THE REPUBLIC OF UGANDA

Government Enterprise Architecture: Implementation and Transition Plan

Project: THE REPUBLIC OF UGANDA CONSULTANCY SERVICES FOR THE DEVELOPMENT OF A GOVERNMENT ENTERPRISE ARCHITECTURE (GEA) AND E-GOVERNMENT INTEROPERABILITY FRAMEWORK (E-GIF)

Project duration: 10 November 2020 – 09 September 2021

09 September 2021

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1. Introduction

1.1.   Background

This report is part of the project for the development of a Government Enterprise Architecture (GEA) and e-Government Interoperability Framework for Uganda. The objective of the project is to develop a Government Enterprise Architecture and e-Government Interoperability Framework and provide the necessary policy and technical recommendations for its sustainable and systematic implementation.

Previous reports:

- Inception report
- Regulatory and Policy environment review
- Uganda e-Government Interoperability Framework (e-GIF)
- GoU e-Government Security Architecture Framework
- e-Government Interoperability Framework Reference Architecture (GIRA)

Implementation strategy is adjusted with previous strategical policies and plans of GOU:

- Uganda's e-Government Master Plan. Prepared by the Ministry of ICT and National IT Industry Promotion Agency of Korea in 2012, 276pp.
- Digital Uganda Vision. Prepared by the MoICT in 2020, 45pp
- NDPIII Digital Transformation Programme Implementation Action Plan. Programme 10: Digital Transformation. Prepared by the National Planning Authority in July 2020, 91pp

In our project we have focused on the interoperability aspects of e-Government. This report does not capture details of all e-Government implementation but deals primarily with the implementation of the GIRA.

In the GIRA, we divided the GEA into views and viewpoints. Every view/viewpoint was divided into Architecture Building Blocks. Based on the TOGAF® definition, an Architecture Building Block (ABB) is an abstract component that captures architecture requirements and that directs and guides the development of Solution Building Blocks. An ABB represents a (potentially re-usable) component of legal, organisational, semantic or technical capability that can be combined with other ABBs. An ABB describes generic characteristics and functionalities. ABBs are used to describe reference architectures, solution architecture templates or solution architectures of a specific solutions.

In this report we bring out the most crucial components of the GEA that are important for achieving interoperability in the Ugandan e-Government.

1.2.   Context

The Ugandan GEA is the structure of the Ugandan e-Government components, their inter-relationships, and the principles and guidelines governing their design and evolution over time.

The purpose of an Enterprise Architecture is to optimize the fragmented architectural processes (both manual and automated) into an integrated environment that is responsive to change and supportive of the delivery of the business strategy.

We distinguish the following steps/levels in the GEA lifecycle:

1. **Preliminary Phase**. The strategy of the Ugandan e-Society and e-Government has been fixed in vision papers and legislations. Numerous studies on the situation of the Ugandan e-Government have been carried out. The inception report[1] includes a review of existing e-Government policy documents and Ugandan readiness assessments for building an eGovernment architecture.

2. **e-GIF**.[2] The e-GIF provides the implementation strategy for the GEA. It defines the basic interoperability guidelines in the form of common principles, models, and recommendations for interactions between public institutions. In terms of TOGAF®, the e-GIF covers all phases of the ADM cycle, primarily the Vision phase. The purpose of the e-GIF is to describe the strategic level of the GEA as it depicted in **Error! Reference source not found.** (left side).

3. **e-Government Interoperability Reference Architecture (GIRA**).[3] In terms of TOGAF®, the GIRA is a reference architecture focused on the interoperability of digital public services. It is composed of the most salient Architecture Building Blocks needed to promote interactions between public administrations. GIRA covers, in terms of TOGAF®, the core phases of ADM: business architecture, information systems architecture and technology architecture (**Error! Reference source not found.** right side) mainly.

