



**LANGUAGE; ENGLISH**

# **CHALLENGES AND OPPORTUNITIES OF A UNIFIED HEALTH INFORMATION SYSTEM: FOCUS ON THE CAME- ROONIAN HEALTH SECTOR**

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## **ABSTRACT**

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The information landscape in every industry is the core to improving efficiency and quality. This is not different for the health Information system which when harnessed and improved can help the healthcare industry to meet its goals faster and better. In order to develop a healthcare information system that relies on the power of technology to solve issues, it must be carefully analysed and designed to match the needs of the environment in which it is deployed.

EHealth and mHealth are the keys to harnessing the power of technology in a one and unified system. Cameroon has a very low usage of IT which can be enhanced by slowly developing a health infrastructure in which we initiate every stakeholder into the technological system to interact with every other stakeholder in ways which were traditionally done physically. The demand for such a system can be seen as the overall development of ICT has already penetrated the healthcare sector in telephones and computers which already serve real purposes. Carrying out research in the Cameroonian health sector further exposed the opportunities and challenges for such a system.

## A. INTRODUCTION

The healthcare sector has slowly adopted aspects of modern technology with the aim of providing enhanced care at cheaper costs. This adoption of technology will enable easy and subtle access to health data and help the ideas of universal health coverage. The careful and private nature of healthcare data opens the health information systems to several risks in terms of security. The success of a Health information system lies in the effective collaboration between healthcare and sectors such as IT and both the public and private arms of the healthcare sector. (Padhy, R. P., Patra, M. R., & Satapathy, S. C. 2012; Tull, K. 2018; Wiederhold, G., & Shortliffe, E. H. (2006). Fernando, J. 2004 argues that the security and threat assessment of IT in the healthcare sector are overplayed and that no Health Information system can ever boast of a 100% security assessment. He further states that when planning the security of Health information systems, developers must use iterative

methods as only known dangers can be controlled.

Four main functions of Health information systems can be identified; Data generation, Data compilation, analysis and synthesis along with the communication and uses.

They stated that the health information has as primary aim the collection of data from the health sector and other subsectors in the healthcare ecosystem with the purpose of generating valuable information to aid the decision-making process. Much valuable information is not readily available at the point of care and this causes inefficiencies. A good health information system gathers all relevant sectors together in order to create a network of relevant data which can be processed and yield necessary insight. For health systems to offer maximum efficiency to the sector, they must aid the decisionmaking process at different levels of the healthcare system (World Health Organization. (2009); Fernando, J. 2004).

Tull (2008) identifies several stakeholders in the healthcare ecosystem; the civil socie-

ty, NGOs, patients, health insurance companies, and the private sector. These groups have vital roles to play in the smooth functioning of the health information systems in terms of their networking and knowledge exchange capacities. The creation of effective HIS models have become a major challenge to researchers, managers and healthcare practitioners as a lot of attempts have been unsuccessful. It is a fact that no two health information systems can function identically at all 12 levels. The design and development of a health information system must be closely linked to the organization for which it has been designed taking into consideration workflows and the sociotechnical nature of such systems. Most systems have failed to present the information in clear and easily usable forms for their end users (Wiederhold & Shortliffe (2006); Lippeveld, T., Sauerborn, R., Bodart, C., & World Health Organization. 2000; Chaulagai, Moyo, Koot, Sambakunsi, Khunga, & Naphini, 2005).

The cost of implementing fully functional healthcare information systems is very high. The continuous development of technology and simultaneous increase in quantity of data means the cost of maintaining these systems at optimal levels is on the rise. Due to this, the cost of healthcare is on a constant rise in organizations that develop their internal health information systems to manage their processes. Smaller healthcare providers have mostly preferred to retain their activities in traditional manual systems with minimal intervention from technology. This decision stems from a desire to maintain costs down. The difference in data storage formats in different institutions hinders interoperability and drives researchers and professionals to look towards the development of unified systems on a national level (National Health Information systems). (National Academies of Sciences, Engineering, and Medicine, 2016).

Unified health information systems give rise to a unique business model which makes use of the positive network externalities brought about by HIS implementation and

benefits all members of the healthcare ecosystem. Benefits such as increased efficiency in healthcare interventions, enhanced process for continuity of care, hence, reduction in the overall cost of healthcare services. The current trend aims at integrating data from a variety of sources to address more complex situations at hand. (Padhy, Patra & Satapathy, 2012; Brailer 2005; McGlynn, Brook, Kerr, & Damberg 1999). Tull (2018) mentions that the success of an integrated (unified) HIS will be dependent not only on the quality and design of the technology put in place, but on good management, a high commitment and all stakeholders in the healthcare ecosystem. All these attributes will be implemented in a long-term iterative process. Four main functions of Health information systems can be identified; Data generation, Data compilation, analysis and synthesis along with the communication and uses. Bringing all this data together from different healthcare sys-

tems into a single centralised system will be insightful and aid decision making greatly.

