

Digital Skill-Up Training and Performance of Pharmacist in the University of Nigeria Teaching Hospital (UNTH), Enugu

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Abstract

The proliferation of digital technology has precipitated a paradigmatic shift in organisational activities, necessitating a concomitant evolution of skill set. This has increasingly transformed the way work is done, bringing about efficiency and effectiveness. Therefore, to capitalise on this trend and enhance its services, the pharmaceutical department of the University of Nigeria Teaching Hospital, Enugu, organised the digital skill-up training programme 1.0. for its staff. This program, which aimed to enhance further the efficiency and effectiveness of pharmacists in areas such as working with email, Google, and other digital competencies, has its outcomes as the main focus of this study. Therefore, to investigate these issues, we adopted the systems theory of organisations. Data was sourced through a survey, where structured questionnaires were distributed to the respondents. The study adopted the cross-sectional research design and the findings revealed that training on digital technologies, such as training on the use of emails, Google, and computers, enhanced the quality of communication and service delivery of pharmacists. However, though the training improved certain aspects of pharmacist performance, it did not translate to improved service delivery or job satisfaction. Based on this, it was recommended that future training programmes be advanced and tailored to meet the unique needs of pharmacists at different stages of their careers.

Keywords: Training, digital, pharmacist, Google, email

Introduction

The increasing integration of digital technology in the healthcare industry has brought significant advancements and opportunities for pharmacists. This is as digital tools have the potential to enhance pharmacists' capabilities in patient care, medication management, and overall healthcare outcomes. As a result, the acquisition of digital skills has become crucial for pharmacists to effectively leverage these technological advancements (Smith et al., 2018). Thus, digital skill-up training has been identified as a relevant skill for pharmacists as they are equipped with the necessary knowledge, abilities, and competencies to utilise digital tools and platforms effectively in their professional roles (Agarwal et al., 2019). These skills, which include proficiency in Electronic Health Record (EHR) systems, telehealth technologies, medication management applications, medical diagnosis software, pharmacy management software and online communication platforms, have been identified as one of the useful tools pharmacists can have to improve performance. Therefore, with the vast development of Information Technology (IT) and with the invasion of IT to the medical field especially on diagnosing diseases, patient management,

and disease control as well as in teaching of medical personnel and other paramedical staff, a good computer knowledge is needed to carry out these duties optimally (Laerum et al., 2001; Satharasinghe et al., 2004). According to Eleni (2019), offering digital skills training shows that an organisation is interested in the growth and development of its employees, as this can attract talented individuals who are eager to learn and adapt to new technologies, thus, leading to increased efficiency in tasks and processes, allowing teams to accomplish more in less time and improved efficiency that will give organizations a competitive edge that will enable them deliver products or services faster and more effectively.

Between 2014 and 2015, Nigeria's Federal Ministry of Health and Federal Ministry of Communication Technology collaborated to develop the National Health Information and Communication Technology Framework (Federal Ministry of Health, 2019). This framework served as the roadmap for leveraging digital technology to enhance healthcare delivery in Nigeria, capitalising on the recognised benefits of ICT integration in the healthcare sector. The framework focused on enhancing the efficiency, effectiveness, accessibility, and quality of healthcare services through the use of ICT solutions, such as electronic health records, telemedicine, and health information systems, to improve healthcare delivery in Nigeria. Based on this, teaching hospitals in Nigeria, which are citadels of medical training, adopted ICT training. According to Adewale (2017), these trainings were adopted to harness the benefits of ICT in healthcare and, by extension, offer quality services. Many teaching hospitals, such as the University College Hospital (UCH), Ibadan, developed an ICT training curriculum for their medical staff, with a curriculum covering areas as electronic medical record systems, data analysis, and utilisation of ICT-driven healthcare applications (Oshikomaya et al., 2020). Similarly, the University of Nigeria, Teaching Hospital (UNTH), Enugu, organised ICT training programs targeting its medical and paramedical staff. The training program covered various aspects of ICT, including basic computer operations, electronic documentation, health information management, and telemedicine applications (Chime et al., 2018).

