e-Government architectures, technical and political situation in Latin America

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April 2007

The electronic version of this document can be found at: http://www.eclac.org/SocInfo

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e-Government architectures - Abstract

E-Government architectures started out as management instruments mainly focused on the technical (ICT) side of government. Today, they are developing into tools that map out the business side of government, and link this both to the governance and technology dimensions of government. There is a large consensus on the necessity of building «e-Government » on solid architectures, but no clear definition of what « e-Government architectures » are.

The terms architecture, interoperability framework, reference architecture are often confused and used interchangeably. A Framework is rather a list of applications and tools. It provides e-Government interoperability by creating a pool of common tools. Architectures take it one step further by organizing these applications and not only listing them. "*Interoperability means the ability of information and communication technology (ICT) systems and of the business processes they support to exchange data and to enable sharing of information and knowledge.*"[1] It allows different channels to rely on a common infrastructure to complement each other. It also allows service delivery applications to be independent from the front-end delivery channels.

The first part of this paper aims to discuss the various literature referring to e-Gov architectures. The second part looks at the institutional and technical environment by looking at some country case-studies around the world (UK, Germany, France, USA, Canada, Hong-Kong and Singapore). The third part looks at the technical and political situation of the Latin American environment by looking at a four country-case study (Brazil, Chile, Colombia, Mexico). Given the heterogeneous scenario on which countries in the region are currently developing their e-Gov architectures, the final part issues some recommendations by pointing out their main characteristics and thresholds to cross.

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[1]   European Interoperability Framework for Pan-European eGovernment Services, January 2004, Page 5.

I. Introduction

E-Government architectures started out as management instruments mainly focused on the technical (ICT) side of government.

Today, they are developing into tools that map out the business side of government, and link this both to the governance and technology dimensions of government. This requires the participation of programme, policy and budget, as well as IT offices in the design and implementation of service and business architectures.

An e-Government architecture must depict how departments with various IT and management elements work together as a whole: business process, data/information, applications, and technology infrastructure. The emergence of "e-Government" as a strategic challenge for governments in the second half of the 90's has generated a new wave of e-government policies, plans, programs and of « e-Government architectures".

E-Government architectures are believed to solve administration processes as they help modernize the State by fulfilling government services and help solve problems such as efficiency, accountability and Interoperability between agencies inside and outside the country. In order to meet these goals, some countries have defined working architectures becoming positive examples to other experiences. This is why it is important to analyze the current situation around the world regarding e-Government architectures in the light of the decisions taking place in the Latin American region.

Generally the e-Gov working architecture works under two environments that are necessarily interdependent of one another: the technical and the political. In this sense, these two lines of action will be used as the axis of the e-Gov architecture discussion.

The study contains five main parts. The Introduction (part 1), Literature review (part 2), Global analysis of the technical and political e-Gov architectures (part 3) Latin American analysis of the technical and political e-Gov architectures (part 4) and the general recommendations (part 5).

The literature review will help understand the global background of e-Gov Architecture s by discussing and summarizing previous literature regarding e-Gov architectures mostly

highlighting each paper's main relevance, focus and outputs. The chapter will look at the main technical definitions of e-Gov architectures.

Part 3 will focus on the various e-Gov technological strategies around the world by looking both at the technical and institutional environment. A pro-active approach has been proposed in order to understand and describe the country-cases chosen. It draws the lessons that countries have learned as they have pioneered e-Government initiatives: UK, Germany, France, USA, Canada, Hong-Kong.

Part 4 will aim to describe and analyze some Latin American experiences (Brazil, Chile, Colombia and Mexico) and their different approaches towards the technical and structural development of e-Government architectures following the same structural analysis as in part 3. Given the heterogeneous scenario around this issue in the region, comparisons and specificities from each experience will be considered in the analysis.

The final part will take into account chapters 2, 3 and 4 and will draw some recommendations in the form of conclusions.

II. Literature review

2.1. Introduction

This part of the study explores and analyzes a huge corpus of studies, reports, White Books and academic research.[2] There is a large consensus on the necessity of building «e-Government» on solid architectures, but no clear definition of what « e-Government architectures » are.

The terms architecture, interoperability framework, reference architecture are often confused and used interchangeably.

This part aims to present the state of the art and some debates relating to interoperability frames, e-Government architectures and technological issues that make e-Government possible.

It tries to clarify the « e-Government architecture » puzzle.

2.2. The growing importance of « e-Government architecture »

eGov importance in Academic research, institutional analysis and initiatives …

"e-Government expands beyond internal government operations to include electronic service delivery to the public and to the business. e-Government is not a simple on-line information provision: it is about interaction."[3]

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[2] #400 documents. The literature on e-Gov is very prolific. The selection of papers has been driven by the following criteria: 1- Relevance according to the "e-Gov Architecture" issue (and not e-Gov policy), 2- Citation analysis in literature, 3- Multiplicity of conceptual approaches of Architectures, 4- Intellectual diversity (Institutional Analysts, Academics, Consultants, Government experts …), 5- Avoidance of similar and redundant papers.

[3] The eGovernment Imperative, OECD, Page 17

FIGURE 1
STAGES OF ONLINE SERVICE DELIVERY AND CORE SERVICE DELIVERY OBJECTIVES[4]
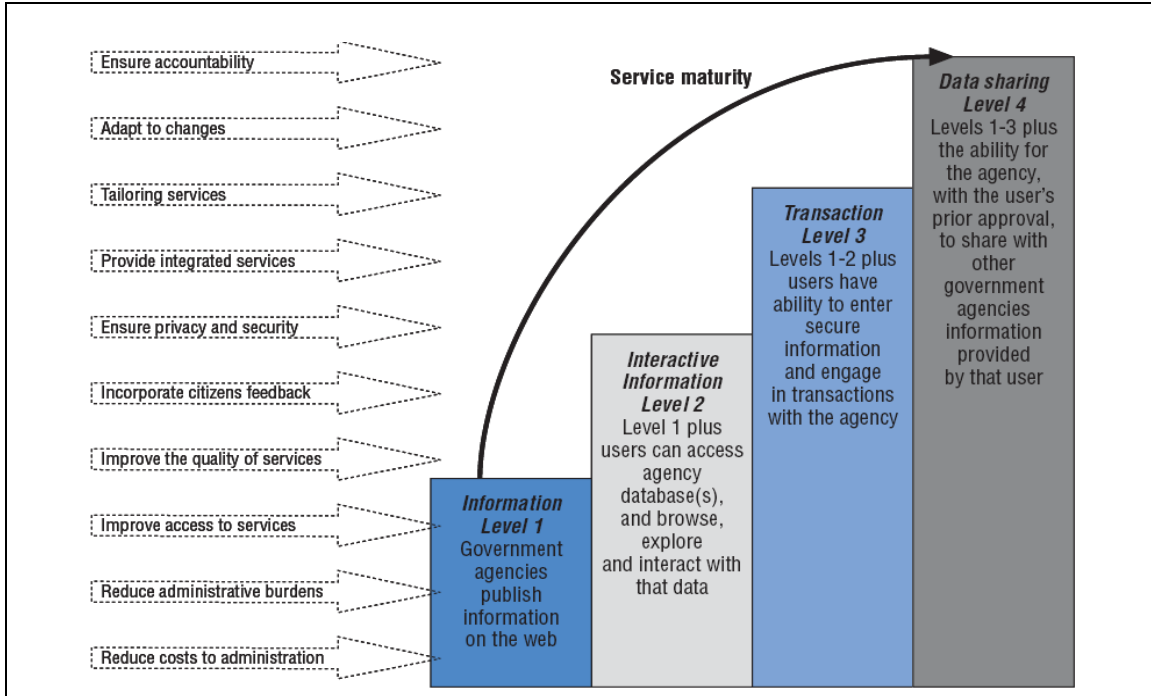
Source: Author's compilation.

Modernising government structures, governance frameworks and processes to meet the e-Government imperative requires an evolutionary and comprehensive architecture to avoid unnecessary duplication of infrastructure and major components and to integrate disparate processes, services and activities located outside administrations.

On its side, Deloitte & Research splits up e-Government modernization into six stages. "Think of e-Government as a continuum. At one end, governments first realize the Internet has uses outside of personal recreation. Much further along the continuum, governments have made the Internet the focal point of customer-centric enterprise transformation, arriving at the ability to provide "Everything: Anytime.Anywhere.Any way."

There are six dynamic stages (Figure 2) through which governments will pass as electronic service delivery evolves both inside the organisation and as it faces the public – and as governments face the daunting task of establishing an enduring synergy between the inward and outward-facing fronts. We describe these stages and later explore the key issues all governments will need to resolve to make the journey successful.

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[4] The eGovernment Imperative, OECD, 2003, www1.oecd.org/publications/e-book/4203071E.PDF, Page 74.