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[1] Inception report for Government Enterprise Architecture and E-Government Interoperability Framework for Uganda. Report was carried out by e-Governance Academy in March 2020
[2] https://www.nita.go.ug/sites/default/files/Draft%20e-GIF.pdf
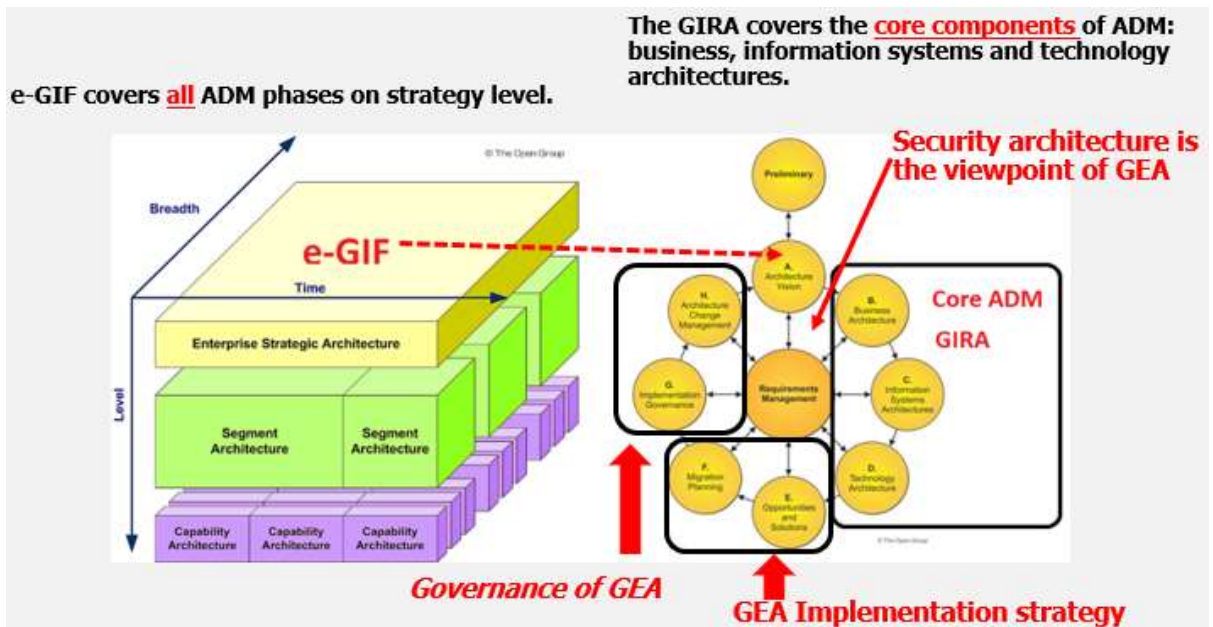[3] Internal report of eGA

Figure 1 e-GIF covers all ADM phases on strategy level. The GIRA covers the core components of ADM: business, information systems and technology architectures. Implementation strategy covers phases: Opportunities and Solutions, Migration and Planning.

4. **Security architecture.**[4] Security architecture is the viewpoint of the GEA. All phases of the ADM cycle contain security and privacy aspects.

5. **Implementation strategy of GEA.** Terms of reference of projects prescribes for this report to provide recommendations for sustainable and systematic implementation of the GEA. This step results in the implementation strategy of the GIRA. In terms of ADM, it covers phases E and F. The Ugandan e-Government is an extremely wide system. We cannot give the implementation plan for all e-Government components. We need to divide this task into work packages and initiate a new ADM cycle for each component.

6. **Governance of GEA.** Building, monitoring, managing, and steering of the implementation of the GEA is in the focus of this step. Building the GEA is an iterative process. Some components might need to be renewed; some components might need to be added. Sometimes it is reasonable to restart a new lifecycle from the beginning. In terms of ADM, it covers phases G and H.

1.3.   Scope and Structure

In the GIRA we divided the GEA into views and viewpoints. Every view/viewpoint was divided into ABBs. Several ABBs already exists in Uganda. Several ABBs have been formulated by the

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[4] Internal report of eGA

eGIF and GIRA. Implementation of several ABBs have been started. The Ugandan e-Government is an extremely wide system. It is not possible give the implementation plan for all e-Government components in details. This report gives a strategy for the implementation of the GIRA.

According to the TOGAF®, the building of big systems is an iterative process. It is reasonable that every MDA will build their own architecture independently, considering the requirements of the e-GIF and GIRA. **In this report we concentrate onto the components important for achieving interoperability.** The report is the first iteration for the implementation of the GIRA. We bring out the most critical segments of the GEA important for achieving interoperability in the Ugandan e-Government. For implementing those segments, new ADM cycles need to be initiated.

The division of the GEA into segments and initiating new ADM cycles for each component is illustrated in Figure 2. For several segments, their division into subsegments and initiating the next level of ADM cycles may be reasonable. Figure 2 does not reflect all components of the Ugandan GEA: only very few segments and subsegments are outlined.