In furtherance of these digital trainings, UNTH organised the digital Skill-up [1.0](#) program for pharmacists at the hospital. The training was aimed at educating these healthcare professionals on the relevance of technology and innovation by equipping the pharmacists with digital skills to improve their efficiency and productivity. The program encompassed a comprehensive curriculum of digital literacy skills, including audiovisual setup, email management, and Google applications. Additionally, the program focused on cultivating digital competencies specifically tailored for pharmacists, as well as exploring non-traditional pathways in digital health. The curriculum also incorporated virtual patient simulations and case studies to enhance knowledge, skills, and confidence, alongside continuous professional development modules aimed at updating the knowledge and skills of the pharmacists.

Despite the novel nature of these trainings, investigating the effects of the trainings has not been conducted, leaving a significant knowledge gap regarding their impact on pharmacists' digital literacy, professional practice, and patient outcomes. To fill this research gap, the study will be guided by the following research questions:

1. Has the training of pharmacists on the usage of Emails and Google enhanced effective quality service delivery in UNTH Enugu?
2. Did the training on the use of new technologies, such as computers, enhance the accuracy of drug records and sales in UNTH Enugu?
3. What strategies can be implemented to improve training on the use of medical equipment in the dispensing of drugs by pharmacists in UNTH Enugu?

In order to effectively interrogate these issues, the study is organised into distinct sections, starting with a literature review, followed by the theoretical underpinning of the study, and methods of data collection. The study then presents the results of the investigation, which provide insights into the impact of digital training programs on pharmacists' digital literacy and professional practice. Following the presentation of the findings, the study engages in a comprehensive discussion of the results, situating them within the broader context of digital health adoption and healthcare innovation in Nigeria, contributing to the body of existing knowledge on the impact of digital technology training on the performance of pharmacists. The findings will also have implications for healthcare organisations, policymakers, and educators, highlighting the need for targeted training programs that address the unique needs of pharmacists in the digital age.

Literature Review

The relationship between digital literacy and employee productivity has been a subject of increasing interest in recent years. Empirical evidence suggests that digital literacy has a direct positive correlation with employee productivity. For instance, a study conducted by Oladimeji et al. (2024) on local government employees in Nigeria found that enhanced digital skills led to significant performance gains. The study further revealed that access to Information and Communication Technology (ICT) amplifies this relationship, underscoring the importance of investing in digital infrastructure alongside training. This amplifies the significance of continuous training and development in improving job performance. According to Vincent (2020) and Khunaini et al. (2023), ongoing training programs enable employees to adapt to technological changes and enhance their competencies. Organisations that prioritise continuous training reap numerous benefits, including boosted productivity, enhanced employee engagement, and improved job satisfaction (Khunaini et al., 2023; Kartheeswari, 2024). These outcomes are crucial for employee retention and overall organisational success.

Because of these digital needs by organisations, the integration of digital technology in healthcare has been a recurring theme in recent studies, where the potential benefits and challenges of digital technology adoption in healthcare have been highlighted by scholars. One of the primary benefits of digital technology in healthcare is the improvement of patient care through enhanced communication and information sharing. According to Moloney & Farley (2015), while discussing the concept of Electronic Health Records training for health professionals, such training facilitates the collection and sharing of patient data between clinicians. They further argued that, though Electronic Health Records have the potential to save much time and money through an efficient sharing of patient data between clinicians, there remain significant potential pitfalls that must be considered. These are the inappropriate sharing and dissemination of patient data and other breaches of confidentiality and privacy, authorship ambiguities (particularly where patients are able to directly amend the documents), misleading histories, inadequate discharge summaries and miscommunications between clinicians and patients. They conclude that these risks can be mitigated if appropriate measures are put in place, but this risk mitigation requires the providers of electronic health records systems to work closely with clinicians and other stakeholders to ensure an effective and secure system. Their position is in line with the position by Bynhall (2016), who noted that digital literacy imbues in one a set of competences required for inclusion in a knowledge society, where, to enhance productivity and efficiency in any industry, digital literacy brings the necessary tools needed for abilities to enhance productivity. Adebayo et al. (2024) establish a positive relationship between digital literacy and productivity among public sector

