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Predicting the Factors Influencing Intention to Use e-Health Systems Towards Healthy Lifestyles in Nigeria Using Technology Acceptance and Information Systems Success Models

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ABSTRACT

It is an irrefutable assertion that communication technologies play a significant role in sustaining healthy lifestyles. However, to achieve this goal, one needs to be literate on how to maximise communication tools for acquiring health information. This study, therefore, examined the predictors of healthy lifestyles in Nigeria by utilising Technology Acceptance Model (TAM) and Information System Success (ISS) tents. The quantitative method through a survey approach was employed for quantifying the data and for inferential requirements. The survey was administered to 375 undergraduate students at Baze University Abuja, Nigeria. The descriptive parts of the data were analysed via Statistical Package for Social Science (SPSS) while the relationships between variables and mediating mechanisms were analysed through Structural Equation Modeling (SEM). The findings disclosed that perceived usefulness, ease of use, and intentions to use e-health systems were important in shaping user attitudes toward using e-health systems for healthy lifestyles. The study also projected the value of information and service qualities in shaping user perceptions of e-health systems. Hence, the need to improve information and service qualities to enhance user perceptions of e-health systems is recommended. This study further identified factors that could instigate the utilisation of communication technologies for sustaining healthy lifestyles in emerging countries, specifically in the African continent.

Keywords: *Communication technologies, information quality, healthy lifestyles, e-health systems, emerging countries.*

INTRODUCTION

The convergence of communication technologies has, undoubtedly, played a major role in influencing healthcare decisions because it provides forums for liaising with the medics (Barello et al., 2015). However, to adopt healthcare decisions electronically, the intention to utilise electronic health systems is recommended to avert critical health conditions that can hamper healthy lifestyles (Kasoju et al., 2023). This is because a healthy lifestyle can minimise the mortality rate (Su et al., 2022). A healthy lifestyle does not only reduce mortality rate but is also efficacious in lowering cardiovascular disease (CVD) complications in younger people. Therefore, one way of strengthening a healthy lifestyle is by embracing e-health communication

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technologies (Tsai et al., 2020). Utilising an e-health system also enables one to adhere to behavioural advice by abiding by positive changes that can help to stay free from avoidable illnesses (Stonerock & Blumenthal, 2017). Moreover, it offers health personnel the opportunity to appraise available health information that helps in making crucial decisions while facing health challenges (Tubaishat & Habiballah, 2016). This is because the e-health system serves as an avenue for promoting health information literacy (Yang et al., 2017). Thus, utilisation of an e-health system is indispensable for managing health challenges (Chiou et al., 2016; Paige et al., 2017).

In other continents such as Asia, the urgent need to enhance health lifestyles electronically has been among the foremost issues that need concern and this has been addressed through embracing and hosting the Ninth Global Conference on Health Promotion in Shanghai (Abdullah et al., 2020). Malaysian primary care clinics study also identified a lack of information quality on e-health systems as an issue of concern (Abdullah & Mohd, 2016; Hamzah et al., 2016). Furthermore, Lestari and Handiyani (2017) with Rachmani et al. (2019) emphasised that adequate e-health systems provision can enhance healthy living; hence, the scholars demonstrated that health professionals were able to maximise the electronic health systems than non-health professionals due to better exposure to health communication technologies. They eventually recommend boosting digital health and information qualities to instigate healthy lifestyles. Another study that examined the effect of the e-health system on Indian older patients demonstrated that it availed them the opportunity to improve their digital health skills (McKinley et al., 2022).

In the African continent, an Ethiopian study added that the utilisation of e-health systems can be promoted by having regard for online resources and acquiring multifarious computer literacy for adopting an e-health system (Shiferaw et al., 2020). In reference to Nigeria as the study's setting, the use of e-health systems is still evolving, some of such services are providing virtual doctor consultations, drug prescriptions shipment to homes, virtual medical consultations, and distant observing of patients with chronic conditions (Oluwakemi, 2020). Other emerging telemedicine e-health services utilise by Nigerians are Mobihealth International, iWello, CribMD, Tremendoc, DRO Health, HealthConnect247, Clafiya, Doctor247, and JEAY Healthcare (Fakiya, 2023). With regard to other Nigerian studies, Zayyad and Toycan, (2018) established that perceived usefulness, beliefs, willingness, and attitude may trigger the adoption of e-health systems. However, it was indicated that low literacy, inadequate motivation, and low managerial policies could hamper adopting e-health apps. To determine the predictors of effective use of e-health tools among Nigerian rural residents, Aririguzoh et al. (2021) posited that internet accessibility and implementation of policies that encourage online participation should be initiated. Aleke et al. (2020) attested from another Nigerian study that health professionals had little knowledge about embracing e-healthcare delivery. Thus, they recommend extensive information communication and technology teaching and re-training for the healthcare personnel on how to utilise e-healthcare delivery.

