

Interoperability Governance Model (IGM): Envisages Areas of Activities and Relationships to Establish Information Interoperability within Government

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ABSTRACT

The Interoperability Governance Model (IGM) is a practical focussed tool that defines the areas of activities and their relationships to establish interoperability within a Government. It has a set of references structure and guidelines aimed at ensuring mutual interactions at different levels of interoperability within a Government. The IGM is composed of three interlinked areas: strategy and management, relationships and Technical infrastructure. The strategy and management drives the creation of the desired state of interoperability. While the relationships focus on the forms and nature of Government collaboration required to meet the overall Government strategy. The technical infrastructure addresses the technical standard/architectural issues involved in exchanging data and sharing functionalities between computer systems. Furthermore, the IGM is extended to the Interoperability Governance Framework (IGF) which serves as a common governance and technical frame of reference to guide the process of establishing interoperability within a Government. The IGF consists of seven domains that are aligned with the IGM areas. The IGF domains map to the higher level IGM areas, which provide the overhead functional groupings.

Keywords: Interoperability Governance Model, Interoperability Governance Framework, interoperability, e-Government, interlinked, strategy and management, relationships and technical infrastructure

1. INTRODUCTION

This work introduces the Interoperability Governance Model (IGM), a tool which envisages the areas of activities and their relationships to establish interoperability within a Government. The IGM is a set of references structure and guidelines aimed at ensuring mutual interactions at different levels of interoperability (IOP) within a Government. It has three interlinked areas, the Strategy and Management, Relationships and Technical Infrastructure. The Strategy and Management area of the model deals with the political/legal, Government vision/mission as well as management aspects required to achieve the desired state of interoperability. The second aspect of the area of IGM, the Relationships focuses on the forms and nature of Government collaboration required to meet the overall Government strategy. The third component, Technical Infrastructure area of the model addresses the technical and standards/architectural issues involved in exchanging data and sharing functionalities between computer systems.

The IGM has an extended Interoperability Governance Framework (IGF). The IGF expands the IGM to a level of a reference framework. The IGF consists of seven interlinked domains which are aligned with the IGM areas. The IGF has outer layer domains that consist of Legal/policy, Planning and Organising and Monitoring and Evaluation of the IGF and these are mapped to the Strategy and Management area of the IGM shown in Figure 1. The inner domain of Collaboration is mapped to the IGM's Relationships area, whereas the Data and Functionality, Standards/Architecture and Infrastructure of the IGF

are mapped to the Technical area of the IGM. Therefore, to achieve the desired level of IOP among Government Agencies using the IGF, issues should first be addressed in the outer layer of the IGF before moving towards the inner triangle of the IGF as demonstrated in Figure 2.

To achieve the desired level of IOP among Government Agencies using the IGF, issues should first be addressed in the outer layer of the IGF moving towards the inner triangle of the IGF as shown in Figure 2.

Statement of the Problem

Some of Government, private and NGO's systems are currently physically connected to one another though concentrated in urban areas, especially in the Sub-Saharan region. The heterogeneous information installed in these systems is not designed to flow from one system to another. The data in these systems are not programmed to interoperate, making the exchange of information among departments, companies, NGO's and Government impossible. It is in view of this none-interoperable heterogeneous information among the systems that necessitated the envisaging of the IGM model and its extended IGIF. The IGM and IGF provide a structured checkpoint based approach to achieve government interoperability in a managed manner.

2. RELATED WORK

A considerable amount of work has been done on e-Government involving the concept of interoperability (IOP) in trying to share and exchange valuable data by the relevant stakeholders. In this section, we look at literature from other authors organised as follows: first the general definition of interoperability (IOP), second is IOP maturity, third is IOP frameworks.

Sharing and Exchanging Data

[3] points out that Government(s) around the world are challenged in their efforts to effectively share authority, resources and information across organisational boundaries, i.e. to become interoperable. This is also supported in [4] where they described IOP as the ability of information and communication technology (ICT) systems and the business processes they support to exchange data and share information and knowledge. In-line with the previous, in [6] they defined the concept IOP as "...the ability to transfer and use information in a uniform and efficient manner across multiple organisations and information technology systems". Further, in [9] they perceived the concept of IOP as the ability of government organisations to share and integrate information and business by using common standards. From these three descriptions, one main common thread is found among them all; that IOP was the ability to exchange data and information among multiple organisations.

Measuring Interoperability Maturity

According to [2] maturity models describe the stages of progress or evolution through which systems, processes or organisations progress. In 1993 the Levels of Information Systems Interoperability (LISI) project was initiated by the C4ISR Integration Task Force which resulted in a LISI reference model and process for assessing Information Systems' interoperability. The LISI Interoperability Maturity Model in [1] defines five stages of increasing levels of sophistication regarding system interaction and the ability of the system to exchange and share information and services.

The Organisational Interoperability Maturity Model for C2 was proposed by [2] and serves to compliment the LISI reference model by extending it into the area of organisational IOP. The C2 model defines five levels of organisational maturity of which each level is defined by one or more primary enabling attributes.