employees in Nigeria, highlighting the critical need for a digitally literate workforce to improve performance in public organisations and emphasising the importance of investing in structured digital skills development programs to motivate employees and unlock potential productivity improvements.

The rapid evolution of digital technologies has transformed the healthcare landscape, presenting both opportunities and challenges for pharmacists. According to Ana Maria et al. (2024), there is a need for pharmacists to acquire knowledge in digital comprehensive health, including artificial intelligence, technology, automation, and new communication methods with patients. This was also echoed by Alowais et al. (2024), who highlights the critical role of digital health technologies in enhancing patient care and the necessity for a digitally literate pharmacy workforce. The importance of digital skills training in higher education is also highlighted by Miguel-Angel Sicilia et al. (2018). The study emphasises the need for a better understanding of digital skills from various stakeholders' perspectives and reveals a perceived gap between the digital skills that students possess and the skills that employers expect. Prioritising these skills, Celik & Ölçer (2018) emphasised the importance of email and Google services in enhancing communication and collaboration in healthcare institutions. They argued that since E-mail is one of the most important applications that internet technology brought to us, and has evolved since the early days of the internet, bringing about a large part of the total traffic on the Internet belonging to the use of e-mail, thus bringing about quality service delivery, inclusive communication convenience that are low cost and more accessibility.

The integration of digital health tools into pharmacy practice is not without its challenges. Aila (2024), while investigating the knowledge and attitudes of community pharmacists towards digital health tools, revealed that there is a significant gap between the design of these tools and the actual needs of patients. His assertion underscored the need for targeted interventions in order to bridge the knowledge gap and improve the integration of digital health tools in community pharmacy practice. In the context of the modern workforce, Suong et al. (2024) argued that digital transformation is significantly altering labour structures and markets globally, creating a pressing need for employees to develop relevant digital skills. They identified the specific digital skills that employees need to thrive in the digital economy and emphasised the importance of these skills for enhancing employee performance and organisational efficiency. Furthermore, Moloney & Farley (2015) identified potential pitfalls that might affect a digitised healthcare system. These include breaches of confidentiality and privacy, authorship ambiguities, and miscommunications between clinicians and patients. Yuvaraj & Nadheya (2018) noted that the introduction of new technology can pose stress on employees and impact their behaviour, performance, and interpersonal relationships. In contrast to this, Grappasonni et al. (2015) argued that training for pharmacists should be geared towards what the pharmacist and other health practitioners want. Moreover, Anusi & Mutambara (2022) noted that technological change is usually challenging in health care systems as a result of the discovery of diseases, complex health interventions, where implementation is one of the key model challenges in healthcare organisations.

Despite these shortfalls, scholars are optimistic that the use of digital technology can improve healthcare outcomes and enhance workers' performance (Moloney & Farley, 2015; Yuvaraj & Nadheya, 2018; Anusi & Mutambara, 2022; and Iyawa et al., 2016). Thus, germane as these submissions by scholars are, there is a dearth in literature on how the training conducted by the University of Nigeria, teaching hospital, Enugu enhanced the performance of pharmacy staff in the hospital. Therefore, this forms a gap in the literature, which this study aims to fill.

