Globally, more government products and services are being delivered through the use of information systems. This has led to great improvements in the quality of public service delivery. However, for the case of Uganda, full realization of the benefits of computerization of government services is constrained by the inability of some of the e-government systems to interoperate. This is because most of these systems have continued to be built in silos with inadequate attention to the need to share data and processes. This has resulted into the existence of many heterogeneous systems that have limited interfacing and whose development is unsynchronized.

1. This paper proposes a National Enterprise Architecture (NEA) to support the implementation of an e-government interoperability framework (e-GIF).

2. The second policy proposal is the use of ontologies to provide semantic interoperability in e-government systems.

3. Thirdly, this paper proposes the development of interoperability standards and specifications for use as a reference guide for implementing e-government systems.

4. Lastly, this paper proposes the set-up of a multi-stakeholder team to oversee the implementation of the e-GIF by government entities.

Consequently improving the ability of government organizations to deliver coordinated public services (Novakouski & Lewis, 2012; Lallana, 2008).

Review of existing e-GIFs: We analyzed seven e-GIFs from selected countries at different levels of economic development and e-government maturity. The variables for analysis were a) scope of the e-GIF, b) design principles used in developing the e-GIF and c) the conceptual framework on which the e-GIF is premised.

a) Scope of the framework: This covered interoperability dimensions and categories of e-services offered. The e-GIF’s in Estonia, Nepal and Mozambique provided detailed organizational interoperability. All the e-GIF’s...
analyzed offered common e-government services. The UK and Estonia e-GIFs provide for Government to other Government e-services, while Estonia also provided for Government to Business services.

b) Design principles: This parameter covered the guiding principles on which the e-GIF is premised. All the e-GIFs recommended the e-government applications to be Internet based and the use of open standards. Other common design principles included resource sharing and reuse, collaboration, scalability and confidentiality. For example Estonia and Australia use federated identity management where the users can use one identity for authentication and authorization to access various e-government systems.

c) Conceptual framework: Which identified the components of the e-GIFs that semantic and technical interoperability used. In general, all the e-GIFs were found to identify interoperability standards for implementing a) interconnection, b) data integration, c) content management/metadata, d) information access and presentation and e) security. All the e-GIFs recommend the use of SOA and XML standards. With the exception of Nepal and Estonia who used ontologies. All the e-GIFs recommend and adopt metadata standards for semantic interoperability.

Most of the e-GIFs reviewed do not provide a compliance mechanism to ensure that the government entities implement systems that confirm to the established standards and National Enterprise Architecture. This study recommends that an e-governance task team be constituted to monitor and also ensure that all government entities comply with the provisions of the e-GIF.

Shvaiko et al (2010) also carried out an analysis of several interoperability frameworks and their findings can be summarized as: a) the most active and up-to-date e-GIFs appeared to be those of New Zealand and United Kingdom, b) most of the e-GIFs in the world have been implemented in the developed countries, c) nearly all e-GIFs defined standards to adopt in order to achieve interoperability, d) the earlier implemented initiatives i.e. New Zealand and UK have supported significant infrastructure and organizational development.

Review of Enterprise Architecture Development Frameworks: Numerous authors have carried out surveys to provide comparisons between the leading enterprise architecture frameworks and modeling tools (Goethals, 2005; Guijarro, 2007; Tang, 2004; Urbaczewski & Mrdalj, 2006). The comparison parameters adopted are normally based on views or perspectives, software development life cycle phases, goals, inputs, quality attributes interoperability, re-usability, standardization, communication, and ability to reduce complexity, in order to compare various EAF and outcomes (Tang, 2004; Urbaczewski & Mrdalj, 2006).

From the literature reviewed it became clear that a large number of organizations apply one of these three enterprise architecture frameworks mostly because of their level of maturity: either a) the Zachman framework, or b) the Open Group Architecture Framework (TOGAF), or c) the Federal Enterprise Architecture (FEA). The Zachman’s Framework focuses on constructing views of an enterprise rather than on providing a process for the creation of an architectural description. The TOGAF has an Architecture Development Method which is used as a process to describe how to create an enterprise architecture. The Federal Enterprise Architecture Framework (FEA) extends the Zachman Architecture Framework. An Enterprise Architecture Framework provides a means to communicate information about
architectural artifacts, their relationships to each other, and to their stakeholders using a common vocabulary. Although, these are the most popular frameworks, there isn’t a single framework that addresses all the needs of a particular organization. This is one of the leading reasons as to why organizations are taking a hybrid framework approach in developing an Enterprise Architecture Framework.