FIGURE 2
SIX STAGES OF EGOVERNMENT[5]
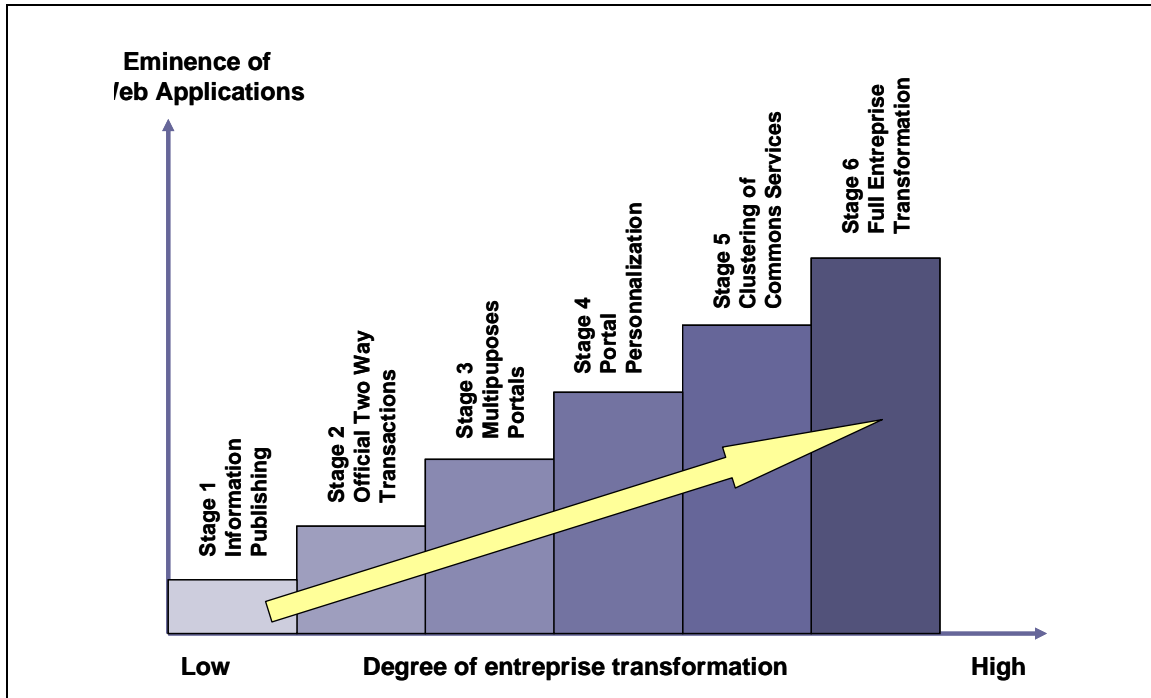
Source: Author's compilation.

The importance of defining an architecture grows at each step in the process of implementing e-Government.

It is necessary to draw a line between Architecture and Interoperability Framework. Words and concepts are difficult to deal with, especially in that case.

Architecture refers to concepts as Entreprise Architecture, Architecture Framework or Reference Architecture. The definition of an architecture used in ANSI/IEEE Std 1471-2000 is: "*the fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution*".

An e-Government architecture is supposed to depict how public entities with various IT and management elements work together as a whole: business process, data/information, applications, and technology infrastructure.

Interoperability Framework refers on its side to a set of standards (Open Standards, de facto standards or ad-hoc specifications) adopted by an organization and which are supposed to be implemented by application or systems in order to exchange formatted data.

Web services are seen as the next wave of web based integration technology. Service Oriented Architecture (SOA) based on open standards can be the basis for the enterprise architecture.

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[5] Six stages of e-government, Deloitte Research, 2000, http://www.egov.vic.gov.au/pdfs/e-government.pdf, page 22.

However, there is another kind of solutions that can be used to treat the decisional and collaborative aspects used for public and/or private sector. These solutions are the Enterprise Information Portals and the Enterprise Application Integration.

2.2.1. A Comparative Study of the e-Government Architectures, Ouchetto H et Al., 2005

Ecole Mohammadia d'Ingénieurs; ENSIAS 2004

International Conference on E-Business & E-learning (EBEL'05), Amman, Jordanie, 23-24 Mai 2005, Conference Paper[6]

Paper's relevance

It is one the few comparative studies dealing with e-Government architectures. The study is not exhaustive. The authors put on the same level generic architectures and specific projects. It compares architectures or approaches that are not necessary compatible at first view. For example, FEA is a complete architecture including policies and technological solutions, but the EOSG is only a technological conceptual approach.

Still, this is an interesting document in the sense that it is one of the very few papers seeking to compare different solutions. Even if the authors did not manage to classify these solutions before comparing them.

Main focus

This comparative study incorporates international best practices and to carry out architectural patterns bringing E- Government solution assistance for the E-Morocco.

The authors study and compare

- the European one-stop government (EOSG) architecture which was a R&D project funded by the European Commission,

- eSDF: Service Development Framework (UK),

- the Federal Enterprise Architecture (USA),

- the Enterprise Information Portals (EIP) which is a generic architecture,

- the Enterprise Application Integration (EAI) which is a generic architecture too.

The European one-stop government (EOSG)

"The main objective of the European egov project is to provide an open, extensible and scalable platform for realizing online one-stop government (Figure 3).

The e-Gov platform allows the public sector to provide citizens, businesses and other public authorities with information and public services that will be structured around life events and business situations, thus increasing public authority's effectiveness, efficiency and quality of service. The technical components of this architecture are: the portal, the national and local service repositories, the service creation environment, the Governmental Mark-up Language and the Governmental Mark-up Language Filters".[7]

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[6]   http://medforist.grenoble-em.com/Contenus/Conference%20Amman%20EBEL%2005/pdf/39.pdf
[7]   Page 2

eSDF: Service Development Framework (UK)

e-SDF is a framework from which an e-Government architecture can be based on. Contrary to the EOSG architecture which is citizen oriented, the eSDF is service oriented. It provides a structure for developing interoperability specifications and standards for e-Services to be used in the public sector.

The author does not explain why he considers that there is incompatibility between a Service Oriented and a Citizen Oriented Architecture.

The eSDF is comparatively low abstraction level compared to the EOSG architecture. However, it provides reusable components for planning, designing, and building major services. The XML and Web Services are mandated by e-GIF standards. They reduce the development and implementation costs and give ability to respond more quickly to changing business requirements. In addition, this framework is service oriented and we did not find where is located in this framework the user or the citizen.

The US Federal Enterprise Architecture (FEA) aims to facilitate the federal government's transformation towards being more citizen-centred and results oriented. It has therefore developed the FEA-PMO (Federal Enterprise Architecture Program Management Office).

The FEA is being constructed through five interrelated "reference models » (Figure 3):

- The BRM which describes the federal government's Lines of Business and its services to the citizen independent from the agencies, bureaus, and offices that perform them.

- The PRM is a framework that measures the performance of major IT initiatives and their contribution to program performance.

- The SRM provides a common framework and vocabulary that characterizes the IT and business components that collectively comprise an IT investment.

- The PRM agencies rapidly assemble IT solutions through the sharing and re-use of business and IT components.

- The Data Reference Model (DRM) promotes the common identification, use, and appropriate sharing of data/information across the federal government.

FIGURE 3
THE FEDERAL ENTERPRISE ARCHITECTURE
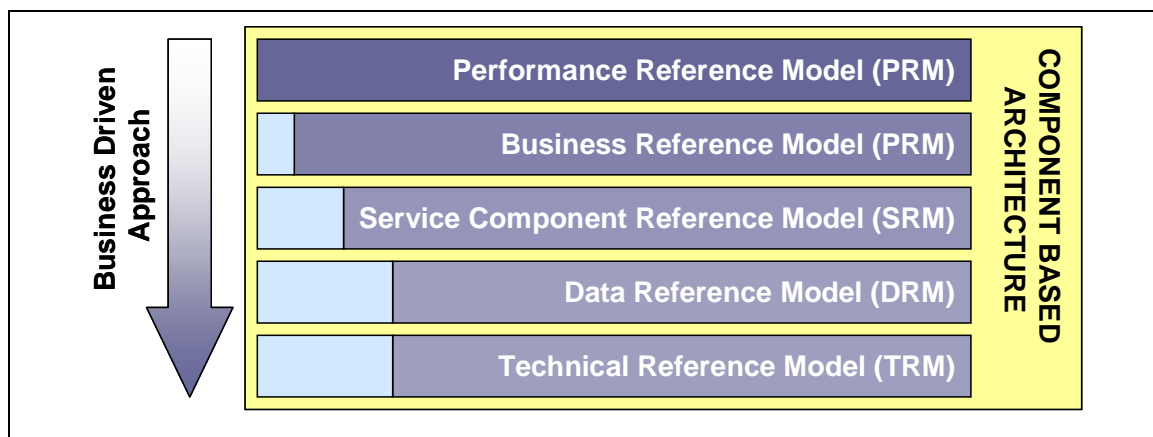
Source: Author's compilation.

Each of EOSG, eSDF and FEA can be implemented on a "*service oriented architecture*" or a "*provider oriented architecture*".

The Enterprise Information Portals (EIP) are applications that enable companies to unlock internally and externally stored information, and provide users a single gateway to personalized information needed to make informed business decisions. The principal goals of the EIP are:

- To provide a single and personalized interface to reach the whole information required by a customer, a partner, or an employee.

- To transform information into knowledge by giving it a context of use.

- To achieve this goal and to satisfy all the user's needs, an amalgam of the portal types was defined

  - Collaborative Portal or Collaborative Processing EIP,

  - Expertise Portal or decision processing EIP,

  - Knowledge Portal.

The Enterprise Application Integration (EAI) has as vocation to integrate and interconnect the various components of a data-processing infrastructure: data bases, platforms, and applications, whatever their level in the infrastructure.

By definition, the EAI is an integration process of independently developed applications, using incompatible technologies and having to continue to be managed separately. To answer such requirements, the platforms of EAI imbricate four technological layers: middleware, data, components, engine of integration.

