scale, each demonstrating robust internal consistency with Cronbach's α ranging from 0.71 to 0.90, and overall α = 0.95.

Tool III: the Nurses' Professionalism Inventory (NPI)

It was developed by Ichikawa et al. (2020), which consisted of 28 items across five dimensions: accountability (8 items), self-improvement (8 items), professional attitude (5 items), advancement of the nursing profession (4 items), and professional membership (3 items). Each item is rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), with higher total scores indicating greater levels of professionalism. Based on overall scores, participant professionalism is classified as low (≤50 %), moderate (51–75 %), or high (>75 %). The tool was adopted in the Egyptian context with excellent internal consistency, a Cronbach's alpha of 0.91(**Ahmed, & Ibrahim, 2023**).

Validity

All instruments used in the study underwent a structured and methodologically rigorous validation process to ensure both linguistic fidelity and content validity within the Arabic-speaking nursing management context. Initially, each tool was translated from English into Arabic by two independent bilingual translators with expertise in both medical terminology and academic research. To ensure conceptual and cultural equivalence, not just literal translational reconciliation process was conducted where discrepancies between the two Arabic versions were resolved collaboratively by

a third expert. Following this, the reconciled Arabic version was back translated into English by two different bilingual experts who were blinded to the original versions. This back-translation step allowed for the identification of semantic inconsistencies or deviations in meaning, which were then addressed through further refinement.

After the translation phase, the Arabic versions of the instruments were subjected to content validation by a panel of five academic experts in nursing administration from Minia and Tanta University faculties. The panel members were selected based on their clinical experience, academic qualifications, and research expertise in nursing leadership and education. Each expert was asked to independently assess the relevance, clarity, and representativeness of each item in relation to the construction being measured. They rated the items using a 4-point scale: 1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, and 4 = highly relevant.

To quantitatively assess content validity, Lawshe's Content Validity Ratio (CVR) was calculated for each item using the formula: CVR = (ne – N/2) / (N/2) where *ne* is the number of panelists indicating the item as "essential" (i.e., rating 3 or 4), and *N* is the total number of experts. According to Lawshe's table, for five panelists, a CVR of 0.99 or higher is required for statistical significance at the 0.05 level. Items that failed to meet the minimum CVR threshold were either revised or removed based on panel recommendations. Additionally, qualitative feedback from the experts regarding language clarity, redundancy, and cultural appropriateness was reviewed, and further adjustments were made to improve the tools' applicability in the local healthcare context.

The final versions of the tools reflected both high content validity and linguistic accuracy, making them suitable for use in the Arabic-speaking nursing population. This multi-step validation approach ensured that the instruments not only retained their original psychometric properties but also achieved cultural and contextual relevance within the Egyptian healthcare system.

Pilot Study

A pilot study was conducted with 10% of the total sample (n = 12) drawn from different hospital units not included in the main study. The aim was to test the feasibility, clarity, and applicability of the instruments. Feedback from participants led to minor adjustments to improve the readability and consistency of the items. Data from the pilot study was excluded from the final analysis.

Reliability

Internal consistency of the study tools was assessed using Cronbach's alpha. The Digital Competence Scale achieved an alpha coefficient of 0.90, the Administrative Competence Scale scored 0.92, and the Nurses' Professionalism Inventory yielded a coefficient of 0.91, all indicating excellent reliability.

Data Collection

Data collection was conducted over a two-month period, from early May to end-June 2025. Prior to administering the questionnaires, the researchers obtained official permission from the hospital administrations and coordinated with unit supervisors to schedule appropriate times that would not interfere with clinical responsibilities. Head nurses were individually approached in their respective work environments, including internal medicine, surgery, and intensive care units. The questionnaire packets were delivered by hand in sealed envelopes to ensure privacy, and participants were given a quiet space and sufficient time during their shifts to complete the forms. On average, completing the instruments required approximately 20 to 25 minutes. The researchers remained available nearby to answer any questions and to collect the completed forms in a secure and confidential manner.

Ethical considerations

Ethical approved by the institutional review board from Faculty of Nursing, Aswan University, Egypt with reference number (ASWAN-5-2025). All participants gave written informed consent to participate in the study. The

right to refuse to participate in the study or to withdraw at any time was guaranteed. The data's confidentiality and the study subjects' anonymity were maintained.