The previous studies that have been done regarding using communication technologies for health literacy in Nigeria by Aleke et al. (2020), and Aririguzoh et al. (2021), remain limited to the level of health literacy and other technological factors that can promote a healthy lifestyle. Moreover, despite other studies done in Nigeria to promote the acceptance of e-health services

for healthy lifestyles; there is still a low turn up in adopting e-health systems in Nigeria (Oluwakemi, 2020). Besides, the studies did by Aririguzoh et al. (2021), Aleke et al. (2020), Zayyad and Toycan (2018) to encourage the adoption of e-health services in Nigeria were limited to the application of the Technology Acceptance Model (TAM). To this end, there is still a dearth of studies that have empirically evaluated the effects of combining TAM and ISS in promoting the adoption of e-health systems and healthy lifestyles in Nigeria. Therefore, to boost the reception of e-health services for healthy lifestyles in Nigeria as an emerging country, integrating Information Systems Success (ISS) is deemed indispensable, because acknowledging the usefulness of a health system, the ease of use, and intentions to use it appears insufficient motivators in developing country where people are still regarded as laggards in embracing health communication technologies (Putri et al., 2020; McKinley et al., 2022; Shiferaw et al., 2020).

Therefore, we adopted external factors from Delone and Mclean's (2003) ISS model for examining the factors that could influence healthy lifestyles in Nigeria. This was done because more studies are needed in Nigeria as a developing country since the use of e-health services in Nigeria is not yet fully maximised. This study, therefore, aims to contribute to healthy lifestyle literature explicitly consolidating: perceived app usefulness, ease of e-health app use, and intention to use health communication technologies with information quality, system quality, service quality as other external factors in validating the effects on a healthy lifestyle.

In line with this, this study posed this research question: can the TAM variables in combination with information quality, system quality, and service quality predict the use of e-health systems for healthy lifestyles in Nigeria? Therefore, the general purpose of the study is to evaluate whether the TAM in combination with (ISS) variables can predict the use of e-health systems for healthy lifestyles in Nigeria.

THEORETICAL FRAMEWORK

Technology Acceptance Model (TAM) and Information Systems Success Model (ISS)

To account for the effects of the use of e-health systems on healthy lifestyles in Nigeria, the study adopted the Technology Acceptance Model (TAM) as one of the models. TAM was propounded by (Davis, 1989). TAM is an information model designed to elucidate the core factors that can instigate the reception of emerging technologies (Shahab, Ghazali et al., 2021). In other words, it is widely recognised as a personal willingness to utilise technologies for the anticipated rationale (Magsamen-Conrad, Verhoff, & Dillon, 2022). Therefore, the model offers the perceived ease of use, the technological tools' usefulness, and potential users' adoption as the core tents (Faqih, 2022). Hence, the extent to which potential users perceive e-health tools' efficacies in improving healthy lifestyles, the more likely they are to adopt such tools (Perdana & Mokhtar, 2022). For instance, towards extending TAM by utilising it for studying Generation X and millennials' acceptance of virtual patient portals for exchanging information with medics in the United States of America, it was illustrated that the simpler a platform appears for efficient interactions with medics, the likelihood that more patients will embrace it for enhancing healthy living (Mao & Hovick, 2022).

A recent review study on the factors that influenced older adults' acceptance use of e-health tools also projected the interrelationships between e-health tools' usefulness, ease of use, and intentions to use with users' healthy lifestyles (Wilson et al., 2021; Ahn & Park, 2022).

Similarly in an attempt to persuade indigent older adults to embrace mobile apps for gratifying their desires, it was found that the intention to utilise it would be triggered if they should realise the effects of not accepting it, the obvious advantages of the reception, and the apparent usefulness of the app. However, perceiving the usefulness will reinforce the ability to acknowledge the cost of not adopting it and the intent desire to use it (Chan, Lee, & Teh, 2024).

A further study that employed TAM for investigating factors that might propel the continuance intention to adopt mobile health (M-health) apps for improving healthy lifestyles in Australia demonstrated that ease of utilising the apps, social persuasion in addition to the impact of the app usefulness were the motivators that could sustain the utilisation of M-health apps for enhancing health status (Rasul et al., 2023). However, other authors who explored two model-based meta-analysis studies by combining TAM and Theory of Reasoned Action (TRA) illustrated that accepting the use of technologies is not enough to trigger the usage but having a positive mindset when it comes to adopting and advancing technological usage (Feng et al., 2021). Thus, having a positive mind of using it to improve healthy lifestyles is a key factor. Another study outlined that other factors such as user characteristics and personal innovativeness can change how Virtual Reality (VR) usefulness is perceived in the technological world, however, personal innovativeness was found not relevant to perceiving VR ease of use and intention to utilise it (Sagnier et al., 2020). From an educational scenario, a systematic review disclosed that perceived ease of use and usefulness impacted accepting technology for learning purposes (Granić & Marangunić, 2019). The integration of TAM and Diffusion of Innovation Theory in predicting factors that can persuade the acceptance of UBER mobile applications also depicted that other external factors like relative advantages, compatibilities, complexities, observability, and social influence have roles to play in perceiving usefulness, ease of use, and attitude toward intention to adopt UBER apps by consumers (Min, So, & Jeong, 2021). In the banking sector setting, Boonsiritomachai, and Pitchayadejanant (2019) merged the Theory of Acceptance and Use of Technology (TAUT) and TAM in exploring the determinants of adopting electronic banking by millennials and found that hedonic desire devoid of banking system security propelled them. Inferring from the TAM-related studies, we deduced that the perceived usefulness, perceived ease of use, and intentions to use were among the TAM key tents. However, these core elements may not be sufficient to influence the adoption of e-health services for enhancing healthy living, especially in a developing country where communication technologies are not seen as vital assets to healthy lifestyles. Thus, the need to incorporate external factors to shape healthy lifestyles cannot be overlooked.