Through this comparative study, the authors determine a number of significant criteria to deduce the relevance of each solution. These criteria are summarized below (Table 1).

TABLE 1
SUMMARIZED ANALYSIS SYNTHESIS

	EOSG	sSDF(UK)	FEA(USA)	EIP	eAL
Type	Architecture	Framework	Framework	Architecture	Architecture
Inter-authorities Integration	o	x	x		X
Legacy System	x	x	x		o
Evolutionarity	x	x	x	x	x
Access Type	Multiple Access Channels	o	Multiple Access Channels	Multiple Access Channels	
Back	x	x	x	x	x
Front Office	x		x	x	
Architecture Orientations	Citizen oriented	Service oriented	Citezen centred & result oriented	Citezen or users oriented	Integration oriented
Technologies & Standars	GovML GovML Filter	XML Web Services	XML Web Services	XML EAI	XML Web Services Middleware

Source: Author's compilation.
x: ensure o: we don't know Blanck: not treated

Main outputs

The authors suggest that these architectures have almost the same requirement tendency

- The citizen must be in the centre of the architecture.

- The multi-channel access is a necessity to be provided by the e-Government portals.

- The legacy systems integration is considered as the most important of e-Government architectures.

- Architectures are evolutionary.

They conclude that e-Government architectures must:

- be based on the XML which had become a standard, or eventually GovML.

- use the Web services as much as possible in order to facilitate its mutualisation.

- integrate and manage the legacy system

- be based on the components (framework) to facilitate its evolution and reuse.

2.2.2. e-Government for Better Government, OECD, 2005

OECD Publication[8]

Paper's relevance

OECD reports can be very influential. This report formulates a sort of "orthodoxy" of e-Government architecture. OECD has been very active, since many years, in promoting e-government. It published "The e-Government Imperative" in 2003. The "e-Government for Better Government" updates the findings of 2003 with a deeper interest for technology and some developments relating to architectures. Stressing the importance of User-focused e-Government and Multi-channel service delivery, the report mentions another task: identifying common business processes.

This report develops and concentrates "user-focused" approaches.

Main focus

Looking at the experience of OECD countries, the report identifies five areas that governments currently need to address for e-Government to help achieve better government:

- "User-focused e-government: making electronic services more responsive to the needs of citizens and businesses.

- Multi-channel service delivery: improving links between traditional and electronic services in order to promote service innovation and ensure access for all users.

- Approaches to common business processes: identifying common processes within government in order to achieve economies of scale, reduce duplication and provide seamless services.

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[8]   www.oecd.org

- The business case for e-government: measuring and demonstrating the costs and benefits of ICT investments in order to prioritise and better manage e-government projects.

- E-government co-ordination: bringing a whole-of-government perspective to e-government initiatives and their management, while taking into account existing structures and cultures of government institutions."[9]

User-Focused e-Government

The "User focused" concept is a critical point of the report.

"Delivery of user-focused e-government services largely involves government dealing with people in their capacity as customers or subjects. Often, the distinction between individuals and businesses is irrelevant for providing user-focused services. Whether acting as customers or subjects of government, both individuals and businesses will have the same broad interest in receiving services that are designed and delivered to best meet their needs."[10]

The report is not completely persuasive to describe the value added of the "User focused" approach including sentences like "A crucial part of providing user-focused e-government is to ask users what they want, need and value as a basis for designing both services and online delivery channels such as Web sites and portals".[11]

Multi-Channel Service Delivery

The report develops as well the concept of Networked Multi-Channel approach.

"Today, the e-government agenda is starting to emphasise the importance of service innovation, often to be achieved by moving to multi-channel service delivery. This agenda is reshaping service delivery models. Traditionally, service delivery, even for online services, has been based around individual agency functions, structures, information, systems and capabilities. New technologies and economic pressures are enabling(and sometimes forcing) private and government organisations to use the same infrastructures to deliver multiple services through multiple channels."[12]

Three generic models of how government agencies use delivery channels are presented:[13]

- Model one – vertical integration ("electronic silos")

- Model two – vertical integration with interoperable delivery platforms

- Model three – vertical integration with integrated service delivery platforms.

The authors develop the interest to adopt the last approach that can enable Networked Muti-Cannel services delivery.

"This (…) model is characterised by fully interoperable and integrated channels that enable service users to transfer between channels and experience seamless service. It is a user-focused model that works both within and across agencies. A "create once, use many times" principle of information and ICT management is incorporated into the service delivery frameworks of all government agencies. The model adopts a government service delivery

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[9] Page 12.

[10] Page 19.

[11] Page 27.

[12] Page 51.

[13] Pages 52 to 55.

architecture built on recognition that ICTs are the backbone of all service delivery channels, regardless of whether actual delivery takes place on- or off-line."[14]

"A Multi-channel service delivery contributes to the larger task of service innovation. This often require re-integrating the process of service design (i.e.policy) and service delivery (i.e. operations) that have been separated in the last decades .In a way, multi-channels services is a component of a transformation agenda".[15]

Entreprise Architecture

In addition of "User–oriented" approach and "Multi-channels services delivery", the OECD expresses that an e-Governement services need to be based on "Common business processes".

"An inventory of basic public-sector processes can help governments think about how administration might be better arranged (i.e. organised around an enterprise architecture). In this way, some common processes could be consolidated and provided by fewer organisations, thereby achieving economies of scale. Reference models for typical processes can also be used to facilitate the duplication and transfer of processes across government, thereby eliminating the need to "reinvent the wheel". The virtual integration of processes across organisations, based on common standards, can allow them to work together seamlessly. This type of approach can also be applied to services that are shared or that have common populations in order to provide more seamless service delivery."[16]

Main outputs

OECD stresses the importance of:

- *"user-focused" approach which is neutral regarding architecture)*
- *"multi-channel service delivery" which has a strong impact on architecture,*
- *On "common business processes" which implicitly suggests the choice of Enterprise Architecture approach as the US Federal Enterprise Architecture and the Danish e-Government architecture.*

Two remarks can to be expressed as conclusions:

- the Report does not analyze the Open Source issue. If some people consider that it can be a controversial issue, for others it is a key point of their strategy. That reality is absent on the report
- the same remark can be done regarding the Open Standards issue.

2.3. Interoperability frameworks

Government services are diverse and are offered by different government Bureaux and "*Interoperability means the ability of information and communication technology (ICT) systems to exchange data and to enable the sharing of information and knowledge...*" [IDABC-EIF].

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[14]   Page 54.
[15]   Page 169.
[16]   Page 13.

To provide one-stop comprehensive services, Government must enable the seamless flow of information, within legal bounds, across individual Bureaux and Departments, as necessary.

Interoperability Frameworks are designed to meet this objective.

It is therefore a collection of technical and data specifications that help B/Ds define the interface between interacting applications. Extensible Markup Language (XML) is a key component of the Interoperability Framework. Data specifications for interface between systems are defined in XML.

2.3.1. European Interoperability Framework for Pan-European e-Government Services, European Commission, 2004-2005

IDABC (Interoperable Delivery of European eGovernment Services to public Administrations, Business and Citizens) Programme[17]

European Commission Publication[18]

Paper's relevance

This paper defines the position of European Commission on Interoperability.

It's a major paper and its publication generated a lot of debate and controversies about the role of Open Source in standards and interoperability.

Main Focus

"In June 2002, European heads of state adopted the eEurope Action Plan 2005 at the Seville summit. It calls on the European Commission "to issue an agreed interoperability framework to support the delivery of pan-European e-Government services to citizens and enterprises". This framework would address information content and recommend technical policies and specifications to help connect public administration information systems across the EU. The Action Plan also stipulated that the Framework would "be based on open standards and encourage the use of open source software".[19]

The European Interoperability Framework (EIF) aims to support the delivery of electronic government services. "In particular, it will be the reference document on interoperability for the IDABC programme. The document represents the highest-ranking module of a comprehensive methodological tool kit for implementing pan-European e-Government services. It will be further developed parallel to the progress and the emerging requirements of pan-European infrastructures and services."

The objectives of the European Interoperability Framework are:

- To support the European Union's strategy of providing user-centred eServices by facilitating the interoperability of services and systems between public administrations, as well as between administrations and the public (citizens and enterprises), at a pan-European level.

- To supplement national interoperability frameworks in areas that cannot be adequately addressed by a purely national approach.

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[17] http://europa.eu.int/idabc/
[18] http://europa.eu.int/idabc/en/document/3761
[19] Page 5.

- To help achieve interoperability both within and across different policy areas, notably in the context of the IDABC programme and any other relevant Community programmes and initiatives."[20]

An **interoperability framework** can be defined as a set of standards and guidelines that describes the way in which organizations have agreed, or should agree, to interact with each other. An interoperability framework is, therefore, not a static document and may have to be adapted over time as technologies, standards and administrative requirements change.

The European Interoperability Framework defines a set of recommendations and guidelines for multilateral framework with a pan-European dimension.

The controversy on this document comes from the two following statements:

Use of open standards

- To attain interoperability in the context of pan-European eGovernment services, guidance needs to focus on open standards.

- The following are the minimal characteristics that a specification and its attendant documents must have in order to be considered an open standard:

- The standard is adopted and will be maintained by a not-for-profit organization, (…).

- The standard has been published and the standard specification document is available either freely or at a nominal charge. It must be permissible to all to copy, distribute and use it for no fee or at a nominal fee.