Theoretical Underpinning of the Study

To interrogate these issues, this study adopted the Systems theory of organisations. The theory formalised in the 1950s by Ludwig Von Bertalanffy, a biologist, challenged the reductionist approach of the 19th-century scientific community that was heavily influenced by the ideas of Auguste Comte and Herbert Spencer. In contrast to these ideas, he advocated for a holistic perspective that recognises the interrelationships within a system. The systems theory is based on the assumption that the whole is more than the sum of its parts, emphasising the importance of understanding the organisation as a whole, rather than focusing on individual parts in isolation (Bertalanffy, 1968). This holistic approach recognises that all components within the organisation are interconnected and interdependent, influencing one another through feedback loops (Katz & Kahn, 1978). Therefore, outputs from one subsystem become inputs for another, highlighting the importance of understanding these feedback loops, which can either reinforce or undermine the system's stability (Bertalanffy, 1968).

Furthermore, Kenneth Boulding, a renowned economist, developed general systems theory and applied it to social systems, thereby emphasising the importance of understanding the relationships between different components within an organisation (Boulding, 1956). In applying the systems theory, Ezeani (2005) noted that one of the pivotal aspects of this theoretical framework is its emphasis on input-output analysis. This analysis underscores the intricate relationships between the various components of a system and their corresponding effects on overall system performance. Thus, inputs refer to the resources, energies, or stimuli introduced into a system to facilitate its operation and also generate outcomes. In contrast, outputs are end results, services, or consequences emanating from the processes of the system. Notably, outputs from one subsystem or process can serve as inputs for another, illustrating the interconnected and dynamic nature of systems, where the outcomes of one process can become the precursors for subsequent processes.

Therefore, by adopting systems theory, our study aims to analyse the complex interactions between the digital skill-up training program, the pharmacists' performance, and the organisational context within the University of Nigeria, Teaching Hospital Enugu (UNTH). This holistic approach will provide a comprehensive understanding of the factors influencing the effectiveness of the training program and its impact on pharmacists' performance.

Methodology

Research Design

This study employed a cross-sectional research design, which allowed for the collection of data from a large number of individuals at a single point in time. This approach enables researchers to observe variables without manipulating them, providing a snapshot of the relationship between outcome and exposure variables. Unlike case-control or cohort studies, participants in this cross-sectional study were selected based on predetermined inclusion and exclusion criteria.

Sample Population and Sample Size

The population of the study involved a portion of staff that makes up the total population of the University teaching hospital staff, selected to reflect the characteristics needed in the study from the pharmacy department. Therefore, the total population of staff at the University of Nigeria Teaching Hospital, Enugu, given by the office of the personnel department, UNTH (2023), is estimated at 1225, while the Pharmacy department staff are put at 162. The population of the

pharmacy department is made up of the pharmacists, the pharmacy technicians, the administrative staff, store officers/keepers, and wardens/porters.

Table 1: Pharmacy Staff Population in UNTH, Enugu.

S/N	Designations	Numbers
1	Pharmacists	87
2	Pharmacy technicians	11
3	Administrative staff	40
4	Store officers/keepers	9
5	Warden/porters	15
TOTAL		162

Source: Office of the Personnel, UNTH. (2023).

In order to determine our sample size, we stratified UNTH, Enugu, into forty-one departments, from which the purposive sampling method was used in selecting the pharmacy department due to its corresponding characteristics for the study. Determining the sample size from here, we adopted Taro Yamane's 1973 formula for sample size determination.

$$n = \frac{N}{1+(r)^2}$$

Where;