Consequently, we adopted Information Systems Success (ISS) to complement TAM. The ISS model was propounded by (DeLone & McLean 1992). The evolution of ISS originated from an integrated information system, the system integration on the other hand is the process of joining units of subsystems into an entity. In other words, it is the compilation of subsystems that can work together to offer complete functionality of a system (Danel & Gajdzik, 2024). Thus, a unified information system is a simultaneously functioning information system that joins varieties of information systems utilised in a scheme as a sole system (Orel, 2024). With regards to the successful adoption of e-health systems, Information Systems Success is the integration of the information qualities, system qualities, and service qualities to improve healthy lifestyles, the rationale is to enhance the effectiveness of e-health system operation (Yusof et al., 2024).

Furthermore, the model aims to offer a broad understanding of information system success (ISS) by classifying, illustrating, and clarifying the associations among the six essential scopes of ISS, which comprises the information qualities, system qualities, service qualities, system usage intents, user satisfaction and the net system benefit (DeLone & McLean, 2003). In reference to findings from previous studies that have adopted ISS, Cheng (2020) identified Information system quality as one of the core elements of ISS that can assist in providing suitable, precise, important, ample, and dependable information about the quality of services rendered by individual firms. Another study which was done from the virtual work setting's perspective to ascertain whether ISS can affect Information System (IS) support for creativities and effective IS utilisation and their consequences on job gratification, demonstrated that IS support creativities can enhance job gratification positively while effective IS utilisation affects IS support for creativities and job gratification notwithstanding controlling them with perceived usefulness and IS gratification (Cho & Park, 2022). Thus, it emphasised that effective IS utilisation is indispensable for improving job gratification in virtual work environments. A further study from theoretically based TAM and ISS models that investigated the students' behavioural intent to utilise social media and real utilisation of social media in tertiary institutions to ascertain their academic performances and gratifications, established that perceived usefulness, ease of use, technology fit, information qualities, and system qualities positively and significantly instigated their behavioural intent to use social media and the real usage (Al-Rahmi et al., 2021). A recent study that expanded ISS by examining the accounting information system (AIS) efficiency in the organisational domain in Jordan, found that personal performance was influenced by information qualities, process qualities, and service qualities before adopting AIS (Al-Okaily, 2024).

We, therefore, argued that e-health systems' information quality, system, and service qualities could strengthen the system's perceived usefulness and perceived ease of use towards the intent to use the system to acquire a healthy lifestyle in Nigeria. Thus, we examined the effects of e-health systems information quality, system quality, and service quality on perceived usefulness and perceived ease of use, respectively.

LITERATURE REVIEW

In this section, the constructs in the two theories adapted to interrogate the problem of the study are reviewed leading to the formulation of the hypotheses.

Information Quality

Information quality is the assessment of information value to the users of a particular communication medium (Al-Rahmi, et al., 2021). Thus, it revolves around timeliness, accuracy, relevance, thoroughness, authenticity, and uniformity of information on services or products provided to the end users by organisations or media (Wang, Agyemang & Jia, 2021). However, to rate the information qualities of any communication technology, it is essential that providing a system that can add value to users' needs will prompt them to adopt such a system, therefore, perceived usefulness (PU) is the extent to which users of a particular technology deem it helpful to them (Chan., Lee, & Teh, 2024). Besides providing quality information and a valuable system, the inability to make the system easy to operate may deter many from adopting it hence, perceived ease of use (PEOU) is the level to which users of communication medium affirm the

simplicity of using it (Akdim et al., 2022). To substantiate these claims, related research that explored the motivators of continuous usage of text mining tools showed that information quality (IQ) helps to increase the utilisation of it because the users perceive the system's usefulness and ease of use (Demoulin & Coussement, 2020). Thus, it implies that presenting quality information has an impact on persuading the users to value the system if the app is deemed simple to use. Thus, to rely on any information tool, the information quality, value, as well as simplicity of its usage should be given paramount concern (Sarkar et al., 2020). Kang and Namkung (2019) with Anumudu et al. (2022), further demonstrated that the decision to use a communication tool was impelled by information quality, the usefulness of the information, and ease of utilising it. Hence, we hypothesise that:

H1: Information quality positively mediates the perceived usefulness and ease of use of the e-health systems