- **The intellectual property** - i.e. patents possibly present - of (parts of) the standard **is made irrevocably available on a royalty-free basis.**

- There are no constraints on the re-use of the standard.

Assess the benefits of Open Source Software

Open Source Software (OSS) tends to use and help define open standards and publicly available specifications. OSS products are, by their nature, publicly available specifications, and the availability of their source code promotes open, democratic debate around the specifications, making them both more robust and interoperable. As such, OSS corresponds to the objectives of this Framework and should be assessed and considered favorably alongside proprietary alternatives."[21]

Actually, the IDABC document formalizes officially a relationship between Open Standard and Open Source. This position is argued by a lot of Industry players which consider it is in opposition with the Technical neutrality.

After strong debates (including lobbying from Industry Associations), the European Commission has amended this latter but has kept these two assessment as they are previously reproduced according the final version.

Main Outputs

According to IDABC, three aspects of interoperability (Figure 4) need to be considered:

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[20] Page 5.
[21] Pages 9-10.

FIGURE 4
ELEMENTS OF INTEROPERABILITY ARCHITECTURE
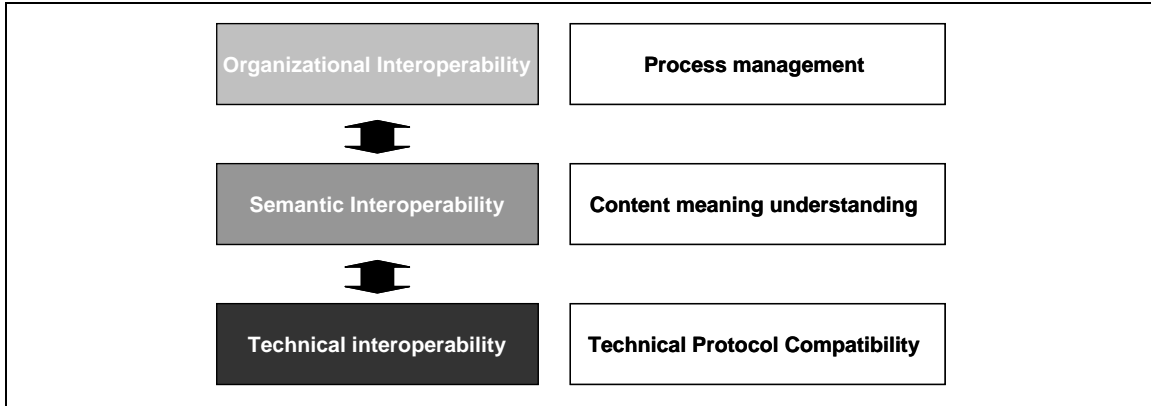
Source: Author's compilation.

In conclusion, the document stresses again the key role of Open Standards.

2.3.2. Government Interoperability: Enabling the Delivery of E-Services, Jerry Fishenden, Oliver Bell, Alan Grose, 2005

A Microsoft White Paper[22]

Paper's relevance

This paper illustrates Microsoft's vision of interoperability. It is interesting in the sense that proposes a review of different interoperability frameworks in the world. It describes the many issues involved in achieving successful interoperability programs-together with the tools, technologies and standards that help make this possible.

Main focus

"Government systems are generally purchased on a solution-by-solution basis, and driven by the need to acquire the best solution for a specific purpose. The result of this is the creation of a wide range of separate information and data islands across Government—with no easy way of unlocking the valuable information assets they collectively contain to support more useful and productive processes.

Interoperability programs can help resolve these problems. A well-structured approach to interoperability helps open up data and information silos and enable information to be exchanged more easily and usefully between systems. (…)

e-Government interoperability programs need to be based on a clear set of publicly accessible technical standards and policies that act as a foundation for the overall e-Government strategy. Such technical standards range from those defined by the numerous open standards bodies (like ISO, ECMA, ETSI, ITU and ANSI-accredited developers), to proprietary standards adopted by companies across the marketplace. For example, HTML and TCP/IP are widely recognized open standards, while Adobe's PDF format, the Microsoft® Office XML file formats

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[22] http://download.microsoft.com/download/2/e/5/2e594f44-e0d5-4d3197eacb1216101c4a/govtservices.doc

and the Java and Win32® APIs are widely accepted proprietary standards. Yet each of these standards provides proven interoperability between different systems and applications."[23]

Main outputs

This paper emphasizes the role of standards adopted by SDOs (Standards Development Organizations) and proprietary standards adopted by the marketplace and the commitment of Microsoft to be involved in their adoption.

2.4. Enterprise architecture

Enterprise Architecture is the practice of applying a comprehensive and rigorous method for describing a current or future structure for an organization's processes, information systems, personnel and organizational sub-units, so that they align with the organization's core goals and strategic direction. Although often associated strictly with information technology, it relates more broadly to the practice of business optimization in that it addresses business architecture, performance management and process architecture as well.

2.4.1. Gartner Enterprise Architecture: A Home for E-Government, G. Kreizman, C. Baum, E. Fraga, 2003

Internet White Paper[24]

Paper's relevance

Gartner updated the 2001 document in 2003 and incorporate e-Government architecture into the Gartner Enterprise Architecture Framework.

This paper is commonly used by many experts and governments. That explains why many figures are thereafter reproduced.

Main focus

Previously, it was used to describe the need to derive and maintain e-Government architecture from constituent needs. Architectural design principles are derived from these needs and, subsequently, from the architecture itself.

A formal governance structure supports the development of the architecture; this governance structure evaluates projects against the architecture, and, ultimately, the project's support for constituent needs. A concept called the "cycle of necessity" illustrates these linkages (Figure 5).

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[23] Page 4
[24] http://whitepapers.techrepublic.com.com/

FIGURE 5
CYCLE OF NECESSITY
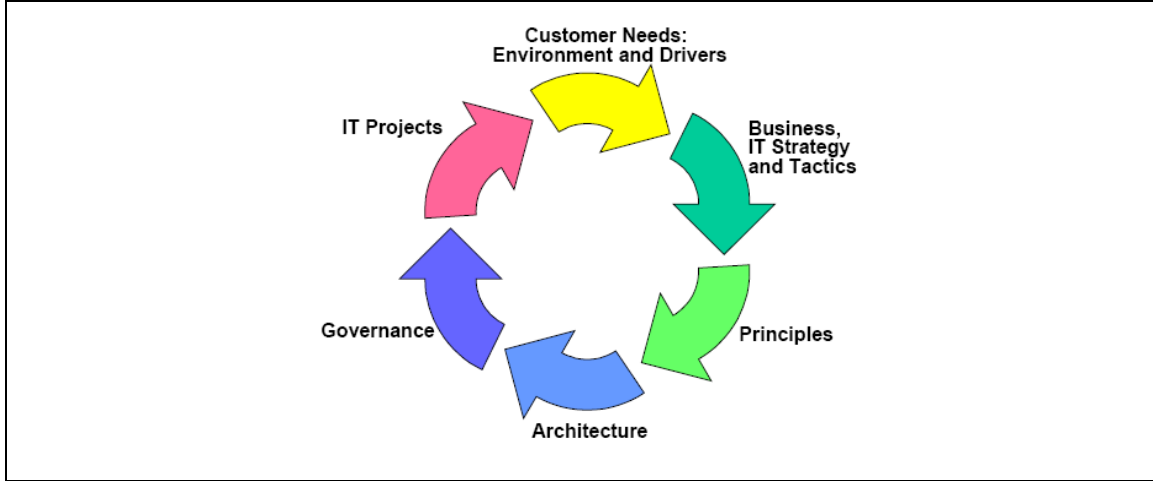
Source: Author's compilation.

"All of these concepts still hold true for government enterprise architectures. However, we add a broader base of initial factors for deriving architecture that includes not only constituent needs, but also environmental trends and business drivers. These factors change the ways that governments operate their lines of business."[25]

The authors proposed a high-level conceptual architecture (Figure 6) that featured a common set of interfaces to serve the constituent base. They noted changes in the ways that applications are developed and data is modeled to support common communities of interest. They recognized that the architecture must support new and legacy applications with an integration layer. They highlighted the need for shared services to support applications jurisdiction wide, and described a set of management layers.

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[25]   Page 1.

FIGURE 6
E-GOVERNMENT CONCEPTUAL ARCHITECTURE[26]
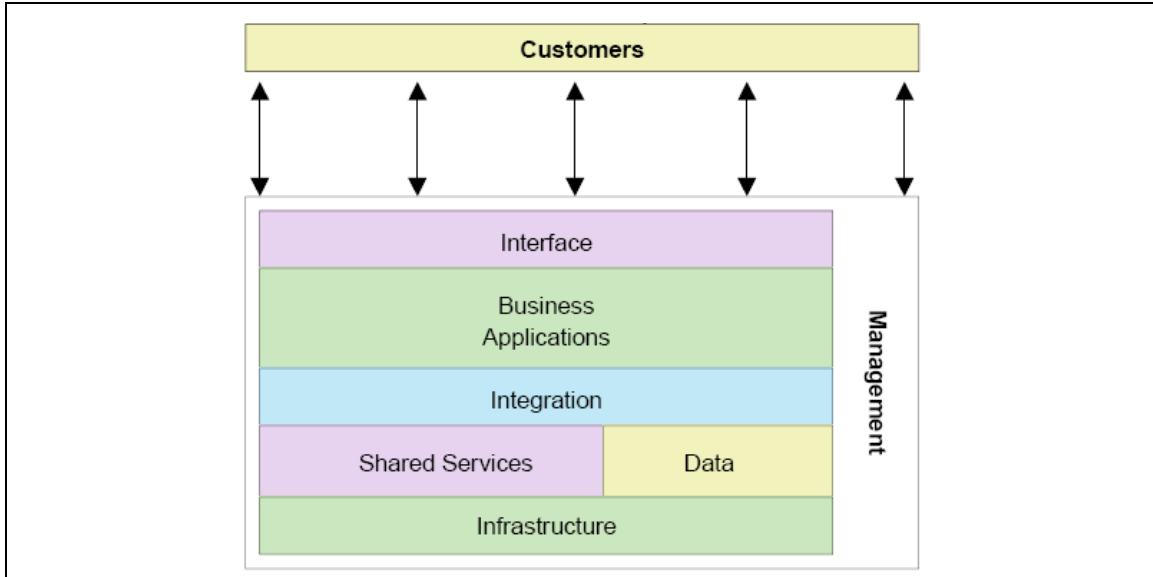
Source: Author's compilation.

