



Ghana Government eGIF Implementation Guide



ABBREVIATIONS

Term	Definition
e-GIF	E-Government Interoperability Framework
EA	Enterprise Architecture
MDA	Ministries Departments and Agencies
GICTeD	Ghana Information and Communication Technology Directorate
GoG	Government of Ghana
CMM	Capability Maturity Model
SDLC	Systems Development Life Cycle



Table of Contents

1. Introduction	5
2. Implementation Strategy	5
2.1. eGIF Implementation in 'Greenfield' Environments	6
2.2. eGIF Implementation In Legacy Environments	8
2.2.1. Wait Until Technology Refresh Approach	9
2.2.2. Implementing eGIF Using A Bridging Approach	9
3. Transition Approach	11
3.1. Systems Development for eGIF Compliance	11
3.1.1. Project Initiation	12
3.1.2. Requirements Gathering And Analysis	12
3.1.3. Design	12
3.1.4. Building	12
3.1.5. Testing	12
3.1.6. Implementation	13
3.1.7. Operations And Maintenance	13
3.2. Programme Management	13
3.3. Programme Structure	13



1. Introduction

The e-Government Interoperability Framework (eGIF) implementation guide is another key deliverable of the e-GIF project and it serves as the strategic framework for implementing policies and technical standards across government. The report describes how eGIF is going to be implemented to transition the MDAs' IT from their current state to the future state of interoperability and the additional business value that the transition will deliver. The report does not provide any specific dates for implementation but broad guidelines for its implementation.

The purpose of the report is to define how the Government of Ghana (GoG) through a central authority (e.g. GICTeD) and MDAs will implement the recommendations provided in the Ghana Government eGIF policies and standards report. The report defines the implementation strategy, which describes the overall approach to the transformation activity. The ultimate goal of the implementation strategy is to make the amendments necessary to the MDA ICT environments to fulfil their e-government objectives while causing the least amount of disruption to business operations. The report also describes the different types of environments, the technical challenges and the transition approaches available to the MDAs. The main objective of the report is to provide a guide to planning for eGIF transformation activities.

2. Implementation Guide

The document is based on our analysis of MDAs who responded to our assessment questionnaire. It suggests that none of the existing MDAs will be fully compliant, because for example none of them employs Web Services and XML for the applications environments and as data interchange is a key requirement for interoperability then MDAs must understand the implications of developing the appropriate steps for full compliance.

Government legislation may be required for the enforcement of eGIF standards and policies in Ghana and the law must clearly determine the date for MDAs to start the process of implementing the required structures in their organisations for eGIF compliance. The adoption of eGIF should be an integral part of the MDAs plans to participate in electronic government and as such Chief Directors and senior officials of the MDAs must integrate eGIF implementation requirements into their future strategic plans.

It is expected that all MDAs will adopt the eGIF on the following basis:

- ☐ Current technologies, applications and information systems do not need to immediately comply with the Ghana Government eGIF;
- ☐ MDAs will use the Ghana Government Enterprise Architecture framework to drive their interoperability implementation plans;
- ☐ From a defined date by the government, all new information systems, applications, interfacing and communications technologies deployed by MDAs (or current instances of systems being redeveloped or replaced) must comply with the eGIF except in instances where:
 - Interoperability is not considered by the MDA as a requirement for a given technology solution; or



- the current version of the eGIF does not include policies and standards on the technologies the MDA wants to deploy; or
 - an alternative approach to achieving interoperability is justified;
- Where an MDA has justifiable reason to be exempted from eGIF compliance it must:
 - Demonstrate to GICTeD or (the central standards authority) that the current eGIF version cannot meet given requirements or why an alternative approach to achieving interoperability is justified;
 - Provide suggestions for necessary changes to the eGIF.
- Exemptions will only apply to a specific system or technology but not the entire ICT environment and business processes of the MDA;
- Specialist systems deployed by the security and intelligence services are automatically exempted where compliance with the eGIF is considered inappropriate;

The implementation strategy must ensure the steps towards the vision are feasible, low in risk and meet government objectives. eGIF implementation strategy affects MDAs in two categories, namely:

- Greenfield ICT environments:
- Legacy environments.