System Quality

System quality is the perception of the degree to which a system realises its goal in a proficient and influential manner (Almaiah et al., 2019). Nevertheless, providing a robust and forceful system may not make much impact on the potential users if they do not see the system adding value to their wants, thus, the system's perceived usefulness is the extent to which individuals feel that utilising a specific technology will help to add values to their needs (Panagiotopoulos & Dimitrakopoulos, 2018). To achieve this proposition, it is crucial to make the system less complicated and easier to use by anyone who comes across it, consequently, perceived ease to use is the extent to which individuals believe that utilising a communication app will be free of hurdles (Rasul et al., 2023). With regards to previous scholars' findings, a study established that system quality was insignificant in influencing the two factors (Shim & Jo, 2020). Thus, our study proposes that online health information system quality may enhance the utilisation of the site if the users find the information useful and the site is easy to use. Even from the use of digital libraries' scenarios, enhancement in system quality made a difference in appreciating the digital library information values and ease of use. Therefore, students who successfully made use of digital libraries perceived the benefits and ease of use were able to do so because of the increase in the digital libraries' system quality (Xu & Du, 2019). A further study added that e-health system quality could influence users to see the system as useful and simple to use for acquiring health literacy (Salloum et al., 2019). Another study equally attested that system quality was a prerequisite for perceiving the helpfulness and ease of use (Aldosari et al., 2018). Consequently, we hypothesise that:

H2: System quality positively meditates the perceived usefulness and ease of use of e-health systems.

Service Quality

Service quality is the perception of the degree to which organisations understand their system users' desires and offer resourceful materials to them (Hossain, 2019). Nevertheless, providing resources and materials to meet the client's needs may not push the clients to adopt the system if they do not perceive the system's ability to add value to their desires; consequently, the system's apparent usefulness is an essential predictor to service quality (Shareef et al., 2019). On

the other hand, to complement apparent system usefulness, making the system easy to operate is non-negotiable, because the simplicity of the system interface is essential to the adoption of it (Ahn & Park, 2022). Regarding one of the previous scholar's findings on the quality impact of electronic systems, service quality was identified as a prominent factor (Xu & Du, 2019). In the banking sector, service quality is also one of the key factors that can bring about gratification among users of electronic banking services (Li et al., 2021). Therefore, service quality may motivate e-health users to value the app if it is easy to use. Moreover, Kavitha and Gopinath (2020) demonstrated that online banking service quality is capable of impacting perceived ease of use and usefulness for electronic bank users. Hence, it can trigger perceiving the benefits of online banking information and the simplicity of using it. On the other hand, service quality was recognised as one of the indispensable factors that made the virtual health resource users value the site's information. However, the effects on both perceived site usefulness and ease of use were not evaluated simultaneously (Shim & Jo, 2020). Furthermore, in speculating the Chinese intent for utilising apparel mobile commerce, Chi (2018) indicated that site service quality made the users appreciate the information's usefulness. Thus, our study proposes that:

H3: Service quality positively mediates the perceived usefulness and ease of use of e-health systems.

Perceived Usefulness

Technology's perceived usefulness is the discernment of how a specific communication tool is set to expedite an individual's engagement and gratify one's motives (Wong et al., 2020, Anumudu et al., 2021). The efficacy of the system's perceived usefulness cannot be underrated, even in academia; it has prompted academics to adopt ChatGPT as a learning tool (Mukred, Asma & Hawash, 2023). Nonetheless, the system's usefulness cannot be recognised, if the Intention to use such a system is not initiated, therefore, the willingness to utilise communication technologies for attaining a healthy lifestyle could help to minimise the tendency of developing minor and chronic sickness (Faiola et al., 2019). A previous study that examined the key predictors of a healthy lifestyle and intention to adopt mobile health apps also demonstrated that having value for an e-health system helps to trigger an individual intent to utilise it for a healthy lifestyle (Zhao et al., 2018). Li et al. (2019) further evaluated factors that impelled the adoption of wearable health surveillance technology among older adults and indicated that the system information usefulness could enhance health status and the desire to embrace it. Conversely, Yan et al. (2021) examined the predictors of adopting mobile health apps and found perceived usefulness and intention to use them as crucial factors that could improve a healthy lifestyle. Leung and Chen (2019) added that providing beneficial information through health technology apps could help induce intentions to use it for improving healthy lifestyles. Therefore, integrating perceived usefulness as a mediator could be indispensable for predicting the influence of intention to use an e-health system on a healthy lifestyle. Hence, we propose that:

H4: Perceived usefulness positively mediates the intention to use an e-health system and a healthy lifestyle

Perceived Ease of Use,

E-Health system ease of use is one of the factors that can push people into nurturing the intention to embrace it. This is because; previous scholars ascertained that making a mobile health system interface appear simple, could trigger the intent of utilising it to enhance healthy living (Yan et al., 2021). On the other hand, a review paper that explored the predictors of users' acceptance and utilisation of mobile health tools demonstrated that the simplicity of health technology apps is essential for instigating the intention to use it for impacting lifestyle (Wang & Qi, 2021). Other scholars who examined the factors that influenced health and fitness technology users' decisions attested that e-health app ease of use can instill the intentions of reluctant users to embrace it for a quality living (Cho, Chi, & Chiu, 2020). Ahn and Park (2022) further portrayed that the simplicity of a healthcare tool can motivate the intention of adopting it for enhancing healthy living, which could lead to attitudinal changes among users. Thus, the three antecedents are indispensable for accepting health information tools (Liu et al., 2022). Consequently, we hypothesise that:

H5: Perceived ease of use positively mediates the intention to use e-health systems and a healthy lifestyle

Intention to Use e-Health Systems

The impact of the intention to adopt digital health platforms for a healthy lifestyle cannot be overemphasised. This is because it motivates people, especially the elderly ones, to acquire health literacy proficiencies that can advance quality of life. Therefore, the intention to embrace health information tools is a prerequisite for healthy lifestyles (Zolbin Huvila, & Nikou, 2022). Healthy lifestyles, therefore, allow one to stay free from critical sickness and untimely death (Leung & Chen, 2019). Thus, it can lower the mortality rate that could be caused by chronic diseases such as cardiovascular disease (Su et al., 2022). Similarly, the intention to adopt Information Communication Technology (ICT) for health behaviours regulating purposes can be induced by performance expectations as evidenced during the peak of the COVID-19 pandemic (Dewi et al., 2023).Another study that evaluated the predictors of mobile information system usage from the perspective of continuous intent emphasised that the desire to maintain a healthy life will greatly motivate reluctant ones to accept the use of health information tools (Yan et al., 2021). A further study illustrated that the disposition to appreciate the value of life will possibly instil one's intent to adopt e-health platforms (Altab et al., 2022). Another study that evaluated the factors that prompted the intention to utilise mobile health apps found that the urge to enhance healthy lifestyles triggered the intention for continuous usage (Represas-Carrera et al., 2021, Yan, Luo, & Chiang, 2017). Hence, it is established that healthy lifestyles were crucial to adopting the tools. Therefore, we offer that:

H6: Intention to use e-health systems positively predicts a healthy lifestyle.

In line with the previous related studies' assumptions, the study's model is conceptualised in Figure 1.

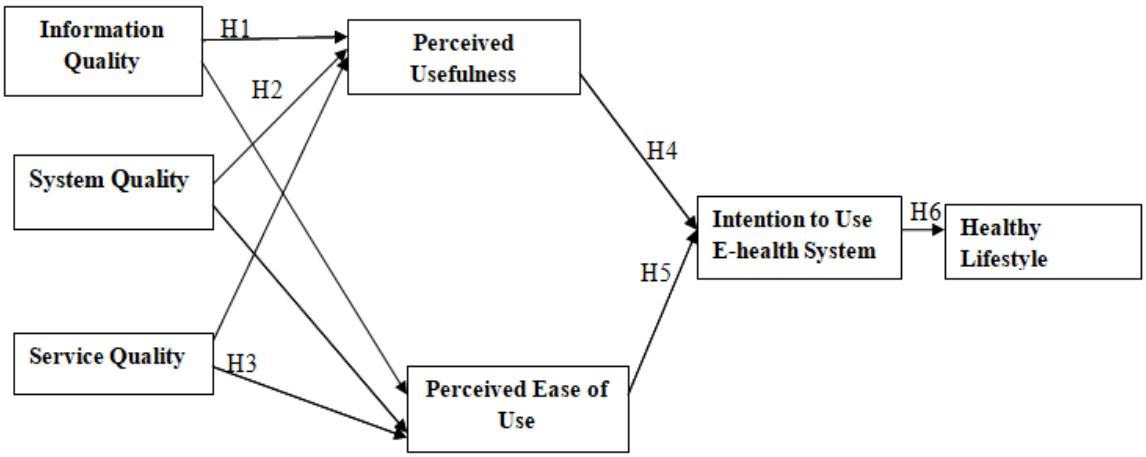

Figure 1: Structural Model of Healthy Lifestyles Antecedents

METHOD

Research Design

To examine the antecedents of healthy lifestyles, a quantitative research design was employed in this study, because it is the most appropriate for studying the effects and cause relationships (Coppock & McClellan, 2019) Furthermore, to enable us to quantify and infer the study's outcomes to the target population, a quantitative study approach was deemed the most suitable for it. To elicit data on the factors that may empower the acceptance of virtual health apps for healthy lifestyles, an online survey questionnaire was used.

Study's Population, Respondents, Location, Sample Size and Sampling Technique

The population of the study comprised 10,109 Baze University undergraduate students. Baze University is a private university located in the Federal Capital Territory in Abuja, Nigeria. A private university was chosen for this study because most of the previous technology acceptance-related studies that were conducted among Nigerian higher institutions were limited to public universities. In terms of the study's population, it comprised 10,109 Baze University undergraduates as estimated in 2023. However, the sample size of 375 was determined by adopting Krejcie and Morgan's Table as Kitenga, Kilika and Muchemi (2020) demonstrated. In terms of sampling technique, the researchers adopted a convenience sampling strategy because the study employed an online questionnaire, and the link was conveniently shared by researchers to students' email addresses and WhatsApp platform groups through referrals. Furthermore, the data were collected between August and October 2023.

