JRIIE Journal of Research Innovation and Implications in Education
Center for Research Implications & Practice

Website: www.jriiejournal.com ISSN 2520-7504 (Online) Vol.10, Iss.3, 2026 (pp. 209 - 223)

Influence of Capacity Building on the Implementation of Telemedicine Projects in Penda Medical Centre in Nairobi County, Kenya

[1]Gloria Kemunto Moranga,[1]Calistus Luhombo Adema, & [2]Edwin A. B. Juma, PhD
[1]The Catholic University of Eastern Africa, Kenya
[2] Karatina University, Kenya
Email: kemunto.gloria.m@gmail.com

Abstract: *Despite increasing adoption, the performance of telemedicine projects in many developing countries remains suboptimal, limiting their potential to enhance healthcare accessibility, efficiency, and sustainability. This study examined the influence of capacity building on the implementation of telemedicine projects in Penda Medical Centre in Nairobi County, Kenya. The study was anchored on Technology Acceptance Model and adopted a convergent parallel research design. The target population was 560 telemedicine users and 5 key informants, from which a sample of 238 respondents was drawn using stratified simple random sampling and purposive sampling. Data were collected using structured questionnaires and interview guides. Quantitative data were analyzed using SPSS through descriptive (frequency, percentage, mean and standard deviation), and inferential statistics (Pearson Product-Moment Correlation Analysis and Simple Linear Regression Analysis), while qualitative data were thematically analyzed. The study found that capacity building plays a critical role in telemedicine project performance, with training and continuous skills development improving staff competence, service quality, and operational efficiency. Inferential results, pearson correlation analysis showed a significant positive relationship between capacity building and the implementation of telemedicine projects, while simple linear regression analysis established that capacity building was a positive and statistically significant predictor of telemedicine project implementation ($\beta = 0.301$, $p < 0.001$). The study concludes that effective capacity building significantly enhances telemedicine project performance. It recommends strengthened continuous capacity building to enhance telemedicine sustainability. Further research should explore patient-centered adoption dynamics in private healthcare settings.*

Keywords: *Capacity building, implementation of telemedicine projects, Penda Medical Centre in Nairobi County, Kenya.*

How to cite this work (APA):

Moranga, G. K., Adema, C. L. & Juma, E. A. B. (2026). Influence of Capacity Building on the Implementation of Telemedicine Projects in Penda Medical Centre in Nairobi County, Kenya. *Journal of Research Innovation and Implications in Education, 10*(3), 209 – 223. **https://doi.org/10.59765/cxt64k**

1. Introduction

Telemedicine refers to the use of audio, video, and other telecommunications technologies to provide healthcare services and support healthcare professionals at distant locations (Haleem et al., 2021). The implementation of telemedicine projects involves the adoption and integration of digital health technologies to improve healthcare accessibility, efficiency, and quality of service delivery (Anawade et al., 2024). However, the successful implementation of telemedicine depends not only on technological infrastructure but also on the capacity of healthcare workers to effectively utilize these technologies (Kho et al., 2020).

Capacity building, which entails enhancing the knowledge, skills, and competencies of healthcare providers through training, mentorship, and continuous professional development, is a critical factor in the

implementation of telemedicine projects (World Health Organization. 2022). Globally, according to Zhou et al., (2020) have invested heavily in capacity-building initiatives to equip healthcare professionals with digital skills necessary for telemedicine adoption. Studies have shown that healthcare institutions with well-trained staff are more likely to achieve successful telemedicine implementation, improved service delivery, and higher user satisfaction (Baylak, 2020).
In Africa, telemedicine adoption is expanding, although challenges related to inadequate training and limited digital competencies persist. Countries such as Ghana, Nigeria, and South Africa have implemented capacity-building programmes to improve healthcare workers' ability to use telemedicine technologies effectively (Azalekor, 2024). Similarly, East African countries, including Tanzania, have strengthened telemedicine implementation through healthcare worker training and technical support, although gaps in digital skills remain a challenge (Chubwa, 2024).

In Kenya, the adoption of telemedicine has been supported by increased mobile phone penetration, improved internet connectivity, and government policies promoting digital health. The Kenya Health Policy 2014–2030 emphasizes the integration of information and communication technologies in healthcare and the need to strengthen healthcare workers' digital competencies (Anyonje, 2022). Despite these efforts, challenges such as inadequate continuous training and varying levels of technological proficiency among healthcare providers continue to affect telemedicine implementation (Koech, 2024).

Penda Medical Centre has embraced telemedicine as part of its strategy to enhance healthcare accessibility and efficiency. However, the successful implementation of telemedicine projects at the facility largely depends on the capacity of healthcare workers to effectively utilize digital technologies. Despite the growing importance of telemedicine, limited empirical evidence exists on how capacity building influences the implementation of telemedicine projects at Penda Medical Centre in Nairobi County, Kenya. Therefore, this study seeks to examine the influence of capacity building on the implementation of telemedicine projects at Penda Medical Centre in Nairobi County, Kenya.

1.1 Statement of the Problem

Telemedicine has become an important innovation in healthcare delivery by improving access to healthcare services, reducing geographical barriers, and enhancing the efficiency and continuity of care (Were, 2023). To realize these benefits, healthcare institutions are increasingly investing in telemedicine projects and strengthening the capacity of healthcare workers through training and skills development to ensure effective implementation (World Health Organization, 2021). In Kenya, Penda Medical Centre has adopted telemedicine through initiatives such as the Pigia Penda Telemedicine Service, which provides virtual consultations, medical advice, and prescriptions, as well as the Home Delivery Solutions Program that facilitates the delivery of prescribed medications to patients (Penda Medical Centre, 2022).

Despite these initiatives, the implementation of telemedicine projects at Penda Medical Centre continues to face challenges. Inadequate training, limited digital competencies among healthcare providers, and insufficient continuous professional development have constrained the effective utilization and integration of telemedicine services. As a result, the uptake and use of telemedicine services remain below expectations, with many patients and healthcare providers still relying on conventional face-to-face consultations (Were, 2023). Similarly, a study by MyPocketDoctor Kenya (2021) found that although approximately 50% of healthcare providers had adopted telemedicine, 83.5% reported that virtual consultations accounted for less than 25% of their patient interactions, indicating low utilization of telemedicine services.

