e-Government Interoperability: Overview

OVERVIEW

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UNDP Regional Centre in Bangkok
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Foreword

Information and communication technologies (ICTs) provide developing nations with an unprecedented opportunity to meet vital development goals such as poverty alleviation, basic health care improvement and universal education more effectively than before, via the appropriate utilization of technological tools. There is increasing evidence that e-government, if implemented strategically, can improve efficiency, accountability and transparency of government processes. However, the full potential of e-government applications and other ICTs remains to be fully harnessed by developing countries.

Through UNDP's experiences in e-government initiatives, one of the key challenges we have identified is the existence of a patchwork of ICT solutions in different government offices that are unable to 'talk' or exchange data. In the process of digitization, government processes and systems are, in many instances, reinforced rather than transformed. As a result, citizens continue to visit different departments to access public services, even after the introduction of ICTs, as systems are not interconnected.

Recognizing that e-government should be transformative and become more citizen- rather than government-focused in delivering public services, investing in the development of an e-government interoperability framework is fundamental. Otherwise, the millions of dollars spent on e-government would rarely lead to good governance and the achievement of the Millennium Development Goals.

UNDP created a Study Group of government officials from 14 nations, supported by a team of experts from IBM, Oracle and the International Open Source Network, to help countries, especially those in the Asia-Pacific region, reverse this trend of fractured ICT projects by developing and promoting Government Interoperability Frameworks (GIFs). Working collaboratively, this group shared and reviewed existing GIFs, promising practices around interoperability and strategies and policies for promoting open standards, resulting in the development of guidelines that are now reflected in a GIF series of three publications.

The three publications on e-Government Interoperability (the Overview, the Guide and the Review of GIFs in selected countries) aim to assist countries who are striving to set up or improve interoperable ICT frameworks for better e-government delivery. It is our hope that the series will provide a helping hand – a guiding tool – to understanding what e-government interoperability is, why it is important and how governments can improve or start to develop GIFs.

The idea for the project came to life during a policy dialogue at a regional conference on open standards that the UNDP Asia-Pacific Development Information Programme (APDIP) organized with the National Electronics and Computer Technology Center in Bangkok in 2006. Participants agreed that government policies of interoperability are advantageous and that, if governments have not already done so, they should consider formulating their respective GIFs.

In order to ensure that the final publications are responsive to the requirements for interoperability in the respective countries, the GIF Study Group collaborated online and had face-to-face conversations. Hosted by the Chinese Government's State Council Informatization Office, the GIF Study Group met in Beijing on 18-20 April 2007. At the workshop, participants shared experiences, asked questions and set goals for their work.

The GIF Study Group includes representatives from the Governments of Brazil, Canada, China, Egypt, India, Indonesia, Malaysia, Netherlands, New Zealand, Philippines, South Africa, Sri Lanka, Thailand and Viet Nam. Also represented are the European Commission and a standards expert from the United States. The study was convened by UNDP and project advisor Dr. Emmanuel C. Lallana, who is also the author of all three publications in the series.

This series is a practical guide and attempts to answer questions that policy makers and practitioners may have on GIF and open standards. For ICT and e-government to work for development and poverty alleviation, information and knowledge need to flow seamlessly across agency borders and various levels of government, and ultimately between different countries, across regions and continents without being locked into specific software packages. Eventually, this will lead to better and more informed decisions, better public service and better governance.

Please visit our e-Government Interoperability website for additional information: http://www.apdip.net/projects/gif

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Appreciative of the inclusive publication development process and the careful reviews by the Study Group members listed below, the views expressed in this paper are the views of the authors alone.

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Government Interoperability Framework Enterprise Architecture and Open Standards

What is e-government interoperability?

e-Government interoperability, in its broad sense, is the ability of constituencies to work together. At a technical level, it is the ability of two or more diverse government information and communications technology (ICT) systems or components to meaningfully and seamlessly exchange information and use the information that has been exchanged.