"The e-Government service delivery architecture is predominantly a transaction-oriented style of architecture. Its focus is to deliver services consistently through a variety of channels. Real-time and analytical processing styles may be implied and appropriate to support e-Government service delivery; however, these styles are not emphasized."

The table below (Table 2) maps the other e-Government architecture domains and management support layers to the Gartner Enterprise Architecture Model.

TABLE 2
MAPPING E-GOVERNMENT ARCHITECTURE TO THE GARTNER EAI FRAMEWORK[27]

E-Government Architecture	Gartner Enterprice Architecture Framework for Government
Agency Business Applications and Community of Interest Applications	Application
Infraestructure (Networks and Platforms)	Data
Shared Services	Infraestructure
Middleware	Integration
Systems Management	System Management
Channels	Point of Access
Channel Interfaces	Point of Access
Costumer Relatonship Management	Point of Access

Source: Author's compilation.

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[26]   Page 3.
[27]   Page 6.

Gartner proposes a detailed view of e-Government architecture (Figure 7).

FIGURE 7
DETAILED VIEW OF E-GOVERNMENT CONCEPTUAL ARCHITECTURE[28]
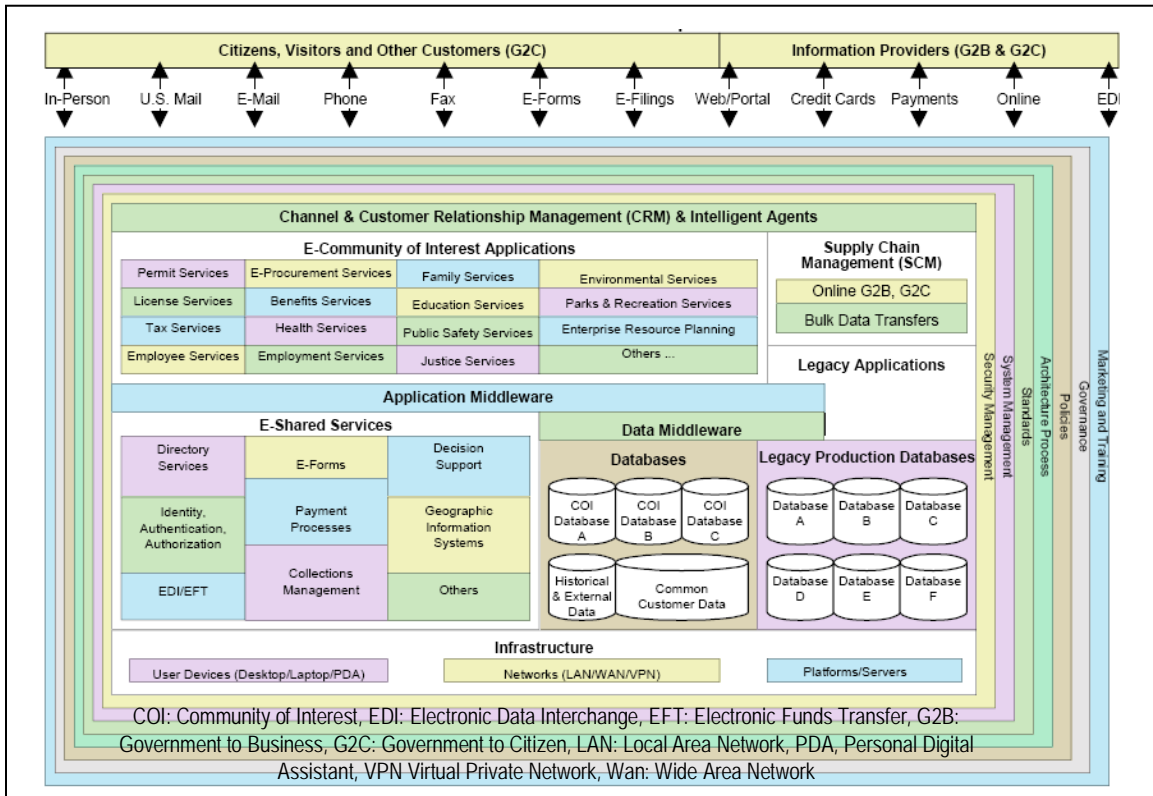
Source: Author's compilation.

At the end, Gartner proposes a 3-Dimension Business architecture including technical issues, domains and functional issues (Figure 8).

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[28] Page 4.

FIGURE 8
GARTNER BUSINESS & ARCHITECTURE MODEL[29]
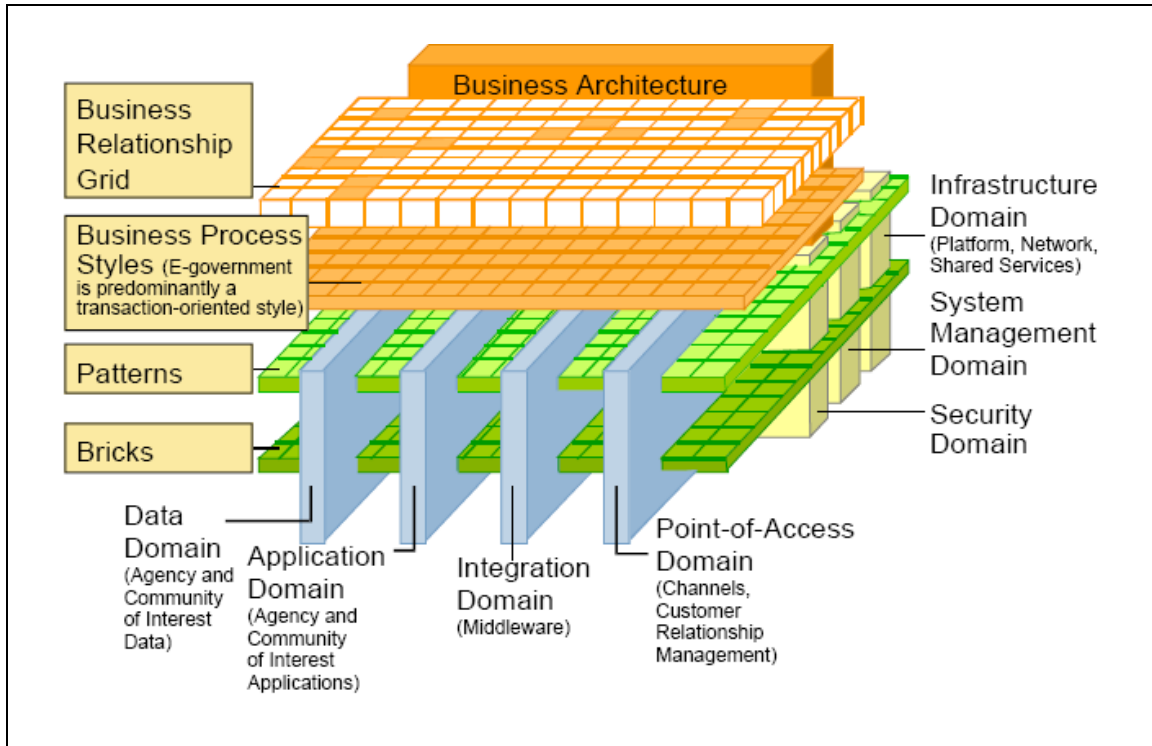
Source: Author's compilation.

Main outputs

This paper points out the necessity to develop a strong and very structured approach in e-Government architecture based on a EAI framework. It emphasizes the "Transaction-oriented" architectures. "*Its focus is to deliver services consistently through a variety of channels. Real-time and analytical processing styles may be implied and appropriate to support e-government service delivery; however, these styles are not emphasized.*"[30]

2.4.2. In Principle … Towards an Open Architecture for e-Government Identity Management, B. Katzy, Jeroen van den Hoven

Center for Technology and Innovation Management (CETIM),

Working Paper No. 2504[31]

Paper's relevance

This paper is centered on architecture of Open Identity that could protect privacy. But it is interesting even if it concentrates on this specific topic.

It is linked with the Liberty Alliance approach. It also features a historical review of Enterprise Architecture for e-Gov.

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[29] Page 5.
[30] Page 6.
[31] http://www.ejov.org/Projects/407/25_04.pdf

This paper fosters the idea of an open architecture for e-Government Identity Management as a general organizational and technical structure for administrations that reduces uncertainty. It also explores how governments can adopt the experience in the domain of Enterprise Architecture.