If these capacity gaps persist, telemedicine projects may fail to achieve their intended objectives of improving healthcare accessibility, efficiency, and quality of care. While previous studies have largely focused on technological and infrastructural aspects of telemedicine, limited empirical evidence exists on how capacity building influences the implementation of telemedicine projects in private healthcare institutions in Kenya. Therefore, this study sought to examine the influence of capacity building on the implementation of telemedicine projects at Penda Medical Centre in Nairobi County, Kenya.

1.2 Research Hypothesis

H_0: Capacity building has no significant influence on the implementation of telemedicine projects at Penda Medical Centre in Nairobi, Kenya.

H_1: Capacity building has a significant influence on the implementation of telemedicine projects at Penda Medical Centre in Nairobi, Kenya.

2. Literature Review

Capacity building is a critical factor in the successful implementation of telemedicine projects as it enhances the knowledge, skills, and competencies required by both healthcare providers and patients to effectively use digital health technologies (Mantziari et al., 2021). It encompasses patient education, staff training, and knowledge transfer, all of which contribute to improved adoption, utilization, and sustainability of telemedicine services (Paleari et al., 2022). Patient education increases

awareness and confidence in using telemedicine platforms, while staff training equips healthcare professionals with the technical and clinical skills needed for virtual healthcare delivery. Knowledge transfer ensures that best practices and experiences are shared across healthcare teams, promoting continuous improvement and sustainability (Latifi et al., 2021).

In developed countries, capacity building has significantly enhanced telemedicine implementation. In the United Kingdom, patient education programs under NHS Digital improved telemedicine acceptance by providing multimedia learning resources that enabled patients to understand virtual consultation processes and telemedicine platforms, resulting in increased patient satisfaction and reduced technical challenges during consultations (Shaw et al., 2021). Similarly, in Germany, structured training programs on digital health platforms, remote patient monitoring, and virtual consultations improved healthcare providers' competencies and increased the effectiveness of telemedicine services (Peine et al., 2020).

In Asia, Japan has successfully implemented knowledge transfer initiatives through collaborations between urban and rural healthcare facilities. Through virtual mentoring, case conferences, and shared clinical protocols, healthcare providers in remote areas gained the expertise needed to offer specialized telemedicine services, thereby improving healthcare access and service quality (Jha et al., 2021). In Africa, capacity building has also played an essential role in advancing telemedicine. In Nigeria, patient education programs delivered through mobile technologies improved health literacy and enhanced patients' understanding and acceptance of telemedicine services, particularly in rural communities (Ibeneme et al., 2020). In South Africa, healthcare facilities have invested in staff training programs focusing on digital health tools and remote consultation skills, leading to improved healthcare delivery and increased confidence among healthcare workers (Dodoo et al., 2022). Likewise, Morocco and Ethiopia have strengthened telemedicine through knowledge transfer initiatives that promote mentorship, skills sharing, and continuous learning among healthcare providers (Sagaro et al., 2020). In East Africa, Uganda and Tanzania have prioritized capacity building through patient education and staff training programs aimed at improving digital literacy and telemedicine competencies among healthcare providers and patients (Kabukye et al., 2023; Ngowi et al., 2024). These initiatives have enhanced healthcare accessibility and strengthened the implementation of telemedicine services.

In Kenya, capacity building remains central to telemedicine implementation. Counties such as Mombasa, Kisumu, and Nakuru have invested in patient awareness programs, healthcare worker training, and knowledge-sharing initiatives to strengthen digital health competencies and improve telemedicine service delivery (Rashid, 2021; Gombe, 2023; Were, 2023). These experiences demonstrate that continuous training, patient education, and effective knowledge transfer are essential for enhancing the implementation and sustainability of telemedicine projects. However, limited empirical evidence exists on how capacity building influences the implementation of telemedicine projects at Penda Medical Centre in Nairobi County, Kenya, thereby necessitating this study.

2.2 Theoretical Framework

The study was guided by Technology Acceptance Model which offer a comprehensive lens for examining influence of capacity building on the implementation of telemedicine projects in penda medical Centre in Nairobi County, Kenya.

2.2.1 Technology Acceptance Model

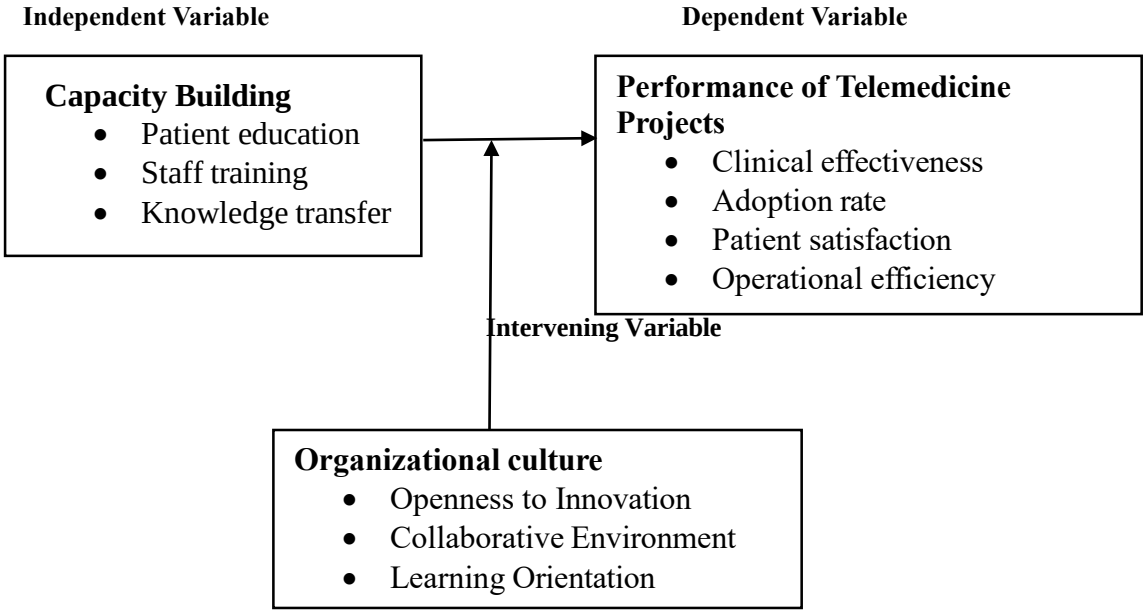
The Technology Acceptance Model (TAM) was developed by Davis (1986) to explain how individuals accept and use new technologies. The model proposes that technology adoption is influenced by two key factors: perceived usefulness, which refers to the extent to which users believe that a technology improves their performance, and perceived ease of use, which refers to the degree to which the technology is considered easy to use (Davis, 1989).

