



E-consultation Acceptance in Ghana: A Quantitative Analysis and Proposed Model for Enhancing Digital Health

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Abstract

This study investigates the adoption and enhancement of digital health through e-consultation in Ghana's healthcare systems. It examines the challenges hindering the successful implementation of e-consultation, including security, privacy and awareness. By conducting a quantitative analysis and proposing a comprehensive model, this study aims to provide insights into overcoming these barriers, to improve healthcare accessibility and reduce disparities through e-consultation. The research integrates the DeLone and McLean IS Success Model, focusing on quality, use, user satisfaction, and net benefits, alongside the Diffusion of Innovation theory of technology adoption. The study employs a mixed-methods approach, combining literature review and quantitative analysis. Clinicians and patients received distinct questionnaires, covering knowledge, skills, performance, safety, and e-consultation challenges. Univariate statistics provides an initial data overview, followed by factor analysis. With a Kaiser-Meyer-Olkin value of 0.710 and Bartlett's test of sphericity yielding 1300.894, the data proves suitable for factor analysis. Using Principal Axis Factoring, the study reveals significant correlations among factors: Attitude, Regulatory Framework, Diffusion, and Acceptance. Based on these findings, an E-consultation Framework is proposed, emphasizing robust E-consultation Technology Frameworks. By adopting e-consultation and advanced digital health integration, Ghana can advance healthcare accessibility, diminish disparities, and enhance citizens' well-being within the digital health domain.

Keywords: Acceptance, Digital Health, E-consultation, Technology,

1. INTRODUCTION

Electronic-consultation (E-consultation) has the potential to bridge the healthcare gap in Ghana, particularly in remote areas. It offers convenience, cost-effectiveness, and improved accessibility through digital platforms. Successful implementation relies on effective utilization of E-health Technology Frameworks, including electronic medical records, telemedicine, and mobile health applications [1]. Factors influencing adoption include infrastructure



development, regulatory policies, healthcare workforce training, and user-friendly interfaces Research highlights the low computer skills among healthcare professionals in Ghana, emphasizing the need for training [2]. Internet accessibility and mobile phone penetration are crucial, with 50% of the population connected to the internet and 90% having mobile phones [3]. Mobile health interventions, such as SMS and toll-free calls, have been implemented to improve accessibility [3]. Ghana's early adoption of cellular mobile solutions and internet connectivity has expanded the potential reach of E-consultation services [4].

The successful adoption of e-consultation in healthcare systems is hindered by various challenges, including security and privacy concerns, unfriendly government policies, limited diffusion of technology, and insufficient education on its availability and usage [5] These challenges are amplified by the critical role security plays as a deterrent to technology adoption [6]. Also, privacy concerns pose significant barriers to implementation. Lack of inter-organizational perspectives in information systems research leads to a dearth of academic research and industry adoption of secure and privacy-centric technologies [7]. Unfavorable government policies that regulate and promote e-consultation further impede its adoption. Limited education and awareness among healthcare professionals and the general population contribute to low adoption rates [8]. In Ghana, healthcare staff often lack the necessary skills and training for effective utilization. Moreover, most hospitals in Ghana do not have strong data Security apparatus, which being an indispensable facet, stands as a formidable barrier to the widespread embrace of e-consultation technology in healthcare. Addressing these challenges is crucial to unlock the potential of e-consultation, enhance healthcare accessibility, and reduce disparities. Overcoming these barriers requires addressing security concerns, developing comprehensive government policies, improving technology diffusion through education and training, and raising awareness about E-consultation's benefits and availability. The relevance and significance of the problem addressed in this study lie in its potential to revolutionize healthcare accessibility and equity through the integration of e-consultation within healthcare systems. Overcoming these challenges is not only crucial for optimizing healthcare delivery but also for bridging the disparities that exist in remote areas and underserved populations. This study therefore aims to explore E-consultation acceptance in Ghana through quantitative analysis and propose a model for enhancing digital health.