2.1. eGIF Implementation in ‘Greenfield’ Environments

90% of the MDAs assessed could be categorised as ‘greenfield’, with little or no ICT infrastructure in place. There is no architecture and MDAs in this category are yet to deploy any major applications to automate their business processes and have no technologies in place to exchange data automatically within or across MDAs. Our analysis of the Ghana public sector ICT environment suggests that these MDAs will have to adopt the Ghana Government Enterprise Architecture (GGEA) framework and the implementation guide to meet their eGIF requirements.

It is recommended that MDAs considered as ‘greenfield’ sites adopt the GGEA implementation methodology, which provides a logical, step by step approach to implementing the Enterprise Architecture (EA) and defining the necessary technologies. MDAs are expected to comply with the eGIF standards and policies when implementing their EAs. The GGEA delivery model will take MDAs through a maturity process as the technologies are implemented. The different stages of the model are:

- **Stage 1** – this stage involves adoption of the EA by the MDA and definition of applications, data and infrastructure requirements for implementation. This stage also involves the implementation of the critical processes and structures necessary to position the MDA within the leveraged applications delivery structure. It is expected that the MDAs eGIF requirements are established at this stage.
- **Stage 2 (6 – 12 months)** – this stage involves establishing basic operating requirements and transitioning services to the government shared infrastructures and the customisation of application services for the MDA. eGIF requirements must be established and incorporated into the design of systems.



- **Stage 3 (12 – 24 months)** – involves the deployment of the necessary technologies for the MDA and evolving organisational processes. All systems are eGIF compliant and the MDA participates in compliance reviews.
- **Stage 4 (24 months +)** - eGIF adoption is complete and MDA is able to interoperate effectively using appropriate standards and policies.