n = the required sample size

1 = constant

N = the total population

r = level of significance at 95% confidence interval given as 0.05

$$n = \frac{162}{1+162(0.05)^2}$$

$$n = \frac{162}{1+162(0.0025)}$$

$$n = \frac{162}{1+0.405}$$

$$n = \frac{162}{1.405}$$

$$n = 115$$

Area of Study

The study area covered the University of Nigeria Teaching Hospital but with specific reference to the Pharmacy department of the health institution. The health institution built by the Nigerian colonial administration became a general hospital after independence and later a specialist hospital in 1970. It was handed over to the University of Nigeria to manage in 1974 by the then-military Head of State, making the health institution an independent hospital with an autonomous management board. The pharmacy department of the health institution which is the focus of this study is made up of twenty three units namely: Administrative pharmacy units, Accident and Emergency (casualty) pharmacy, children and out patients (CHOP) pharmacy, Dermatology, Ear, Nose and Throat (Skin/ENT) pharmacy, Drug information Centre, General Outpatient (GOPD) Pharmacy, HIV/Special Clinic Pharmacy, In patient Medical Pharmacy, In-Patient Surgical Pharmacy, Intensive Care/Cardiothoracic Unit (ICU/CTU) Pharmacy, National Insurance Scheme (NHIS) Pharmacy, Oncology Pharmacy, Clinical Pharmacy, Pharmacy Therapeutics, Pharmacy Main Stores, Pharmacy Sub Store 1 (injective and Surgical Consumables), Pharmacy Sub Store 11 (Non-parental dosage forms), Quality Control Unit, Theatre Pharmacy, Compounding Units, Medical Out Patient (MOP) Pharmacy, Unit Dose Dispensing System (UDOS) pilot scheme. The digital skill-up training was conducted for pharmacists in the above units; hence, a focus on the units would aid in eliciting the relevant information from targeted respondents. Taking cognisance of these areas, it was hypothesised as follows:

1. The training of pharmacists on the usage of emails and Google enhanced quality service delivery in UNTH Enugu.
2. The training on the use of new technologies, such as computers, enhanced the accuracy of drug records and sales in UNTH Enugu.
3. The strategies implemented can improve training on the use of medical equipment in the dispensing of drugs by pharmacists in UNTH Enugu.

Research tool

In order to gather data, a close-ended, structured, self-administered questionnaire was created as it was thought to be simple to handle, cost-effective and have a high response rate. In addition, the structured questionnaire was designed based on a 5-point Likert scale with 5 = Strongly Disagree (SA); 4 = Disagree (D); 3 = Neutral (N); 2 = Agree (A); 1= Strongly Agree (SA)

Method for Gathering Data

The study's primary data came from a field survey. Data were gathered from the hospital's twenty-three units on various days and times of the week. In the vast majority of the time, participants answered the questionnaire at their convenience, and the fieldworkers collected it at a scheduled time. The respondents were made aware of the study's objectives, and their participation was voluntary because no incentives were provided. Between September and October 2022, the main survey was administered on campus, resulting in the distribution of 115 questionnaires altogether.

Presentation of Findings

Hypothesis One

H₀₁: There is no significant difference between the responses of male and female pharmacists on how training on the usage of emails and Google has enhanced the quality of service delivery of pharmacists in UNTH Enugu

Table 1: Mean and Standard Deviation of Responses of Respondents on how Training on the use of Emails and Google has Enhanced the Quality-of-Service Delivery of Pharmacists in UNTH Enugu

S/No.	Item description	$\bar{X}$	Std. Dev.	Remark
1	Training on the use of emails and Google enhance quality communication among pharmacists.	3.29	0.62	Agree
2	A pharmacist's competency is enhanced through the use of emails and Google.	3.46	0.50	Agree
3	Enhanced communication service of the pharmacist has ensured efficiency and effectiveness.	2.61	0.67	Agree
4	The training on the use of emails and Google enhances effective service delivery.	2.45	0.57	Disagree
5	Has the training on the use of emails and Google ensured accountability among pharmacists?	3.03	0.54	Agree
Grand Mean and Standard Deviation		3.09	0.39	Agree

Note: $\bar{X}$ = Mean, Std. Dev. = Standard Deviation

Source: Field Study 2023.