E-consultation, a form of telemedicine, has gained global attention for improving healthcare accessibility. This literature review examines existing research on e-consultation acceptance and usage in various regions, including Ghana, Sweden, the Netherlands, Spain, the United States, Canada, Mexico, India, China, and South Korea. In Ghana, studies highlight the interest in e-consultation but note barriers such as lack of awareness and trust concerns [9]. Internationally, studies

show positive outcomes. In Sweden, e-consultation increased patient satisfaction, especially for simple cases [10]. The Netherlands found cost-effectiveness and improved outcomes for chronic conditions [11]. In Spain, e-consultation improved patient engagement and communication [12]. Similar benefits were seen in the United States, Canada, Mexico, and India, including patient satisfaction, reduced waiting times, and cost-effectiveness [13, 14, 15]. This review underscores the potential of e-consultation to enhance healthcare delivery worldwide but highlights the need for further research in diverse contexts. Addressing barriers can help harness its potential to improve healthcare accessibility and outcomes.

The conceptual framework of the study looks at the DeLone and McLean IS Success Model, an updated version of the original model and one of the most commonly used models in Information System [16], includes dimensions such as information, system, and service quality, use, user satisfaction, and net benefits. It has been validated in various contexts [17]. Some studies have demonstrated strong validity of the construct, while others have revealed only partial validity [18]. In light of these findings, the researcher opted to adopt the theory of diffusion and innovation to complement the D&M model. The diffusion of innovations theory by Everett Rogers provides insights into technology adoption, which aligns with the adoption of E-consultation. The Diffusion of Innovation model outlines five stages: knowledge, persuasion, decision, implementation, and confirmation. The researcher identified a model that bridges the models of Delone & Mclean IS success and the diffusion of innovation to form a suitable model for the successful implementation of e-consultation in Ghana. Understanding the impact of E-Health Technology Frameworks on E-consultation adoption in Ghana can inform healthcare professionals, patients, and policymakers in improving healthcare accessibility and outcomes.

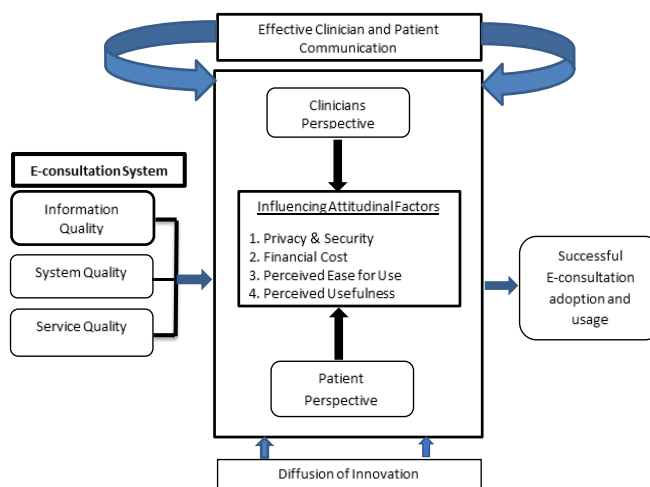


Figure 1. Conceptual Framework

2. METHODS

The study employed a comprehensive methodology, including literature review and quantitative analysis, to ensure robustness [19]. A systematic review and meta-analysis approach ensured methodological rigor. The Prisma flow diagram visually represented the study's systematic selection process (see figure 2).

