Factors Influencing the Successful Implementation of eHealth in Healthcare Facilities in Developing Countries: A Scoping Review

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Abstract
eHealth is the leveraging of Information and Communication Technologies (ICT) in health. Its use in complementing health services has risen substantially in the previous 20 years. The study explored the factors that influence the implementation of eHealth in healthcare delivery in developing countries. Three scientific bibliographical databases: PubMed, EBSCO Host, and Google Scholar were reviewed. Titles and abstracts were assessed using predefined inclusion and exclusion criteria. An exploratory study was done to assess the factors (facilitators and barriers) influencing the successful implementation of eHealth in developing countries. The searches yielded 11,001 resources, with 33 articles meeting the inclusion criterion of being in English and describing eHealth implementation in developing countries in the period January 2016 to December 2023. These were included in the study and thoroughly analyzed. Some key factors that influence the successful implementation of eHealth services were presented with computer literacy having the highest frequency in eHealth implementation. It is worth noting that barriers are factors that have a negative impact on implementation; nevertheless, by addressing barriers early on, they can be viewed as facilitators.

Introduction
Using computers enhances a timely approach to data capture, processing, storage and access; hence, evidential data can be accessed in real time. Implementing health information technology (HIT), also called eHealth, which leverages information technology in health, has been associated with improved quality healthcare services, increased efficiency, cost-effectiveness, and better patient satisfaction. Key components of eHealth include Health Management Systems, Clinical Decision Support Systems, Information Systems and Communication Systems for Care (Mair et al., 2012).

Research has shown a growing interest in eHealth uptake and use resulting from the increased knowledge of the potential to advance the quality of healthcare services in both developed and developing countries (Kiberu et al., 2017). The use of ICT to improve healthcare delivery is a key driver for addressing quality and accessibility challenges in healthcare, as well as lowering healthcare delivery costs. Although there is increased implementation and use of eHealth, there are high failure rates, typically caused by a lack of eHealth readiness in developing countries (Semwanga et al., 2021). There is a need to interrogate the factors determining success or failure in eHealth implementation. Thus, this study explored the factors that influence the implementation of eHealth in healthcare service delivery in developing countries.

Methods

A desk review was conducted using content analysis to examine the literature on factors influencing the successful implementation of eHealth in developing countries. This research employed a literature review to establish what has been published on this given topic and to determine the magnitude to which the body of knowledge regarding eHealth implementation has been explored (Paré et al., 2015). The authors established inclusion and exclusion criteria for the study. The keywords used were eHealth, implementation, factors influencing eHealth, and developing countries.

Three databases, namely PubMed, Google Scholar and EBSCOhost, were used for the research. The search string used in PubMed was '(eHealth) OR (e-health) AND (implementation) AND (healthcare facilities) AND (developing countries) NOT (developed countries)', which retrieved 22 records. These were filtered according to (full-text, peer review, period 2016-2023 and English language). The following search string in Google Scholar was used: ehealth|ehealth implementation + Healthcare facilities + developing countries - developed countries + factors. This search yielded 10,700 hints, filtered according to; (full-text, peer review period -2016 to 2023 and English language). The search under EBSCOhost using the search string 'TX implementation AND TX (eHealth or e-health) AND TX (health care facilities) AND TX (developing countries)' yielded 279 results. These were filtered according to (full-text, peer review, period 2016-2023 and English language).

Inclusion and Exclusion Criteria
Considering the vast amount of pre-existing literature and as a means of avoiding bias, a set of pre-defined characteristics was devised to determine which type of literature was to be included and excluded in this research. The inclusion criteria were articles published in English, full-text articles with abstracts, peer-reviewed and scholarly articles, articles on eHealth activities in developing countries, and articles published from January 2016 to December 2023 based on the recent eHealth implementation evidence. On the other hand, the exclusion criteria were all non-English-language articles, Articles not full-text and study protocols, non-scientific or non-peer-reviewed articles, articles describing eHealth activities in developed countries and articles published outside January 2016 to December 2023. A total of 33 articles were selected and used from the three databases.

Results

PubMed
Full-text, English, excluding pre-prints, further filtered these results, and the period from 2016 to 2023 and 20 records were retrieved. Upon further screening, only seven articles were identified and reviewed after meeting all the inclusion criteria, and One (1) article was eliminated based on having been retracted.

Google Scholar
The first 50 displayed results were the latest and most relevant, as per the search. Thirty were sampled as they fell within the scope of the study and were reviewed. Finally, 14 articles met the inclusion criteria.

EBSCOhost
Out of these results, only 50 articles were related to the scope of the study and covered eHealth implementation in developing countries. Thirteen (13 articles) were used as they met all the inclusion criteria. However, three articles were duplicates and were eliminated.

Key determinants of eHealth implementation in health facilities

The researchers looked at the factors that affect eHealth implementation and the frequency of those factors in the 33 publications.

