Developing a Conceptual Framework Suitable for E-Health in War-torn Zones: The Case of Libya Conflict Regions

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Abstract. The myriads of healthcare challenges are no doubt more complex among nations under the siege of war and conflicts, such as the case of Libya. The healthcare systems are mostly overburdened due to escalated cases of injury, poor hygiene and limited number of medical expertise. Libya prior to the civil uprising had depended on foreign medical expertise, and as a result of the uprising these experts were forced to relocate. Series of civil conflict and random attacks has further weakened the health care system in Libya, which is basically the traditional or conventional system. This conventional system of health record management, diagnosis and prescription can easily be damaged or loss in the phase of conflict. Application of ICT in the health sector known as e-health has proffered solutions to most of these challenges through electronic health record management, diagnosis, booking appointments and medical prescriptions. Hence health records can be accessed online and easily on request. While developed countries have since adopted and implemented the e-health system, it is still a relatively new phenomenon in most developing countries like Libya. It is pertinent to know that adoption and successful implementation of e-health requires a thorough assessment of readiness level in terms of the different components and factors affecting e-health system. The study aims to apply knowledge from e-health readiness assessment to the design of a suitable e-health framework for implementing e-health services for the case of conflict zones such as Libya.

Keywords: e-Health, Health care system, Conflicts zones, Libya, Conceptual Model

1. Introduction

E-Health principally involves the use of information and communication technologies in health care services, this has been growing at an exponential rate in the last three decades (Neuhauser & Kreps, 2011). Though its growth is mainly within the field of medicine and less in health promotion (Neuhauser & Kreps, 2011; Timpka, Finch, Goulet, & Noakes, 2008). The traditional system of applying paper work in managing health care system is quite a daunting and ineffective task with many weaknesses. In recent years, fast-paced development in Information Communication Technology (ICT) has led the world to swiftly move from manual to automating services, especially in services relating to health. It is generally known that health is key to human development, especially in socio-economic development of any country. The adoption and use of e-health is more common among the developed countries and relatively a new concept in most developing countries of the world like the Arab countries such as Egypt, Saudi Arabia, Iraq, Iran, Jordan and Libya.
The concept of E-health may still be young in many developing Arab countries. However, e-health generally has become an issue on the table of the bodies concerned in Arab countries. The series of uprising and rise in conflict among the Arab nations such as Libya has widened the need for a better health care system. This is needed to cater for the increasing number of war victims and patients in these countries. Libya’s healthcare remains deficient and incapacitated even after the post war era especially, western Libya which has been under persistent insurgence and occasional state of riots. The persistent state of armed conflict in Western Libya has deterred progress and affected the services of health workers to properly attend to patients. Consequently, patients and medical workers in developing countries need a working system that enables a gratified use on proffering solutions to recurring health challenges (Drury, 2011).

E-Health can deliver healthcare to geographically remote locations, by facilitating remote access to critical medical data. More importantly, it has the overall potential to minimize the cost by eliminating redundancy of diagnostic testing, travel expenses accumulated by rural patients travelling to urban hospitals and reducing emergency cases by promoting regular check-ups (Hossain, Yokota, Sultana, & Ahmed, 2018). Information technology has been successful in optimising performance and reducing costs in sectors such as banking and engineering. The pervasiveness of digital platforms has resulted in the emergence of digital health platforms addressing various health care needs globally. Digital platforms, typically, bring about an international division of labor between platform owners in developed countries where they are usually developed and platform consumers in developing countries leveraging them (Msiska, et al, 2019).

Implementation of health information systems improves organisational efficiency by optimising business processes and improving decision making by generation of accurate and reliable data as illustrated in Figure 1.

Furthermore, various studies have found that e-Health systems have enhanced treatment outcomes, reduced clinical visits and increased hospital efficiencies. Hospitals that maintain electronic health records have also been successful in reducing medical error rates (Drury, 2011; Ossebaard, 2013; Grunwell, 2017 and Msiska et al., 2019).

The need to design an e-health model for different health services using ICT to improve the organizational performance of primary health care services in western Libya is paramount. This approach can enhance ease of sharing patients’ data online, diagnoses, booking appointments and unifying the electronic health records or healthcare remotely. However, to develop a suitable e-health
organizational model, there is need for the assessment of the readiness level of the region in order to avoid implementation failure resulting from regional specific barriers or factors.