Main focus

"E-Government solutions face the challenge to integrate smoothly with existing systems. Such interoperability of multiple systems is the rationale to develop open architectures, for which they adopt the broadly accepted definition by IEEE: "Architecture is defined as the structure of components, their relationships, and the principles and guidelines governing their design and evolution over time." Enterprise Architecture is an established disciplined approach to understand how components of an enterprise information system communicate, change, and function together as a whole.[32]

Overall, these architectures have been largely accepted for industrial and trade organizations.

Recent years also show clear trends in the evolution of enterprise architectures:

1) The levels of integration

2) Enterprise Architectures are extended from technology to also accommodate organizational changes and even business aspects (…),

3) Enterprise Architectures increasingly take into consideration dynamic organizational environments and flexible business strategies, to govern the evolution over time."[33]

History of e-gov architectures

"Any initiative that aims at facilitating the evolution of a generally accepted architecture needs to provide an acceptable migration path for existing regional and national solutions. The challenge is to not just invent jet another architecture and add it to the growing collection of already existing proposals like the ones listed in table of e-Government Architectures and Frameworks but to extract commonalities and adequate structures as a basis for consensus".

The following chart (Table 3) lists the existing Interoperability frameworks including the date of last release according to the date of publication of this document.

TABLE 3
EXAMPLES OF E-GOVERNMENT ARCHITECTURES AND FRAMEWORKS[34]

Country	Name of framework	Version	Issuer
Australia	Interoperability Technical Framework (ITF)	June 2003	Australian Government Office, [10]
Canada	Federated Architecture	June 2000	Treasury Borrad of Canada, [11]
EU	IDA Architecture Guidelines	Version 6.1, June 2001	European Comisión [12]
EU	European eGovernment Services (EIF)	Version 4.2, June 2004	European Comisión [13]
Germany	SAGA	Version 2.0, Dec. 2003	Federal Ministry of the Interior, [14]
Switzerland	SAGA.ch	Version 1.0, Jan. 2004	eCH [15]
UK	e-GIF UK	Version 5.0, April 2003	Office of the e-Envoy
USA	FEAF	Version 1.1, 1999	Federal CIO Council

Source: Author's compilation.

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[32]   Page 5.
[33]   Page 6.
[34]   Page 6.

Recommendations

"The young history of e-Government architectures shows some similar experiences as the domain of Enterprise Architectures:

1) The level of integration increased with time from rather low integration in early architectures to higher levels in current versions. (…)

2) Earlier versions of e-Government architectures focused on technical issues only. Over time and after several failures of architecture efforts, the need for business-driven approaches was widely accepted, broadening the scope to organizational and policy issues. (…)

3) The dynamic element of system evolution in the IEEE definition is barely addressed in e-Government architectures so far. Early signs that this will become import can be seen in European vision-driven policy statements, that e-Government is about continued modernization of governments and administrations, which will certainly lead to the need to constantly evolve e-Government architectures. Authors see early signals that organizational processes and governance structures are being institutionalized to support such evolution.

Figure 9 below summarizes the four basic components of a e-Government architecture: principles, policies, organization and technology.[35]

FIGURE 9
BASIC COMPONENTS OF AN E-GOVERNMENT ARCHITECTURE
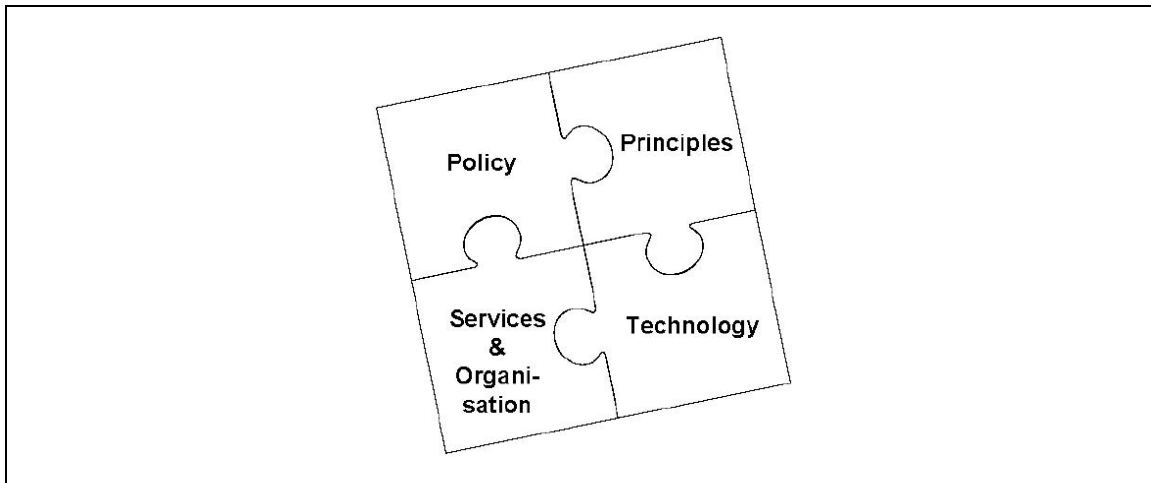
Source: Author's compilation.

Main outputs

The paper argues that simply replicating business solutions in the public realm would be inadequate and therefore propose other rules guided by principles that apply to governments, especially centered around their topic, citizen identity.

The adoption of an EAI approach seems to be the most appropriated framework for the governments to meet their objectives.

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[35]   Page 7

2.5. XML

The Extensible Markup Language (XML) is a W3C-recommended general-purpose markup language for creating special-purpose markup languages, capable of describing many different kinds of data. In other words: XML is a way of describing data and an XML file can contain the data too, as in a database. It is a simplified subset of Standard Generalized Markup Language (SGML). Its primary purpose is to facilitate the sharing of data across different systems, particularly systems connected via the Internet.

Within the public sector, "the Governmental Markup Language (GovML) will be specified as a recommendation for a new XML vocabulary that will define and support particular data structures, which are necessary to support the life-event approach towards the delivery of online public services. Moreover, GovML will support the interoperability and the data flow between the portal and the distributed services repositories. Hopefully, it will be a basis for the exchange of documents with a common format within the domain of public secto".[36]

2.5.1. Principles of E-Government Architecture, Sean McGrath and Fergal Murray, 2003

A Propylon White Paper[37]

Paper's relevance

This white paper discusses some of the principles that should be considered in any e-Government project, and identifies specific causes of failure which should be avoided.

Mac Grath and Murray suggest that XML representations of processes, services and documents become the cornerstone of e-Government integration strategy because XML is:

- Open: it is not owned by any organization

- Transparent: it can be read by any computer or person

- Responsive: new tags can be added as necessary to describe new types of data

This paper considers that the data is the only stable reference. As a consequence, any e-gov system should concentrate on data rather than on a specific set of solutions.

It is one of the major papers that advocates a clear point of view on architectures key issues.

Main focus

The key starting point of the analysis is the tension (conflict) between purchasers (government) and the vendors

"It has been argued that one of the causes of failure in e-Government initiatives is the conflict between purchasers and private sector vendors and service providers. While a public

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[36] An Integrated Platform for Realising Online One-Stop Government, European IST Project, E. Tambouris, E. Spanos, G. Kavadias (ARC), A. Gassner (SIE), A. Varkkola (TIE), O. Fox (IKV), M. Wimmer, J.Krenner (LIN), D. Papa, C. Minetou (DEM), J. Tsaliki (MOI), P. Eleftheriou, E. Maglara (AMA), O. Glassey, O. F. Glassey (IDH), M. Kallinger (BMO), B. Eichler (BRZ), 2001, http://www.egov-project.org/egovsite/tambouris_dexa2001.pdf

[37] http://www.propylon.com/

institution shares many concerns with a private sector buyer, they have other completely different priorities, needs and duties

It is no secret that technology vendors seek to build technologies that make it difficult for their customers to switch to another vendor. Indeed technology lock-in is one of the most powerful competitive weapons of technology vendors. It is impossible for purchasers to eliminate lock-in."[38]

The Author takes into account the innovation cycles of IT: « Only the Data Endures »: E-Government Infrastructure should be based on the data that it needs to store and process.

"The integration strategy should last for decades.

This can be difficult with IT where the life cycles of specific technologies are measured in years, not decades. Individual computers are obsolete in about 3 years. Back-end applications like databases have a lifespan of about 2-5 years before needing costly, complex upgrades. Programming languages and system architectures (dumb terminal, client/server, web browser) last about 10 years. Irrespective of lifespan, there is certain to be a broad variety of systems, languages and applications across agencies at any given point in time. This makes it impossible for any long-term integration infrastructure to be based on a specific application, language or system architecture.[39]

The key point is summarized in the following sentence: "The only way to build an integration infrastructure to last is to base it on the one thing least likely to become obsolete: the data."[40]

The consequence is clear for the authors: the architecture needs to be based on data which are the only stable element: "E-Government Infrastructure should be based on the data that it needs to store and process. Applications and specific technology implementations should be considered expendable, and should in no way determine the integration infrastructure."[41]

XML

The authors advance the idea that a strategy based on XML needs to be generalized in order to managed data in a efficient way.

"One rarely has choice in the way data is stored within individual applications but it is relatively immaterial to the overall e-Government framework. The key is to ensure that the data can flow between systems and agencies in a format that can be easily understood by all.