The model is applicable to this study because the successful implementation of telemedicine projects depends on healthcare providers' acceptance and use of telemedicine technologies. Capacity building plays an important role in enhancing users' digital skills and confidence, thereby improving their perceptions of the usefulness and ease of use of telemedicine systems. As healthcare workers become more competent in using telemedicine platforms, they are more likely to adopt and utilize them effectively.

Although TAM has been criticized for focusing primarily on individual perceptions while giving less attention to organizational factors such as leadership and infrastructure (Bagozzi, 2007), it remains a suitable theory for this study because it explains how capacity building influences healthcare workers' acceptance and utilization of telemedicine technologies at Penda Medical Centre.

2.2.2 Conceptual Framework

The figure below presents the conceptual framework of the study. The independent variable is capacity building while the dependent variable is the implementation of telemedicine projects.
The study has also noted the moderating variable, which is not the focus of the study.



Source: Researcher (2026)

3. Methodology

3.1 Research Design

This study adopted a convergent parallel research design that integrated both quantitative and qualitative approaches to provide a comprehensive understanding of the influence of capacity building on the implementation of telemedicine projects at Penda Medical Centre in Nairobi County, Kenya. The quantitative component enabled the researcher to establish the relationship between capacity building and telemedicine project implementation, while the qualitative component provided in-depth insights from key informants regarding the implementation process. Data from both approaches were collected concurrently, analyzed separately, and integrated during interpretation to provide a more comprehensive understanding of the study phenomenon.

3.2 Sampling and Samples

The target population comprised 560 adult outpatient patients utilizing telemedicine services at Penda Medical Centre and five key informants involved in the implementation and management of telemedicine services. The patient population included male and female patients aged 18 years and above who had accessed telemedicine services at least once during the study period and were drawn from the various areas served by Penda Medical Centre within Nairobi County. Using Slovin's formula, a sample size of 233 outpatient patients was obtained, while the five key informants were selected purposively. Stratified random sampling and simple random sampling techniques were used to select patient respondents, whereas purposive sampling was used to select key informants based on their roles and expertise in telemedicine implementation.

The inclusion criteria for patient respondents were adult outpatients aged 18 years and above who had utilized telemedicine services at Penda Medical Centre at least once during the study period, resided within Nairobi County, and voluntarily consented to participate in the study. Key informants comprised healthcare providers and administrative personnel directly involved in the planning, management, or implementation of telemedicine projects. The exclusion criteria included patients below 18 years of age, emergency patients requiring immediate medical attention, long-term admitted inpatients, patients who had never utilized telemedicine services at Penda Medical Centre, patients residing outside Nairobi County, individuals who were too ill to participate, and those who declined to provide informed consent.

3.3 Data Collection Tools

The study utilized a structured questionnaire to collect quantitative data from outpatient respondents and a key informant interview guide to collect qualitative data from healthcare providers and administrative personnel involved in telemedicine implementation.

3.4 Validity of the Instruments

To ensure the validity of the data collection instruments, this study assessed content validity, construct validity, and face validity. Content validity was established using the Content Validity Index (CVI). A panel of experts comprising university supervisors and professionals

knowledgeable in health systems, telemedicine, and research methodology reviewed the questionnaire and interview guide to assess the relevance, clarity, and representativeness of each item in relation to the study constructs.
The validity of the questionnaire was determined using the Item-Level Content Validity Index (I-CVI), computed by dividing the number of experts who rated each item as relevant (scores of 3 or 4 on a four-point relevance scale) by the total number of experts involved in the validation process (Kipli & Khairani, 2020). Thereafter, the Scale-Level Content Validity Index (S-CVI) was computed as the average of all I-CVI values across the instrument.

According to the criteria established by Lynn in 1986 and Polit and Beck in 2006, an I-CVI of at least 0.78 and an S-CVI of 0.80 or above indicate acceptable content validity. The instruments used in this study attained an overall S-CVI of at least 0.80, confirming that the questionnaire items were relevant, clear, and adequately represented the constructs of capacity building and implementation of telemedicine projects (Rokeman & Kob,2024). During the pilot study, respondents were also requested to comment on the clarity, wording, and interpretability of the questionnaire items. Any ambiguous or unclear statements identified during the pilot exercise were revised to improve comprehensibility and ensure that the instruments accurately measured the intended variables.

3.5 Reliability of the Instruments

Reliability refers to the degree to which a research instrument consistently measures the variables under investigation and produces dependable results when administered under similar conditions (Ahmed & Ishtiaq, 2021). In this study, the reliability of the questionnaire was assessed using Cronbach's Alpha (α) coefficient following a pilot study conducted among respondents who possessed characteristics similar to those of the study population but were excluded from the main study.

According to Kumar (2024), a Cronbach's Alpha coefficient of 0.70 or higher is considered acceptable for social science research. The results show that capacity building and performance of telemedicine projects recorded a Cronbach's Alpha of 0.85 and 0.91 respectively signifying good reliability across items. These results demonstrate that the questionnaire items were well-structured, coherent, and suitable for measuring the intended constructs. Consequently, the instrument was deemed statistically sound and appropriate.

3.6 Data Collection Procedure

Ethical approval was first obtained from the relevant University Institutional Ethics Review Committee, followed by the acquisition of a research permit from the National Commission for Science, Technology and Innovation (NACOSTI). Permission to conduct the study was subsequently sought from the management of Penda Medical Centre. Eligible outpatient respondents were identified with the assistance of the facility staff and selected using the prescribed sampling procedures. After obtaining informed consent, the researcher administered structured questionnaires to the sampled respondents, who completed them during their visit to the facility. The completed questionnaires were collected immediately after completion to minimize non-response. Key informant interviews were conducted at mutually convenient times using an interview guide. With participants' consent, interviews were audio-recorded to ensure accurate capture of information, while field notes were also taken to supplement the interview data.

