Leveraging E-learning to Optimize E-health Usage in Low- and Middle-income Countries

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Abstract: The objective of this study is to explicate the strategic utilization of E-learning to optimize E-health usage in low and middle income countries. Literature indicates that there is serious shortage of medical personnel and community healthcare workers worldwide. However, there is also scarcity of medical educators that could facilitate and provide quality training, mentorship and for the dissemination of medical information especially in low income countries. On the other hand, several E-health studies have indicated the significance of training, awareness campaigns and medical information accessibility in the use of E-health. This study therefore, suggests a framework that could be used to leverage E-learning for optimal E-health usage. By using a composite conceptual framework designed with the constructs from the theories of; the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology, Organization and Environment (TOE) this study designed a framework that could be used to inform the use of E-learning for E-health optimization. Results of the study indicated that; awareness, effort expectance and training are key elements for E-health usage. E-learning has been applied in many perspectives but its use for E-health usage has been limited, hence this study will act as a source for future research dealing with the optimization of E-health usage.

Keywords - E-learning, E-health, Rural areas, rural healthcare

I. INTRODUCTION

Worldwide the progress of achieving a relatively sound healthcare is hindered by the shortage of health workforce and experienced medical personnel. The lack of medical personnel is acute in low and middle-level income countries which experience the continuous exodus of medical personnel as they move for greener pastures. Thus has not only brought shortage of these medical personnel but has also negatively impacted on the quality of services rendered by those that remain. The few personnel that sacrifice to remain behind especially in rural areas are faced will a lot of challenges that include but not limited to; big number of patients, limited access to information and sharing of ideas, support by poorly trained medical carders, inappropriate in-service training, poor supervision and imbalances in skill-mix composition [1].

Considering the financial constraints in many of the low and middle-income countries, many of these challenges can’t be solved overnight though solutions are needed. Hence, healthcare providers need a paradigm shift in the strategies of learning and training of medical personnel if they are to counteract these challenges. Such rationale implies that healthcare providers and medical training institutions need to embrace E-learning. Researcher [2] noted that, E-learning for E-health doesn’t only provide the traditional benefits like; support curriculum development, course scheduling and management, provision of multiple learning environments, reduction in costs associated with learning but also comes with benefits that are paramount for the success of healthcare provision. They noted that these extra benefits include but not limited to;

E-learning is capable of strengthening communication between medical personnel and patients and medical personnel with each other regardless of the geographical constraints. It could provide supplementary and up to date information to healthcare workers across the board at any time and in any place hence offering flexibility in learning and effortlessly access to information. Such could improve information literacy needed for E-health optimization. On the other hand, the improved accessibility to healthcare learning and knowledge transfer could be seen as an effort to address medical expertise drain in the healthcare sector of low and middle-income countries [1]. As [3] noted, leveraging on new technological innovations for healthcare provide unlimited opportunities for healthcare workforce of developing countries that could enable them to participate in technological advancements not only for their benefits but also to improve the quality of services they provide. They put it that, such will also enable them to overcome the challenges of limited infrastructure and improve their collaboration with their counterparts in developed countries who are familiar and confident in using technologies as part of their everyday practice.

Researchers [2] noted that, the use of E-learning tools like; video conferencing, recording, webcasting, localization and playback of training enhance a wide and unlimited access of information to educators who are sparsely located in different geographical regions. They put it that, such methods of teaching and learning are more cost-effective than standard face-to-face teaching programmes. Putting in mind that these healthcare providers are few, hence arranging for the tradition face-to-face in-service or upgrading programmes could look destructive they will be drawn away from their already human resource constrained health institutions to attend these courses. Hence, using e-learning these healthcare personnel will participate in the training programmes at the time of their choice while still attend to patients in their communities without disruption. More so, as [4] noted, the use of E-learning will equip the healthcare personnel with technological expertise and skills that is sufficient enough to handle and use E-health facilities. As [1] also noted, medical schools already suffers poor course uptake, their small classes could also impeded by lack of stainability hence, leveraging E-learning could improve enrollment at reduced costs that are supportable.
II. RELATED WORK