Why is e-government interoperability important?

e-Government interoperability is becoming an increasingly crucial issue, especially for developing countries that have committed to the achievement of the Millennium Development Goals (MDGs) by 2015. Enhanced government efficiency and effectiveness coupled with the delivery of basic public services to all citizens are essential components required to achieve such goals. To date, most governments have finalized the design of national e-government strategies and are busy implementing priority programmes.

However, these technology investments have not automatically led to more effective public e-services. On the contrary, in many cases, they have ended up reinforcing old barriers that made access to public services cumbersome – not to mention expedient decision-making processes. The e-government promise of more efficient and effective government institutions is not being fulfilled due, to a large extent, to the seemingly ad hoc deployment of ICT systems. In the short run, these ad hoc deployments address the specific needs of government agencies, but they do not pay the required attention to the overall need of interaction among the diverse ICT systems in order to share and exchange data. This collaboration is a function that is key, for example, in e-government 'one-stop shops' that aggregate many public services into one service window.

Furthermore, the seamless flow of information across government and between government and citizens also increases transparency and accountability. Governments are thus better able to justify their programmes while citizens are better informed – all prerequisites for a vibrant democracy.

What would e-government interoperability accomplish?

Better decisions. Better public services. Better governance.

Today, far too often, the data needed by policy makers to make better decisions is available but inaccessible. Policy makers are faced not only with overlapping and uncoordinated data sources, but also with the absence of common terms of reference and means of representing these data. This results in the time-consuming and complex cost of comparing data that is represented differently. Interoperability will allow data compiled by different agencies to be used together to make faster and better decisions.

An important goal of governance is to enable the citizenry to have easier and faster access to government information and services. The seamless flow of data from one government office to another provides the policy maker with the information needed to draft sound policy and deliver better services.

Providing one-stop comprehensive services to citizens and businesses requires interoperability since government services are diverse and are offered by different agencies. Furthermore, increasing the ease at which information is shared among individual agencies (up to the point allowed by law) makes for better and/or new services. For instance, health services can be delivered faster and become more convenient to citizens if public hospitals are interconnected with health insurance agencies. The administration of justice would be faster and more effective if the information

systems of various agencies under the criminal justice system (police, public prosecutors, public attorneys, courts, prisons) could share data.

Interoperability allows governments to manage their internal operations better. Governments can interchange or substitute one piece of software from one provider for another without having to buy more hardware and software and/or introduce new systems.

Finally, interoperability also promotes international cooperation. Interoperability among governments, also known as inter-government interoperability, can help create the infrastructures necessary to solve cross-border problems such as drug trafficking, environmental pollution, money laundering, and illegal arms trafficking. Interoperability among governments can also encourage delivery of e-government services to citizens and businesses across a region (as in the case of the European Union) and facilitate trade between a group of countries and their trading partners (as in the case of the Association of Southeast Asian Nations Single Window Initiative).

How is e-government interoperability realized?

e-Government interoperability can be achieved through the adoption of standards[1] and through architecture[2] – either enterprise-wide or service-oriented.

Standards: Government Interoperability Framework

A Government Interoperability Framework (GIF) is a set of standards and policies that a government uses to specify the preferred way that its agencies, citizens, and partners should interact with each other. The GIF includes the technical specifications that all agencies involved in e-government implementation should adopt. These standards address the following:

- Business process or organizational interoperability;
- Information or semantic interoperability; and
- Technical interoperability.

Architecture: Enterprise and Service-Oriented Architecture

An Enterprise Architecture (EA) is a strategic planning framework that relates and aligns ICT with the governmental functions that it supports. The Danish government has defined EA as a "common framework that ensures general coherence between public sector IT systems at the same time as the systems are optimized in terms of local needs."[3]

A Service-Oriented Architecture (SOA) is an "enterprise-wide IT architecture that promotes loose coupling, reuse, and interoperability between systems".[4] A service orientation defines the needs and outcomes of e-government in terms of services, independent from the technology (the hardware platform, operating system, and programming language) that implements them. What distinguishes SOA is its implementation of "a service platform consisting of many services that signify elements of business processes that can be combined and recombined into different solutions and scenarios, as determined by the business needs".[5] This capability to integrate and recombine services is what gives a service-oriented enterprise the agility needed to respond quickly and effectively to new situations and requirements.