3.7 Data Analysis

Quantitative data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS) Version 30. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' characteristics and study variables. Inferential statistics comprising Pearson's correlation analysis and simple linear regression analysis were employed to determine the relationship between capacity building and the implementation of telemedicine projects. Pearson's correlation analysis established the strength and direction of the relationship between the variables, while simple linear regression determined the extent to which capacity building predicted the implementation of telemedicine projects.
The simple linear regression model was specified as:
$Y=\beta_0+\beta_1X_1+\varepsilon$

Where:
Y = Implementation of telemedicine projects
β_0 = Regression constant (intercept)
β_1 = Regression coefficient for capacity building
X_1 = Capacity building
ε = Error term representing unexplained variation in the implementation of telemedicine projects.
The regression coefficient (β_1) was tested at the 5% level of significance ($\alpha=0.05$). The null hypothesis was rejected if the p-value was less than 0.05, indicating that capacity building had a statistically significant influence on the implementation of telemedicine projects. Qualitative data were analyzed thematically, and the findings were presented narratively and supported by verbatim quotations to enrich and complement the quantitative results.

3.8 Ethical Considerations

Ethical considerations are essential in safeguarding participants' rights, ensuring the credibility of research findings, and maintaining the integrity of the research process (Pizzolato & Dierickx, 2021). Prior to data

collection, ethical approval was obtained from the relevant University Institutional Ethics Review Committee. Thereafter, a research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). Permission to conduct the study was also sought from the management of Penda Medical Centre.

The researcher obtained informed consent from all participants before their involvement in the study. Participants were provided with adequate information regarding the purpose of the study, data collection procedures, potential benefits and risks, and their right to voluntarily participate or withdraw from the study at any stage without any penalty.

Confidentiality and anonymity were strictly maintained throughout the study. Participants' names and other personal identifiers were not captured on the questionnaires or interview guides; instead, identification codes were used. All information obtained from participants was treated with the highest level of confidentiality and used solely for academic purposes. The collected data were securely stored in password-protected electronic files and locked storage facilities accessible only to the researcher.

The study also upheld the principles of honesty, objectivity, and academic integrity by ensuring that all sources of information were appropriately acknowledged and that no fabrication, falsification, plagiarism, or other forms of research misconduct occurred during the research process.

4. Results and Discussion

Out of the targeted 238 respondents, 223 participated in the study, yielding an overall response rate of 93.7%. Specifically, 218 out of 233 patients completed the questionnaires (93.6%), while all the five key informants participated in the interviews (100%). The high response rate indicates that the data collected were adequate and suitable for analysis.

Table 1: Aspect of Capacity Building

n=218

Statements	SD % F	D % F	N % F	A % F	SA % F	Mean	Std Dvt
I receive adequate education on how to access and use telemedicine services at Penda Medical Centre.	8 (3.7)	18 (8.3)	30 (13.8)	110 (50.5)	52 (23.9)	4.02	0.93
Healthcare providers provide clear guidance on the use of telemedicine services.	10 (4.6)	20 (9.2)	28 (12.8)	105 (48.2)	55 (25.2)	4.01	0.95
I receive sufficient information and awareness about telemedicine during my healthcare visits.	12 (5.5)	25 (11.5)	32 (14.7)	95 (43.6)	54 (24.8)	3.93	0.99
Healthcare providers appear well-trained to conduct telemedicine consultations effectively.	15 (6.9)	28 (12.8)	35 (16.1)	90 (41.3)	50 (22.9)	3.86	1.01
Healthcare providers demonstrate adequate knowledge and skills when using telemedicine technologies.	10 (4.6)	20 (9.2)	30 (13.8)	105 (48.2)	53 (24.3)	4.00	0.94
Healthcare providers rarely experience difficulties when using telemedicine technologies during consultations.	12 (5.5)	22 (10.1)	28 (12.8)	105 (48.2)	51 (23.4)	3.97	0.95
Healthcare providers adequately address my questions and concerns regarding telemedicine services.	8 (3.7)	18 (8.3)	35 (16.1)	105 (48.2)	52 (23.9)	4.01	0.91
Healthcare providers regularly share important information and updates regarding telemedicine services.	10 (4.6)	20 (9.2)	30 (13.8)	100 (45.9)	58 (26.6)	4.03	0.96
I am usually provided with complete information about telemedicine services whenever I seek clarification.	12 (5.5)	25 (11.5)	32 (14.7)	95 (43.6)	54 (24.8)	3.93	0.99

Healthcare providers possess adequate competencies to provide accurate diagnoses through telemedicine consultations.	8 (3.7)	18 (8.3)	28 (12.8)	105 (48.2)	59 (27.1)	4.06	0.91
I am well aware of the telemedicine services offered by Penda Medical Centre due to the information and education provided.	20 (9.2)	35 (16.1)	50 (22.9)	70 (32.1)	43 (19.7)	3.48	1.11
Composite Mean and Standard Deviation						**3.95**	**0.97**

Source: Field Data, 2026

As presented in Table 1, the composite mean of M = 3.95 and a standard deviation of SD = 0.97 indicate that respondents generally agreed that capacity building positively influences the implementation of telemedicine services at Penda Medical Centre. Regarding whether respondents receive adequate education on how to access and use telemedicine services at Penda Medical Centre, 8 respondents (3.7%) strongly disagreed, 18 (8.3%) disagreed, 30 (13.8%) were neutral, 110 (50.5%) agreed, while 52 (23.9%) strongly agreed. The mean score of 4.02 (SD = 0.93) indicates that respondents generally perceived patient education regarding telemedicine access as adequate. The finding suggests that educational initiatives implemented by Penda Medical Centre have enabled most patients to understand how to access telemedicine services, thereby improving their confidence and willingness to utilize the technology.

This finding is consistent with Shaw et al. (2021), who reported that structured patient education significantly improves telemedicine adoption by enhancing users' understanding of digital healthcare platforms. The finding also supports the Technology Acceptance Model, particularly the perceived ease of use construct, which postulates that users are more likely to adopt technology when they perceive it to be easy to understand and operate. Adequate education enables patients to navigate telemedicine platforms with minimal difficulty, thereby increasing acceptance and continued utilization.

The qualitative findings corroborated the quantitative results. Key informants reported that patient education is routinely provided before the first telemedicine consultation to familiarize patients with appointment scheduling, accessing consultation links, and receiving electronic prescriptions. One respondent stated: *"Every patient using telemedicine for the first time is guided through the entire process, including registration, appointment booking, and joining the consultation. This has significantly reduced challenges among first-time users."* (Key Informant 1).
Another respondent added: *"Patients who receive proper orientation become more confident and rarely require assistance during subsequent consultations because they already understand the system."* (Key Informant 3).