Measurement of the Variables and Data Analysis

The study's questionnaire comprised the demographic factors questions and other sections that examined healthy lifestyle antecedents. The questions were structured in a 5-point Likert scale that ranged from "5-strongly agreed to 1-strongly disagree" All the statements in the questionnaire were taken from earlier similar studies and modified to suit the context of this study. Furthermore, the questions that were used and measured the e-health information

quality, system, and service qualities were adapted from (De Jager & Gbadamosi, 2013; and DeLone & McLean, 2003). Out of the nineteen questions adapted from these scholars; six were used for measuring 'information quality" and these included questions such as whether the information contained in the e-health app is accurate; etc. For the "system quality variable", seven questions adapted from the above-mentioned authors were used and examined the variable; these included questions such as: e-health system data is accurate; e-health system data is current; e-health system data is easy to use; etc. "Service quality" was equally measured with six questions which were adapted from the same authors and these covered questions such as service performance is regularly audited; e-health app service encourages users to utilise it; e-health app service is regularly updated to encourage users to adopt it etc.

For the perceived usefulness, perceived ease of use, and intention to use the e-health system, sixteen questions adapted from Guner and Acarturk (2020) were used and measured the variables. Six questions out of the questions assessed "Perceived usefulness" and these include questions like e-health app provides me with information that can trigger a healthy lifestyle; using the e-health app improves my healthy lifestyle; and four other questions. In terms of "Perceived ease to use", six questions out of the sixteen questions were used to measure it. These contained questions such as I find it easy to get information from e-health apps for improving a healthy lifestyle; I find it easy to recover from errors encountered while using e-health app; Interaction with the e-health app is easy for me to understand and so on. The remaining four questions from the sixteen adapted ones were used and examined "Intention to use e-health system" The questions involved things like: I intend to use e-health app more in my daily life; I will use e-health to support a healthy lifestyle; I intend to use e-health app to sketch healthy lifestyle; etc.

Healthy lifestyle as the dependent variable of the study was measured with 10 items, However, Li et al. (2020)'s five healthy lifestyle dimensions which constituted eating habits, smoking habits, self-efficacy, health and diseases, sleep habits, and quality were adapted and designed in ordinal scale for measuring it. Thus, each of the five dimensions of a Healthy lifestyle was measured with two questions. The questions were structured on a 5-point Likert scale that ranged from "5-strongly agreed to 1-strongly disagree". Examples of questions used for measuring healthy lifestyle were: Eating fish two or more times weekly can improve healthy living, Respecting mealtimes improves a healthy lifestyle, smoking regularly hampers active lifestyles, drinking alcoholic beverages regularly on weekends deteriorates healthy living, etc.

In terms of the data analysis, the descriptive data of the study were analysed through Statistical Package for Social Science (SPSS) while the inferential objectives such as influence, and mediation effects were analysed with Structural Equation Modeling (SEM) embedded in the Analysis of Moment Structures (AMOS). The outcomes showed that each variable's Cronbach alpha ranged between .70 and above as Construct reliability (CR) depicted in Table: 1.

In other words, the reliability outcomes for information quality, system quality, service quality, perceived usefulness, perceived ease of use, intention to use, and healthy lifestyles are: .81, .83, 82, .78, .80, .79, and .76 respectively. Hence, it implied that all the seven variables ' Cronbach alpha were reliable.

In terms of the convergent validity, the values were all satisfactory as could be seen in Table 1, because all the convergent validities were all above .50, respectively, according to (Sarstedt et al., 2019). Moreover, the discriminant validity values were also fulfilled since the

values of the variables (Heterotrait-Monotrait Correlations) were lesser than each variable's Average Variance Extracted as stipulated by (Hair et al., 2019).

Table 1: Summary of confirmatory factor loadings, construct reliability, and convergent validity from SEM analysis

Item Numbers	Construct Name	Factor Loading	Construct reliability	Convergent Validity
IQ1	Information Quality	.728	.801	.74
IQ2		.635		
IQ3		.798		
IQ4		.782		
IQ5		.718		
IQ6		.797		
SYQ1	System Quality	741	.831	.72
SYQ2		.753		
SYQ3		.741		
SYQ4		756		
SYQ5		.632		
SYQ6	.	.747		
SYQ7		.692		
SEQ1	Service Quality	.673	.821	.68
SEQ2		.590		
SEQ3		.750		
SEQ4		.665		
SEQ5		.699		
SEQ6		.701		
PU1	Perceived Usefulness	.720	.78	.71
PU2		.681		
PU3		.652		
PU4		.721		
PU5		.701		
PU6		.787		
PEU1	Perceived Ease of Use	.650	.80	.,69
PEU2		.731		
PEU3		.640		
PEU4		.638		
PEU5		.791		
PEU6		.702		
IU1	Intention to Use	.620	.79	.67
IU2		.740		
IU3		.631		
IU4		.701		

Furthermore, the descriptive statistics outcomes for all the independent and mediating variables used in the study are accounted for. The descriptive statistics analysis for information quality, system quality, service quality, perceived usefulness, perceived ease of use, and intention to use the e-health system are displayed in the Table 2.

Table 2: Statistical descriptive analysis of the independent and mediating variables (n=375)

Variables	Mean	SD
Information quality	8,15	1.804
System quality	6,84	1.816
Service quality	14.88	3.727
Perceived usefulness	12.15	2.399
Perceived ease of use	15.17	3.578
Intention to use E-health System	11.77	2.392

The statistical descriptive analysis for the five dimensions integrated for measuring healthy lifestyles is presented in Table 3. Ten questions were used and measured Healthy lifestyles, however each of the five dimensions was measured with two questions. The questions were structured in a 5-point Likert scale which ranged from "5-strongly agreed to 1-strongly disagree.