Ethical approval for the study was obtained from the Research Ethics Committee at the Faculty of Nursing, Aswan University. Participants were informed of their right to refuse or withdraw from the study at any stage without penalty. Informed written consent was obtained from each participant prior to data collection, following a clear explanation of the study's aims, procedures, and confidentiality safeguards. Additionally, official administrative permissions were secured from hospital authorities before initiating the research process.

Data analysis

IBM SPSS Statistics, Version 27 (IBM Corp., Armonk, NY, USA), was used to analyze the data. The mean ± standard deviations (S.D.) and frequencies (number and percentage) were used to provide descriptive statistics and the main characteristics of the individuals. To ascertain whether the study variables were related, Pearson's correlation coefficient was employed. To evaluate potential interaction effects, Hayes' Process Macro software, version 4.2, Model 4, was utilized. 95% bias-corrected confidence intervals and 5000 bootstrap samples were used in the mediation analysis. A significant value was observed at $p<0.05$.

Result

Table 1 presents the demographic and professional profile of 120 nurse managers. The majority were aged 21–30 years (60.0%), followed by 30–40 years (25.8%) and above 40 years (14.2%). In terms of gender, 53.3% were female, and 46.7% were male. The dominant work unit was surgery (55.8%), while internal medicine (22.5%) and intensive care (21.7%) were less represented. Educationally, 48.3% held a bachelor's degree, 32.5% had a technical secondary diploma, and 19.2% were technical health institute graduates. Most participants worked in university hospitals (45.0%), followed by government hospitals (28.3%), and public hospitals (26.7%). Regarding experience, 42.5% had 5–10 years in nursing, and 41.7% had 5–10 years in their current unit, indicating a relatively experienced group. Morning shifts were most common (54.2%), with 32.5% working all shifts and 13.3% limited to evening duty.

Figure 1 shows that most nurse managers reported moderate digital competency, with approximately 56 participants (46.7%) falling into this category. High digital competency was reported by 38 participants (31.7%)**,** reflecting a significant proportion who are proficient in digital tools and systems. Meanwhile, low digital competency was identified in 26 participants (21.7%)**,** suggesting a need for targeted training for this subgroup. These results indicate that nearly 78.4% of nurse managers possess at least a moderate level of digital readiness, which is essential for technology-driven healthcare environments.

Figure 2 illustrates the distribution of total administrative competency scores. High administrative competency was reported by 47 participants (39.2%)**,** while moderate levels were seen in 52 participants (43.3%)**.** Only 21 participants (17.5%) reported low administrative competency**.** This suggests that over 82% of nurse managers demonstrate sufficient or strong administrative ability, an encouraging indicator of leadership capacity across clinical units.

Figure 3 indicates that high professionalism was reported by 63 participants (52.5%)**,** the largest group. Moderate levels were reported by 41 participants (34.2%)**,** while only 16 participants (13.3%) scored in the low professionalism range. This means that more than 86% of the nurse managers in the study maintain a moderate-to-high standard of professional conduct, values, and identity, reinforcing the maturity and ethical grounding of the nursing leadership cohort.

Table 2 demonstrates strong, statistically significant relationships among the three primary variables. Administrative competencies were positively correlated with digital competency ($r = .394$, $p < .001$) and professionalism ($r = .499$, $p < .001$)**.** Furthermore, digital competency showed a strong correlation with professionalism ($r = .527$, $p < .001$)**.** These findings suggest that

improvements in administrative or digital competencies are associated with elevated levels of professionalism among nurse managers.

Table 3 details the results of the mediation analysis. The direct effect of administrative competencies on professionalism was statistically significant **(**β = .345, 95% CI = 0.211–0.469, p < .001**),** indicating that strong administrative abilities directly enhance professional conduct. Additionally, administrative competencies significantly predicted digital competency **(**β = .394, 95% CI = 0.233–0.523, p < .001**),** and digital competency in turn significantly predicted professionalism **(**β = .391, 95% CI = 0.269–0.507, p < .001**).** The indirect effect**,** which captures the mediating role of digital competency in the relationship between administrative competencies and professionalism, was also significant (β = .154, 95% CI = 0.085–0.228). The total effect of administrative competencies on professionalism was β = .499**,** reflecting both direct and indirect influences. These results confirm that digital competency partially mediates the relationship between administrative competencies and professionalism.