Regarding whether healthcare providers provide clear guidance on the use of telemedicine services, 10 respondents (4.6%) strongly disagreed, 20 (9.2%) disagreed, 28 (12.8%) were neutral, 105 (48.2%) agreed, while 55 (25.2%) strongly agreed. The mean score of 4.01 (SD = 0.95) indicates that respondents generally perceived healthcare providers as offering clear guidance during telemedicine consultations. The findings suggest that healthcare providers play a significant role in facilitating effective telemedicine utilization by providing appropriate instructions and technical support throughout the consultation process.

This finding corroborates Peine et al. (2020), who emphasized that effective provider-patient communication is fundamental to successful digital healthcare implementation. The findings also align with the Technology Acceptance Model, whereby clear guidance enhances users' perceived ease of use, making patients more comfortable and confident in utilizing telemedicine services.

The qualitative findings further strengthened this observation. The interviewees explained that healthcare providers deliberately allocate time to explain telemedicine procedures, assist patients experiencing technical difficulties, and ensure that consultations proceed smoothly. One key informant explained: *"Healthcare providers guide patients throughout the consultation, especially elderly patients and first-time users who may not be familiar with digital technologies."* (Key Informant 5).
Another respondent noted: *"Providing clear instructions has reduced consultation interruptions and improved patients' confidence in using telemedicine services independently."* (Key Informant 2).
These qualitative responses demonstrate that provider guidance contributes significantly to improving patients' experiences and promoting sustained utilization of telemedicine services.

Regarding whether respondents receive sufficient information and awareness about telemedicine during healthcare visits, 12 respondents (5.5%) strongly disagreed, 25 (11.5%) disagreed, 32 (14.7%) were neutral, 95 (43.6%) agreed, while 54 (24.8%) strongly agreed. The mean score of 3.93 (SD = 0.99) indicates that respondents generally perceived that adequate information regarding telemedicine is provided during routine healthcare visits. This finding suggests that

healthcare encounters provide important opportunities for creating awareness and encouraging patients to utilize telemedicine services.

The finding agrees with Latifi et al. (2021), who observed that continuous provider-patient communication enhances awareness and acceptance of telehealth services. It also supports the Technology Acceptance Model, whereby continuous dissemination of information improves both perceived usefulness and perceived ease of use. When patients understand the benefits and operational procedures of telemedicine, they are more likely to perceive it as useful and convenient for accessing healthcare services.

The qualitative findings further explained these results. Interview participants reported that healthcare providers routinely introduce telemedicine services during outpatient visits and follow-up consultations. However, they acknowledged that awareness creation remains largely facility-based and has not sufficiently reached the wider community. One respondent stated: *"Most patients become aware of telemedicine when they visit the facility because healthcare providers explain the available virtual consultation services during routine appointments."* (Key Informant 4).
Another key informant added: *"Although we educate patients who visit the hospital, there is still limited public awareness outside the facility. More community sensitization programmes would help increase telemedicine uptake."* (Key Informant 1).

Regarding whether healthcare providers are well trained to conduct telemedicine consultations effectively, 15 respondents (6.9%) strongly disagreed, 28 (12.8%) disagreed, 35 (16.1%) were neutral, 90 (41.3%) agreed, while 50 (22.9%) strongly agreed. The mean score of 3.86 (SD = 1.01) indicates a moderately positive perception of healthcare providers' training in telemedicine service delivery. Although the majority of respondents agreed that providers are adequately trained, the relatively higher proportion of neutral and negative responses suggests that training opportunities may not be consistently provided across all healthcare providers or departments.

This finding implies that capacity-building initiatives have equipped many healthcare providers with the competencies required to conduct telemedicine consultations effectively. However, the variability in responses indicates that additional investment in continuous professional development is necessary to ensure uniform competency across all healthcare personnel involved in telemedicine service delivery.

The finding is consistent with Zhang (2023), who emphasized that continuous professional development is essential for maintaining healthcare providers' competencies in telemedicine delivery due to the rapidly evolving nature of digital health technologies. Similarly, studies have shown that regular training improves healthcare providers' confidence, technical proficiency, and quality of patient care during virtual consultations.

The findings further support the Technology Acceptance Model, particularly the perceived ease of use construct. According to TAM, adequate training increases users' familiarity with technology, making telemedicine platforms easier to operate and consequently enhancing healthcare providers' willingness to utilize them during clinical practice.

The qualitative findings reinforced the quantitative results. Key informants explained that healthcare providers undergo orientation and periodic training before using telemedicine platforms. However, they acknowledged that refresher training is sometimes constrained by limited financial resources, heavy workloads, and frequent technological changes. One participant explained: *"Every healthcare provider receives orientation before using the telemedicine platform, but refresher training is sometimes delayed because of limited resources and competing clinical responsibilities."* (Key Informant 3).

Similarly, another respondent observed: *"Technology keeps changing, so continuous training is necessary. Without regular updates, some staff may struggle to keep pace with new telemedicine features."* (Key Informant 5).

Regarding whether healthcare providers demonstrate adequate knowledge and skills when using telemedicine technologies, 10 respondents (4.6%) strongly disagreed, 20 (9.2%) disagreed, 30 (13.8%) were neutral, 105 (48.2%) agreed, while 53 (24.3%) strongly agreed. The mean score of 4.00 (SD = 0.94) indicates that respondents generally perceive healthcare providers as possessing adequate knowledge and skills in using telemedicine technologies. The findings suggest that healthcare providers are sufficiently competent to operate telemedicine platforms effectively, thereby contributing to improved quality of healthcare delivery.

This finding implies that healthcare providers' technical competence has enhanced patients' confidence in telemedicine consultations while promoting efficient service delivery. Skilled healthcare providers are more likely to utilize telemedicine technologies effectively, resulting in better patient experiences and improved healthcare outcomes.

The finding agrees with Jha et al. (2021), who established that healthcare workers' competence in digital technologies significantly improves the quality, reliability, and effectiveness of telemedicine services. Similarly, competent healthcare providers are more capable of managing virtual consultations, electronic medical records, and digital communication platforms.