## **B. CAMEROONIAN HEALTH SYSTEM PILLARS**

In 2001, as part of the health system performance assessment, WHO classified Cameroon 164 out of the 191 countries assessed. Such a poor rank goes to show how weak Cameroon health system pillars have been. As a consequence, it has been unable to efficiently address the needs of the populations. The health sector's vision developed in the 2016-2027 Health sector strategy originates from the 2035 vision of the President of the Republic for Cameroon to be seen as "a country where universal access to quality health care and services is ensured for all social strata by 2035, with the full participation of communities".

The health sector's analysis enabled to develop a logical methodology for interventions which is centered around 5 main strategic focus areas:

- a) **Health promotion:** that will seek the adoption of healthy behaviors by the population;
- b) **Disease prevention,** which on the one hand shall focus on the intensification of the control of priority diseases under surveillance,
- c) **Case management:** that will prioritize the implementation of integrated high-impact intervention packages;
- d) **Health system strengthening:** which will emphasize on implementing a financing strategy financing strategies need consistent data and making the overall cost of healthcare to reduce.
- e) **Strengthening governance, strategic steering and leadership:** at all levels of the health system will be based on a more efficient management of financial resources, the reinforcement of the monitoring/evaluation system, governance, monitoring and evaluation can be easily enhanced by increased communication and availabil-

ity of necessary data for decision-making.

This analysis brings out 5 pillars that can better be managed in a National system that integrates all points of contact in one system capable of promoting healthy habits, help intensify the already existing disease control, prioritise certain interventions, help administrators take better financial decisions and strengthen governance and leadership across the Cameroonian territory from a centralised system.

### C. HEALTH SECTOR CATEGORISATION

National Health Development Plan implementation and monitoring/evaluation shall be carried out at all levels of the healthcare pyramid (central, regional and operational). The weakness of the health system pillars is indeed one of the main reasons that stops the populations from accessing the healthcare and well-being packages meant for them.

Cameroon's health sector spans three main levels (central, intermediate and peripheral) and comprises three sub-levels:

- a. Public sub-sector: Controlled by government.
- b. Private sub-sector (non-profit making and for-profit); and
- c. Traditional sub-sector.

In 2014, there were 4,034 public (72%) and private (28%) health facilities. These numbers are not up-to-date as there is no current health map. Difficulties are encountered in surveillance and response due to the lack of communication between different levels in the HIS. Each level of the hierarchy has mechanisms for management, health and conversational structures. The public and private sector activities can be aggregated efficiently into an eHealth strategy. This will enable an improvement in quality of surveillance and efficiency of reporting strategies.

Household's contribution to health expenditures represented 70.6% of total health ex-

penditure in 2012. The bulk of this funding is done through out of pocket payment at the time of care and there is not yet a strategy aimed at capitalizing these funds to reinforce the sector's overall quality and sustainability. In 2011, it was estimated that less than 3% of the population was covered by a health risk mechanism. A unified system has the potential to bring this figures of personal spending down as overall healthcare costs go down in the long-run.

The National Health Information System (NHIS) is faces various challenges mainly because:

- a. **Numerous collection tools:** There are so many tools used to collect data and these tools do not aggregate on time and in a distinct method such that data is lost in the re-transmission process.
- b. The great number of indicators to collect and analyze: All these indicators are collected and analysed manually in such a way that it is slow and highly inefficient.
- c. The existence of many non-interrelated parallel information sub-systems: Individual

healthcare entities develop and utilize individual sub-systems to help aid their internal affairs. Since these systems do not communicate with each other and are not created using the industry standards, the results they generate cannot be immediately introduced to the general NHIS hence, not very valuable out of the private environment.

#### **D. OPPURTUNITIES FOR eHealth AND A UNIFIED HIS IN CAMEROON**

In January 2020, 90% (23.62 million) of Cameroonians had a mobile phone with 30% (7.87 million) of them being active internet users. Active social media users were an estimated 14% (3.7 million). The trend from January 2019 showed a 19% increase in number of mobile connections and 7.8% rise in number of internet users (Hootsuite & We Are Social, 2020).

As concerns weekly exposure to the mass media, heads of households frequently use the television (42%) than the radio (24%) or read newspapers (11 %). Yet, a little more than half of heads of households (51%) are not exposed to any media on a weekly basis

(radio, television, newspapers). Exposure to Information and Communication Technologies (ICT) and to the medias increases with the educational and income levels of the population. Therefore, information on healthcare is not always available the underprivileged. Moreover, social networks are increasingly used to rally and inform the populations. To date, the main issue in the health system is "its weak capacity to meet the social and health needs of populations because of the weakness of its pillars"

The innovative implementation of computer technology is one of the most acclaimed means of improving the efficiency, quality, speed, accuracy, presentation of information for primary healthcare management (Wilson & Smith 1991). These statistics shows us an encouraging wave which encourages the use of eHealth strategies that involve the mobile phones (mHealth) in order to foster the health pillars which the Cameroonian Ministry of Health have set in place. The fact that 90% of the population can be reached through mobile interventions shows real

promise for the development of innovative solutions towards better healthcare.