The model was built using the PROCESS SPSS macro with Professionalism as the dependent variable, digital competency as the mediating variable, and administrative competencies as the independent variable (Hayes, 2022). **Figure. 4** illustrates this model.

Table 1. Number and distribution of the general characteristics of the managers

	n	%
Age (Years)		
21 – 30	72	60.0
30 – 40	31	25.8
> 40	17	14.2
Gender		
Male	56	46.7
Female	64	53.3
Work Unit		
Internal Medicine	27	22.5
Surgery	67	55.8
Intensive Care	26	21.7
Educational Qualification		
Bachelor's degree in nursing	58	48.3
Diploma from the Technical Health Institute	23	19.2
Diploma from the Technical Secondary School of Nursing	39	32.5
Workplace		
Government Hospital	34	28.3
University Hospital	54	45.0
Public Hospital	32	26.7
Years of Experience in the Nursing Field		
< 5	47	39.2
5 - 10	51	42.5
> 10	22	18.3
Years of Experience in the Work Unit		
< 5	48	40.0
5 - 10	50	41.7
> 10	22	18.3
Work Shifts		
Morning	65	54.2
Evening	16	13.3
All times	39	32.5

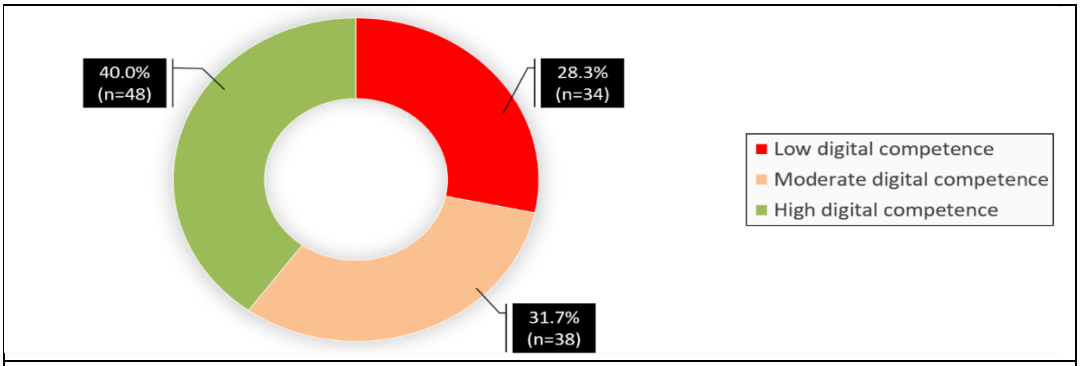

Fig. 1. Number and distribution of the Digital Competence total level

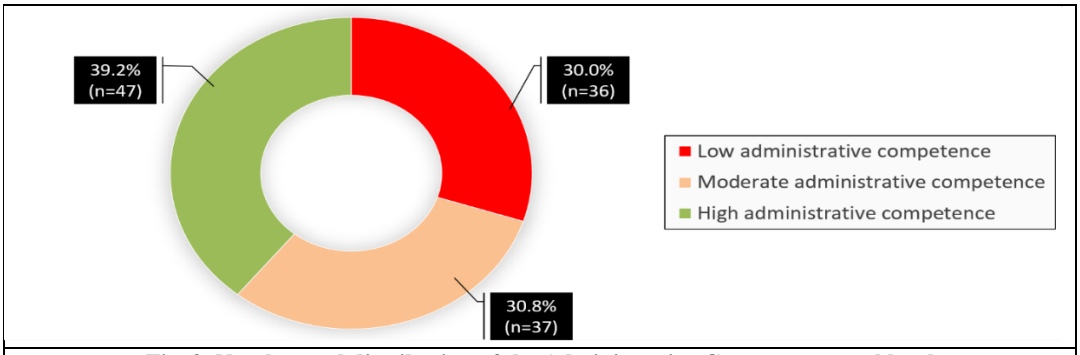

Fig. 2. Number and distribution of the Administrative Competence total level