The data presented in Table 1 shows the mean responses and standard deviation ($\bar{X}$ and Std. Dev.) of respondents on how training on the use of emails and Google has enhanced the quality of communication services of pharmacists in UNTH Enugu. The table revealed that item statements 1, 2, 3, and 5 had their mean ranged from 2.61 – 3.46, indicating that the respondents agreed that the training on the usage of emails and Google has enhanced the quality of service delivery of pharmacists in UNTH Enugu. However, item statement 4 had a mean of 2.45, indicating that the respondents disagreed that the training on the use of emails and Google enhances effective service delivery.

In addition, the standard deviation values ranged from 0.50 – 0.67, which were below 1.50, indicating that the respondents were close to each other in their opinions and that their responses are not far from the mean.

Hypothesis Two

H₀₂: There is no significant difference among the responses of respondents on how training on the use of new technologies, such as computers, enhances the accuracy of drug records and sales in UNTH Enugu based on their educational qualification.

Table 2: Mean and Standard Deviation of responses on how training on the use of new technologies, such as computers, enhances the accuracy of drug records and sales in UNTH Enugu

S/No.	Item description	$\bar{X}$	Std. Dev.	Remark
1	Training on the use of new technologies ensures accuracy of drug records and sales in UNTH Enugu	2.18	0.84	Disagree
2	Drug sales get better with the training and re-training of pharmacists on digital skills.	3.17	0.78	Agree
3	The University of Nigeria Teaching Hospitals organises seminars that provide pharmacists with digital training on digital skills.	2.47	0.79	Disagree
4	Pharmacists in UNTH are granted permission to attend professional courses and other training to improve their skills and performance	2.37	0.79	Disagree
5	Regular digital training on emerging technologies are organized for pharmacists in UNTH.	2.52	0.60	Agree
Grand Mean and Standard Deviation		2.54	0.49	Agree

Note: $\bar{X}$ = Mean, Std. Dev. = Standard Deviation

Source: Field Study 2023.

The data presented in Table 2 showed the mean responses and standard deviation ($\bar{X}$ and Std. Dev.) of respondents on how training on the use of new technologies, such as computers, enhances the accuracy of drug records and sales in UNTH Enugu. The table revealed that item statements 2 and 5 had mean ranges from 2.52 – 3.17, indicating that the respondents agreed they being trained on the use of new technologies, such as computers, enhances the accuracy of drug records and sales in UNTH Enugu. However, item statements 1, 3 and 4 had a mean of ranged from 2.18 to 2.47, indicating that the respondents disagreed that the training on the use of new technologies such as computers enhances the accuracy of drug records and sales in UNTH Enugu. In addition, the standard deviation values ranged from 0.60 – 0.84, which were below 1.50, indicating that the respondents were close to each other in their opinions and that their responses are not far from the mean.

Table 5: Post-hoc Analysis of Differences in Perceived Strategies for Improving Pharmacist Training at UNTH Enugu Based on Years of Experience

Scheffe

(I) Year of Experience	(J) Year of Experience	Mean Difference (I-J)		Sig.	95% Confidence Interval	
			Std. Error		Lower Bound	Upper Bound
1-5 years	6-10 years	-.27085	.11946	.168	-.6100	.0683
	11-15 years	-.19524	.11724	.432	-.5281	.1376
	16 and above	-.66667*	.19430	.010	-1.2182	-.1151
6-10 years	1-5 years	.27085	.11946	.168	-.0683	.6100
	11-15 years	.07561	.09562	.890	-.1958	.3471
	16 and above	-.39582	.18206	.199	-.9127	.1210
11-15 years	1-5 years	.19524	.11724	.432	-.1376	.5281
	6-10 years	-.07561	.09562	.890	-.3471	.1958
	16 and above	-.47143	.18062	.084	-.9842	.0413
16 and above	1-5 years	.66667*	.19430	.010	.1151	1.2182
	6-10 years	.39582	.18206	.199	-.1210	.9127
	11-15 years	.47143	.18062	.084	-.0413	.9842

*. The mean difference is significant at the 0.05 level.