[8] proposed the Government Interoperability Model Matrix (GIMM) that can be used by organisations to assess their current e-Government IOP status in respect to IOP readiness and performance. The GIMM defines five different sets of organisational IOP maturity levels similar to those of the C2 model, where each level corresponds to a different IOP level for a set of Interoperability Attributes (IA).

The IOP maturity models reviewed defined very similar interoperability maturity levels with the main differences between the models being the manner in which they rate interoperability.

Interoperability Frameworks

A number of e-Government IOP frameworks have been developed by first world countries such Australia, Malaysia, United Kingdom and Estonia. In [5] the Australia Government IOP framework addresses the information, business processes and technical dimensions of IOP, setting the principles, standards and methodologies that support the delivery of integrated and seamless services. The MyGIF in [7] of Malaysia spans the IOP areas of interconnection, data integration, information access, security and metadata with focus on adopting de facto ICT standards and technical specifications for all IOP areas. The United Kingdom (e-GIF) of [4] covers the government's technical policies and specifications for achieving IOP and ICT systems coherence across the Public Sector, defining prerequisites for joined-up and web-enabled government. [5] describes the Estonia IOP framework that consists of a set standards and guidelines aimed at provisioning of services both at the national and European context.

The IOP frameworks reviewed showed that these frameworks addressed the IOP needs and issues of the country concerned. The majority of IOP frameworks focussed on semantic, technical and organizational IOP. These frameworks mostly lacked proper coverage of administrative process standardizing.

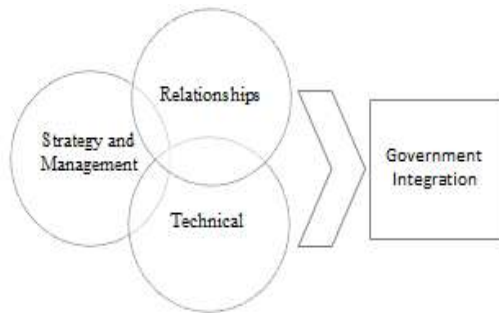


Figure 1. Interoperability Governance Model (IGM)

In view of the above, the literature review provided deeper insight into the different IOP maturity models and frameworks. It revealed that there are a number of different viewpoints and emphasis regarding IOP maturity and frameworks for Governments.

3. INTEROPERABILITY GOVERNANCE MODEL (IGM)

The Interoperability Model (IGM) as depicted in Figure 1 is a practical focussed model that defines the areas of activities and their relationships to establish interoperability within a Government. The IGM is composed of three interlinked areas namely: Strategy and Management, Relationships and Technical infrastructure. By addressing the IGM focus areas and their inter-relationships a Government will move towards Government integration.

The three areas of the IGM are summarized below:

Strategy and Management

The Strategy and Management area of the model refers to the political/legal, Government vision/mission as well as management aspects required to achieve the desired state of interoperability. To implement interoperability related policy and all of its objectives, Government should develop a governance regime. In this sense, interoperability planning and organising within the Government is essential to reach alignment with the strategies of Government. Strategies and plans developed within this area will impact interoperability both within and across Government Agencies.

Relationships

This area focuses on the forms and nature of Government collaboration required to meet the overall Government strategy. The implementation of a Government interoperability solution on top of the existing structures, processes and procedures is unlikely to add real value to Governments. Therefore, Government Agencies need to evaluate and re-align or redefine their internal processes, procedures and structures.

Technical

Technical area of the model entails addressing the technical and standards/architectural issues involved in exchanging data and sharing functionalities between computer systems. Key elements include standards on areas such as data semantics and syntactic as well as supporting technologies.

4. INTEROPERABILITY GOVERNANCE FRAMEWORK (IGF)

The Interoperability Governance Framework (IGF) extends the IGM to a level of a reference framework. The objective of Interoperability Governance Framework (IGF) serves as a common frame of reference to guide the process of establishing IOP within a Government. The IGF in Figure 2 consists of seven interlinked domains which are aligned with the IGM areas as demonstrated in Figure 1.

The IGF outer layer domains namely Legal/policy, Planning and Organising and Monitoring and Evaluation of the IGF map to the Strategy and Management area of the IGM as shown in Figure 1. The inner domain of Collaboration map to the IGM Relationships area whereas the IGF inner domains of Data and Functionality, Standards/Architecture and Infrastructure map to the Technical area of the IGM.

To achieve the desired level of IOP among Government Agencies using the IGF, issues should first be addressed in the outer layer of the IGF demonstrated Figure 3 moving towards the inner triangle of the IGF. In a more formal manner, the IGF may be implemented through seven steps that directly relate to the seven domains of the IGF as depicted in Figure 3.

The seven implementation steps of the IGF in Figure 3 forms a process cycle that may be re-iterated as government interoperability matures over time.