Luckily there is widespread global consensus on the best way to exchange information - a format known as XML (eXtensible Markup Language). XML is the obvious choice because unlike other formats, humans can read it, all computer systems can be modified to understand it and it can contain not only raw data, but information about what the data means through embedded data-description tags.

The challenge with XML is that different computer systems can use different tags to describe the same data. While there are many separate efforts to standardize data descriptions at industry, national and international levels, it is apparent that consensus will not be reached in the near future. However it is certain that translating the tags as messages pass from one system to another is a trivial task compared to translating the internal data formats used by different systems (…)

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[38] Page 1.
[39] Page 1-2.
[40] Page 2.
[41] Page 2.

XML representations of processes, services and documents become the cornerstone of e-government integration strategy because XML is:

Open: it is not owned by any organization

Transparent: it can be read by any computer or person

Responsive: new tags can be added as necessary to describe new types of data." 42

Free software

Following the same logic that consists in "Minimizing Technology Lock-in", the authors emphasize the key role of Open Source.

"Indeed technology lock-in is one of the most powerful competitive weapons of technology vendors. It is impossible for purchasers to eliminate lock-in. One strategy that is gaining increasing momentum in government is to turn to Open Source software to reduce or even eliminate license costs, but that does not reduce the integration complexity for large-scale projects. There will always be switching costs to move from one technology to another. However buyers should understand and minimize lock-in because it quickly reduces flexibility and dramatically increases costs in any technology investment."43

Main outputs

The paper tends to demonstrate a relationship between the strategic role of data and the use of XML.

The recommendation to use XML comes with a large caveat - one needs to make sure that XML is being used in an open manner. There are ways to use XML and other open standards while perpetuating technology lock-in.

2.6. Web services architectures

Web services, in general, are a distributed computing architecture and are considered to be one of the most significant advances in the area of computer architecture in the past 30 years. The purpose of any distributed computing architecture is to enable programs in one environment to communicate and share data/content with programs in another one.

"The term "service-oriented architecture" (SOA) is associated with a pioneering integration concept based on a coordinated set of international standards that already enjoys wide acceptance from most manufacturers.

The aim of this standard is to improve the interoperability of heterogeneous software systems whilst also significantly cutting the current high level of integration costs. SOA is based on established internet protocols and data models like http and XML supplemented by other standards."[44]

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[42]   Page 2.
[43]   Page 2-3.
[44]   Fokus White Paper - §2.7.3.

2.6.1. Introduction to Web services architecture, K. Gottschalk, S. Graham, H. Kreger, and J. Snell, 2002

Volume 41, Number 2, 2002

New Developments in Web Services and E-commerce

IBM Internet Paper[45]

Paper's relevance

This paper described the different components of WebServices Architecture. The description is illustrated by a concrete example which refers to a "*a real-world business scenario in order to illustrate how the Web services approach helps solve real business problems.*"[46]

Main focus

Web services, in general, are a distributed computing architecture and are considered to be one of the most significant advances in the area of computer architecture in the past 30 years.

Web services, however, feature a new way to perform program-to-program communications that allow applications to communicate with each other regardless of which application language is used, and regardless of what platform and operating environment is used.

Webservices

"A Web service is an interface that describes a collection of operations that are network-accessible through standardized XML messaging. It performs a specific task or a set of tasks. A Web service is described using a standard, formal XML notation, called its service description, that provides all of the details necessary to interact with the service, including message formats (that detail the operations), transport protocols, and location. Web service descriptions are expressed in WSDL.

This paper describes Web services in terms of a service-oriented architecture. It gives also an introduction to the Web services programming stack. This stack is a collection of standardized protocols and application programming interfaces (APIs) that lets individuals and applications locate and use Web services. After introducing the stack itself, they illustrate how each of its layers facilitates the use of Web services".[47]

Service description standards for Webservices

"*Standardization of service descriptions to support Web services is achieved via WSDL. This language defines the interface required for interaction between a requester and a service provider and also defines the location of the service provider. A service provider publishes a service by making its WSDL description document available to potential requesters. This can be done in a variety of ways, but one standardized way is for the service provider to register the service with a registry and for the service requester to discover the service by searching the registry.*"[48]

Web Services Programming components

The author proposes a interesting view of the different components of Web Services (Figure 10).

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[45] http://www.research.ibm.com/journal/sj/412/gottschalk.pdf
[46] Abstract, Page 1.
[47] Page 170.
[48] Page 174-175.

"Prominent at each layer in the Web services programming stack is the standardization of simple, open protocols and APIs. This standardization is the key to the ubiquitous deployment of Web services architectures, and the ubiquitous deployment of the infrastructure is the key to the network effect of Web services adoption.

The network is the foundation layer for the Web services programming stack. All Web services must be available over some network. The network is often based on an HTTP protocol, but other kinds of network protocols (…). On top of the networking layer is an XML-based messaging layer that facilitates communications between Web services and their clients. The messaging layer is based on SOAP. SOAP is an XML protocol that facilitates to publish, find, bind, and invoke operations described previously. WSDL is a specification that describes available Web services to clients. These descriptions take the form of XML documents for the programming interface and location of Web services.

Publication of a service is really any action by the service provider that makes the WSDL document available to a potential service requester. Sending the WSDL (or a URL pointer to the WSDL) as an e-mail to a developer is considered to be publishing. Publishing is also advertising the WSDL in a UDDI registry for many developers or executing services to find."[49]

FIGURE 10
WEB SERVICES PROGRAMMING STACK[50]
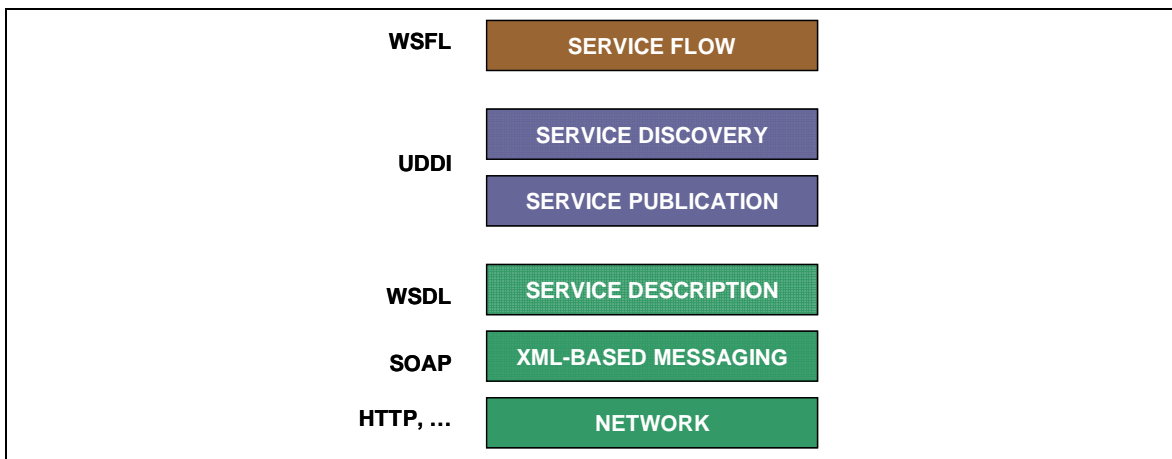
Source: Author's compilation.

Main outputs

This paper formalizes a clear view of WebServices including its different components and illustrated by an example.

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[49] Page 171
[50] Page 171. WSFL is a XML language proposed by IBM (challenged by BEPL). Others acronym are described in Glossary.

2.6.2. e-Government Enterprise Architecture, A Study of Web services and ebXML, Robert H. Smith, 2002

University of Maryland, College Park. December 2002

Study Report[51]

Papers' relevance

This paper is not only a new presentation of WebServices and ebXML architectures focused on e-Government issues. It presents a comparison – as it would be an alternative – of these two architectures in the perspective of building an e-Government Enterprise Architecture.

The analyze is apply to two cas study : United Kingdom and Australia.

Main focus

"The current climate for application integration offers two viable platforms that deserve close scrutiny: Web services and ebXML. There exist significant differences between the two frameworks; and there exist complementarities as well."[52]

Detailed view of WebServices and ebXML architectures

This study includes a "*review of current literature on the subject of enterprise architecture with a particular focus on Web services and ebXML. It also includes interviews with experts in the government and private sectors, and academic experts.*

The study investigates the potential enterprise architecture for government by examining the concepts behind Web services and ebXML, as well as the evolution and maturity of the two frameworks. The study also analyzed the benefits and limitations of each of the frameworks and profiled some of the early adopters. This report also includes a cost-benefit frame for achieving application integration and interoperability, case studies of current e-Gov initiatives in other countries and considers the challenges of interoperability across the federal, state and local spectrum of e-Gov activities."[53]

"A formal definition of Web services is as follows: Web services are a new class of cross-platform program-to-program communications that enable loosely coupled applications to easily find each other, to easily and dynamically establish parameters that enable similar or disparate programs to work together cooperatively, and enable them to communicate in an automated, unattended fashion over the Internet.

Web services, like any other program-to-program communication architecture, pass content between applications using a common format known as XML; Web services use a registry (UDDI), a template (WSDL), and a programmatic interface (SOAP) to enable applications to find and interact with each other; and they use a common network (the Internet) to transport information and data between cooperating applications (Figure 11)".[54]

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[51]   http://www.smart.gov/information/ebxml_final_report_02.doc
[52]   Page 3.
[53]   Page 1.
[54]   Pages 3-4.