The findings are also consistent with the Technology Acceptance Model, whereby increased competence enhances perceived ease of use. As healthcare providers become more familiar with telemedicine technologies, they experience fewer operational challenges, thereby increasing their confidence and willingness to continue using digital healthcare systems.

The qualitative findings supported the quantitative evidence. Interview participants consistently reported that healthcare providers have developed substantial competence through continuous practice, mentorship, and practical experience. One key informant remarked: *"Most healthcare providers have become highly proficient in using telemedicine because they use the system daily and continue learning through experience."* (Key Informant 2).

Another respondent explained: *"Apart from formal training, peer learning and mentorship have greatly improved staff competence in conducting virtual consultations and managing electronic patient records."* (Key Informant 4).

These qualitative responses reinforce the quantitative findings that provider competence has become an important driver of successful telemedicine implementation.

Regarding whether healthcare providers rarely experience difficulties when using telemedicine technologies during consultations, 12 respondents (5.5%) strongly disagreed, 22 (10.1%) disagreed, 28 (12.8%) were neutral, 105 (48.2%) agreed, while 51 (23.4%) strongly agreed. The mean score of 3.97 (SD = 0.95) indicates that respondents generally believe healthcare providers experience relatively few operational difficulties when using telemedicine technologies during consultations. This finding suggests that healthcare providers have acquired sufficient technical competence to operate telemedicine platforms effectively and efficiently.

The findings imply that continuous exposure to telemedicine technologies has enhanced healthcare providers' technological adaptability and confidence, thereby minimizing disruptions during virtual consultations. Nevertheless, the presence of some neutral and negative responses indicates that operational challenges still exist for a small proportion of providers, particularly when new technologies or system updates are introduced.

This finding is consistent with Paleari et al. (2022), who observed that repeated exposure to digital healthcare systems significantly improves technical proficiency and reduces operational challenges during telemedicine service delivery. As healthcare providers gain experience, they become more efficient in navigating digital platforms and troubleshooting minor technical problems.

The findings also support the Technology Acceptance Model, specifically the perceived ease of use construct. According to TAM, technologies that users perceive as easier to operate are more likely to be accepted and consistently utilized. The relatively high level of agreement among respondents suggests that healthcare providers have become comfortable using telemedicine systems through training and practical experience.

The qualitative findings further strengthened this interpretation. Key informants reported that healthcare providers experienced some technical challenges during the initial implementation of telemedicine services. However, continuous use, mentorship, and technical support have substantially reduced these difficulties over time. One participant explained: *"When telemedicine was first introduced, some staff experienced difficulties navigating the platform. However, continuous use and regular technical support have significantly improved their confidence and efficiency."* (Key Informant 1).

Another respondent stated: *"Most operational challenges we encounter today are related to internet connectivity rather than staff competence. Healthcare providers are now generally comfortable using the telemedicine platform."* (Key Informant 5).

These qualitative findings emphasize that capacity-building initiatives, practical experience, and continuous technical support have collectively reduced operational challenges and strengthened healthcare providers' ability to deliver telemedicine services effectively.

Regarding whether healthcare providers adequately address patients' questions and concerns regarding telemedicine services, 8 respondents (3.7%) strongly disagreed, 18 (8.3%) disagreed, 35 (16.1%) were neutral, 105 (48.2%) agreed, while 52 respondents (23.9%) strongly agreed. The mean score of 4.01 (SD = 0.91) indicates that respondents generally agreed that healthcare providers effectively respond to patients' questions and concerns during telemedicine consultations. The relatively low standard deviation suggests consistency in respondents' perceptions that healthcare providers are responsive and supportive throughout the telemedicine process.

The findings imply that effective communication between healthcare providers and patients enhances trust, patient satisfaction, and confidence in telemedicine services. Addressing patients' concerns promptly enables them to better understand their health conditions, treatment plans, and the telemedicine process, thereby promoting positive healthcare experiences and encouraging continued utilization of telemedicine services.

This finding is consistent with Ibeneme et al. (2020), who established that timely responses to patients' concerns improve healthcare quality, patient satisfaction, and confidence in digital healthcare services. Similarly, effective communication has been identified as an

essential component of successful telemedicine implementation because it minimizes uncertainty and strengthens provider-patient relationships.

The finding also supports the Technology Acceptance Model. When healthcare providers effectively address patients' concerns, patients perceive telemedicine services as both useful and easy to use. Prompt responses increase perceived usefulness by demonstrating that telemedicine can effectively meet healthcare needs while simultaneously enhancing perceived ease of use through clear explanations and continuous support.

The qualitative findings strongly supported the quantitative results. Key informants explained that healthcare providers deliberately allocate time during virtual consultations to respond to patients' questions, clarify medical information, and resolve technical difficulties experienced during consultations. One participant explained: *"We encourage healthcare providers to allow patients enough time to ask questions because this improves their confidence and satisfaction with telemedicine services."* (Key Informant 2).

Similarly, another respondent stated: *"Patients are more willing to continue using telemedicine when their concerns are listened to and addressed promptly. Effective communication has become one of our priorities during virtual consultations."* (Key Informant 4). These qualitative responses reinforce the finding that responsiveness to patients' concerns contributes significantly to improving telemedicine implementation and patient satisfaction.

Regarding whether healthcare providers regularly share important information and updates regarding telemedicine services, 10 respondents (4.6%) strongly disagreed, 20 (9.2%) disagreed, 30 (13.8%) were neutral, 100 (45.9%) agreed, while 58 (26.6%) strongly agreed. The mean score of 4.03 (SD = 0.96) indicates that respondents generally perceived healthcare providers as consistently sharing relevant information and updates concerning telemedicine services. The findings suggest that effective communication contributes significantly to maintaining patient awareness, engagement, and confidence in telemedicine.

The findings imply that regular dissemination of information enables patients to remain informed about available telemedicine services, appointment schedules, treatment plans, and changes in healthcare delivery processes. Continuous communication therefore strengthens patient engagement and facilitates successful implementation of telemedicine services.

This finding is supported by Dodoo et al. (2022), who reported that structured communication and regular information sharing improve healthcare service delivery by enhancing patient awareness and participation. Effective communication also promotes continuity of care and strengthens provider-patient relationships.

The findings further support the Technology Acceptance Model, particularly the perceived usefulness construct. Patients who consistently receive relevant healthcare information are more likely to perceive telemedicine as beneficial in meeting their healthcare needs. Regular communication also enhances perceived ease of use because patients become more familiar with telemedicine procedures and service delivery processes.