Table 1: Factors that influence eHealth implementation from 33 included publications

Sn	Factors that influence eHealth implementation and citation	Frequency (N) N = 33	Percentage (%)
1	Computer literacy (Ngusie et al., 2022); (Dubale et al., 2023); (Jensen et al., 2020); (Senishaw et al., 2023); (Hailegebreal et al., 2023); (Berihun et al., 2020); (Awol et al., 2020); (Tiwari et al., 2023); (Walle et al., 2023); (Zayyad & Toycan, 2018); (Haque et al., 2019); (Furusa & Coleman, 2018); (Boore et al., 2017)	13	39
2	Training on the eHealth System/capacity building (Dubale et al., 2023); (Senishaw et al., 2023); (Hailegebreal et al., 2023); (Ngugi et al., 2021); (Berihun et al., 2020); (Akwaowo et al., 2022); (Awol et al., 2020); (Patel et al., 2019); (Assaye et al., 2023); (Namatovu et al., 2022)	10	30
3	Professional attitude (Ngusie et al., 2022); (Hailegebreal et al., 2023); (Awol et al., 2020); (Tiwari et al., 2023); (Alaiad et al., 2019); (Yusif et al., 2020); (Walle et al., 2023); (Malik et al., 2021); (Zayyad & Toycan, 2018)	9	27
4	Perceived benefit / usefulness (Ngusie et al., 2022); (Akwaowo et al., 2022); (Patel et al., 2019); (Ncube et al., 2023); (Walle et al., 2023); (Malik et al., 2021); (Zayyad & Toycan, 2018); (Hoque et al., 2017); (Namatovu et al., 2022)	9	27
5	Perceived service quality/ performance expectancy (Dubale et al., 2023); (Ngugi et al., 2021); (Nuhu et al., 2023); (Sondaal et al., 2016); (Alam et al., 2020); (Alaiad et al., 2019); (Yusif et al., 2020); (Kesse-Tachi et al., 2019)	8	24
6	IT infrastructure (Ngugi et al., 2021); (Deriel et al., 2018); (Rajkumar et al., 2023); (Hailemariam et al., 2023); (Haque et al., 2019); (Furusa & Coleman, 2018); (Boore et al., 2017)	7	21
7	Management support (Berihun et al., 2020); (Tiwari et al., 2023); (Hailemariam et al., 2023); (Malik et al.,	7	21

	2021); (Zayyad & Toycan, 2018); (Kesse-Tachi et al., 2019); (Semwanga et al., 2021)		
8	Technical support personnel (Senishaw et al., 2023); (Ngugi et al., 2021); (Assaye et al., 2023); (Tiwari et al., 2023); (Hailemariam et al., 2023); (Furusa & Coleman, 2018)	6	18
9	Data security (Akwaowo et al., 2022); (Patel et al., 2019); (Ncube et al., 2023); (Tiwari et al., 2023); (Alaiad et al., 2019); (Furusa & Coleman, 2018)	6	18
10	Organisation culture and policy (Pagalday-Olivares et al., 2017); (Yusif et al., 2020); (Walle et al., 2023); (Zayyad & Toycan, 2018); (Kesse-Tachi et al., 2019); (Semwanga et al., 2021)	6	18
11	Social influence (Pagalday-Olivares et al., 2017); (Alaiad et al., 2019); (Walle et al., 2023); (Boore et al., 2017); (Semwanga et al., 2021)	5	15
12	User satisfaction (Dubale et al., 2023); (Patel et al., 2019); (Ncube et al., 2023); (Malik et al., 2021)	4	12
13	Perceived information quality (Dubale et al., 2023); (Patel et al., 2019); (Alaiad et al., 2019); (Semwanga et al., 2021)	4	12
14	Perceived system quality (Dubale et al., 2023); (Sondaal et al., 2016); (Pagalday-Olivares et al., 2017); (Alaiad et al., 2019)	4	12
15	Knowledge of eHealth systems (Berihun et al., 2020); (Awol et al., 2020); (Zayyad & Toycan, 2018); (Furusa & Coleman, 2018)	4	12
16	Data confidentiality (Patel et al., 2019); (Ncube et al., 2023); (Alaiad et al., 2019); (Hoque et al., 2017)	4	12
17	Resource allocation / funds (Hailemariam et al., 2023); (Malik et al., 2021); (Furusa & Coleman, 2018); (Semwanga et al., 2021)	4	12
18	Limited Human Resource (Pagalday-Olivares et al., 2017); (Walle et al., 2023); (Malik et al., 2021)	3	9
19	Cultural and traditional beliefs (Ncube et al., 2023); (Pagalday-Olivares et al., 2017); (Zayyad & Toycan, 2018)	3	9