Post-hoc analysis with the Scheffe test of multiple comparisons in Table 9 is used to show the direction of the significant difference in the mean ratings of the responses of the three groups of respondents on the grand mean of Table 8. Post-hoc analysis using the Scheffe post-hoc criterion for significance, as shown in Table 9, indicates that there is a significant mean difference between responses of pharmacists with 1-5 years of experience and pharmacists with 16 years of work experience and above, $p = .010$.

Discussion of Findings

The finding herein uncovers a complex and rather conflicted pharmacist-performance link with digital skill-up training at UNTH Enugu. At face value, the training is effective in building specific communication competencies. The Pharmacists sampled largely agreed that email and Google competencies enhanced intra-professional communication (Mean=3.29) and personal competency (Mean=3.46). This accords with arguments of Celik & Ölçer (2018), who state that digital tools, especially emails, foster collaborative efficacy. This validates the Systems Theory approach, where training (input) positively impacts communication subsystems. However, this localised outcome was not reproduced in more general organisational outcomes. It is important to note that significantly, pharmacists disagreed that the identical skills enhanced service delivery (Mean=2.45), demonstrating a critical disparity or disconnection between individual competency and systemic performance. This dissonance problematises deterministic assumptions that digital literacy automatically yields organisational effectiveness, suggesting instead that UNTH's

sociotechnical infrastructural workflows, incentive systems, or resource allocation lack the integration mechanisms to translate individual competencies into collective outcomes. As such, the training functioned as an isolated intervention rather than an embedded component of the organisational system and thus was an insufficient catalyst for change.

Furthermore, inconsistencies can be seen in Hypothesis Two's findings regarding the impacts of computer training on core pharmaceutical functions. The results revealed that Pharmacists concurred that retraining would improve drug record accuracy (Mean=3.17), but vehemently rejected that the actual training provided achieved this outcome (Mean=2.18). This division between potential and actualised beneficial effect highlights extreme implementation failure. Negative attitudes also extend to institutional support structures, as the contention that pharmacists can receive external training (Mean=2.37) or that UNTH provides adequate seminars (Mean=2.47) indicates system-level barriers to continuous skill development. This is in line with Anusi & Mutambara's (2022) research into healthcare systems struggling with technology change implementation. The Systems Theory point of view illuminates this failure, as feedback loops between training, practice, and system development are broken. Outputs (pharmacists trained) were not effectively recycled as inputs (incorporation of knowledge into drug management systems), leading to ineffective system performance. Hence, the marginal endorsement for intensive digital training (Mean=2.52) is less indicative of endorsement and more suggestive of aspiration, reflecting unmet institutional commitment to sustainable digital capacity building.

More so, the post-hoc evaluation of significant differences by experience (1-5 years vs. 16+ years) adds another level of complexity. Veterans and early-career pharmacists were more optimistic about strategies for improvement. This dichotomy may be explained by generational familiarity with technology, differences in institutional support expectations, or veterans' increased acknowledgement of institutional inertia. Thus, meaning that digital transformation disproportionately influences cohorts of labour, generating intergenerational tension. Organizationally, this means a one-size-fits-all training approach ignores diverse demands along career stages, potentially degrading program quality and morale. If young pharmacists, who are digital natives, perceive fewer constraints while the older colleagues, who tend to occupy leadership or mentorship roles, are more conservative, the organisational cycle of learning is disrupted. This intra-professional digital divide might hinder innovation diffusion and knowledge transfer, further limiting systemic benefits to training investments.