The qualitative findings corroborated the quantitative results. Interview participants reported that healthcare providers regularly communicate with patients through appointment reminders, follow-up telephone calls, text messages, electronic notifications, and virtual consultations. One respondent explained: *"We regularly update patients about appointment schedules, medication reviews, and follow-up consultations through phone calls and text messages. This keeps patients engaged throughout their treatment."* (Key Informant 1).

Another participant added: *"Sharing timely information has reduced missed appointments and improved continuity of care because patients know exactly what is expected of them."* (Key Informant 5).
Regarding whether respondents receive complete information about telemedicine services whenever they seek clarification, 12 respondents (5.5%) strongly disagreed, 25 (11.5%) disagreed, 32 (14.7%) were neutral, 95 (43.6%) agreed, while 54 (24.8%) strongly agreed. The mean score of 3.93 (SD = 0.99) indicates that respondents generally agreed that healthcare providers provide adequate and complete information whenever clarification is required. The findings suggest that transparency in communication enables patients to understand telemedicine services and make informed healthcare decisions.

The findings imply that providing comprehensive information strengthens patients' confidence in telemedicine services while reducing uncertainty regarding diagnosis, treatment, follow-up care, and use of digital healthcare technologies. Complete information therefore promotes informed decision-making and improves patients' overall healthcare experiences.

This finding is consistent with Asan et al., (2021), who found that transparent healthcare communication improves patient trust, satisfaction, and healthcare service utilization. Providing complete information has also been associated with improved patient engagement and better treatment adherence in digital healthcare settings.

The findings further align with the Technology Acceptance Model (TAM). Comprehensive and transparent information enhances perceived usefulness because patients recognize the value of telemedicine in

meeting their healthcare needs. It also improves perceived ease of use by helping patients understand how telemedicine services operate and what to expect during virtual consultations.
The qualitative findings reinforced these quantitative results. Key informants explained that healthcare providers make deliberate efforts to provide detailed explanations regarding diagnosis, treatment options, medication use, follow-up procedures, and telemedicine processes whenever patients seek clarification. One participant observed: *"We ensure that patients leave every consultation with a clear understanding of their diagnosis, treatment plan, medication instructions, and the next steps in their care."* (Key Informant 3).

Another respondent added: *"Whenever patients require clarification, healthcare providers take time to explain the information until the patient fully understands. This has helped improve trust in telemedicine services."* (Key Informant 2).

These qualitative findings demonstrate that transparent communication and provision of complete information strengthen patients' confidence, promote informed decision-making, and contribute positively to the successful implementation of telemedicine services.

Regarding whether healthcare providers possess adequate competencies to provide accurate diagnoses through telemedicine consultations, 8 respondents (3.7%) strongly disagreed, 18 (8.3%) disagreed, 28 (12.8%) were neutral, 105 (48.2%) agreed, while 59 (27.1%) strongly agreed. The mean score of 4.06 (SD = 0.91), the highest among all the capacity-building indicators, indicates that respondents have high confidence in the competencies of healthcare providers to conduct accurate diagnoses through telemedicine consultations. The relatively low standard deviation further demonstrates consistency in respondents' perceptions regarding providers' diagnostic competence.

The findings imply that the knowledge, technical skills, and clinical competencies acquired by healthcare providers through training and practical experience have enabled them to effectively assess patients and make reliable clinical decisions using telemedicine platforms. This enhances patients' confidence in telemedicine services and contributes significantly to the successful implementation of telemedicine projects at Penda Medical Centre.

The finding is consistent with Jha et al. (2021), who established that telemedicine can achieve clinical outcomes comparable to conventional healthcare services when healthcare providers possess adequate technical and clinical competencies. Similarly, competent healthcare providers improve service quality, patient confidence, and the reliability of telemedicine consultations.

The findings also support the Technology Acceptance Model, particularly the perceived usefulness construct. According to TAM, users are more likely to adopt and continue using technology when they believe it improves task performance and produces beneficial outcomes. Patients who perceive healthcare providers as competent in conducting accurate diagnoses through telemedicine are therefore more likely to trust, accept, and continue utilizing telemedicine services.
The qualitative findings strongly reinforced the quantitative results. Key informants indicated that healthcare providers have acquired sufficient competencies to manage most routine consultations through telemedicine because of continuous training, mentorship, and accumulated experience. However, they acknowledged that certain complex medical conditions still require physical examination to ensure comprehensive clinical assessment. One participant explained: *"Most routine consultations can be handled effectively through telemedicine because our healthcare providers have developed the necessary competencies. However, patients with complex conditions are referred for physical examination whenever necessary."* (Key Informant 5).

Similarly, another respondent observed: *"The continuous improvement in staff competencies has increased patients' confidence in telemedicine consultations because they trust the quality of care they receive."* (Key Informant 2).

These qualitative findings emphasize that healthcare providers' competencies are fundamental to improving service quality, patient trust, and the successful implementation of telemedicine services.
Regarding whether respondents are well aware of the telemedicine services offered by Penda Medical Centre due to the information and education provided, 20 respondents (9.2%) strongly disagreed, 35 (16.1%) disagreed, 50 (22.9%) were neutral, 70 (32.1%) agreed, while 43 (19.7%) strongly agreed. The mean score of 3.48 (SD = 1.11), the lowest among all the capacity-building indicators, indicates moderate awareness of telemedicine services among respondents. The relatively higher standard deviation suggests greater variability in respondents' perceptions, implying that awareness initiatives have not reached all patients equally.

The findings suggest that although patients who have interacted with telemedicine services generally receive adequate education and information, awareness creation strategies have not been sufficiently extended to the wider community. Consequently, some potential users remain unaware of the availability, benefits, and procedures for accessing telemedicine services.
This finding is consistent with Were (2023) and Anthony (2021), who reported that inadequate public awareness remains one of the major barriers to telemedicine adoption in developing countries. The authors emphasized that continuous public education,

community sensitization, and strategic communication campaigns are essential for increasing telemedicine utilization.

The finding also supports the Technology Acceptance Model. According to TAM, awareness influences both perceived usefulness and perceived ease of use. Individuals who understand the benefits and operation of telemedicine are more likely to perceive it as useful for accessing healthcare services and easier to use, thereby increasing their intention to adopt the technology. Conversely, inadequate awareness reduces technology acceptance because potential users may not fully appreciate the value or accessibility of telemedicine services.