GIF or Architecture

One way to consider the differences between a GIF and EA/SOA is to think of the GIF as a building code and the EA/SOA as a town plan. Like a building code, a GIF is a set of rules that specifies what standards are to be used (in the case of GIF, to achieve interoperability, while in the building code, to ensure safety). The EA/SOA as a town plan consists of provided common resources and defined rules for their use and reuse.

While some stress the distinction between GIF and EA, there are those who see the two as increasingly linked. Germany's Standards and Architecture of e-Government Applications (SAGA) version 2 is an example of a document that contains both the architecture and standards for interoperability.

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1 "A standard represents a codified representation of an agreement on how to perform a process or implement a technology." Jason Bloomberg and Ronald Schmelzer. Service Orient or Be Doomed. Hoboken, NJ: Wiley & Sons, 2006, p. 81.

2 IEEE defines architecture as "the fundamental organization of a system, embodied by its components and their relationships to each other and to the environment and by the principles guiding its design and activity," cited in Bloomberg and Schmelzer, Service Orient or Be Doomed. Hoboken, NJ: Wiley & Sons, 2006, p. 118.

3 (Denmark) Ministry of Science, Technology and Innovation, White Paper on Enterprise Architecture, p.16. http://www.oio.dk/files/whitepaper.pdf

4 Norbert Biebertein, Sanjay Bose, Marc Fiammente, Keith Jones, and Rawn Shah. Service Oriented Architecture Compass: Business Value, Planning, and Enterprise Roadmap. Upper Saddle, NJ: IBM Press, 2006, p. 4.

5 Ibid., p. 3.

What are open standards? What role do they play in e-government interoperability?

Open standards play a key role in achieving interoperability. Open standards enable products to work together. This gives governments choice among a diversity of applications from a wide range of suppliers/vendors and leads to innovative technological developments – the Internet is a great example as it is founded on open standards such as TCP/IP and HTTP. Open standards also ensure quality.

Open standards describe openness in both: (1) the standards-setting process; and (2) access to the specifications. Open standards are usually contrasted with proprietary standards or a specification that is owned and controlled by an individual or a corporation. While there is no universal agreement on the definition of open standards, the following have emerged and are the minimum characteristics for a standard to be open:

- Easy accessibility for all to read and use;
- Developed by a process that is open and relatively easy for anyone to participate in; and
- No control or tie-in by any specific group or vendor.[6]

Many believe that open standards should be at the core of e-government interoperability because they help define component interfaces, which leads to simpler, repeatable and quicker efforts of integration.

Open standards are also the backbone of a service-based approach to e-government interoperability. They ensure flexibility so that criteria and decisions are service-oriented and technology neutral. Open standards enable managers to combine, mix and match, and replace components without the expense and expertise of custom coding connections between service components.

Additionally, e-government programmes built around open standards will allow public agencies to keep up with technology innovations and benefit from technology cost reductions. Open standards also help governments avoid vendor lock-in and give governments more flexibility by widening technology choices. Open standards are beneficial for economic growth and for keeping local industry on par with global competition and apace with technology advances, often with few resources. Local companies benefit from lower costs and lessened risk, knowing that others can produce and implement follow-on products. By relying on open standards, entrepreneurs anywhere can focus a greater portion of their resources on innovation and on addressing the needs of the market, thus benefiting governments and their citizens.

What makes a well-designed GIF/EA?

For reasons given above, a well-designed GIF/EA would promote the use of open standards in government.

A successful GIF/EA promotes open standards that are forward-looking and supportive of the wider-encompassing (national) e-government strategy. This is because the wider strategy usually sets out the values and principles for e-government. Tying in the standards selection in the GIF with the more general policy directions of government itself ensures that the GIF is closely aligned with the overall strategy of government.