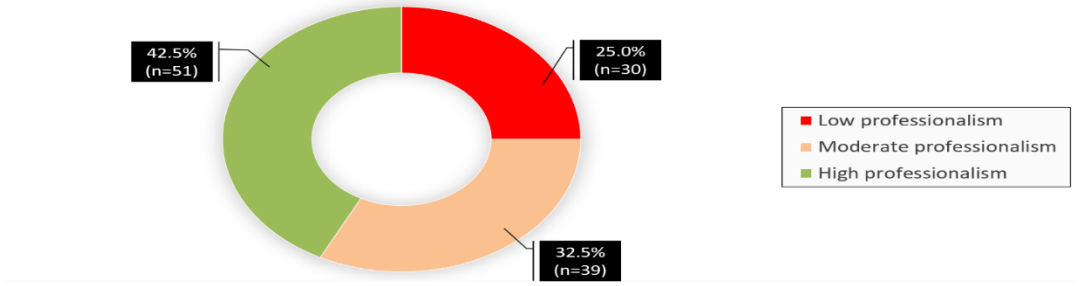

Fig. 3. Number and distribution of the Nurse Professionalism Scale total level

Table 2: Correlation between study variables (N=120)

Variables		Administrative Competencies	Digital Competency	Professionalism
Administrative Competencies	r	1		
	p			
Digital Competency	r	.394**	1	
	p	<.001		
Professionalism	r	.499**	.527**	1
	p	<.001	<.001	

**Correlation is significant at the 0.01 level (2-tailed).

Table 3: Direct, indirect, and total effects of Administrative Competencies on Professionalism.

Path	Effect size	LLCI-ULCI	P-value
Indirect effect			
Administrative Competencies → Digital Competency → Professionalism	.154	.085-.228	
Direct effect			
Administrative Competencies → Digital Competency	.394	.233-.523	<.001
Digital Competency → Professionalism	.391	.269-.507	<.001
Administrative Competencies → Professionalism	.345	.211-.469	<.001
Total effect			
Administrative Competencies → Professionalism	.499	.269-.507	<.001

CI: Confidence Interval, LLCI: Lower Limit Confidence Interval, ULCI: Upper Limit Confidence Interval

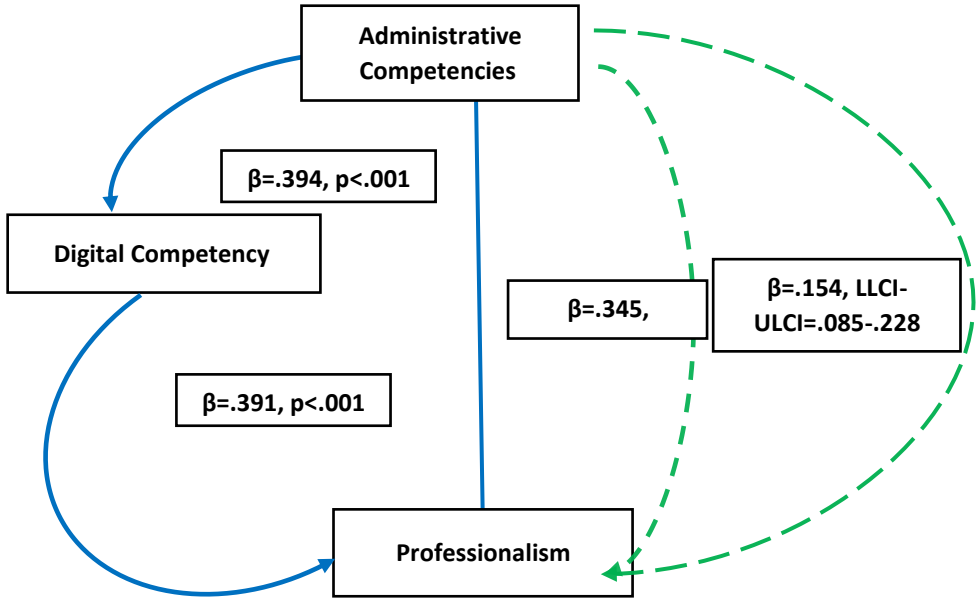

Fig. 4: The mediating effect of Digital Competency on the relationship between Administrative Competencies and Professionalism.