The report provides an Implementation and Transition Strategy of the GIRA only. For each subsegment and sub subsegment, a new iteration needs to be initiated.
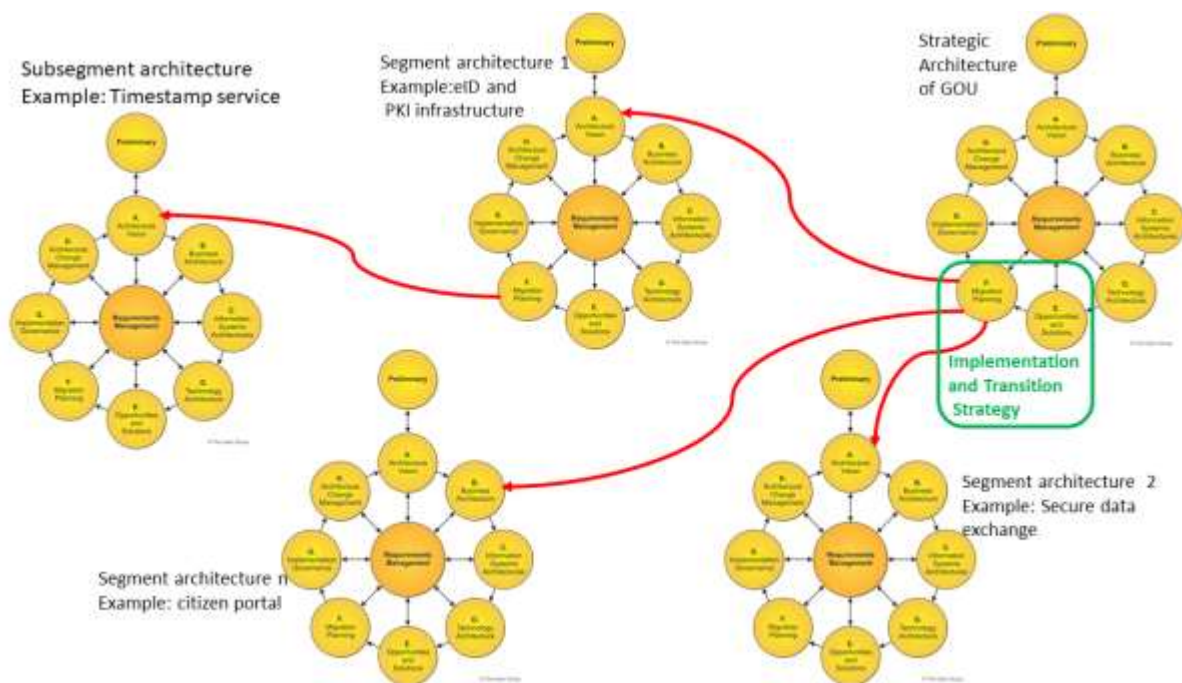
Figure 2 Segmentation needed for building e-Government Architecture (example)

The GIRA described the GOU target reference architecture. In this report, we make recommendations on how to achieve this architecture. We analyse five architecture views:

- Legal interoperability architecture view

- Organisational interoperability architecture view

- Data architecture view

- Application and Infrastructure Architecture views (implementation is described together in one chapter)

In this report we present for each architecture:

- Main indicators of baseline architecture

- Crucial components for implementation of the target architecture

- Recommendations for the Ugandan government.

In recommendations sections we list recommended activities, proposed time, responsible bodies, and indicative amount of money (if possible). Amounts are taken or derived from Action Plan.[5] If amount is not applicable N/A is shown.

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[5] NDPIII Digital Transformation Programme. Implementation Action Plan. Programme 10: Digital Transformation. July 2020, 919

2. Business architecture

2.1.   Legal view

2.1.1. Baseline legal interoperability architecture[6]

Uganda has a legal framework for e-government in place. This is positive and provides Uganda with an advantage over many countries and a good basis for the increase and improvement of e-government in the country. There should not be too many detailed laws on digital issues, as these form a part of all aspects of the society rather than a separate unit. In Uganda, the focus of the legal work related to e-government should be on ensuring that the existing laws are properly implemented.

Uganda has a designated authority with the competence for e-Government in the form of NITA-U, with adequate competence for further development in the ICT area. May be the mandate of the organisation could be modernised, both in the sense of having an even clearer mandate to promote e-government but also so as to avoid excessive regulations in the ICT sector.