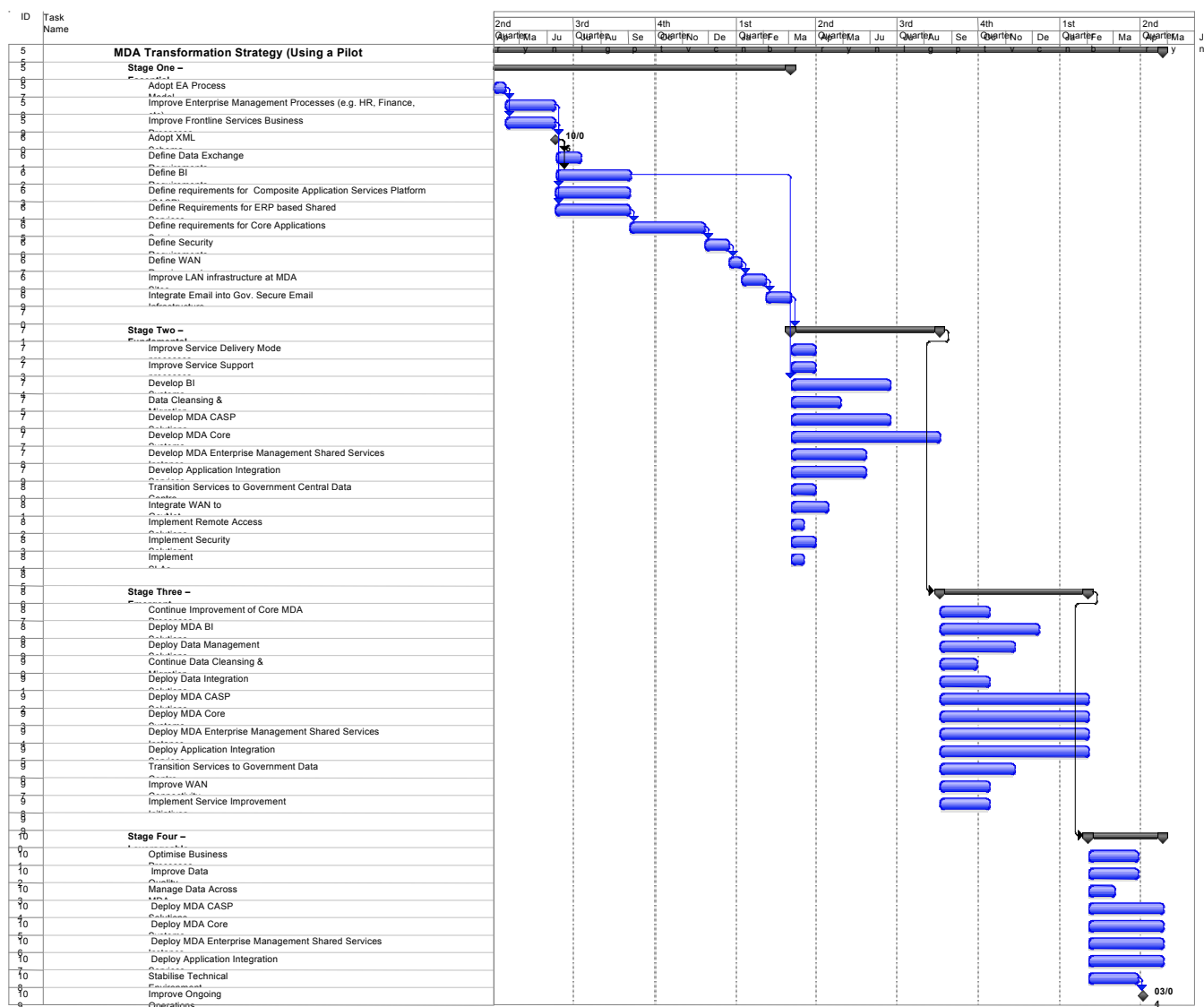


Figure 1: EA Implementation Maturity Plan

Figure 1 above illustrates that as MDA's progress through the stages in the EA implementation maturity process, eGIF policies and standards must be applied by the agencies. For instance MDAs in stage one of the capability maturity processes has to adopt the EA and define applications, data infrastructure for implementation. In defining them the XML schema, which has been define in the eGIF should be the underlying mechanism used by applications for data interchange and integration.



As the MDAs Enterprise Architecture implementations mature, the alignment with the eGIF will occur as part of the normal cycle of systems and software upgrading, and introduction or revision of functions and business processes. MDAs with the requirement to deploy new systems are expected to go through GICTeD for proper scrutiny to make sure that no element of the system to be deployed conflicts with the EA and e-GIF principles. The effect of this approach will be that across time, and driven by operational requirements, interoperability will become the norm in government not the exception. It will also mean that agencies will not be able to participate effectively unless they align with the eGIF.

2.2. eGIF Implementation In Legacy Environments

Some MDAs have legacy systems, which may run on old non-eGIF compliant technologies but yet are vital to the organization in the discharge of their duties. Such systems despite the fact that they may not be eGIF compliant cannot be discarded immediately due to:

- **Cost of implementing new systems:** new systems are usually introduced at a cost. The cost is for hardware, development of applications whether built in-house or off the shelf, training, support staff, etc. If existing systems are working satisfactorily, and MDAs see no reason for changing them, re-learning a new system would have a prohibitive attendant cost in lost time and money, which the MDAs usually don't have.
- **Role of the system in the organisation:** Some systems are vital and key to the performance of the MDA because of the tasks and roles they perform. Even if such systems run on obsolete or non-eGIF complaint technologies changing them could be a big hurdle for the organisation because of impact on service delivery, which could be detrimental to the MDA and the government of Ghana in short to medium term.
- **Budget constraint:** implementation of EA and eGIF comes at a cost to the MDA itself. Apart from the shared infrastructure and application services, MDAs are expected to build their own applications in conformance with the EA and the eGIF. Some MDAs may struggle to raise funds for the technology projects.
- **Resistance to change:** in situations where staffs of MDAs are resistant to change it will be difficult for any sort of change regardless of the organisation's compliance obligations. MDAs have a specific way of doing things and what they stand for. Implementing new systems may seem to be a breach of organisational culture and attitude and that may affect productivity and the delivery of services to citizens.
- **Fear:** introduction of new ways of doing things creates a sense of job insecurity and the fear of getting things done wrongly. Implementing eGIF could mean that certain changes may have to be made and business process re-engineered, which could generate fear among some of the employees.