Discussion

The present study aimed to investigate the influence of administrative competencies on professionalism and to examine the mediating role of digital competency in this relationship. According to the results of this study, it was determined that most nurse managers reported moderate digital competency. The fact that nearly half of the participants reported moderate competency suggests that while they are familiar with digital tools and systems, there may still be room for improvement, particularly in advanced or emerging technologies. Moreover, Nurses with elevated levels of DC tend to exhibit strong goal orientation in their work, heightened attentiveness, and adaptability on the job, along with a reduced inclination to leave their positions (**Demir et al., 2024**). On the other hand, Nurses who lack technological proficiency are less inclined to seek out resources on their own and may face increasing job pressures. A qualitative study revealed that nursing managers identified key barriers to technology adoption, including insufficient institutional support, heavy patient care responsibilities, and gaps in necessary skills. (**Navarro et al., 2024**).

The findings indicate that nurse managers generally have a positive view of digital competency, showing at least a moderate level of technological proficiency. This implies that nurse managers are well-positioned to be early adopters of technologies, potentially improving

the efficiency and quality of patient care planning. This trend is supported by the fact that over two-thirds of these leaders possess a master's degree in nursing, reflecting both a solid knowledge base and an openness to integrating technologies into their professional practices **(Kotp et al.,2025).**

The results of other studies align with our findings. For instance, (**Sharpp et al., 2019**). emphasized that leaders view technology as essential to their roles, noting that they are unable to carry out their responsibilities without it. They also highlighted that day-to-day management depends heavily on various technological tools and systems. Similarly, (**Myllymäki et al., 2022**). It was reported that having a positive attitude toward technology and telemedicine is generally crucial for leaders. Their willingness to advance and improve telemedicine operations, along with a genuine concern for their staff, plays a significant role in fostering the growth and success of telemedicine initiatives.

The current study findings indicated that more than 86% of the nurse managers in the study maintain a moderate-to-high standard of professional conduct, values, and identity, reinforcing the maturity and ethical grounding of the nursing leadership cohort. Such levels of professionalism are critical in healthcare leadership, as they impact both the behavior of nurse managers and their ability to motivate and lead their teams. Professional conduct in leadership builds trust, strengthens team unity, and encourages a culture of responsibility and mutual respect—all key elements in providing safe, high-quality patient care. In addition, strong professionalism enhances clear communication, ethical choices, and compliance with professional standards, thereby strengthening the nurse managers' credibility and effectiveness in their roles.

The current study results were supported by **Bekalu, & Wudu, (2023)** who reported a significant proportion of nurses demonstrated a high level of professionalism. However, the present study results contrast with findings from other studies. For instance, earlier studies conducted at Jimma Public Hospitals (**Gizaw et al., 2016; Solomon et al., 2015**) and among Japanese nurses (**Tanaka et al., 2014**) reported slightly lower levels of professionalism compared to the findings of the current study.

The mediation analysis provides compelling evidence that administrative competencies play a pivotal role in shaping professional behavior, both directly and indirectly through digital competency. Similarly, a study conducted by **Makie et al., (2021)** further study examined leadership and administrative competencies and reported that Administration plays a crucial role in nursing practice, with nurse administrators being a key component of nursing functions that support and guide professional competence like digital competence. Furthermore, some researchers in the field of competence have argued that it is the responsibility of management to encourage nursing teams to enhance their professional competence, which is viewed as an integration of knowledge, skills, values, and emotional attributes—such as digital competence (**Kuo et al., 2021).**

The present study revealed that the direct effect of administrative competencies on professionalism was statistically significant, indicating that individuals with stronger administrative skills are more likely to exhibit professional conduct. This result aligns with prior research suggesting that Effective management skills are essential for individuals in any professional setting. For managers especially, strong management abilities are critical to performing their responsibilities effectively. These include time management, accountability, self-discipline, motivation, commitment, personal responsibility, and adaptability, all of which contribute significantly to professional conduct and performance **(Thapa et al., 2023).**

Furthermore, digital competency was found to significantly predict professionalism, suggesting that individuals who are digitally competent are better positioned to engage in professional behavior. In this respect, two studies were reported that nurses require sufficient digital competence (DC) to effectively utilize technology and maintain productivity in the workplace (**Booth et al., 2021; Li et al.,**

2023). Moreover, this may be attributed to the ability to communicate effectively, manage digital workflows, and uphold digital ethics and responsibilities elements increasingly considered integral to professional performance in the digital age.