Several studies such as; [2]; [3]; [6]; [7] have indicated the need for the use of E-learning intervention to increase awareness, expertise and skills and information and communication technology (ICT) literacy for healthcare workers to improve the readiness, acceptance and usage of E-health. The studies also indicated that, in order to increase the number of healthcare personnel needed to meet the increasing demand for good healthcare, the context in which training is done need to be accelerated. Hence, this calls for the consideration and acknowledgment of the potential of e-learning in the enhancement of teaching and learning. This is paramount for low and middle-income countries that are increasingly confronted with many challenges that prevent them to deliver sound healthcare and medical services. The use of E-learning in the implementation of E-health doesn’t only mitigate challenges of; financial needs, resources, proficiency, accessibility, collaboration and sharing of medical information, lack of physician and other healthcare professionals but also helps in building competent healthcare teams and also raises the standards of basic healthcare workers as well as improving the quality of services rendered by such healthcare personnel.

As [5] noted, E-learning in medical education is a means to an end, rather than the end in itself. Its utilization for E-health could stimulate active learning for health students irrespective of the learning environment. This could help to develop higher cognitive clinical reasoning skills and display interpersonal skills. As [8] noted, many low and middle income countries encounter the problem of scarce medical personnel by increasing students’ intake or opening up new medical schools. It is important to note that, without proper facilitation and equipped medical training staff, the increase of students’ enrollment just and opening up new schools just worsen the situation as it compromises the standards of the output. In some instances, well established medical schools are put on pressure to provide, facilitate or share staff with these newly created schools such increases pressure and workload to the already constrained personnel. However, if such establishments leverage E-learning, they would be in position to extend faculty availability to new medical schools and reach distant students.

[6]; [7] noted that, where E-health has been implemented, there are cited cases of medical errors accruing from ineffective usage. They noted that, in order to reduce these medical errors, minimize repetition of medical tests and reduce costs arising from such mistakes, healthcare personnel need constant training, collaboration and consultations. However with face-to-face consultations and training, such will prove impossible. With the use of E-learning medical personnel can quickly construct e-learning courses and material, for individuals or groups, hence getting refresher training while at the same time attending to their patients. More so, it should be noted that taking the initiative in using E-learning for E-health empowers medical personnel to get ICT literacy skills that could enable them to easily access health information, collaborate and hence improve the delivery of services. However, much as a lot has been said and suggestions made, little has been done for the implementation of E-learning for E-health solutions. Above all, many low and middle-income countries are still in their early stages of e-health development and have so far not yet realized its benefits. Hence factors influencing the use of E-learning for the optimization of E-health need to be investigated for smoother implementation of such an innovation.

Researcher [9] noted that, effective delivery of healthcare services is paramount for any country be it developed, developing or least developed. It is therefore vital that, healthcare facilities and centres implement technological systems to increase the access of medical services most especially by the economically disadvantaged communities. [3] noted that, for E-health to firmly find its roots in low and middle-income countries dissemination of medical information is needed to increase awareness, collaboration and self-efficacy. [10]; [11]; [12] noted that gaining success with e-learning methods both synchronous (online) and asynchronous (offline) teaching methods, computer-based, web-based, and internet-based teaching methods is influenced by many factors ranging from institutional, individual and technological factors. They further noted that, it is essential to investigate those factors that play substantial roles in e-learning since attaining E-learning efficacy is paramount for E-health usage.

Consequently, [7]; [13] also noted that the inability for healthcare providers to effectively share and access health information leads to difficulties in providing consistent and coordinated patient care. They emphasized the need to investigate those factors necessary for use of E-learning to optimize E-health usage. Researchers [1]; [5]; [10] noted that, much as there numerous factors that could impede the use of E-learning in for healthcare, many these factors may be categorized as; individual perceptions towards technology, institutional/organizational, environmental and technological factors. They recommended that, such factors should be investigated so as to provide a framework necessary for the use of E-learning to optimize E-health usage.