The basic legal framework for enabling interoperability appears to be in place, including essential rules about databases and their interoperability. Although the essential basic issue of recognising electronic transactions and identities is handled via the relevant laws, the laws do not make it mandatory for government agencies to use the electronic format and additional rules need to be issued.

It remains necessary to pay attention to the form requirements finally made and how these are made the most suitable for each situation as well as easy to use. The laws on Electronic Transactions and Electronic Signatures could be merged, as the core issues are the same. Consumer protection rules for electronic transactions would be more suitable in general consumer protection legislation, rather than a law only for electronic transactions.

Regarding form requirements and the possibility to use electronic transactions, although the legal framework is in place, it is essential that courts and administrative authorities have the ability in practice (which includes the proper competence of staff) to use this new form of transactions. Another practical question is how it is possible to present a proof of payment electronically, for transactions that carry a charge, on which there have been recent developments. In this context, it can be mentioned that there should be as few costs and charges for transactions and data use as possible.

Uganda has recent data protection legislation, which introduces the modern best practice of one general data protection legal framework rather than provisions in various sectoral legislation.

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[6] More information in report: Regulatory and policy environment review, e-Governance Academy, 2021

The implementation of the legislation is in a very early phase. Given that many reports mention the problem of low awareness of digital legislation in general, there is a need for attention to the data protection question, as such legislation plays a very important role when it comes to strengthening people´s trust in digital services.

ICT related legal acts:

- Draft Data Protection and Privacy Regulations 2019
- NITA-U (Certification of Providers of IT Products and Services) (Amendment) Regulations
- Computer Misuse Act 2011 (Act No. 2 of 2011)
- Data Protection and Privacy Act 2019
- Electronic Signatures Act 2011 (Act No. 7 of 2011)
- Electronic Signatures Regulations 2013 - SI 43 of 2013
- Electronic Transactions Act 2011 (Act No. 8 of 2011)
- Electronic Transactions Regulations 2013 - SI 42 of 2013
- NITA-U Act (Act No. 4 of 2009)
- NITA-U (Authentication of IT Training) Regulations 2016 - SI No. 70 of 2016
- NITA-U (Certification of IT Providers and Services) Regulations 2016 - SI No. 69 of 2016
- NITA-U (E-Government) Regulations 2015 - SI No. 27 of 2015
- NITA-U (National Databank) Regulations 2019 No 109

2.1.2. Crucial components of the target legal interoperability architecture

Uganda has a Legal Framework for e-Governance in place, but continuous improving and amendment of it is needed. The GIRA implementation strategy for achieving legal interoperability is formulated by the e-GIF and GIRA. The most crucial activities:

1. Continuous improving of the GOU Legal Framework including implementation and supervision of ICT regulations:

   - Improving ICT related GOU Legal Framework
   - MDAs SHOULD ensure that legislation is screened by means of 'interoperability checks', to identify any barriers to interoperability[7]

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[7] Interoperability barriers are restrictions in the use and storage of data, different data license models, over-restrictive obligations to use specific digital technologies or delivery modes to provide public services, contradictory requirements for the same or similar business processes, outdated security and data protection needs, etc.

- When drafting legislation to establish public service, seeking to make it consistent with relevant legislation, MDAs MUST perform a 'digital check' and consider data protection requirements.

2. Listed below are the IT areas where new legislation needs to be created or existing legislation needs to be supplemented / improved:

(1) Legislation about public information (Freedom of Information Act or similar)

(2) Legislation about Electronic identification (eID) and ecosystem of Public Key Infrastructure (PKI): similar to the EIDAS in EU

(3) Regulation about registries (rules for management registries, registry of registries)

(4) Secure data exchange regulation

(5) Implementation of data protection and Privacy legislation

(6) Regulation about information security

(7) Legislation about Legislation Catalogue: business processes, add machine readable form (XML) for legal acts, improve/create metadata for legal acts, improve search and navigation.

(8) Legislation about digital archiving

2.1.3. Recommendations for implementation

In Table 1 you'll find a roadmap for the implementation of crucial components of the GIRA legal view.