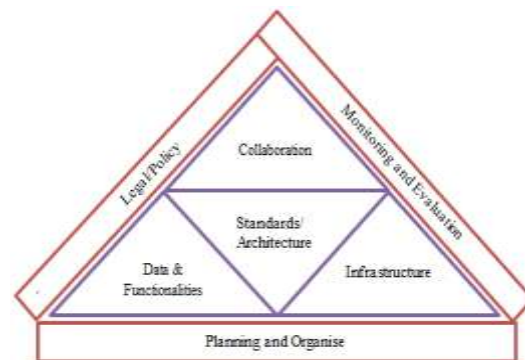


Figure 2. Interoperability Governance Framework (IGF)

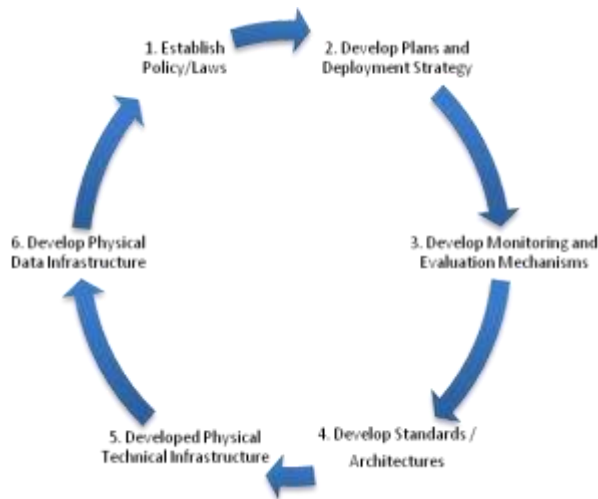


Figure 3. IGF Process Cycle

The seven domains of the IGF are described below and summarised in Table 1.

Legal and Policy Domain

The Legal and Policy domain refers to the regulatory and policy frameworks which define the interoperability scale, content, standards and performance references. The development and enactment of laws/policies that provide the basis for Government interoperability should be the first priority.

Planning and Organising

Once the legal/policy framework is enacted, plans need to be developed to implement the interoperability directives. Plans should focus on the methodologies and process of establishing interoperability standards/architectures, interoperability infrastructure, data and system functionalities.

Monitoring and Evaluation

The monitoring and evaluation of interoperability planned activities will play an important role in making certain that targets are met on time, within budget and that identified issues are addressed. To access and measure impact and performance on planned activities, key performance indicators (KPIs), monitoring and evaluation tools and mechanisms will need to be developed.

Collaboration Domain

This domain refers to both the nature and level of collaboration within and among Government Agencies in respect of data exchange and the sharing of functionalities. Attention should be given to identifying the different bilateral agreements and process domains involved, level of interoperability (e.g., manual, peer-to-peer, distributed, integrated, global) required, security considerations and

compatibility requirements for exchanging data and sharing of functionalities among organisations. Once this done, attention should be given to forming the relationships, establishing trust and obtaining top management support for those organisations involved. To facilitate the synthesis of business processes across the Government focus will need to be given to issues concerning the coordination and alignment of business process and architectures of organisations within and outside of Government agency boundaries.

Standards/Architecture Domain

The technical aspects of interoperability may be guided by reference or compatibility standards or by conceptual architecture. In developing standards/architecture consideration should be given to standards concerning the syntactical and semantics of data to be exchanged and the provision of technology guidance. De facto standards (e.g., XML, Unicode, LDAP) should be adopted as far possible.

Data and Functionality Domain

Focus in this domain is in describing and developing the data structures (e.g., meta-data) to exchange and/or functionalities to be shared among computer systems. An important aspect relating to data that needs to be address is the manner in which data will be represented (e.g., documents, objects and graphics and formal messages) and accessed by 3rd parties.

Infrastructure Domain

This domain serves the purpose to establish the technical interoperability environment connecting both front and back office systems. Issues of technologies (e.g., hardware, software), communication and protocols, interfaces, computer system organisation (style and topology), system security and system services need to be addressed within this domain. The infrastructure will provide the platform and mechanism to exchange and or share system functionalities.

5. CONCLUSION

Much of the infrastructure architecture and physical connectivity has been completed in an attempt to provide the communication foundation for e-Government services. However such an adequate physical connection has not met the requirements of implementing the e-Governance services especially to the vulnerable communities because of the systems that are not interoperable in terms of information exchange. It is in view of this that the IGM model has been devised to specifically address the interoperability of data among the existing systems in a governed manner. The model envisages the areas of activities and their relationships to establish interoperability within the companies, NGO's and Government. The IGM is a set of references structures and guidelines aimed at ensuring mutual interactions at different levels of interoperability (IOP) within a Government. The IGM has an extended Interoperability Governance Framework (IGF). The

IGF consists of seven interlinked domains which are aligned with the IGM areas. The inner and outer components of the IGF are interlinked to facilitate the efficient and effective establishing of interoperability

among government organisations, NGO's and its customers.

Table 1. IGF Domains and Facets Summary

	Domains						
	Legal/Policy	Planning & Execution	Monitoring & Evaluation	Collaboration	Standards / Architecture	Data & Functionalities	Infrastructure
Facets	Laws and Policies.	Overarching Plans, Action Plans, Implementation Structures.	Performance Measures, Tools.	Relationships, Agreements, Trust & Confidence, Align of Processes.	Principles, Standards and/or Conceptual Architecture(s).	Data Structures, Data Representation, Data Access, System Functionality Forms.	Technologies, Communication, Security, Services.

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