Table: 3: Descriptive statistics of Healthy Lifestyles dimensions (n=375)

Healthy Lifestyles Dimensions	Mean	SD
Eating habit	0.170	0.454
Smoking habits	0.107	0.760
Self-efficacy	0.339	0.613
Health and diseases	0.204	0.569
Sleep habits and quality	0.664	0.595

Before arriving at the findings of the hypotheses, a structural model analysis was run to ascertain that the model fits the data. The outcomes indicated that the model fits the data because the three criteria of goodness of fit indices, which comprised absolute fit, incremental fit, and parsimonious fit, were met. In other words, the CMIN/DF was <5, (1.349); the Tucker-Lewis Index (TLI) was also ≥ .90 (.987) and the Root Mean Square Error of Approximation (RMSEA) was equally ≤.08 (.054) as stipulated by (Hair et al., 2012). Bootstrapping was run subsequently to analyse the hypotheses that required a mediation effect test.

RESULTS AND DISCUSSIONS

This section discusses the findings of the six hypotheses we examined in the study as could be seen in Table, 4. Regarding the first hypothesis of the study which tested whether information quality positively mediates the perceived usefulness and ease of use of the e-health systems, the outcome showed that standardised indirect effect outcome (Beta = 0.531, p = 0.039) was supported. This indicates that information quality significantly mediated on perceived usefulness and perceived ease of use of e-health systems. Thus, it implies that providing quality information on e-health systems will mostly prompt the potential users to see the usefulness of the system and master any complications posed by the interface while making use of it towards attaining healthy lifestyles, this is because it made the most contribution to healthy lifestyles. It also agrees with prior findings that emphasised that information quality is valuable in shaping user opinion on the usefulness and ease of use of e-health systems (Sarkaret al., 2020; Anumudu et al., 2022).

In terms of the second hypothesis that *examined if the system quality positively meditated the perceived usefulness and ease of use of e-health systems*, the outcome as Table 4 presented, demonstrated that standardised indirect effect result (Beta = 0.125, p = 0.052), was not supported. Hence, it implies that utilising a quality system for displaying online health information cannot reinvigorate the users to perceive the system's helpfulness and simplicity of utilising it for obtaining health-related information. Therefore, the result contradicts the previous scholars that demonstrated that system quality is indispensable in changing users' perception of the system's usefulness and intent to adopt e-health systems (Salloum et al., 2019; Xu & Du, 2019). On the other hand, our study's finding is in line with Shim and Jo (2020), who also established that using the quality system for creating virtual health awareness cannot instigate potential users to see the usefulness of the system and simplicity of the usage.

The third hypothesis of the study which evaluated whether *service quality positively mediates the perceived usefulness and ease of use of e-health systems*, showed in Table 4 that the standardised indirect effect outcome was supported (Beta = 0.520, p = 0.042). This signifies that granting quality service to e-health system users would impel them more to appreciate the helpfulness of the e-health system and upgrade their skills in utilising it even when the interface appears complicated (Kavitha and Gopinath, 2020 Chi, 2018).

The fourth hypothesis of the study which aims to determine if *perceived usefulness positively mediates the intention to use an e-health system and a healthy lifestyle* proved that the standardised indirect effect finding in Table 4 was supported (Beta = 0.442, p = 0.004). This indicates that projecting the e-health system's usefulness can motivate the intention to embrace it for maintaining healthy lifestyles. Therefore, the intention to maintain healthy behaviours through e-health apps may not be actualised if one fails to recognise the helpfulness of the apps Our study's finding supports the earlier scholars who demonstrated that perceiving the usefulness of e-communication apps could prompt users to embrace it for sustaining healthy lifestyle (Yan et al., 2021, Zhao et al., 2018).

The outcomes of the fifth hypothesis which examined the possibility of *perceived ease of use positively mediating the intention to use e-health systems and a healthy lifestyle,* as presented in the Table 4, showed that the standardised indirect effect result was supported (Beta = 0.336, p = 0.003). This suggests that making an e-health app simple to use can substantially prompt the intention to use it more for sustaining healthy lifestyles (Ahn & Park, 2022; Cho et al., 2020).

The final hypothesis outcome which ascertained if *the Intention to use e-health systems positively predicts a healthy lifestyle* shows that the direct effect finding in Table 4 was supported (Beta = 2.58, p = 0.021, Critical Ratio = 5.110). This illustrates that having the intention to use an e-health system can significantly boost one's healthy lifestyle. In other words, the urge to utilise e-health apps could avail one the opportunity to come across health information that can help one to stay healthy. This finding aligned with prior studies that projected the intentions to use the e-health system as an indispensable key in shaping healthy behaviour (Zolbin et al., 2022; Altab et al., 2022; Represas-Carrera et al., 2021).