Table 1 Roadmap for legislation architecture

Activity	Time	Responsible	Resources
Improving ICT related GOU Legal Framework	constantly	JLOS MoICT&NG NITA-U MDA	N/A
Legislation about public information (Freedom of Information Act or similar	2021-2023	MoICTNG NITA-U JLOS	N/A
Electronic identification (eID) and ecosystem of Public Key Infrastructure (PKI): similar to the EIDAS in EU	2022-2024	JLOS MoICT&NG NIRA NITA-U	N/A
Regulation about registries (rules for management registries, registry of registries)	2021-2023	MoICT&NG NITA-U	

Secure data exchange regulation	2022-2024	MoICT&NG NITA-U	
Legislation about Legislation Catalogue: business processes, add machine readable form (XML) for legal acts, improve/create metadata for legal acts, improve search and navigation	2023-2025	Justice	N/A
Regulation and agreements about information security	2022-2024	NITA-U	N/A
Implementation the Data Protection and Privacy Regulation	2021-2025	MoICT&NG	0.2
Digital Archiving legislation	2024-2025	MITA-U MOPS	N/A

2.2.   Organisational view

2.2.1. Baseline organisational interoperability architecture

Baseline organisational view is described in the Inception Report[8] and the Regulatory and policy environment review[9]. The NITA-U Strategic Plan 2018-2023[10] assesses political will as follows: "The government of Uganda has also expressed political will in the promotion of IT infrastructure and services as depicted by direct investment in ICT infrastructure such as the NBI as well as provision of conducive policy institution and legal environment. The government policy framework towards communication has been focused on liberalization and competition."

There is a National Information Technology Authority-Uganda (NITA-U), which is an autonomous statutory body with the task to coordinate and regulate Information Technology services in Uganda. NITA-U is under the general supervision of the Ministry of ICT and National Guidance. It is set up by law with specific duties and responsibilities according to regulations. NITA-U has the mandate to coordinate, promote, monitor, and support IT use and plan and

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[8] Inception Report. Project: THE REPUBLIC OF UGANDA CONSULTANCY SERVICES FOR THE DEVELOPMENT OF A GOVERNMENT ENTERPRISE ARCHITECTURE (GEA) AND E-GOVERNMENT INTEROPERABILITY FRAMEWORK (E-GIF). E-Governance Academy, 2020, 74 p

[9] Regulatory and policy environment review. Project: THE REPUBLIC OF UGANDA CONSULTANCY SERVICES FOR THE DEVELOPMENT OF A GOVERNMENT ENTERPRISE ARCHITECTURE (GEA) AND E-GOVERNMENT INTEROPERABILITY FRAMEWORK (E-GIF). E-Governance Academy, 2020, p

[10] https://www.nita.go.ug/publication/nita-u-strategic-plan-201819-%E2%80%93-202223

implement e-Governance infrastructure. Uganda has a National Data Transmission Backbone (NBI) managed by NITA-U.

The overall responsibility for the coordination of e-government topics in the state lies with the NITA-U under the supervision of the Ministry of Information and Communications Technology. Each ministry has their own IT unit who oversees their system and services, whereas NITA-U provides consultancy and support.

The survey showed that the coordination component is on sustainable level.

2.2.2. Crucial components of the target organisational Interoperability architecture

Uganda has an organisational framework for e-Governance in place. The survey[11] showed that the coordination component exists on sustainable level. Improving the organisational interoperability is a continuous process.   The implementation strategy for achieving organisational interoperability is formulated by the GoU e-GIF. Recommended activities include:

1.   Continuous improvement of the implementation and supervision of organisational interoperability aspects: frameworks, agreements, policies, standards.

2.   Interoperability Skills. Expertise in organising, implementing and managing interoperability in digital public services

3.   MDAs SHOULD document business processes using commonly accepted modelling techniques and agree on how these processes SHOULD be aligned to deliver a GoU public service.

4.   MDAs SHOULD clarify and formalise organisational relationships for establishing and operating public services.

5.   Implementation of the e-GIF and GIRA

6.   Establishment of policies and framework listed in the e-GIF and GIRA

2.2.3. Recommendations for implementation

In Table 2 you'll find a roadmap for implementation of crucial components of the GIRA organisational view and the Governance Viewpoint.