This study represents a conceptual paper as part of an ongoing PhD dissertation thesis on development of E-health readiness framework for conflict zones. The study aims to apply knowledge from e-health readiness assessment to the design of a suitable e-health framework for implementing e-health services for the case of conflict zones such as Libya. This will take into cognizance challenges identified from the readiness assessment of Libya’s primary health care system. Different factors could hinder the use of Information and Communication Technology (ICT) or readiness to adopt e-Health services. The field of e-health is an Applied Health Technology domain; that is an interdisciplinary research field at the interface between health and technology, and studies of how health may be related to the implementation and impact of technology, both directly and indirectly. Interdisciplinary research is necessitated when dealing with complex problems that do not fit neatly within disciplinary boundaries, resulting in the need to draw upon diverse bodies of expertise (Huber, 2019).

2. Literature review

Studies on e-health integrates knowledge from various fields such as Public Health Sciences; specifically, Health promotion Participatory Design, Human Computer Interaction and Computer Supported Cooperative Work (Fitzpatrick & Ellingsen, 2012; Jolley, 2014; Sy, 2018). The common denominator for the above-named fields is the centrality of human involvement in the design of programs. Interdisciplinary research has in the last three decades re-shaped the e-health landscape, resulting in innovations that contribute to more usable systems (Ronchi, 2019). Disciplines have long established histories and cultures, which can be hard to bridge (Sutton & Kemp, 2006).

In the development of e-health applications for health promotion, researchers from the technology field might be more interested in the technical elegance and innovations of the utility than researchers from the health promotion field who are more interested in how accessible the applications are to the users and how well they fit into the organizations’ practices and infrastructures. The latter are issues of importance to health promotion researchers whose ultimate concern is if the utilities are designed to cater for diverse population of users and if the information/services support the recipients’ health decision making (Kreps & Neuhauser, 2010).

The field of research for the proposed study is the adaptation of modern technology for healthcare services in a Primary Health Care (PHC) setting. PHC is identified as an important setting for health promotion (WHO, 2016) and an important tool to reach out to the grassroot, since it is the gateway to the health care system and has good contact with the local communities (Basholli, Lagkas, Bath, & Eleftherarakis, 2015) PHC has both professional knowledge and access to a large segment of citizens. This places it in an opportune position to promote health, prevent basic health challenges and diseases as well as contribute to enhanced health literacy among the population (Drury, 2011; Ossebaard, 2013 and Kiberu, Scott, & Mars, 2019).

Health communication is a key strategy for promoting health within and outside of health care settings (Gustafson, Wise, Bhattacharya, & Pulvermacher, 2012). Modern health care systems have witnessed what some researchers term a ‘communication revolution (Neuhauser & Kreps, 2011) whereby modern technology has changed health care provision through a wide range of e-health applications including ubiquitous health information websites, online social support networks, tele-health applications, healthcare systems’ web portals, tailored health education programs and personal medical records (ibid.). The use of e-health technologies for promoting health is a new and growing branch of health technology. Different kinds of Internet and mobile applications are devised to prevent diseases and empower people to take more responsibility for their own health (Hoyo-barbolla, Carisio, Ortega-portillo, & Arredondo, 2007).

Lindberg, (2017) presented the design and development of a study that will investigate whether the introduction of a maternal and child health (MCH) e-Registry leads to time efficiency. Efficiency was measured in terms of reduced time spent on health information management in the context of antenatal care in primary healthcare clinics with and without the MCH e-Registry in the West Bank of Palestine.
It describes the mapping of care providers’ workflow, the development of a data collection tool, and the conduct of a pilot time-motion style study. The time-motion methodology involves continuous observation of care providers’ work tasks and recording of the time taken to perform a set of predefined tasks. The pilot study results suggest that care providers in the clinics with the MCH e-Registry spend more time on both antenatal care consultations and health information management compared to care providers in clinics still using the paper-based system. The sample size was small and not balanced between the two groups. The results were not statistically significant. The pilot study results suggest that there are no statistically significant differences in time spent on health information management between clinics with and without the MCH e-Registry. e-health not only holds a lot of potential to relieve the overburdened healthcare system but can also contribute to health-related behaviour modification and long-term management of chronic illnesses (Drury, 2011). It can make healthcare accessible to populations that previously did not have financial means or geographical access to modern medicine. Implementation of e-health will require a dedicated information system tailor-made for the medical field, due to increased privacy concerns surrounding medical data, time critical nature of treatment and varying skill levels of stakeholders.