Crucially, the analysis revealed a significant indirect effect, indicating that digital competency partially mediates the relationship between administrative competencies and professionalism. This partial mediation highlights that while administrative skills directly enhance professionalism, they also contribute indirectly by fostering digital capabilities, which in turn bolster professional behavior.

Limitations of the Study

Several limitations should be acknowledged. First, cross-sectional design restricts the ability to infer causal relationships between administrative competencies, digital competency, and professionalism. Longitudinal or experimental studies are needed to confirm the directionality of these associations. Second, the use of convenience sampling in only three hospitals within Aswan Governorate may limit the generalizability of the findings to other settings or countries with different organizational cultures and resources. Third, self-reported measures may be subject to response bias, including social desirability effects, which could have influenced participants' reporting of their competencies and professionalism. Finally, the study did not explore potential moderating factors such as organizational support, workload, or access to digital infrastructure, which may further shape the relationship between competencies and professionalism.

Despite these limitations, the study provides valuable insights into the mediating role of digital competency and offers a foundation for future research that could adopt multi-site, larger-scale, or mixed-method approaches to strengthen evidence and applicability.

Conclusion

This study demonstrated that administrative competencies significantly and directly influence professionalism among nurse managers, while digital competency partially mediates this relationship. Nurse managers with higher administrative skills and stronger digital competency are more likely to display professional behaviors, reinforcing the vital role of digital readiness in contemporary healthcare leadership. These findings emphasize that professionalism is not shaped by administrative ability alone but is strengthened by the integration of digital competencies, which are now indispensable in nursing management. By addressing both administrative and digital skill domains, healthcare institutions can foster a professional nursing workforce capable of navigating the complexities of modern healthcare systems.

Implications for Nursing and Health Policy

The findings of this study underscore the importance of integrating digital competency into the professional development frameworks of nurse managers. Administrative competencies alone are not sufficient to sustain professionalism in an era where healthcare delivery is increasingly shaped by digital transformation. Digital competency enhances managerial effectiveness by facilitating evidence-based decision-making, improving communication, strengthening accountability, and enabling innovation in nursing services.

For nursing practice, the results highlight the need for structured training programs that equip nurse managers with digital literacy skills alongside traditional administrative competencies. Nurse managers who are digitally competent are better positioned to lead teams, uphold professional standards, and foster environments that support safe, high-quality patient care.

At the policy level, healthcare organizations and national nursing bodies should prioritize the integration of digital competency into leadership development strategies and

accreditation standards. Embedding digital skills in competency frameworks, continuing education, and succession planning can build a workforce that is resilient to technological change. Furthermore, policy directives that allocate resources for digital training, infrastructure, and mentorship will help reduce skill gaps and ensure equitable access to technological advancement across healthcare institutions.

Acknowledgment

We express our sincere gratitude to all the nurse managers who took part in the study and to those who assisted in making the research possible.

Consent for publication

Not applicable.

Availability of data and materials

Data will be available on reasonable request from the corresponding author.

Funding

No fund or profit received for this study.

Competing interests

The authors declare that there are no conflicts of interest.

Highlights

- Digital competency partially mediates administrative skills and professionalism
- Nurse managers showed moderate digital, high administrative, and professionalism levels
- Strong positive correlations exist among digital, administrative, and professionalism
- Training in digital skills enhances professionalism and managerial effectiveness
- Policy: embed digital literacy into nurse manager leadership and education standards

References

Ageiz, H. M., Elshrief, A. H., & Bakeer, M. H. (2021). Developing a professionalism manual for nurse managers to improve their perception regarding professionalism and professional identity. *SAGE Open Nursing, 7,* 1–12. https://doi.org/10.1177/23779608211026174

Ahmed, M. F., & Ibrahim, A. A. (2023). Head nurses' professionalism, systems thinking and its relation to safe nursing care. *Port Said Scientific Journal of Nursing, 10*(1), 257–277. https://doi.org/10.21608/pssjn.2023.186500.1246

American Organization for Nursing Leadership (AONL). (2022). *AONL nurse leader core competencies*. AONL.