Table 2 Roadmap for implementation of GIRA organisational architecture

Activity	Time	Responsible	Resources Billion UGX

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[11] Inception report. January 2021, 74 p

Continuous development, improving of implementation and supervision of organizational interoperability aspects: frameworks, agreements. policies, standards.	2021-2025	NITA-U MDA	6
Coordinating, developing, and expanding flagship e-services and rollout of e-services across all NDPIII programs	2021-2025	NITA-U	38
Supervision of information systems/registries over compliance with legislation, e-GIF, GIRA.	2021-2025	NITA-U	Capacity building
Administrative and state supervision over the WASA Framework and the connection to the data exchange layer of information systems.	2021-2025	NITA-U	Capacity building
Implementation of the e-GIF and GIRA	2022-2025	NITA-U MDA	N/A
Establishment of policies and frameworks listed in the e-GIF and GIRA	2022-2024	NITA-U	N/A
Interoperability Skills. Expertise in organising, implementing and managing interoperability in digital public services	constantly	NITA-U MOICT&NG MDA	N/A
Review, alignment and documenting of business processes	constantly	MDA	N/A
Supporting the MDAs/LGs to review/re-engineer their processes and also in the development of e-solutions	2021-2025	NITA-U MOICT&NG	35
Clarifying and formalising organisational relationships for establishing and operating public services	constantly	MDA	N/A
Assessment of Institutions on NISF implementation and handhold MDAs in the implementation of the Framework	2021-2025	NITA-U	2.5
Develop National cyber security strategy and implementation guidelines	2021-2025	MOICT&NG	0.8
Strengthening Cyber Security, including CERT/SOC	2021-2025	NITA-U	21
Transform postal outlets into e-service delivery points	2021-2025	POSTA	20

Establish information and service Uganda centers and digital kiosks	2021-2025	MOPS NITA-U MOICT&NG	10

3. Data architecture

3.1.   Baseline data interoperability architecture

Semantic (data) interoperability ensures that the precise format and meaning of exchanged data and information is preserved and understood throughout exchanges between parties, in other words 'what is sent is what is understood'. Semantic interoperability covers both semantic and syntactic aspects.

- The **semantic** aspect refers to the meaning of data elements and the relationship between them. It includes developing vocabularies and schemata to describe data exchanges and ensures that data elements are understood in the same way by all communicating parties.

- The **syntactic** aspect refers to describing the exact format of the information to be exchanged in terms of grammar and format.

The main characteristics of baseline data architecture:

1. A significant number of Government registries and services are digitised.
2. Semantic interoperability requirements formulated in the e-GIF awaits implementation.
3. A catalogue of registries does not exist.
4. A catalogue of public services exists only as a list of services.
5. A catalogue of data services does not exist.
6. Data sharing is organised in ad hoc manner.
7. Data policy, base registry policy, reference data policy formulated in the e-GIF awaits implementation

3.2.   Crucial components of the target data interoperability architecture

A starting point for improving semantic interoperability is to perceive data and information as a valuable public asset. Improving semantic interoperability is a continuous process. The implementation strategy for achieving semantic interoperability is formulated by the GoU e-GIF.

An information management strategy SHOULD be drafted and coordinated at the highest possible level to avoid fragmentation and set priorities.

Key prerequisites for achieving semantic interoperability are agreements on reference data, in the form of taxonomies, controlled vocabularies, thesauri, code lists and reusable data

structures/models. Approaches like **data-driven-design**, coupled with **linked data** technologies, are innovative ways of substantially improving semantic interoperability.

Catalogues. Data about data (metadata) MUST be properly managed and made publicly available. Catalogues help others to find reusable resources (e.g., services, data, software, data models). Various types of catalogues exist, e.g. directories of services, libraries of software components, open data portals, registries of base registries, metadata catalogues, catalogues of standards, specifications and guidelines.[12]

Catalogues provides trustworthy assistance and tool for the developers, administrators, and users of the Ugandan information systems. Catalogues are supplementary instrument for coordination of Ugandan information systems. All objects of catalogues MUST be reviewed and approved by NITA-U.

The single identifier of objects. Information about some objects like persons, addresses, land properties are used in many services. For interoperability it is important to use the same identifiers for these objects in all information systems of Uganda.

Classifications. To understand process and categorise data in information systems in a standardised way, data need to be classified and tagged. Government agencies cannot communicate and exchange data properly without using the same names/codes (e.g., codes of cities, countries, banks, currencies, goods declared for example for customs etc.) The use of classifications facilitates the standardisation of data, enables information exchange between information systems (data providers and data receivers), and allows the comparison and analysis of the published data. All classifications need to be published in the catalogue of semantic assets.

Uniform addresses. Every administrative unit, infrastructure object, building and certain part of those must have a uniform and unambiguous address.

Data standards. According to the once only principle, data are collected by base registries only once. Base registries will establish syntax and semantic for those data and describe it in the catalogue of information systems. Secondary registries and information systems are using the same syntax and semantics.