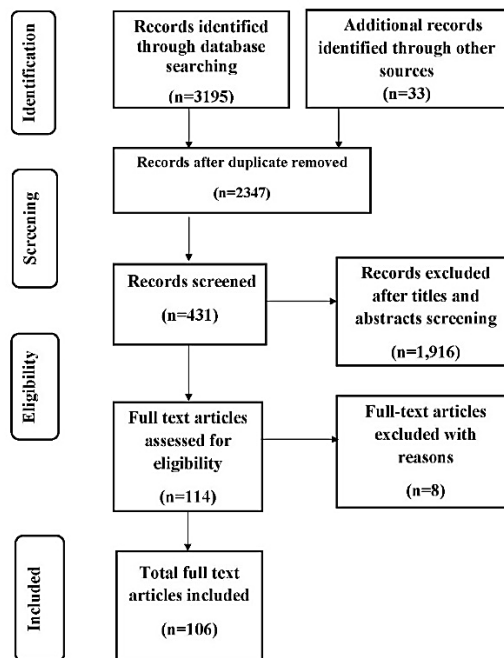


Figure 2. Prisma Flow diagram

Figure 2 illustrates the meticulous process of article selection. Initially, 3,195 records were identified through a search in databases such as ScienceDirect, Scopus, Web of Science, ACM Digital Library and PubMed. Some key words used in the search include E-consultation, Digital health, E-health technology, Telemedicine, and online medical consultation. After an initial screening based on titles and abstracts, 1,916 records were excluded. Following the removal of duplicates, 2,347 records remained. An additional 33 records were identified through alternative sources. Subsequently, a thorough assessment of the full-text articles was conducted, resulting in the exclusion of 8 articles with reasons provided. The eligibility of 114 full-text articles was evaluated, eventually culminating in the inclusion of 106 articles for further analysis. In this study, a survey was done as the main data collection instrument to gather information from both clinicians and patients. Separate questionnaires were designed for each group, addressing their specific perspectives on e-consultation. The questionnaire

included demographic information and covered key areas such as knowledge, skills, performance, safety, quality, communication, partnership, teamwork, trust, usage, challenges, and promoting e-consultation. Descriptive and inferential analyses, including factor analysis, were conducted using SPSS version 23 to analyze survey data. The rigorous methodology, adherence to guidelines, and appropriate statistical techniques ensured the validity and reliability of the study's findings [20].

3. RESULTS AND DISCUSSION

Figure 3 shows an overview of key dimensions associated with E-consultation: Knowledge, Skills, Performance; Safety and Quality; Communication, Partnership, Teamwork; and Managing Trust. By examining each dimension in detail, the study gives a deeper understanding of the specific concerns faced in the context of e-consultation. Concerns include healthcare professionals' proficiency and ongoing training, data security, accuracy of diagnoses, communication skills, collaboration, and establishing trust. Research supports the potential of e-consultation to enhance efficiency [21], improve communication, and increase healthcare quality [17, 22]. However, policy gaps and privacy issues can impact adoption and trust [8]. Addressing concerns in each dimension is vital. Measures include ongoing education and training for healthcare professionals, robust security protocols, quality assurance mechanisms, effective communication, and trust-building strategies. Tailoring strategies to address these concerns can optimize e-consultation services, providing safe, high-quality, and patient-centered care [23]. By considering these dimensions, healthcare organizations and policymakers can enhance the delivery of e-consultation in the digital health landscape.

