Journal of Health Informatics in Africa

8th Health Informatics in Africa Conference (HELINA 2013)
Peer-reviewed and selected under the responsibility of the Scientific Programme Committee

Architecture for Health Information Systems Interoperability in Africa

Boniface Kabaso [a,*] Mikko Korpela [b,a]

[a] Cape Peninsula University of Technology, Cape Town, South Africa
[b] University of Eastern Finland, Kuopio, Finland

Background and Purpose: Africa has seen a steady increase in the Information and Communication Technology (ICT) systems deployed in health care institutions. This uncoordinated mass migration to electronic health information systems in Africa has created an heterogeneous and complex computing environment where most of the deployed systems have technologies that are local, proprietary and insular. Furthermore, the infrastructure in Africa to facilitate the electronic exchange of information has a number of constraints. The infrastructure connectivity on which applications run is still segmented. Most parts of Africa lack the availability of a reliable connectivity infrastructure. In some cases, there is no connectivity at all. The realities of interoperability and re-usability problems have started to become more prominent in Africa as more systems are developed and deployed. It is not practical to either discard the existing systems or have only one system in place to solve this problem.

The standards development work of the ISO TC 215 will have a major impact on the applications deployed across the continent once completed. Some African countries sit on these committees and it is important that the developers of architectures that will be deployed in Africa keep an eye on the work being done by the working groups of the TC 215. Another important aspect particular to an African environment is the connectivity issue. One has to be aware of the fact that the connections between the different systems are unreliable and subject to high segmentation levels. Architectures deployed need to be able to operate in a disconnected environment. Thirdly, technologies, particularly programming languages used to develop systems, need to be based on what the teaching industry, colleges and universities is providing to students in Africa.

The core purpose of this work is interoperability of various IT assets in and outside a health institution and the connectivity of IT systems in the face of unreliable connectivity infrastructure in Africa. The goal of this research was to produce an outcome that can be generalised and applied to other cases in Africa.

Methods: To solve the problem described above required the building of an artefact using specific software engineering methods. What systems that are in use today need, in additional to other standards issues, is an upgrade in order to expose them as web services and make them part of a Service Oriented Architecture (SOA), based on web services.

Results: The three main theoretical contributions are a SOA Driven Disconnected Architecture (SOA-DDA), Runtime Dynamic Routing (RDR), and a methodology to enhance an application for future interoperability. The key practical contribution is an Application Programming Interface (API) design based on the Health Level 7 Reference Information Model (HL7 RIM) that is able to not only deal with the mediation or interoperability issues, but also operate in an unreliable connectivity environment and adjust to the ever changing and evolving health care standards. The API exposes REST based web services to the consumers of the services. It can be used to build systems from the ground up. It was constructed using rigorous documented processes to produce constructs, models, methods and an instantiation.

*Corresponding author: CPUT, IT Department, P.O. Box 652, Cape Town 8000, South Africa. Email: boniface@kabaso.com, Tel: +27-21-469 3713
HELINA 2013 M. Korpela et al. (Eds.)
 DOI: 10.12856/JHIA-2013-v1-i1-59

Conclusions: The framework developed takes care of all the issues that need to be addressed in order to build a workable system.

Keywords: Architecture, Interoperability, Distributed Computing, Web Services, Health Information Systems

Acknowledgements
This study was conducted partly within the ISD4D project of the INDEHELA network, funded by the Academy of Finland (grant no. 253275). The contribution of interns and students of the Kujali Hub of the CPUT is gratefully acknowledged.

 DOI: 10.12856/JHIA-2013-v1-i1-59