Robust, coherent, and universally applicable information standards and specifications are needed to enable meaningful information exchange among public organisations.

The main requirements for the MDAs:

1. MDAs SHOULD perceive data and information as a public asset that SHOULD be appropriately generated, collected, managed, shared, protected, and preserved. Metadata of data MUST be published in catalogues of interoperable solutions and pass through approvement process by NITA-U.

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[12] In several countries catalogue of interoperable solutions were built, which integrate metadata of several interoperable resources. Example from Benin: https://catis.xroad.bj/

2. All registries, business processes and services MUST be digitalised.

3. An information management strategy SHOULD be put in place at the highest possible level to avoid fragmentation and duplication. Management of metadata, master data and reference data SHOULD be prioritized.

4. All objects in the government information systems MUST have a specified single identifier. All information systems MUST use the same identifier.

5. The same data in all information systems MUST be coded by using standard classification. All classifications MUST be published in the catalogue of semantic assets.

6. All address objects MUST be described by a uniform and unambiguous set of data.

7. Data standards SHALL be established and maintained by owners of base registries and SHALL be published in the catalogue of information systems. Other MDAs SHALL be following these standards.

3.3.   Recommendations for implementation

In Table 3 you will find a roadmap for the implementation of crucial components of the GIRA semantic view.

Table 3 Roadmap for implementation data architecture

Activity	Time	Responsible	Resources
Review of catalogue of registries/ information systems. Implementing approval procedures.	2022-2023	NITA-U	N/A
Review of catalogue of public services. Implementing approval procedures.		NITA-U	N/A
Establishment of catalogue of data services	2022-2023	NITA-U	N/A
Establishment of catalogue of business processes	2022-2023	NITA-U	N/A
Establishment of catalogue of semantic assets	2022-2023	NITA-U	N/A
Establishment of data frameworks: Data and information as a public asset that SHOULD be appropriately generated, collected, managed, shared, protected, and preserved.	Constantly	NITA-U (Supervision) MDA (Implementation)	N/A
Digitalising of all registries, business processes and services.	constantly	NITA-U (Supervision)	N/A

		MDA (Implementation)	
Establishment of address data framework	2022-2023	MoICT&NG POSTA Uganda	92

4. Application and technical architecture

For implementation, application and technical architecture have a close relationship. Therefore, we shall look at them together. In the GIRA, this topic is covered by applications and infrastructure views. We do not consider all e-government activities but only activities for achieving interoperability.

4.1. Baseline application and technical interoperability architecture

Ugandan MDAs offer a considerable number of e-services. MDAs have websites where information about the ministry, its functions, contacts, and the public services it offers are published online. The citizen portal https://ecitizen.go.ug/content/ecitizen-portal is systematically structured to offer seamless navigation and quick access to all the services. Services can be accessed through online search, by subject, by topic or through a given MDA link. The portal allows one to access services such as eTax, Business registration, trading license registration and social security statements among others.

A significant number of registries and business processes are digitalised by the MDAs. MDAs are engaged in the development of e-Government. The implementation and management staff have a high level of expertise. The management of MDAs has digital skills to guide IT developments based on business needs and long-term IT strategy.

Ugandan MDAs IT solutions are realised in standalone manner mainly. Data exchange between MDAs is implemented in had hoc manner. No PKI infrastructure has been implemented.

Most e-services are run by web applications. Uganda MDAs miss a guide (security framework) for designing the security of new or validating the security of current web applications.

The existing infrastructure components in Uganda are:

- Citizen portal
- e-Payment
- Short Messaging Services (SMS) gateway (USSD, SMS, Short code services)
- Catalogue of standards
- Open data ecosystem (National Statistics)
- Data exchange/delivery platform (in development: UgHub)

- PKI ecosystem (eID, cerification authority, authentication service, signing services, timestamp services, validation services) (in development)

- Service orchestration (in development: UgHub)

- Data Centre and Disaster Recovery Sites

- National Backbone Infrastructure and E-Government Infrastructure (NBI/EGI) network

4.2. Crucial components of the target application and technical interoperability architecture

For Uganda, the most salient infrastructure components are:

- PKI ecosystem (eID, certification authority, authentication service, signing services, timestamp services, validation services)

- Data exchange/delivery platform

- Public service gateway (citizen portal, single contact point for business, portal for government officials)

- Service orchestration

- e-Payment

- Open data ecosystem (including open data portal)

- Catalogue of legal acts

- Catalogue of standards

- Catalogue of registries/information systems

- Catalogue of public services

- Catalogue of data services

- Catalogue of business processes

- Catalogue of reference data and semantic assets (classifications, Schemas, ontologies, etc.)