20	Internet bandwidth (Patel et al., 2019); (Pagalday-Olivares et al., 2017); (Haque et al., 2019)	3	9
21	Frequent power blackouts (Ngugi et al., 2021); (Hailemariam et al., 2023); (Haque et al., 2019)	3	9
22	Ease of use of the system (Ngugi et al., 2021); (Hoque et al., 2017); (Namatovu et al., 2022)	3	9
23	Awareness about eHealth (Akwaowo et al., 2022); (Patel et al., 2019); (Tiwari et al., 2023)	3	9
24	Strategies, Policy and standards (Furusa & Coleman, 2018); (Boore et al., 2017); (Semwanga et al., 2021)	3	9
25	Age (Demographic factors like age) (Ngusie et al., 2022); (Walle et al., 2023); (Furusa & Coleman, 2018)	3	9
26	Availability of Computers (Ngusie et al., 2022); (Assaye et al., 2023)	2	6
27	Supportive Supervision (Senishaw et al., 2023); (Tiwari et al., 2023)	2	6
28	Risk (Perception of risk) (Akwaowo et al., 2022); (Alaiad et al., 2019)	2	6
29	Staff incentives / Motivation (Hailemariam et al., 2023); (Zayyad & Toycan, 2018)	2	6
30	Perceived technology (Ngusie et al., 2022)	1	3
31	eHealth (EMR) guideline access (Berihun et al., 2020)	1	3
32	Equipment cost (Patel et al., 2019)	1	3
33	Poverty (Pagalday-Olivares et al., 2017)	1	3
34	Performance expectancy (Alaiad et al., 2019)	1	3
35	Education status (Walle et al., 2023)	1	3
36	Organization and Management policy (Zayyad & Toycan, 2018)	1	3
37	Gender (Hoque et al., 2017)	1	3
38	eHealth infrastructure (Boore et al., 2017)	1	3

Data Management
Mendeley reference management software was used to organise the retrieved articles and helped identify duplicates for removal.

Discussion

The study's key findings showed that various factors influence eHealth implementation in developing countries. Thirty-three articles that met the inclusion criteria were identified. From these, the factor that influenced eHealth implementation in developing countries with the highest frequency of 13 and a percentage of 39% was computer literacy. Users who are computer literate easily adopt the eHealth system deployed compared to the users who are not computer literate. Training users in the eHealth system to be deployed positively impacts its adoption. When users are trained on how to use the system, they adopt it, and when no training is done, it becomes a barrier to eHealth implementation.

Professional attitudes towards eHealth systems are critical since positive attitudes and openness to innovation among healthcare practitioners and administrators can help adopt and use these technologies more effectively. Conversely, resistance might create barriers, emphasising the importance of training and change management for successful implementation. Perceived benefits and usefulness of the eHealth system are essential, as users have to understand how the system improves their workflow and overall service quality. When healthcare professionals and patients see tangible benefits, adoption rates increase, and the system is more likely to be implemented successfully. A robust ICT infrastructure is required to provide a platform for e-health systems and is undoubtedly a critical factor for successful eHealth implementation (Boore et al., 2017). Without a vital infrastructure, which includes high-speed internet connectivity, dependable hardware, and updated software, the system's implementation may not be successful. Management support has a critical role that does not need to be over-emphasised. A strong leadership commitment to eHealth initiatives enables proper resource allocation, fosters employee buy-in, and facilitates problem-solving during implementation. As shown in previous studies, having precise guidelines for collecting, using, and storing health data builds confidence, increases confidentiality and integrity, and reduces fears of data misuse (Namatovu et al., 2022).

Resource allocation and financing must be considered for successful eHealth implementation. Building, maintaining, and upgrading eHealth systems requires adequate financial and material resources. Underfunding can result in ineffective implementation, poor system performance, and long-term sustainability difficulties. Overall, successful eHealth implementation relies on a multifaceted set of factors that, when properly managed, can greatly improve healthcare delivery in developing countries.

Limitation

The study relied solely on three scientific bibliographic databases (PubMed, EBSCO Host, and Google Scholar), which excluded relevant studies indexed in other databases. The inclusion criterion of English-only articles might have overlooked significant research published in other languages, particularly in non-English-speaking developing countries. The study's focus on eHealth implementation in developing countries within a specific time frame (January 2016 to December 2023) might have further limited its scope, potentially excluding significant findings from earlier and later periods and research with broader geographical contexts. Finally, focusing on titles and abstracts might have overlooked research in which relevant details are only discussed within the full text.

Conclusion

This study presents a comprehensive list of factors influencing the successful implementation of eHealth services. Furthermore, low computer literacy was the most significant impediment to the long-term acceptance of eHealth systems in developing countries. Addressing barriers early on and utilising facilitators during deployment can assist in developing eHealth systems that meet user expectations and provide additional advantages to health professionals, patients, and caregivers. The steady increase in uptake over time may indicate that implementation becomes more acceptable to

practitioners as computer literacy improves. To ensure the successful implementation of eHealth in developing countries, implementers should consider the level of computer literacy of health professionals and the factors previously listed as affecting eHealth.

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