3. Conceptual Framework
Before developing any framework for war-torn regions (Libya), it is imperative to take note of some factors or barriers of implementing e-health especially in developing or war-torn regions like Libya;

- What is the level of Governmental policy, regulatory and legislative framework readily available to identify health resources necessary to fully operate medical information systems?
- Why the need for a credible indicator to identify health status using health information systems.
- What kind of Data management framework is needed to secure and handle data storage, analysis, flow and quality assurance of data. More so, the type of data needed (Patient and Medical Practitioner data)

The implementation of e-health framework faces different challenges as listed above. To proffer solution to the challenges a proper implementation of e-health model or framework is vital to deliver affordable yet better quality healthcare to the IDPs and people living in war torn countries like Libya. As e-health is a relatively nascent field, implementation issues are expected like any newly surfacing technology. This study seeks to understand and proffer solutions to such issues by developing e-health conceptual framework.

Several studies (Che Nawi et al., 2016; Sharifi, 2016; Waltman, Bergom, Hollenshead, Miller, & August, 2012), recommended the importance of considering the context, while developing a mode or framework for e-health assessment in developing countries. Kiberu et al (2019) suggested that developing a model for e-health assessment should contextualize those aspects that reflect factors which are specific to the studied region or countries.

3.1 Factors in Readiness Assessment
The Identification of the factors for E-Health Readiness in Libya involves systematic and scientific process, beginning with a review of existing literature on E-Health readiness assessment to identify the factors considered, then followed by relevant theories such as UTAUT and TRI (lópez-pérez et al, 2019). Previously studies have employed the use of different factors or components of e-readiness such as Core, Engagement (acceptance and use), Technological, Organisational and Policy readiness depending on the characteristics of the studied population and region. For this study the framework assumes that a typical E-health system will be fully implemented, and evaluators can directly use this framework for organisations that plan to implement E-health systems in cases of conflict prone regions.

The outcome of the literature review was the identification and selection of suitable factors related to our study location (crises prone regions) and target population (Patient, Healthcare expert and Management staffs). Finally, five relevant readiness components were identified from different studies on e-health: Core readiness, Engagement readiness Societal and Cultural readiness, Technological
readiness Organizational readiness and Acceptance and Use readiness (Aziz & Yusof, 2018; Mels, 2018 & Kiberu et al., 2019).

In addition to the identified factors from Literature, this study will include Political readiness. Qureshi, Kundi, Qureshi, Akhtar, & Hussain, (2015) emphasized the influential role of Political factor on E-health and use of other new technologies. This implies political factor plays a facilitating role in influencing e-health implementation and success. Also considering the nature of the study region (crises regions) leading to political rivalry and the existence of multiple Government and instability. Therefore, the frameworks for this study consists of six relevant constructs to assess e-health readiness in the crisis regions in Libya. The constructs are core readiness, technological readiness, acceptance and use readiness, societal readiness, engagement readiness, and political readiness (Mels, 2018).

3.2 Measurement for E-health readiness construct

- **Core readiness measurement** is aimed at assessing the core need of e-health readiness by measuring the realized problem and the perceived satisfaction of e-health services in primary health centres.
- **Engagement readiness measurement** aims at assessing the fear of the unknown potential impacts, recognizing potential benefits and willingness to accept training.
- **Technological readiness measurement** assessment of this construct is solely dependent on information technology used basically for e-health services such as the Hardware, Software, Internet workings of computer and IT Experts or personnel.
- **Societal readiness measurement** is determined by collaborations and communication amongst Health practitioners and Administrative staff within and outside and Health Organization concerning primary health related issues.
- **Political readiness measurement** is based on the level to which Government policies, Finance of services is applied on the public health status of a place.
- **Acceptance and Use readiness measurement** result is based on the concern that patients and medical practitioners understands the successful use of e-health services for performance and effort expectancy of e-health services. The listed factors with its construct can be illustrated as shown in Figure 2.
4. Discussion and conclusion

e-health, once adopted on a large scale, will accumulate useful data for medical research and contribute towards financial planning for healthcare. Thus, e-health aims to help patients, physicians, hospitals and governments optimally utilise the healthcare system. In developed countries, healthcare costs are increasing and making healthcare unaffordable. More than forty million people in the USA are uninsured and cannot afford medical treatment. Even in countries where universal healthcare is in place, fiscal pressure has called for changes to make healthcare more efficient. An efficient healthcare system would reduce patient exclusion based on social inequalities, by increasing stakeholder participation. e-health would contribute to these objectives as its self-service model would promote stakeholder participation by being more accessible.

Most Existing Studies have developed frameworks base specific context or region whereas, the theoretical backings for most existing frameworks are not stipulated or considered. This limitation of most e-health studies informs the need for adoption of theories such as the TRI and other relevant theories in the e-health domain to examine the readiness factors in various context, especially the developed countries.
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