A. Theoretical Foundations and Conceptual Model

Much as the utilization of E-learning for healthcare and medical education has not been fully exploited especially in developing countries, there is strong evidence for its effectiveness to improve E-health usage [13]. Hence, effort has to be made to design an appropriate framework that will guide its use so as to optimize E-health usage. To embrace the factors as categorized by [7]; [11]; [13] this study utilized two theoretical frameworks of the Unified Theory of Acceptance and use of Technology (UTAUT) [14] and the Technological, Organizational and Environmental (TOE) [15]. From the UTAUT three constructs of; effort expectancy, performance expectancy, social influence whereas from TOE three constructs of Technological, Organizational and Environmental were used. The conceptual framework is as demonstrated in Figure 1.
B. Hypotheses Development

Basing on the construct of the conceptual framework, eight hypotheses were suggested. These were as follows:

H1: Effort expectancy when mediated by efficacy with E-learning will influence E-health optimized usage

H2: Performance expectancy when mediated by efficacy with E-learning will influence E-health optimized usage

H3: Social influence when mediated by efficacy with E-learning will influence E-health optimized usage

H4: Organizational factors when mediated by efficacy with E-learning will influence E-health optimized usage

H5: Technological factors when mediated by efficacy with E-learning will influence E-health optimized usage

H6: Technological factors influences E-health optimized usage

H7: Favorable environmental factors when mediated by efficacy with E-learning will influence E-health optimized usage

H8: Efficacy with E-learning will influence E-health optimized usage

III METHODOLOGY

Based on the conceptual framework, a closed-ended questionnaire was designed using a 5-point-Likert scale where 5 and 1 represented strongly agree and strongly disagree respectively, 3 represented neutral whereas 4 and 2 were respective intermediate values. 295 questionnaires were distributed in three hospital of; Kalafong in Gauteng province, Kwa-Mhlanga in Mpumalanga and Philadelphia in Limpopo province in South Africa (SA). 254 questionnaires were returned that gave a response rate of 86.1%. The returned questionnaires were screened, coded and then transcribed in SPSS v 22.0 for analysis. The overall reliability of the measuring instrument was 0.928 a value greater than the recommend threshold of 0.70 [16]. Individual constructs were also tested for reliability by using the Cronbach’s alpha (α) and were found to have reliability above the threshold.

IV. RESULTS

Both correlation and regression analysis were carried out to give the strength and direction of the linear relationship between two variables taken at a time and determine how each construct contribute to the overall prediction of the model. Results indicated that all constructs apart from technological factors had a significant correlation at 0.01 level of significance with the mediating variable E-learning efficacy. Results of correlation have been left out due to space.

A Regression Analysis

[16] noted that, regression analysis gives the relationship between dependent variable and one or multiple independent variables. Multiple regression analysis was carried out to determine the contribution of each independent variable to the overall model. Results indicated that the study’s model predicts 50.1% of the optimization of E-health usage. Results for independent constructs are as demonstrated in Table 1.
TABLE 1: MULTIPLE REGRESSION AND COLLINEARITY ANALYSIS

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig</th>
<th>Collinearity Statistics</th>
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<td>Std Error</td>
<td>Beta</td>
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<td>.206</td>
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<tr>
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<td>.071</td>
<td>.334</td>
<td>3.784</td>
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</tr>
</tbody>
</table>

a. Dependent Variable: E-HealthUsage

Results indicated that E-learning efficacy contributes 33.4% of the prediction of E-health optimization. Furthermore, results also indicated that organizational or institutional factors play a major role in the prediction of the use of E-learning to optimize E-health usage with a prediction power of 28.8%. All constructs showed a significant contribution to the prediction of E-health optimization. Prior analysis had indicated that the correlations between constructs was high, hence this necessitated the test for multicollinearity using the variance inflation factor (VIF). For multicollinearity to exist, VIF >10, otherwise it doesn’t. Results indicated that all values of VIF < 10, hence multicollinearity didn’t exist.

B. Hypotheses Testing

Based on the correlation and regression analysis, the suggested hypotheses were tested. Results indicated that all the suggested hypotheses were accepted. Table of hypotheses testing has been left out due to space.

V. DISCUSSIONS

The ubiquitousness of technology is opening chances to bridge the gap between the information rich and information poor. Such has enabled extensive accessibility of information at reasonable cost and has provided avenues for increased collaboration among professionals. If these technologies are leveraged by medical institutions, healthcare providers will get a chance to share medical information and to increase collaboration. This study’s major objective was to design a framework that could guide the use of E-learning to optimize E-health usage. Results indicated that, much as there are still many challenges for effective utilization of E-learning, there is strong evidence for its effectiveness to optimize E-health usage. This is revealed by the acceptance of hypothesis eight (H8) and the 33.4% influence of E-learning efficacy to the overall E-health optimization as demonstrated in Table 1.