Therefore, it is safe to say that these findings uncover a deeper conflict within the organisation. This is because, while digital competencies have exemplifiable potential for pharmacy practice, realisation as quantifiable performance betterment at UNTH is moderated by underappreciated organisational, structural, and experiential variables. The training improved atomised competence (emailing) but did not influence higher-order outcomes (service delivery, record accuracy) because it was divorced from the workflows, accountability mechanisms, and continuous learning systems necessary for sustained transformation. This means that technology itself cannot drive healthcare enhancement without process redesign support. More so, the negative rating of institutional support (externally granted permissions, seminar quality) reflects a basic

deficiency in organisational digital culture, a metric increasingly recognised as crucial for proper digital transformation. The UNTH, Enugu's approach to training appears more techno-centric than socio-technical, with a focus on tool skills at the cost of the facilitating environment necessary to allow those tools to transform practice.

These findings challenge the conventional wisdom that digital skills interventions always yield positive results, revealing that developing digital skills does not necessarily lead to improved performance without the presence of supportive systemic factors, validating the Systems Theory proposition that subsystem improvements (e.g., digital skills) don't automatically translate to system-wide benefits. Second, the findings highlight context-specific barriers in resource-constrained settings like Nigeria's public healthcare, where the need for digital systems to improve workflow is compounded by infrastructural deficits. Therefore, it is believed that digital training programs, although necessary, are insufficient on their own. Their true value lies in being part of a broader ecosystem that includes supportive infrastructure and a culture of readiness. Without this integrated approach, even well-designed initiatives may have limited impact, failing to drive meaningful change.

Conclusion

This study reveals a disjunctive relationship between digital skills acquisition and performance outcomes among UNTH Enugu pharmacists. Despite training having greatly enhanced skills in digital communication tools like email and Google use, these improvements did not generalise to the overall organisational outcomes. As a result, service delivery remained unchanged, and drug records did not see a significant improvement. This paradox is a result of the isolation of the training program from the operational context of UNTH. As such, gaps in the feedback loops: the output (trained pharmacists) isn't being utilised as input to inform and improve the system (institutional knowledge sharing). Meanwhile, institutional barriers like limited seminars, restricted external training opportunities, and undifferentiated curricula hinder the translation of individual skills into overall system performance. More so, generational variations in digital readiness create intra-professional friction, further inhibiting knowledge spillover. This approach renders the program a technocentric intervention, rather than a holistic sociotechnical transformation that incorporates essential elements like workflow integration, accountability frameworks, and cultural enablers. These elements are crucial for driving sustainable change in resource-constrained environments, such as Nigeria's health sector.

Recommendations

Based on the findings of the study, the study recommends the following;

1. **Reconceptualization of UNTH Training Approach:** There should be a reconceptualisation of the UNTH training approach from a technocentric approach to a sociotechnical approach. This will breach the gap between digital skill and tangible performance outcomes.
2. **Developing Specific Training for Specific Staff Groups:** There is a need to design digital training programmes for early-career pharmacists, advanced digital technologies relevant

to their practice, while older pharmacists would require targeted programs on entry-level digital programmes. This approach would leverage the strengths of both groups in enhancing institutional knowledge and reducing resistance to technological change.

3. **Policy Advocacy for National Standards: The Federal Ministry of Health should set up standards that must be adopted by every health institution** to mandate context-sensitive digital literacy benchmarks for teaching and non-teaching hospitals.

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Competing Interests

The authors have declared that no competing interest exists.

Authors' Contributions

Obi, Doris Eberechukwu, is responsible for writing the original article, data collection and interpretation. Professor Okey Ikeanyibe is the supervisor, responsible for reviewing and editing and formal assessment of the article. Akaose, Chikwere Innocent, is the corresponding author, responsible for data analysis, reviewing and editing the article and formally assessing it.

Ethical Considerations

Permission for the study was obtained from the UNTH ethical committee before the commencement of the research. The participants were informed about the nature of this research and the purpose thereof, as well as given the assurance of the confidentiality of their responses and anonymity of their identity. In addition, the participants were informed of their right to withdraw from participation should they feel uncomfortable during the study. The participants were further assured and guaranteed that the data to be gathered would be purely for academic purposes.

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Data Availability

The data supporting the findings of this study are available upon request from the lead and corresponding authors.

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