It is critical that the framework that supports the selection of standards is clearly articulated in the GIF/EA. This will help prevent ad hoc adoption of standards, particularly when new standards emerge and previous ones have not been retired. One way of achieving this is to publish the standard selection criteria, so all stakeholders can be aware of them and take them into account when developing new standards or specifications.

Clearly articulating the underlying framework that supports the standards selected also builds flexibility within the GIF. Flexibility is important partly because all standards eventually become obsolete. As it is inevitable that standards will transform, it is important to address how the framework can be designed to anticipate and accommodate change.

A successful GIF/EA must also respond to 'realities' that specific governments face. For instance, the use of mandatory or recommended standards (or both) in the GIF depends on the particular conditions – such as the level of development – of the countries implementing the GIF.

[6] Nah Soo Hoe. Free/Open Source Software: Open Standards. UNDP Asia-Pacific Development Information Programme e-Primers on Free/Open Source Software, p. 2. http://www.iosn.net/open-standards/foss-open-standards-primer/foss-openstds-withcover.pdf

Finally, a successful GIF would also have a clearly defined governance model, including proper practical control of project funding. GIF governance could focus on four things:

- **Specifying decision rights:** identifying the decisions that need to be made and who can make them;
- **Determining observance mechanisms:** understanding linkages to processes and policies, such as procurement policies, to ensure that agencies must adhere to these;
- **Managing the standards life-cycle:** retirement of standards that are no longer useful and/or have become obsolete, and incorporation of new ones; and
- **Measuring effectiveness:** defining metrics of success (such as 'reuse' of code and improved service delivery), and using metrics to evaluate progress.

Who should be involved in GIF/EA development?

The GIF and EA should ideally be developed in an open and inclusive manner. All stakeholders, in their appropriate roles, should be allowed to participate in the process.

The development of a GIF/EA should start with the appointment or creation of a lead agency that is in charge of harnessing the talents and ideas in and out of government to produce a technically competent and politically astute document.

Within government institutions, there are two important groups whose support is critical for the GIF success: (1) policy or decision makers; and (2) technical officials and staff. The former are needed to provide the necessary political clout to support both the formulation and implementation processes. The support of those who face the issue of interoperability on a day-to-day basis and who will eventually use the GIF (i.e. technical personnel) is also critical because they understand the problems from an operational perspective and know which solutions work on the ground. For both groups, it will be important to include both state and local officials who know well the conditions outside central government. This last point is particularly important if national e-government strategies are focused on service delivery to poor and under-served constituencies. In addition, industry and the public should be engaged during GIF development. Industry is included because they are at the cutting edge of technology and would have extensive experience in ensuring interoperability in corporation and private enterprises. They have an important role to play in suggesting, vetting and correcting the necessary elements of a GIF.

Likewise, the public, who are the ultimate users of potential GIF services, should be given an opportunity to comment on the draft under a clear and transparent process. While they may not be able to comment on the technical aspects, their views are certainly important in determining priorities. For marginal and under-served areas, engagement with local non-governmental organizations or civil society organizations might be crucial to reach out to such sectors and provide basic services.

What resources are needed to develop and implement a GIF/EA?

At the very least, a budget for the agency that will be mandated to lead in GIF/EA development is needed. A budget is also necessary for the GIF/EA governance body to effectively discharge its function.

Standard selection, setting and retirement require a critical number of technically skilled people in the government. EA and SOA require people with deep understanding of technical and business domains.

Educating and training government personnel will also be required to ensure that interoperability standards take their appropriate place at both strategic and practical levels. Finally, investment in building IT skills required for effective implementation of standards-based e-government services cannot be avoided.

What is the role of policy makers in ensuring e-government interoperability?

Achieving e-government interoperability is not easy and requires leadership and commitment.

Lack of interoperability is due to a number of factors. It may be due to policy reasons. Privacy, particularly as it relates to personal health information and national security, are good examples. Lack of interoperability also has to do with the heterogeneous nature of government information systems – the result of past decisions regarding hardware, software, and legacy systems. There is also the 'turf' issue – various agencies want their own systems and are worried about sharing data and/or common services. Lastly, the network effect of some companies that use proprietary standards have helped create some of the current problems. Many governments did not know they had a choice, nor were they aware of the long-term effects of their procurements.