Bakar, R., Khaerah, Y., Hidayati, N., & Hamid, A. N. (2022). The role of organizational culture in moderating effect of emotional labor strategies on nursing professionalism. *Nurse Media Journal of Nursing, 12*(1). https://doi.org/10.14710/nmjn.v12i1.35626

Bekalu, Y. E., & Wudu, M. A. (2023). Level of professionalism and associated factors among nurses working in South Wollo Zone Public Hospitals, Northeastern Ethiopia, 2022. *SAGE Open Nursing, 9,* 23779608231158976. https://doi.org/10.1177/23779608231158976

Booth, R. G., Strudwick, G., McBride, S., O'Connor, S., & López, A. L. S. (2021). How the nursing profession should adapt for a digital future. *BMJ, 373,* n1190. https://doi.org/10.1136/bmj.n1190

Cao, H., et al. (2023). What is nursing professionalism? A concept analysis. *BMC Nursing, 22,* 34. https://doi.org/10.1186/s12912-022-01161-0

Charalambous, A. (2023). Theoretical frameworks of leadership in nursing: Critical reflections. *Seminars in Oncology Nursing, 39*(1), 151362. https://doi.org/10.1016/j.soncn.2022.151362

Demir, M., Dalgıç, A., & Yaşar, E. (2024). How perceived overqualification affects task performance and proactive behavior: The role of digital competencies and job crafting. *International Journal of Hospitality & Tourism Administration, 25*(3), 552–574. https://doi.org/10.1080/15256480.2022.2147519

Drew, J. R., & Pandit, M. (2020). Why healthcare leadership should embrace quality improvement. *BMJ, 368,* m872. https://doi.org/10.1136/bmj.m872

García, G. A., & Carral, P. A. (2021). Nurse managers' competencies: A scoping review. *Journal of Nursing Management, 29*(6), 1410–1419. https://doi.org/10.1111/jonm.13292

Gizaw, A. B., Kebede, D. B., Hanfore, L. K., & Belachew, Y. B. (2016). Level of professional commitment and associated factors among nurses working in Jimma Zone public hospitals; Jimma South West Ethiopia. *Palliative Medicine & Care, 5*(1), 1–9. https://doi.org/10.15761/PMC.1000205

Gunawan, J., Aungsuroch, Y., Fisher, M. L., & McDaniel, A. M. (2019). Development and psychometric properties of managerial competence scale for first-line nurse managers in Indonesia. *SAGE Open Nursing, 5,* 2377960819831468. https://doi.org/10.1177/2377960819831468

Gunawan, J., et al. (2020). Managerial competence of first-line nurse managers in public hospitals in Indonesia. *Journal of Multidisciplinary Healthcare, 13,* 1017–1025. https://doi.org/10.2147/JMDH.S264432

Gunawan, J., et al. (2023). Refining core competencies of first-line nurse managers in the hospital context: A qualitative study. *International Journal of Nursing Sciences, 10*(3), 492–502. https://doi.org/10.1016/j.ijnss.2023.07.004

Ichikawa, N., Mitani, N., Taka, Y., Tanaka, M., & Takemura, Y. (2020). Understanding and measuring nurses' professionalism: Development and validation of the nurses' professionalism inventory. *Journal of Nursing Management, 28*(7), 1607–1618. https://doi.org/10.1111/jonm.13116

Ibrahim, R., & Aldawsari, A. (2023). Relationship between digital capabilities and academic performance: The mediating effect of self-efficacy. *BMC Nursing, 22,* 434. https://doi.org/10.1186/s12912-023-01593-2