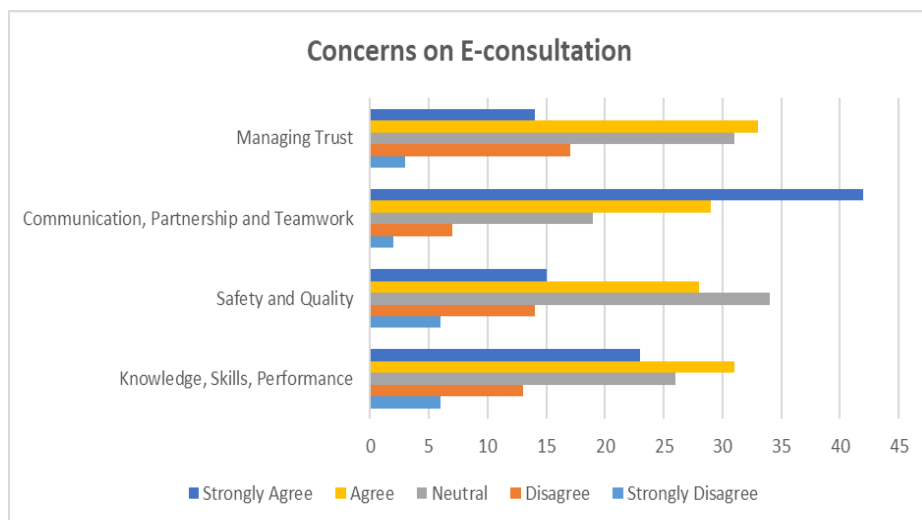


Figure 3. Concerns of E-consultation

3.1 E-consultation Challenges

Figure 4 illustrates the challenges perceived by patients regarding e-consultation. Data protection emerged as the highest-ranked concern, followed by ethical issues, legal and regulatory framework, and resistance to new technology. Patients value the security and confidentiality of their health information, while also considering ethical implications and the need for clear guidelines and regulations. The highest-ranked challenge pertains to data protection, which emerged as a significant concern (mean=3.26, SD=0.77). Resistance to new technology and a preference for traditional methods of healthcare delivery (mean=2.12, SD=0.69) was found to be the least factor. These findings align with prior research on low e-consultation usage rates and highlight the importance of addressing common concerns to promote the successful integration of e-consultation into healthcare systems [24, 25]. Addressing these challenges can enhance patient trust and facilitate widespread adoption of e-consultation as an efficient healthcare delivery modality [26].

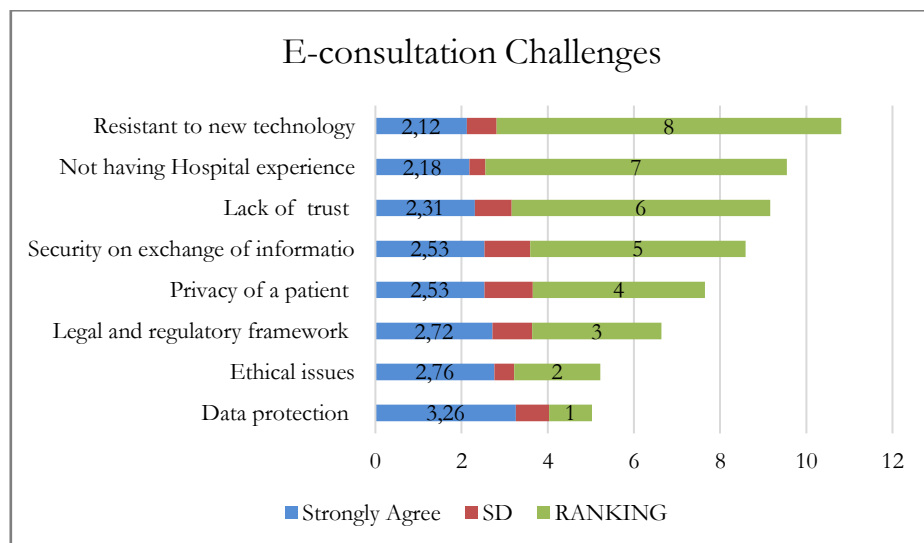


Figure 4. E-consultation Challenges

These insights from figure 4 aligns with previous research highlighting low e-consultation adoption rates [1, 17]. Addressing challenges like data protection, ethics, and regulatory clarity is crucial to building patient trust and fostering broad e-consultation acceptance. Proactively tackling these concerns can cultivate an environment conducive to embracing e-consultation as an efficient and secure healthcare delivery method, potentially revolutionizing healthcare accessibility and quality.

3.2 KMO and Bartlett's Test

Factor analysis on the was done on survey responses using the Principal Component Analysis (PCA) extraction technique. During the analysis, the Kaiser-Meyer-Olkin (KMO) value turned out to be 0.710, indicating that the sample size was appropriate. Additionally, Bartlett's test of sphericity produced a statistic of 1300.894 with a p-value of 0.000 ($p < 0.05$), affirming significant interconnections among the variables. Based on these results, it was deemed appropriate to proceed with the factor analysis. the analysis effectively explored the data structure, revealing key dimensions and informing improvements in e-consultation services.

Table 1. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.710
Bartlett's Test of Sphericity	Approx. Chi-Square	1300.894
	Df	171
	Sig.	.000

3.3 Total Variance Explained

The factor analysis revealed four significant factors explaining 60.830% of the total variance. Factor 1 accounted for 21.667% of the variance, followed by Factor 2 (13.714%), Factor 3 (13.714%), and Factor 4 (11.736%). The researcher disregarded a fifth factor due to its Eigenvalue being less than 1. These factors provide insight into the underlying dimensions of patients' experiences and perspectives on e-consultation.

Table 2. Total Variance Explained

Factor	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.663	35.067	35.067	4.117	21.667	21.667
2	2.096	11.031	46.098	2.606	13.714	35.380
3	1.839	9.679	55.777	2.606	13.714	49.094
4	1.176	6.192	61.969	2.230	11.736	60.830

5	.967	5.088	67.057	1.183	6.227	67.057
Extraction Method: Principal Axis Factoring.						