The vast notoriety of mobile phones and the exposure of Cameroonians to the mass media is an indicative that a Unified system that takes into consideration the media which attracts the bulk of the population has the ability to be rapidly adopted and highly utilized. EHealth and mhealth strategies can easily be put in place such that Cameroonians connect to healthcare institutions in easy, affordable, efficient and timely manners. Computerising the Whole information system will see the generation of valuable data and insights that can propel the quality of healthcare interventions to an all-time high.

### **E. DESIGN DETAILS FOR A UNIFIED HEALTH INFORMATION SYSTEM**

The design of a unified information system is highly motivated by the difficulty faced in producing timely information for decision-makers that is, information that influences the decision-making process. The analysis of existing data and collection of new data

is a constant and recurrent process in an information system and needs a high level of expertise and time. Hence, a poorly functional information system will provide that much needed information only after the decision has already been made (McGlynn, Brook, Kerr & Damberg, 1999).

The complete design of any health information system must take into consideration three distinct aspects:

- a) Patient and client management
- b) Health unit management and
- c) Health system planning and management

The start of HIS design in healthcare will be to name primary stakeholders and clearly describe the value which each will receive from the model proposed. The main issue surrounding proper design of a Health information system is an unclear information framework. The data collected through the system must be channeled in such a way as to propose maximum benefit to the end users. The design phase has to evaluate the level of the end users' technological exper-

tise. A system that is not user friendly enough may not meet the needs of key stakeholders. (Tull, 2018, Wheeler, 2015).

When developing a new and improved system, it is essential to follow the SDLC model. The first step will be the planning and analysis of the existing system in place.

This paper focuses on the analysis and design of the Cameroonian Health information. We intend to propose a new and improved eHealth strategy that will optimize the functioning of this sector.

Simon & Newell (1958) described design as a search process that aims to discover efficient breakthrough to problems. That is, using available resources to reach desired outcomes while respecting existing laws in the environment. We intend to use the existing theoretical and empirical evidence available to design a unified system that unites the entire healthcare sector and helps them take advantage of Big data technologies available.

Health information system design follows some general design rules where there is a

clear process whereby data is being converted into information to support decision-making. In order to design a system that will be usable in the healthcare ecosystem of a particular country, we must examine in detail the administrative, political and socio-economic realities of the case study in question (Lippeveld, Sauerborn, Bodart & World Health Organisation, 2000). A project with heavy technological implications like ours must assess the technological framework of the target country to see which form of design will have the highest impact on its population.

## **F. CHALLENGES FACING THE IMPLEMENTATION OF A UNIFIED HIS IN THE CAMEROONIAN HEALTH SECTOR.**

The Cameroonian Health Information restructuring was done complementarily with the overall reform of other health services in general. Cameroon settle for a decentralized district health system based on primary healthcare. Such a configuration has its advantages but difficulties arise when we real-

ise that communication with other districts is very slow due to the decentralization of information. (Lippeveld et al, 2000).

- a) Difficulties encountered in surveillance and response due to the lack of communication between different levels in the HIS.
- b) Most Cameroonian healthcare institutions lack existing computerized HIS. Creating a Unified system will mean introducing the usage of computerized systems into environments that have never had such. That alone will cause serious delay in implementation as the organisational change and acceptance of new methods is very slow.
- c) The low availability of disaggregated data per region and per district on the analyzed themes does not always provide specific information on the health situation of populations and consequently, does not guide the choice of priority action areas and allocate resources based on needs.
- d) The low quality of care in public health facilities and the very high costs related to services in private health facilities incite users to use informal or home care.
- e) It is apparent that the current information systems tend to be “data-driven” instead of “action driven”. This can be attributed to the fact that the data received does not aid the decision-making process due to the fact that it is usually incomplete, inaccurate, untimely, and not directly related to the priority routines and functions at the level of health personnel. (Sandiford, Annett & Cibulskis, 1992).
- f) The producers of data and the users at each level of the healthcare system have not come to an agreement on what form of data is necessary for the continuity of care.
- g) The current information system has a lack of standard across the entire Cameroonian Healthcare system. This

discrepancy makes the quality of data available at one end of the spectrum difficult reusable at another end even if these were connected. Accordingly, continuity of care will be impeded in the event of an emergency and the full picture of a patient's medical records is never available within the system as it stands. (McGlynn et al, 1999).

- h) Clinical data lacks a unique identifier measure for each particular person throughout the healthcare system, so there is no way to link it to other information sources to conduct a more comprehensive analysis.
- i) The data records are not maintained in a form that is ready for any analytical need. When the in-depth analysis of a patient's data is required for a study, the data will be manually extracted from the historical records of care if available. Also, most medical records exist only as hand-written on paper. The collection of this data is

highly time consuming and costly. It is also subject to a lot of abstraction. The consequences of these key issues are:

- low adoption of healthy behaviors by populations;
- growing prevalence and incidence of risk factors of preventable diseases;
- low quality of case management in health facilities and in the community;
- high morbidity and mortality that could be prevented. (Cameroon MOH, 2016)

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