Kotp, M. H., Ismail, H. A., Basyouny, H. A. A., Aly, M. A., Hendy, A., Nashwan, A. J., ... & Abd Elmoaty, A. E. E. (2025). Empowering nurse leaders: Readiness for AI integration and the perceived benefits of predictive analytics. *BMC Nursing, 24*(1), 56. https://doi.org/10.1186/s12912-025-01644-9

Kuo, C. P., Hsieh, P. L., Chen, H. M., Yang, S. Y., Hsiao, Y. L., & Wang, S. L. (2021). Community health nursing competency and psychological and organizational empowerment of public health nurses: A cross-sectional survey. *Healthcare, 9*(8), 993. https://doi.org/10.3390/healthcare9080993

Li, Y., Jing, Q., Feng, T., & Yang, X. (2023). The impact of self-efficacy on nurses' well-being: Does digital competence matter? *Journal of Korean Academy of Nursing, 53*(4), 385–396. https://doi.org/10.4040/jkan.23038

Liebl, S., et al. (2024). Digital competence using the example of executives in residential care facilities in Germany—a comparison. *Frontiers in Health Services, 4,* 1372335. https://doi.org/10.3389/frhs.2024.1372335

Makie, V., Jooste, K., Mabuda, T. B., Bock, T., Lourens, G. M., Van As, M., & Chipps, J. (2021). Operational nurse managers' perceptions on the competence of community service nurses in public settings in the Western Cape. *Curationis, 44*(1), 1–9. https://doi.org/10.4102/curationis.v44i1.2185

Mbandje, D., Loureiro, M., & Lucas, M. (2024). Digital competence and information literacy: Clarifying concepts based on a literature review. *Educational Media International, 60*(3–4), 306–316. https://doi.org/10.1080/09523987.2023.2324584

Mohamed, A. H., Awad, G. S., Mohamed, E. N., & Elsabahy, E. H. (2023). Effect of the artificial intelligence enhancement program on head nurses' managerial competencies and flourishing at work. *Egyptian Journal of Health Care, 14*(1), 624–645.

Motacki, K., & Burke, K. (2022). *Nursing delegation and management of patient care* (E-book). Elsevier Health Sciences.

Myllymäki, S., Laukka, E., & Kanste, O. (2022). Health and social care frontline leaders'

perceptions of competence management in telemedicine in Finland: An interview study. *Journal of Nursing Management, 30*(7), 2724–2732. https://doi.org/10.1111/jonm.13782

Navarro Martínez, O., & Leyva-Moral, J. M. (2024). Digital transformation led by nurses and nursing managers' priorities: A qualitative study. *Journal of Nursing Management.* https://doi.org/10.1111/jonm.14782

Noeman, A. M., Mostafa, H. W., & Ibrahim, I. E. (2025). The digital competence of nursing interns and its relation to career needs and career maturity. *Journal of Nursing Science, 13*(50), 33–46.

Ofei, A. M. A., Paarima, Y., & Barnes, T. (2020). Exploring the management competencies of nurse managers in the Greater Accra Region, Ghana. *International Journal of Africa Nursing Sciences, 13,* 100248. https://doi.org/10.1016/j.ijans.2020.100248

Sharpp, T. J., Lovelace, K., Cowan, L. D., & Baker, D. (2019). Perspectives of nurse managers on information communication technology and e-leadership. *Journal of Nursing Management, 27*(7), 1554–1562. https://doi.org/10.1111/jonm.12844

Solomon, Y., Beker, J., & Belachew, T. (2015). Professionalism and its predictors among nurses working in Jimma Zone Public Hospitals, Southwest Ethiopia. *Journal of Nursing and Care, 5*(4), 292. https://doi.org/10.4172/2167-1168.1000292

Tanaka, M., Yonemitsu, Y., & Kawamoto, R. (2014). Nursing professionalism: A national survey of professionalism among Japanese nurses. *International Journal of Nursing Practice, 20*(6), 579–587. https://doi.org/10.1111/ijn.12201

Thapa, P., Giridharan, B., Khanal, J., & Adhikari, K. (2023). Exploring the relationship between self-m anagement skills and demographic factors among managers in Kathmandu-based organizations. *Modern Issues of Medicine and Management, 25*(1), 45–61.