3.4 Rotated factor matrix

Table 3 showcases the rotated factor matrix, extracted using the Principal Axis Factoring approach. The presented table exhibits the rotated factor matrix acquired through a Principal Axis Factoring examination with Varimax rotation and Kaiser normalization. The primary purpose of this analysis was to recognize the fundamental factors or dimensions represented by the variables examined in the research [27]. The tabulated results illustrate the factor loadings, denoting the intensity and direction of the association between each variable and the identified factors. The factors are labeled as 1, 2, 3, 4, and 5. The variables related to e-consultation (E-cs1 to E-cs11) and challenges (Chl-1 to Chl-8) are listed in the table. The cells in the table represent the factor loadings for each variable and factor. A high positive loading suggests a strong association between the variable and the factor, while a low or close-to-zero loading indicates a weak association.

Looking at the e-consultation variables (E-cs1 to E-cs11), we observe that variables E-cs1, E-cs2, E-cs3, E-cs4, and E-cs5 have high factor loadings on Factor 1. Similarly, variables E-cs6, E-cs7, E-cs8, E-cs9, E-cs10, and E-cs11 are strongly associated with Factor 3. This indicates that these variables share common variance and contribute to the formation of these factors. Among the challenge variables (Chl-1 to Chl-8), Chl-1, Chl-2, Chl-3, Chl-4, and Chl-5 have high factor loadings on Factor 2, indicating their strong relationship with this factor. Additionally, Chl-8 has a high loading on Factor 4, indicating a strong association with this dimension.

It is important to note that Factor 5 has loadings only for the variable E-c5, suggesting that it is primarily influenced by this specific variable. The results suggest that the variables related to e-consultation and challenges can be grouped into distinct factors based on their shared variance. These factors represent underlying dimensions or constructs that contribute to the understanding of e-consultation acceptance and challenges in the study context. These items describe how patients use, relate to, and feel about e-consultation. Consequently, the researcher named factor 1 as **Attitude**. Factor 2 had five items grouped together, which discuss the challenges associated with e-consultation. It further addresses security, ethical issues, data protection, and legal and regulatory frameworks. The researcher, therefore, named factor 2 as **Regulatory Framework**.

Factor 3 had four items grouped together, exhibiting a high level of correlation among the variables. These items further describe awareness, cost reduction, acceptance, and usage. The researcher, therefore, named factor 3 as Acceptance. Factor 4 had three items grouped together, which explain e-consultation and its challenges. The items specifically address the acceptance of e-consultation, extension to other hospitals, and non-resistance to new technology (acceptance of new technology). As a result, the researcher named factor 4 as **Diffusion**. Continual addressing of patient concerns fosters an environment that embraces digital health innovations, prioritizing patient safety, privacy, and satisfaction.

Table 3. Rotated factor matrix

	Factor				
	1	2	3	4	5
E-cs1	.834				
E-cs2	.809				
E-cs3	.796				
E-cs4	.762				
E-cs5	.696			.447	
Chl-1		.835			
Chl-2	.433	.704			
Chl-3		.629		.563	
Chl- 4		.621			
Chl- 5		.532			
Chl- 6					
E-cs6			.802		
E-cs7			.745		
E-cs8	.489		.693		
E-cs9			.642		
E-cs10	.475			.747	
E-cs11	.451			.738	
Chl-7				-.520	
Chl-8					.957
Extraction Method: Principal Axis Factoring.					
Rotation Method: Varimax with Kaiser Normalization.					
a. Rotation converged in 8 iterations.					