The above reasons might suggest that legacy systems cannot be discarded; nonetheless it is still important that eGIF is implemented across MDAs in order to meet the goal of interoperability in government. We recommend two main approaches for the implementation of eGIF in legacy environments:



- ☐ Wait until technology refresh approach;
- ☐ Technology bridging approach.

2.2.1. WAIT UNTIL TECHNOLOGY REFRESH APPROACH

This approach recommends that systems be allowed to go through their lifecycle to the period where they must be refreshed for eGIF compliance. Technology refresh cycle is the time in between the replacements of technologies. With this approach requires the MDA to wait until the existing non-compliant systems exhaust their refresh cycle and then they will be replaced with new systems that are eGIF compliant. Other events which can also trigger technology refresh:

- ☐ **Technical problems:** this is when the software or hardware encounters a problem in the course of its operations and begins to malfunction or ceases to function. The MDA has no other choice than to replace that software or hardware for work to progress then in the process ensure the new systems are developed to eGIF compliant.
- ☐ **Growth in business volumes:** as the number of citizens and employees who access services from a particular MDA increases, transaction volumes of the MDA will increase. If the existing systems lack scalability and agility, the increasing transaction volumes could affect the performance of the systems and this may call for a replacement of the systems to handle the large volumes of transactions. The new system will then be designed to meet eGIF and other non-functional requirements.
- ☐ **Vendor specified refresh:** Vendors of software products can also trigger a refresh. Some vendors may cease to offer technical support and advisory services for MDA clients. In that case the MDA will not have a choice but to replace the system or upgrade to a supported version. The MDA will then ensure that the new version is eGIF compliant.
- ☐ **New industry trends, standards or paradigm shifts:** Changing industry standards, trends and ways of doing things triggers a refresh (and possibly changes to eGIF standards). For an MDA to want to apply these new trends, the legacy systems may have to be decommissioned and replaced with modern systems which have the needed technological capabilities that meet eGIF specifications.

2.2.2. IMPLEMENTING eGIF USING A BRIDGING APPROACH

This approach recommends the use of middleware technologies to transform data and information from one platform onto another. Our analysis of over 50 MDAs suggests that none of their existing legacy systems is XML based, which makes them non-compliant to eGIF standards at this stage. There is a need to convert the various flat files to XML and SQL to XML to achieve compliance. The issue is that the applications will require a lot of changes to make them compliant. The bridging approach using a middleware could be used for the conversion. Data integration and interchange is the most critical requirement for eGIF implementation and it is accepted that not all systems will be required to be directly XML enabled and where appropriate it is acceptable to use middleware as a bridging mechanism as illustrated figure 2 below.