In this paper we extend the TOGAF framework as it provides a holistic and systemic view of all Enterprise Architecture components, and their business, organizational and environmental contexts. We further adopt a Service Oriented Architecture and an e-government ontology which provides for a classification methodology that can be used by a government to create a common understanding of concepts based on the country’s laws, policies and procedures.

II METHODOLOGY

A qualitative research approach was undertaken where the interoperability requirements were collected from a survey of twenty ministries and ten agencies. The collected requirements were analyzed using a thematic content analysis methodology to develop the interoperability specifications that were then used to design the e-GIF for Uganda.

The Enterprise Architecture Scorecard methodology developed by Schekkerman (2004) was used by a focus group comprised of users, application developers and public service officials to evaluate the developed e-GIF.

III DATA SOURCES

The study used both primary and secondary data. A purposive non-random sample selection method was chosen for convenience since the MDAs are generally homogeneous and there were no significant benefits to be obtained from random sampling. From a population of 22 Ministries and 54 Agencies a sample of 12 Ministries and 24 Agencies was selected. Data was collected using a structured interview guide.

Secondary data was also obtained from manuals of existing systems. Additional data was obtained through observing some of the systems while in use.

IV FINDINGS

The requirements collected from the field were edited and categorized into main themes and sub themes for analysis. The major themes were 3 namely a) current state of Interoperability, b) desired state and c) adoption factors for interoperability. The responses under each theme were further sub-divided into sub-missions according to the earlier identified dimensions of interoperability. Below is a summary of the findings:

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<tr>
<td>a) Types &amp; characteristics of existing systems – standards, electronic applications, networked, Internet based</td>
<td>a) Systems desired – e-Gov’t portal, e-Document Management Software, e-payments;</td>
<td>a) Organizational risk – identified risks include lack of skills, poor quality of data, resistance to change, lack of enabling policies and laws, &amp; vendor management risks</td>
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<td>b) Identified required data exchange</td>
<td>b) Desired Data Exchange - several entities expressed the need to exchange data</td>
<td>b) Technical risks – identified risks of obsolete equipment, lack of necessary hardware, lack of support for proprietary software, lack of systems maintenance &amp; upgrade</td>
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<td>c) Shared processes – mainly registration services &amp; payment services</td>
<td>c) Desired Process Sharing – validation &amp; verification of registration data for Persons, Companies &amp; assets</td>
<td>c) Security risks – covered meta data, data migration, timeliness of data availability, granularity of data risks</td>
</tr>
<tr>
<td>d) Standards in use – no reference guides, open protocols, app development, no compression</td>
<td>d) Desired Standards – Enterprise Architecture reference guides, open protocols, software development standards, encryption standards</td>
<td></td>
</tr>
<tr>
<td>e) Infrastructure: in use – LAN, WAN, data centers, and Disaster Recovery (DR) sites</td>
<td>e) Desired Infrastructure – computers, servers, data centers &amp; DR sites</td>
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The proposed NEA was evaluated using the Enterprise Architecture Scorecard methodology.
Contextual level: was used to measure the extent to which the architecture meet the scope, mission and vision of the organization with respect to each of the four aspect areas. The environmental level was used to measure the business relationships and information flows. The conceptual level explored the functional and non-functional requirements, goals and objectives of the architecture. The logical level measures the logical solutions and sub-functions within each aspect area. The physical level was concerned with assessing the physical solutions, concrete products and techniques proposed in the architecture for the four aspect areas. The transformational level was used to assess the impact the architecture will have on the enterprise when it is implemented. It measured the benefits in terms of good designs, cost savings, and organizational change.

V CONCLUSION

The developed e-GIF was evaluated by a focus group comprised of users, application developers and public service officials who used their knowledge of software engineering and public service delivery to validate the framework for appropriateness, completeness and accuracy.

The proposed architectural Framework and interoperability standards selection procedures are best suited for resolving the e-government interoperability challenge in Uganda.

VI SOURCES/REFERENCES


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