The qualitative findings further explained the quantitative results. Interview participants acknowledged that awareness creation is largely undertaken during routine hospital visits, with limited outreach to individuals who have not previously visited the facility. One key informant explained:

"Most of our awareness activities target patients who come to the hospital. We still need to strengthen community outreach so that more people understand the availability and benefits of telemedicine services." (Key Informant 1).

Another participant added: *"Social media, community health promoters, local radio stations, and public health campaigns should be used more extensively to educate the public about telemedicine because many potential users are still unaware of these services."* (Key Informant 4).

The findings indicate that capacity building positively influences telemedicine implementation at Penda Medical Centre. Respondents reported high confidence in healthcare providers' diagnostic competence, information sharing, patient education, provider guidance, and responsiveness to patient concerns. Qualitative findings supported these results, showing that staff training, mentorship, patient education, and practical experience have improved service delivery and patient confidence. Consistent with the Technology Acceptance Model, capacity-building initiatives enhanced the perceived usefulness and ease of use of telemedicine services. However, lower awareness levels suggest the need for stronger community sensitization and public education to increase telemedicine uptake.

Inferential Statistics and Hypothesis Testing

This section presents inferential statistical analysis and hypothesis testing on the influence of capacity building on telemedicine project performance at Penda Medical Centre. Pearson correlation and simple regression analysis were used.

Correlation Analysis

Pearson correlation analysis was conducted to determine the strength and direction of the relationship between capacity building and telemedicine project performance. The results indicated a strong, positive, and statistically significant relationship between the two variables ($r = 0.689$, $p < 0.01$).

This implies that improvements in capacity building practices such as staff training, patient education, skills development, and information dissemination are associated with enhanced performance of telemedicine projects at Penda Medical Centre. The positive direction of the relationship further suggests that strengthening capacity building mechanisms is likely to improve service utilization, efficiency, and user satisfaction in telemedicine delivery.

Qualitative findings supported this result, where respondents indicated that continuous training of healthcare providers improves service delivery, while patient education enhances confidence and willingness to use telemedicine services. These findings align with the Technology Acceptance Model, which emphasizes that user competence and perceived ease of use enhance technology adoption, as critical enablers of successful organizational change.

Simple Regression Analysis

Simple linear regression analysis was conducted to determine the extent to which capacity building predicts telemedicine project performance. The results are presented in Tables 2 and 3.

Table 2: Model Summary

Model	R	R^2	Adjusted R^2	Std. Error
1	0.689	0.475	0.472	0.286

Source: Field Data (2026)

The model summary indicates a moderately strong positive relationship ($R = 0.689$) between capacity building and telemedicine project performance. The coefficient of determination ($R^2 = 0.475$) shows that 47.5% of the variation in telemedicine project performance is explained by capacity building alone. The adjusted R^2 value of 0.472 confirms the stability and reliability of the model.

The remaining 52.5% suggests that other factors outside capacity building also influence telemedicine project performance, such as infrastructure, leadership support, and communication systems.

The F-test (ANOVA) results confirmed that the regression model was statistically significant ($p < 0.05$), indicating that capacity building is a significant predictor of telemedicine project performance.

Table 3: Regression Coefficients

Predictor Variable	B	Std. Error	Beta	t	p-value
Constant	0.621	0.108	—	5.750	0.000
Capacity Building	0.612	0.061	0.689	10.033	0.000

Source: Field Data (2026)

The regression coefficient indicates that capacity building has a positive and statistically significant effect on telemedicine project performance ($\beta = 0.689$, $p < 0.05$). This implies that a unit improvement in capacity building leads to a corresponding improvement in telemedicine project performance.

The regression equation was therefore expressed as:

Telemedicine Project Performance = 0.621 + 0.612(Capacity Building)

Where: CB = Capacity Building

Hypothesis Testing

Hypothesis testing was conducted using the t-test for the regression coefficient and the F-test for overall model significance at a 0.05 level of significance.

The null hypothesis (H_0), which stated that capacity building has no significant influence on telemedicine project performance, was rejected ($p < 0.05$). This confirms that capacity building has a statistically significant and positive effect on telemedicine project performance at Penda Medical Centre.

The F-test further confirmed that the model was statistically significant ($p < 0.05$), indicating that capacity building significantly predicts telemedicine project performance.

The inferential statistical results establish that capacity building has a significant positive influence on telemedicine project performance at Penda Medical Centre. The findings demonstrate that strengthening staff training, patient education, communication skills, and technical competence enhances the effectiveness, efficiency, and acceptance of telemedicine services. These results further affirm that successful telemedicine implementation is strongly dependent on continuous capacity development and structured learning processes within the healthcare

5. Conclusion and Recommendations

5.1 Conclusion

This study concludes that capacity building is a key factor influencing the performance of telemedicine services at Penda Medical Centre. The findings from both quantitative and qualitative data indicate that capacity building significantly enhances patient education, improves healthcare providers' competence, strengthens communication, and increases overall understanding and utilisation of telemedicine services. Through structured training of healthcare providers, patient education initiatives, and routine information sharing during service delivery, users are adequately supported in accessing and using telemedicine services, thereby improving the effectiveness and efficiency of service delivery.

However, the study also concludes that capacity building alone is not sufficient to ensure optimal and sustained effectiveness of telemedicine services. While it plays a critical role in strengthening initial understanding and service uptake, its impact is undermined by inconsistencies in awareness creation and variations in the depth and consistency of training and communication. Therefore, there is need for continuous capacity development, regular refresher training, and more structured and standardized awareness strategies to ensure uniform understanding and sustained utilisation of telemedicine services across all users.

5.2 Recommendations

1. Penda Medical Centre management should institutionalize continuous capacity-building programmes for telemedicine services through regular staff training, structured patient education sessions, and comprehensive onboarding procedures for both healthcare providers and patients. These initiatives will enhance users' knowledge and competence, improve service delivery, and strengthen the effective implementation of telemedicine projects.
2. Penda Medical Centre management should develop and implement standardized communication protocols and awareness strategies across all service points. This should include clear communication during telemedicine consultations, consistent dissemination of information on available telemedicine services, and regular patient awareness campaigns. These measures will improve patients' understanding of telemedicine, promote consistent information sharing, and enhance the utilization and implementation of telemedicine projects.

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