Thus, to achieve interoperability, there needs to be a desire for transformation and the cooperation of the various agencies of government. Unless commitment to achieving interoperability is demonstrated at the highest levels, a plethora of policies, as well as bureaucratic and narrowly construed corporate interests can always be used to challenge efforts to make interoperability happen. Policy makers need to play various roles relative to the GIF and/or EA/SOA. In developing and implementing the GIF and EA/SOA, the policy maker must:

- Provide a specific vision that the government hopes to achieve with the use of technology. The technical aspect of GIF or EA formulation can be delegated to the technical personnel in government.
- Provide political sponsorship to the development and implementation process.

The absence of demonstrable commitment to interoperability by senior government officials would be counterproductive to the efforts of government in harnessing the power of ICT for good governance and national development.

What are the important lessons to remember about e-government interoperability?

No government will achieve interoperability in one big step. Securing interoperability is a process that includes many incremental activities over time. Hence, a significant infrastructure of people, technology and knowledge needs to be in place to create, use and revise an e-government interoperability document – be it a GIF or an EA.

The development of a GIF includes the setting-up of inter-agency organizations in order to establish its institutional base. It should involve all the concerned stakeholders in the process.

An open and inclusive process not only helps create a better document but also ensures support for the document among those who will eventually implement it.

e-Government interoperability cannot be realized by addressing technical issues only. Interoperability emerged as an issue as a result of the proliferation of independent e-government projects, which often have limited coherence and remain largely uncoordinated. To truly enable interoperability across government, one does not start with technology. One starts with the government's strategic framework, and the vision and goals of its leaders. This is even more the case in developing countries where governments have already committed to key development goals and are striving to reduce poverty and enhance good governance.

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This series on *e-Government Interoperability* comprises three publications – An Overview, A Guide and A Review of Government Interoperability Frameworks in Selected Countries. e-Government interoperability leads to better decision-making, better coordination of government agency programmes and services, cost savings and/or cost avoidance, and is the foundation of a citizen-centred, one-stop delivery of services. The series aims to assist countries who are striving to set up or improve interoperable ICT frameworks for better e-government delivery. The Overview provides a quick introduction on the what, who, why and how of e-government interoperability and is aimed at policy makers. The Guide is a practical tool for technical officials and policy makers who plan to draft or revise a Government Interoperability Framework (GIF). The Review provides a comparative analysis of eight existing GIFs and serves as a useful resource for those involved in the development or revision of a GIF.

Overview

The Overview introduces and guides policy makers to the what, who, why and how of e-government interoperability. Through a question-and-answer format, the publication walks its readers through the vision, rationale and value of GIF and a National Enterprise Architecture (NEA). It answers some fundamental questions such as what are the resources required, who should be involved and what are the key factors for its successful development and operationalization. It also looks at open standards and what they have to do with GIF. This Overview is particularly useful for senior officials in governments who are starting to implement their e-government strategies and for those who are planningto develop a GIF or NEA.

Guide

The Guide is a practical tool for technical officials and policy makers in governments who plan to draft or revise a GIF to ensure e-government interoperability among national government agencies. It is a comprehensive guide giving details on the approaches and principles of a GIF, and the standards categories and selection processes. It provides a step-by-step guide to developing and revising a GIF, illustrated with relevant case studies. This Guide also provides guidance on operationalizing the GIF, examining key issues related to implementation, compliance, enforcement and capacity development.

Review

The Review provides a comparative analysis of eight existing GIFs of Australia, Brazil, Denmark, the European Union, Germany, Malaysia, New Zealand and the United Kingdom. It serves as a useful resource for government officials, the corporate sector and civil society involved in the development or revision of a GIF. This Review focuses on how GIFs in different countries were developed, the principles that animate them, the technical standards they mandated and/or recommend, the way these GIFs are managed, and the implementation and compliance mechanisms they established.

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