- Archiving

- Network services (Public and GOU network)

- Data centre and cloud services (public and GOU hosting services)

- Web Application Security Architecture Framework (WASA Framework)

- National Backbone Infrastructure and E-Government Infrastructure (NBI/EGI) network

4.3. Recommendations for implementation

In Table 4 we find a roadmap for implementation of crucial components of the GIRA application and infrastructure view. Most recommended activities, proposed time, responsible bodies, and indicative amount of money are taken or derived from Action Plan.

Table 4 Roadmap for implementation application and technical architecture

Activity	Time	Responsible	Resources Billion UGX
PKI ecosystem (eID, certification authority, authentication service, signing services, timestamp services, validation services)	2021-2025	NITA-U	35
Developing a Data exchange/delivery platform	2021-2025	NITA-U	11
Service orchestration[13] (integration)		NITA-U MDA	
Point of Service contacts (PSC) (citizen portal, single contact point for business, portal for government officials)	2021-2025	NITA-U	0.35
SMS gateway. Rollout of SMS services (USSD, Bulk, Notifications) across MDAs Maintain connection (MNO Integrations, USSD)	2021-2025	NITA-U MDA	50
e-Payment gateway (rollaut)	2021-2025	NITA-U MDA	15
Developing an ICT statistics system (Data warehouse)	2021-2025	MoICT&NG	2.50
Open data ecosystem (including open data portal)	2021-2025	MoICT&NG	0.25
Catalogue of standards	constantly	NITA-U	N/A

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[13] Service orchestration represents a single centralized executable business process (the orchestrator) that coordinates the interaction among different services. The orchestrator is responsible for invoking and combining the services. The relationship between all the participating services are described by a single endpoint (i.e., the composite service). The orchestration includes the management of transactions between individual services. Orchestration employs a centralized approach for service composition.

		UNBS	
Development of a management and coordination system, including: • Catalogue of registries/information systems • Catalogue of data services • Catalogue of public services • Catalogue of business processes • Catalogue of reference data and semantic assets (classifications, Schemas, ontologies,	2021-2025	MoICT&NG NITA-U	12
Implementation of a national addressing system	2021-2025	MoICT&NG	92
Developing centralised Archiving systems	2021-2025	UBC MOPS	12.8
National Backbone Infrastructure and E-Government Infrastructure (NBI/EGI) network	2021-2024	UCC NITA-U MOICT&NG SIGNET	1400
Data centre and cloud services (public and GOU hosting services)	2021-2024	NITA-U	110
Development and Testing Service	2023-2024	NITA-U	N/A
AI services	2023-2024	NITA-U	N/A
Web Application Security Architecture Framework (WASA Framework)	2021-2023	NITA-U MDA	N/A

5. Abbreviations

Abbreviation	Meaning
ABB	Architecture Building Block
ADM	The Architecture Development Method
EGI	E-Government Infrastructure network
eID	Electronic identification
e-GIF	e-Government Interoperability Framework
GEA	e-Government Enterprise Architecture
GIRA	The e-Government Interoperability Framework Reference Architecture
GOU	Government of Uganda
ICT	Information and communication technology
JLOS	The Justice Law and Order Sector
MDA/LG	Ministries Departments, Agencies and Local governments
MOES	Ministry of Education and Sports
MoICT&NG	Ministry of ICT & National Guidance
MOPS	Ministry of Public Service
NBI	National Data Transmission Backbone
NITA-U	National Information Technology Authority
NIRA	The National Identification and Registration Authority
PKI	Public Key Infrastructure
POSTA	Uganda Post Limited
PSC	Point of Service Contacts
SA	Security Architecture
SIGNET	Signet is the sole national Digital Terrestrial Television signal distributor.
TOGAF	The Open Group Architecture Framework
UBC	Uganda Broadcasting Corporation
UICT	Uganda Institute of Communications Technology
UCC	Uganda Communications Commission
UgHub	Application and data integration platform for the government of Uganda
UNBS	Uganda National Bureau of Standards
WASA	Web Application Security Architecture Framework
XML	Extensible Markup Language