Table: 4: Hypotheses results

Hypothesized Path	Beta	P	95% Bootstrap BC CI LB	UB
Direct Model				
Information quality → perceived usefulness → perceived ease of use	.160	.025		
Mediation Model				
Information quality perceived usefulness → perceived ease of use	.125	.090		
Standardised Indirect Effect (SIE)	.531	.039	.001	.103
Direct Model				
System quality → perceived usefulness → perceived ease of use	.217	.002		
Mediation Model				
System quality → perceived usefulness→ perceived ease of use	.192	.081	.002	.
Standardised Indirect Effect (SIE)	.125	.052	.001	0.076
Direct Model				
Service quality → perceived usefulness → ease of use	.457	.000		
Mediation model				
Service quality → perceived usefulness → ease of use	.438	.000		
Standardised Indirect Effect (SIE)	.520	.042	.000	.055
Direct Model				
Perceived usefulness → intention to use e-health → healthy lifestyle	.265	.000		
Mediation model				
Perceived usefulness → intention to use e-health → healthy lifestyle	.225	.000		
Standardised Indirect Effect (SIE)	.442	.004	.013	.090
Direct Model				
Perceived ease to use →intention to use e-health → healthy lifestyle	.035	0.001		
Mediation Model				
Perceived ease to use → intention to use e-health app → healthy lifestyle	.046	0.001		
Standardised Indirect Effect (SIE)	.336	0.003	0.018	0.056
Intention to use e-health systems → Healthy lifestyle	2.58	.367	0.021	5.110

*Significant at $p < 0.05$

CONCLUSION AND IMPLICATIONS

We specifically examined the influence of information quality, system quality, service quality, perceived usefulness, ease of e-health app use, and intention to use e-health system on healthy lifestyles. The findings highlight the value of information and service quality in shaping user perceptions of e-health systems. The outcomes also imply that perceived usefulness, perceived ease of use, and intentions to use e-health are vital factors that can influence user attitudes toward adopting e-health systems and subsequent behaviour. However, the study found that system quality does not significantly affect user attitudes toward e-health systems, which suggests that other variables may be more important in shaping user perceptions of system quality. Nevertheless, the study's findings support the TAM and ISS models in highlighting the efficacy of e-health systems on healthy lifestyles.

The significant mediation of information quality on perceived usefulness and ease of use suggests that providing accurate and comprehensive health information could enhance the adoption of e-health systems in Nigeria. This aligns with the importance of reliable health data in a country where access to health information is often limited and can significantly influence health outcomes. Furthermore, the positive mediation of service quality emphasizes the need for user-friendly and efficient e-health platforms, crucial in a setting where digital literacy and technological infrastructure are still developing (Kenny, O'Connor, & Eze, 2017; Nelissen et al., 2018).

In Nigeria, where infrastructure and consistent service delivery pose significant hurdles, e-health systems must be designed with robustness and resilience to withstand infrastructural limitations. One of such is to develop more mobile health innovations that use the Unstructured Supplementary Service Data (USSD) code because they are often simple and cheap (Ekong, Chukwu, & Chukwu, 2020). However, the strong correlation between perceived usefulness, ease of use, and the intention to maintain healthy lifestyles suggests that once these systems are adopted, they could substantially improve public health outcomes.

Practical Implication

One of the practical implications of our study is the projection of a new model for boosting the adoption of e-health systems towards buttressing healthy lifestyles through combining TAM and ISSN Models. Through the outcomes of the study, developers and policymakers are to prioritise advancing information and service qualities to boost user perceptions of e-health systems since they have been proven to be more efficacious in shaping the perceptions of e-health systems. There is a need for health policymakers to also note that the apparent e-health system's usefulness, ease of use, and intentions to use it are important in shaping user attitudes toward e-health systems. Thus, they need to intensify efforts in providing a system that should add value to people's needs.

Theoretical Implication

The study also has theoretical implications. One of them is the extension of TAM by integrating some external variables from ISS such as information quality, system quality, and service quality in conceptualising a new model that can influence healthy lifestyles in developing societies. By doing so, the new model has demonstrated that the combination of the two models can

sufficiently account for the e-health system effects on healthy lifestyles in emerging countries. Thus, it stands as a good model for prospective scholars who may wish to re-validate the model or complement it. Another theoretical implication is that the study has been able to identify a gap in the proposed new model by illustrating that e-health system quality cannot independently impact healthy life attitudes, hence the need to fill in the gap by considering other antecedents while extending the model.

Limitations and Suggestions for Future Studies

One of the limitations of the study was its constraint on the core tenets of TAM and ISSmodels; therefore, prospective scholars should consider investigating the influence of other external factors, such as trust, social influence, personal innovativeness, and users' attitudes towards e-health systems adoption for healthy lifestyles. Another limitation of the study was that it failed to explore the intervention of health literacy programs in adopting e-health systems for promoting healthy lifestyles. Therefore, we recommend that subsequent studies should consider adding an e-health literacy program to their proposed model to boost healthy lifestyle behaviours. Furthermore, the study has methodological limitations by adopting only a quantitative approach in conceptualising the influence of e-health systems on healthy lifestyles. Hence, we suggest that future scholars should triangulate the method by integrating interview techniques for generating new concepts from the context of the study since each country has peculiarities in terms of the variables that affect the use of e-health systems and healthy lifestyles.

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