

Relationship Between Semantic Layer, Technical Infrastructure with eHealth Interoperability in Ugandan Public Hospitals

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Abstract—Although eHealth technology has been adopted in developed countries for some years, it seems to be in its early stages in developing countries like Uganda. In this study, the connection between Technical Infrastructure, Semantic layer and eHealth interoperability in Ugandan Public Hospitals was investigated. Quantitative research methods to collect and analyze data were employed in this study. Stratified sampling was used to select three public general hospitals of Kitagata, Nebbi, and Naguru while simple random sampling technique was used to collect data from a total of 14 administrative staff, 44 medical workers and 32 patients from each of these hospitals at a response rate of 89.3 percent. Data was collected using a self-administered questionnaire. Descriptive statistics were used to derive background information of the respondents while regression analysis techniques were used to analyze variable relationships and also to test the predicting power of the independent variables on the dependent variable. The final model was confirmed using structural equation modelling analysis tools. The key findings indicated a significant positive relation between Technical Infrastructure and eHealth Interoperability (Beta = 0.475, $p < 0.001$), Semantic Layer and eHealth Interoperability (Beta=0.595, $p < 0.001$). The proposed model showed a significant relation between Technical Infrastructure with eHealth Interoperability, Semantic Layer with eHealth Interoperability in Ugandan Public Hospitals. It is recommended that stakeholders implementing eHealth in Ugandan Public Hospitals to consider Technical Infrastructure, Semantic Layer, and eHealth Interoperability relationships for effective healthcare systems leading to quality eHealth care.

Keywords—eHealth Interoperability, Semantic Layer, Structural Equation Modeling, Technical Infrastructure, Ugandan Public Hospitals

I. INTRODUCTION

From empirical literature, sources of health data include text-notes from physicians, health data from patients, data available from public, physiological-monitoring, credit card, purchases, social media, and from medical imaging [1]. Health data may not be generated at a single point or by the same computer system and may increase at high rate [2]. The Human Resource (HR) Software, Accounting Software, and Diagnostic Software generate data that is exchanged in various departments within the organization [3]. Moreover, health data can be transmitted over different networks that are wireless or wired local area networks, metropolitan networks among others. eHealth systems must not only be able to exchange information but also consume information that is being exchanged so that the recipient can understand it [3]. Empirical literature states that lack of interoperability has been recognized as one of the biggest obstacles in medicinal services in healthcare information technology.

Interoperability involves standards, organizational policies, laws, and procedure [4].

In developing countries, eHealth interoperability has been a great concern which traces its route when the [5] [6] in USA indicated that there was need to give electronic medical records (EMRs) the priority in transforming from healthcare service delivery to Information and Communication Technology (ICT) for quality improvement in healthcare. As a result, the National Health Information Network (NHIN) was proposed in the USA as a concept to facilitate the movement of electronic health records within the health records providers and Health Information Exchange (HIE) entities [7]. Similar studies about eHealth Interoperability issues were reported elsewhere in Europe [7][8]. Although eHealth interoperability campaigns were conducted in the developing countries, it has remained a big issue to resolve in Uganda. The study conducted by mHealth pilot project was meant to report health issues but could not handle interoperability issues [9].

In Ugandan context, Health Management Information system (HMIS) is defined as a paper-based system used by the Ugandan Public Hospitals to get appropriate health information periodically [10]. The Health Management Information System (HMIS) that has emerged over the past 15 years is mainly mortality, paper, and patient-based system [11]. On the other hand, [12] defines, an electronic Health Information System (eHIS) as a basis for making conclusions that consist of four components including generation of data, compilation, analysis and synthesis, communication, and use. eHealth interoperability is defined as the ability of eHealth systems to consume and share computer and human understandable information [13]. Plans for centrally capturing public healthcare records using systems such as DHIS2 have been designed by the Ugandan Ministry of Health (MoH) in partnership with Uganda Communications Commission [14], although the aims of implementing eHealth interoperability have not been fully achieved in Ugandan Public Hospitals.

The researchers considered semantic and technical infrastructure as a concept for eHealth Interoperability in Ugandan Public Hospitals. In this study, technical level was conceptualized as technical infrastructure where systems in Ugandan Public Hospitals just exchange information with and without interpretation of information [15], [16]. The semantic level was conceptualized as the semantic layer in Ugandan Public Hospitals where more than one system exchange information for consumption thus improving the