3.5 Model for E-consultation implementation

Based on the study findings, a conceptual framework is proposed for the successful implementation of e-consultation in the Ghanaian Health Sector. This framework integrates the DeLone & McLean updated IS Success Model and the Diffusion of Innovation model. Key factors identified include Attitude, Acceptance, Education, Internet connectivity, Diffusion, Benefits, and Regulatory Framework. The framework emphasizes three dimensions: Information quality, System quality, and Service quality. In the context of e-consultation, reliable internet connectivity stands as a pivotal factor for seamless communication between medical practitioners and patients [28, 29]. The robustness of the internet connection significantly influences users' perceived quality of the system, service, and information they interact with. Education plays a significant role in driving the adoption and usage of e-consultation. If there is resistance or lack of acceptance towards technology, it may result in its underutilization or complete abandonment [30]. Increasing understanding of the technology, its benefits, and usage promotes acceptance and positive attitudes towards e-consultation. The diffusion of innovation influences attitudes and acceptance. A robust regulatory framework is vital for addressing information, system, service, education, and diffusion policies. Attitude and Acceptance are crucial and influenced by education, diffusion, system quality, information quality, service quality, and benefits. Positive experiences and perceived benefits enhance acceptance and favorable attitudes towards e-consultation. This framework provides a comprehensive guide for implementing and promoting successful e-consultation in the Ghanaian healthcare system as seen in figure 5.

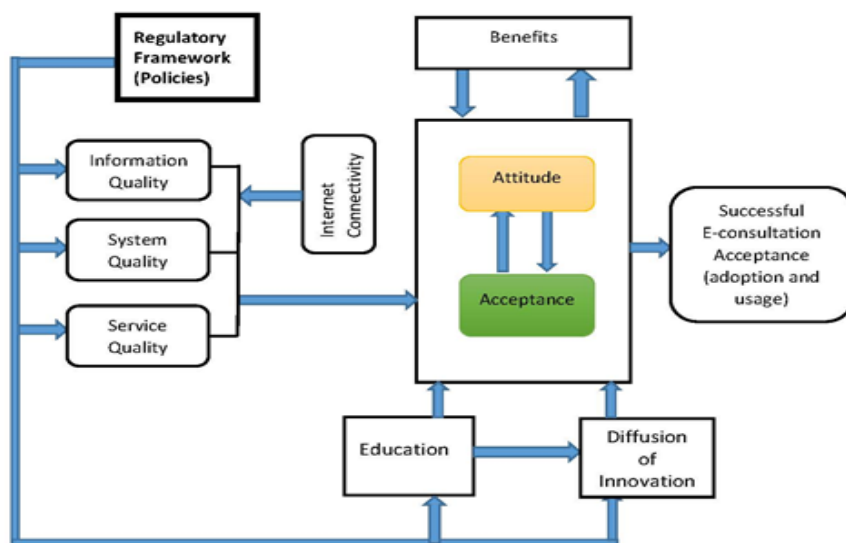


Figure 5. Model for E-consultation Adoption and Usage

The proposed framework gains validation through alignment with established theories, empirical evidence, practical insights, and expert review. The framework is grounded in the DeLone & McLean IS Success Model and the Diffusion of Innovation model, which are established and widely recognized theoretical constructs. These models have been validated and applied in various contexts, providing a strong foundation for the proposed framework's validity. With practical relevance and applicability, the framework offers a comprehensive guide to understanding e-consultation adoption in Ghana's healthcare system.

4. CONCLUSION

In conclusion, this study presents a significant contribution to the field of E-consultation adoption within the context of the Ghanaian healthcare sector. By using a novel conceptual framework, the study offers fresh insights into the challenges and opportunities associated with digital health adoption. The proposed model, integrating the DeLone & McLean updated IS Success Model and the Diffusion of Innovation theory, provides a tailored approach to address the complexities of E-consultation implementation. The study's emphasis on clinical staff concerns, contextual relevance, and patient-centric approach underscores its practical significance. The findings also offer actionable recommendations for policymakers, healthcare practitioners, and administrators. The integration of technology, policy, and patient perspectives aligns with current healthcare trends, making the study a relevant and timely resource. This study's potential impact reaches beyond academia, resonating with healthcare practitioners, policymakers, educators, and patients. By shedding light on the challenges, the study equips stakeholders with the knowledge to drive evidence-based decisions that can enhance healthcare accessibility and quality. Ultimately, this study advances the discourse on E-consultation adoption, contributing to the evolution of digital health practices and the enhancement of healthcare services in Ghana and beyond. Future studies could look at investigating emerging technologies such as artificial intelligence, machine learning, and secure data sharing, examining their potential to further enhance E-consultation's effectiveness and user experience.

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