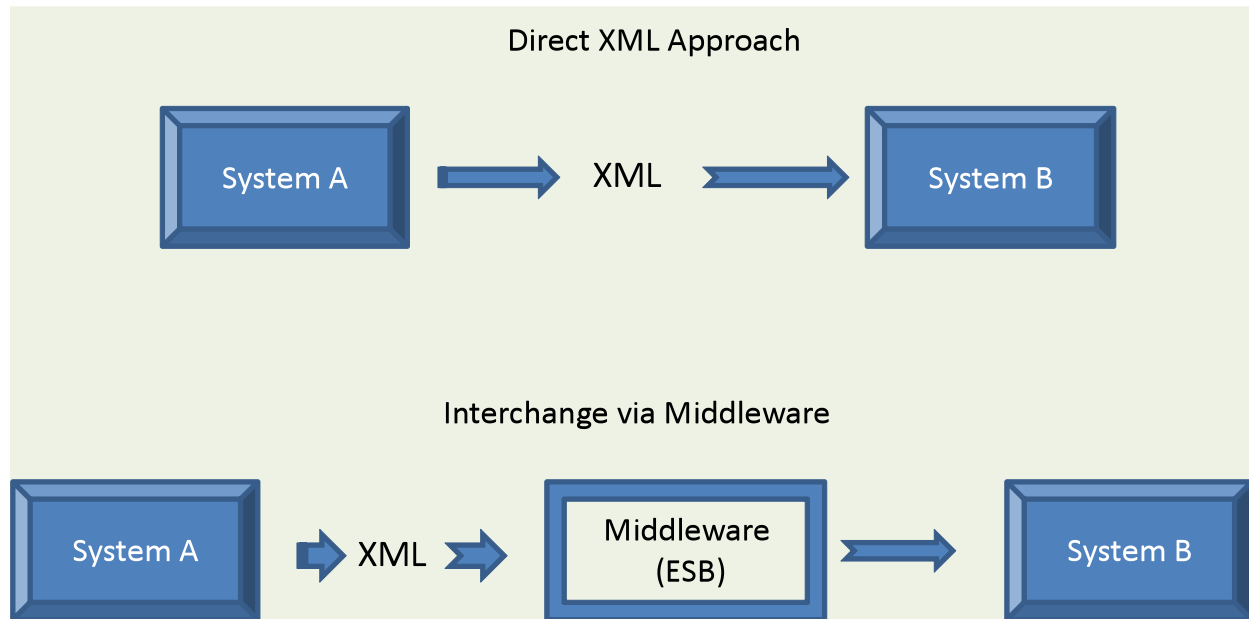


Figure 2: Data Interchange Approaches

The diagram presents different options for the MDAs to achieve data interchange. It must be noted that it is a requirement that all new systems strive to use the direct XML model as shown in the diagram for eGIF compliance but the adoption of the Enterprise Service Bus (as recommended in GGEA) coupled with certain technologies such as the XSLT could be used to achieve this purpose. The Enterprise Service Bus (ESB) is a technology, which provides an abstraction layer on top of systems allowing systems to be interoperable and communicate. MDAs are expected to develop their Enterprise Architectures based on the GGEA framework and as such will be expected to deploy and ESB, which will enable applications that are not interoperable to communicate on a common platform via the ESB, which is the middleware acting as an intermediary between applications. For example applications that do not use the XML schemas will be able to use XSLT component of the ESB, which defines a transformational syntax well formed as an XML document for creating interoperability through the XML.

Middleware technologies provide an interface mechanism for inter-process and inter-application communications and as such could provide the bridging mechanism for non-eGIF compliant legacy environments. Web Services are a specific type of middleware that use XML-based protocols to provide non-proprietary inter-process communications.

The interface and protocol standards provided by middleware products provide an environment for processes and applications to communicate and share information. Middleware can also be used to 'wrap' applications so that they provide a consistent interface to other applications and processes. The use of middleware technologies will improve the ability to gain access to services provided by applications and processes stored and executed on other MDA environments. They provide the ability to encapsulate legacy applications so that they offer a standardised interface to other users of their services and increased support for interoperability between applications.



3. Transition Approach

The adoption of the eGIF must allow for a sensible transition due to the cost implications and the lack of skilled resources. The Government of Ghana must therefore set the appropriate date for MDAs to start the transition process and also agree on the basis where current information systems, software applications, or electronic data/information resources do not need to immediately comply with the eGIF.

The transition strategy for the MDAs will depend on the unique MDA's situation and the current technologies deployed and their alignment with the eGIF specifications. In fact, the transition from the current to the future eGIF compliant state will vary between MDAs but the transition strategy provides a broad framework for the implementation of the eGIF. During implementation the following should be considered:

- ☐ The MDAs Enterprise Architecture implementation plans;
- ☐ Other changes occurring in the organisation – there is a need to consider how much change is occurring in the MDA, the people involved in the changes and the thresholds for accepting change.

The first step is for GICTeD to plan the various drivers for effective implementation. These drivers will enable eGIF to be understood by all stakeholders and also uphold the sustainability of compliance measures that are going to be put in place. They are as follows:

- ☐ **Sensitisation workshops:** workshops must be organised for all government MDAs to create the awareness and the importance of eGIF and the need for every agency to comply with the set standards and policies.
- ☐ **Establishment of an implementation team:** there is the need to set up a team of IT professionals that will ensure the successful implementation of the eGIF in Ghana. The eGIF Advisory Board must be set up to monitor the process of implementation.
- ☐ **Accreditation and Certification Authority:** GICTeD should set up an accreditation and certification authority to offer accreditation and certification to government MDAs and other business agencies that are eGIF compliant.
- ☐ **Establishment of a compliance team:** The formation of a compliance team by GICTeD to oversee the compliance of government systems after eGIF has been implemented is a strategic decision and an important step for eGIF sustainability.
- ☐ **Training the trainers:** a workforce of e-GIF auditors must be created to monitor and audit government MDAs to check whether their systems are eGIF compliant.