More so, E-learning is a better way forward to build capacity of healthcare providers keeping in mind that they are faced with heavy workloads [2] yet they need in-service training and upgrade. E-learning will not only help them to keep working without disruption and at the same time enable them to improve their expertise with E-health. This argument is supported by the acceptance of hypothesis two (H2). It is therefore important for medical institutions to provide support in terms of training, awareness and helpdesk support. This is supported by the acceptance of hypotheses one and four (H1) and (H4). Results of this study are in agreement with the recommendations of [4] who noted that for E-learning to be used to optimize E-health usage, there is a need for medical institutions to pave way for healthcare practitioners to update their medical knowledge and skills and fulfilling continuing medical education requirements with minimal negative impact on other life areas including personal and professional life.

Globally, there is advancement in technology. These technological innovations come with opportunities for healthcare providers of low and middle-income countries to enable them handle and diagnose complicated diseases. However, this requires good infrastructure that may not be available in these countries hence collaboration becomes inevitable. This implies that technological factors are paramount for E-learning to be effective in the optimization of E-health such explains why hypotheses five and six (H5; H6) were supported. Results of this study are in agreement with that of previous researchers [1]; [11]; [13] who also noted that good technological facilities will improve accessibility to medical information and the gaining of expertise in using new technological devices. More so, it should be noted with concern that, medical institutions and governments should provide constant support by training healthcare providers for them to be able to use the new technologies. Thus also explains why hypotheses H1, H4, H7 and H8 were accepted.

A. Limitations and Recommendations

This study only collected data from three hospitals from SA. However, much as effort was made to ensure that these hospitals are selected from urban, semi-urban and rural, they may not be a good representative of either all hospitals in SA or all low and middle-income countries. Therefore, results of this study may be limited in generalization to all low and middle-income countries. This study recommends a comparative analysis of data collected from different countries. As [11] factors influencing the use of E-learning may vary from country to another due to the different technological and infrastructure development.

The researchers also believe that acceptance and use of technology may also be moderated by users’ demographics, characteristics, situational variables and change in time that were not included in the analysis of the collected data. The
study recommends that future research include the analysis of these variables to examine their interacting effects.

B. Contribution of the Study

Literature indicates that few studies have investigated the use of E-learning to improve E-health usage. Much work on E-health is reporting on the challenges developing countries are facing. More so, the little work that has been done in the use of E-learning to optimize E-health usage is still in White papers and project reports which are also written in the developed countries context. Hence, the empirical findings of study will be of significant theoretical and practical contribution. First this study will extend research of devising means of optimizing E-health in low and middle income Countries like E-learning. Further still, the policy makers in these countries will use the results of this study in planning so as to have better strategies for implementing E-health services.

It is also important to note that several studies have been carried out to investigate the success of E-learning: acceptance, adoption and use in developing countries. However, many of these studies of E-learning success in developing countries are focusing on learning institutions and national perspectives. The use of E-learning to improve in-service training for professionals like medical personnel is least investigated. This study indicated that E-learning usage can be extended beyond learning institutions to healthcare providers based in their respective health institutions. Theoretically this is an argument of interest that will attract more research. When researchers extend research in this direction, this study will be a theoretical contribution in the information systems body of knowledge in E-learning domain. These insights may also reveal additional useful information of implementing E-learning in other industries of low and middle-income countries.

C. Conclusions

This study sought to design a framework that could guide the use of E-learning to optimize E-health usage. This study showed that there is an increasing need for continued education of healthcare providers as this will help them to keep abreast with the ever changing technology. The use of E-learning to boost healthcare provider’s knowledge will not only help them to be digital natives but also help in the improvement of care to patients especially in the resource constrained countries. This is so as the experience and skills obtained by using E-learning will boost these personnel’s expertise and efficacy of using E-health. Further still, the pro's and con's of e-learning could vary from country to country so do the factors of its effective usage and its applicability. However, it is important to note that much as e-learning is rapidly growing as a form of training delivery it is not a second-rate alternative to traditional healthcare providers’ education. E-learning is just a means of adding value to make it easy and possible to overcome the limitations of existing educational strategies especially in the resource constrained countries. It should therefore be looked at as a facilitator to maintain competencies acquired during formal training and means of bridging the gap of technological innovations usage like E-health.

REFERENCES