3.1. Systems Development for eGIF Compliance

It is expected that MDAs will use a standard systems development methodology that incorporates the different Systems Development Life Cycle (SDLC) stages to develop or change information systems for eGIF compliance. Some of the processes include requirements gathering, validation, training, and user ownership. The use of the SDLC will result into a high quality transition process.



The transition lifecycle is based on the phases below during which defined system products are created or modified for eGIF compliance. Not every project will require that the phases be sequentially executed. However, the phases are interdependent. Depending upon the size and complexity of the project, phases may be combined or may overlap.

3.1.1. PROJECT INITIATION

This is where the MDA identifies that a problem or loophole is spotted in the existing system in terms of eGIF compliance. There are two options available; to fix the problem or implement another system to replace the existing one. A feasibility study must be conducted to establish the appropriate option to take. The aim of this stage is to generate a high-level view of the intended changes and determine the goals and costs involved for justification.

3.1.2. REQUIREMENTS GATHERING AND ANALYSIS

The goal of performing a system analysis is to determine how to get to a compliant state and the amount work involved in the transition process. This step will involve understanding the different components involved and perform a thorough analysis of the standards, policies and specifications involved. With respect to the implementation of the eGIF in legacy systems various issues of non interoperability are spotted during this phase. The output from this stage is the requirements specification document which will contain applicable eGIF policies and standards involved.

3.1.3. DESIGN

The design phase identifies all the functional areas to be changed to enable interoperability. This will include the use of the appropriate XML schemas or technical specifications to enable interoperability. The output of this stage will describe the new system as a collection of modules or components to be built to achieve eGIF compliance.

3.1.4. BUILDING

This stage is the development, customisation or configuration of the components or subsystems to achieve interoperability. In the case of software components unit testing and module testing are done in this stage by the developers. With inputs from the requirements gathering and design phases, the MDAs can make contacts with various software vendors, submit their requirements and designs which will comprise of eGIF policies and standards.

3.1.5. TESTING

System, user acceptance testing and test for interoperability are often performed at this stage. The goal of testing is to ascertain whether the system is functioning according to the functional requirements gathered from the requirements gathering and analysis stage.

3.1.6. IMPLEMENTATION

This phase is when the system is introduced into the production environment. Employees use the system and report any problem or loop-holes back to the development and testing teams. This



stage can also be incorporated into the testing stage where users of the system are closely involved in the testing before the system is finally deployed and integrated into the working environment.

3.1.7. OPERATIONS AND MAINTENANCE

Maintaining the system is an important aspect of interoperability by ensuring a future change does not affect the integrity of the system from an eGIF standpoint. New changes will be implemented, which will require system updates. Also as industry standards and trends change, the eGIF policies and standards are going to change. It is the responsibility of GICTeD to update the technical policies and standards set out in the eGIF policy documents to reflect industry best practices.

3.2. Programme Management

Due to the complexity of managing the GGEA and eGIF implementations across government, GICTeD must implement a Programme Management Office (PMO) to support the various projects. The PMO team must be made up of at least two full-time project office administrators, and led by an experienced project manager. The programme office will provide:

- ☐ An integrated set of project management standards and procedures;
- ☐ A focal point for the development teams;
- ☐ Agreed ways of dealing with administrative and project management procedures to provide consistency and better control across the two projects and work teams;
- ☐ An understanding of the dependencies between the projects, as they relate to work products and deliverables;
- ☐ Experienced staff to assist project staff in effectively applying tools and methodology.

3.3. Programme Structure

An industry best practice programme management methodology is required to provide a set of logical processes to manage the various implementation projects of all types and sizes in a structured and standardised manner. The methodology must be very flexible and be able to use existing tools or techniques currently used by GICTeD. The programme structure will be based on the following:

- ☐ Steering Committee (composition to be determined);
- ☐ Programme Manager;
- ☐ Project Managers;
- ☐ Development Teams (Consultants and MDA staff).