FIGURE 11
WEBSERVICES COMPONENTS[55]
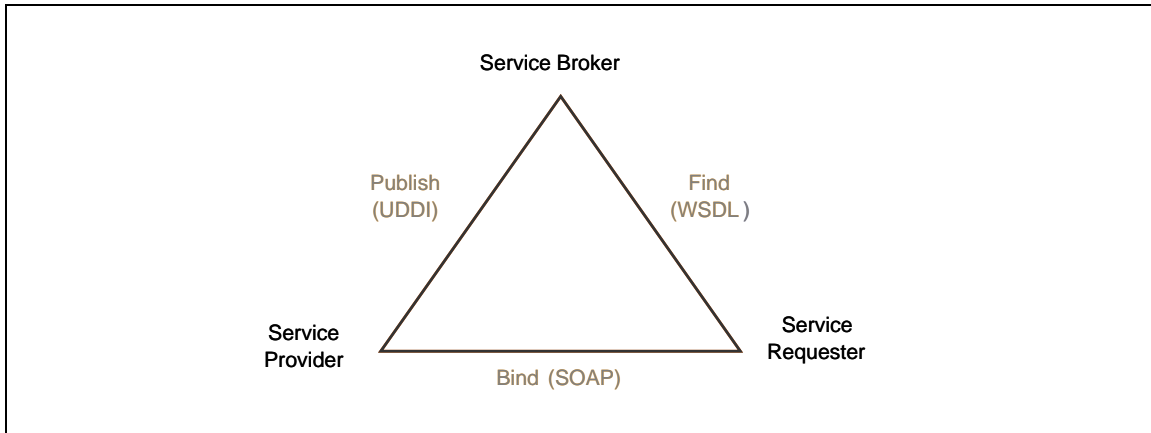
Source: Author's compilation.

ebXML is an XML-based open framework for e-business transactions. ebXML not only defines architecture, but also views business with a new idea. It is a set of specifications to reach specific business objectives and covers Business Processes, documentation of a company's capabilities and transfer of documents among new and existing trading partners.

"An analysis of the two architectures, ebXML and Web services, brings out essential similarities underlying the two frameworks. At this point in time, the two architectures are in a way competing with one another. The vendors led by Microsoft, IBM, Oracle, Intel, etc. are actively backing Web services while various industry associations (Covisint, Open Travel Alliance), especially those with EDI background, are active supporters of ebXML.

Web services have a ready to use product, though with basic integration functionalities. ebXML, by contrast, offers standards based on which these services/software can be provided by a software vendor (for e.g. ebXML Connector 1.0 - btrade, Inc.) Increasingly, companies are viewing with curiosity the development of these frameworks before making a decision on investment. There is immense potential for companies to start integration with services at the edge, such as the existing outsourced functions, before looking at adopting one of these frameworks for the organization's core activities."[56]

Main outputs

The author advices the government to design an Enterprise Architecture that combines Werservices and ebXML.

"Complementarity between ebXML and Web services: We see the two frameworks / standards as complementary and not in conflict with each other; they are parts of the complete solution. Despite the fact that at this point of time, there seems to be two different camps in Web services and ebXML, the strengths of the two frameworks are in different areas."[57]

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[55] Page 4.
[56] Page 17.
[57] Page 17.

2.6.3. Application Interoperability for e-Government, Efficient Integration of Legacy Applications based on SOA, Dr. O. Fox, U. Holzmann-Kaiser, P. Martin, Majid Salehi Dr. M. Tschichholz, 2006

Fraunhofer Institute for Open Communication Systems FOKUS, White Paper Version 2.0 Berlin, May 2006

Fokus White Paper[58]

Paper's relevance

"This White Paper on application interoperability for e-Government documents research results from the Fraunhofer FOKUS e-Government Laboratory."[59]

"The goal of the study was to provide a model investigation of the possibilities and limits of service-oriented architecture (SOA) concepts and Web services for the realization of cooperative e-Government solutions."[60]

The interest of this paper comes from the analysis of effective standards implementations (in Fraunhofer FOKUS e-Government Lab) like XML, and products based on them like the Microsoft and Oracle solutions.

Main focus

"*For this study model infrastructures for a range of public agencies were built in the FOKUS e-Government Lab to simulate the inter-working of heterogeneous e-Government platforms, basic components and a range of administrative applications. Interoperability of the technologies and products under review was tested in a series of model scenarios requiring communication between a set of disparate applications and a number of different public administrations.*

The research focused on two key aspects:

Identifying the possibilities and limits of existing e-Government platforms in terms of their capacity to integrate heterogeneous administration procedures, cross-department applications (like Document Management Systems) and basic e-Government services;

Identifying the possibilities and limits offered by Web service technologies for the integration of legacy applications in e-Government systems." [61]

The test is implemented for three applications:

- Residents Registry (Fachverfahren Einwohnerwesen – Meso)

- Civil Registry (Fachverfahren Personenstandswesen – AutiSta)

- Business Registry (Fachverfahren Gewerberegister – Migewa)

Fokus proposes a representation of e-Gov architecture to describe where standards and products apply (Figure 12).

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[58] http://www.egovgoodpractice.org/publication_details.php?PHPSESSID=7b8d6e997&pub licationid=46 c16123f560838b0f98...

[59] Page 8.

[60] Page 13.

[61] Page 8.

FIGURE 12
DIAGRAM OF E-GOVERNMENT REFERENCE ARCHITECTURE[62]
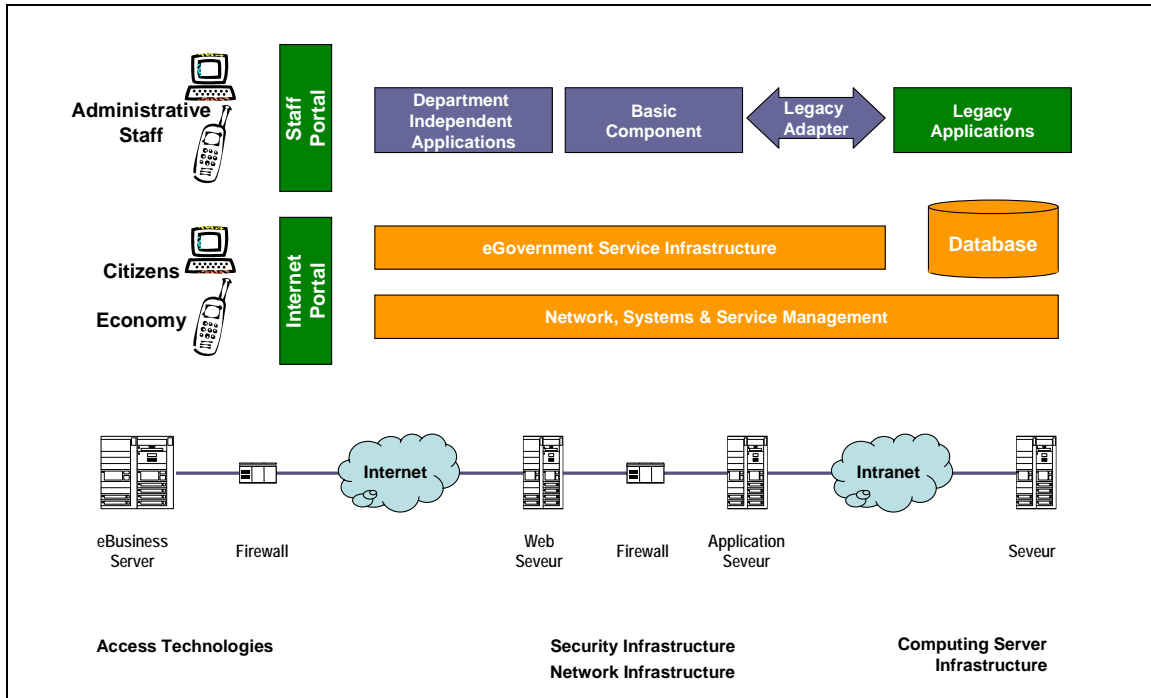
Source: Author's compilation.

According to Fokus, the result of test is very positive. It shows that "standardized Web service technologies and SOA concepts are well suited for the implementation of interoperable, cooperative e-Government and may be recommended." [63]

With the adoption of XML standard and the Web service concept by proprietary solutions (Microsoft and Oracle in this case), to the authors confirm that the problems of interoperability can be solved and that it is possible to implement efficient and cost-effective cooperative e-Government. [64]

Main outputs

"*The Laboratory trial runs draw the following conclusions:*

Web service adapters do enable the integration of legacy e-Government applications – even the older ones – in cooperative e-Government environments;

The components required for integration can be implemented relatively easily with a minimum amount of effort;

Cross-department applications or systems like Document Management Systems operating via Web services can be efficiently integrated with minimum effort." [65]

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[62]   Page 25.
[63]   Page 11.
[64]   Page 11.
[65]   Page 8.

2.6.4. Making Collaborative Government Work,[66]
Center for Digital Government, 2006

CDT Strategy Paper[67]

Paper's relevance

The paper examines how governments can better serve citizens through Service-Oriented Architecture (SOA). CDT is an influential US non profit think tank which "works to promote democratic values and constitutional liberties in the digital age".

Main focus

The paper defines SOA, Web Services and Extensible Markup Language (XML), and looks at the ways these tools can best be used in governments.

It proposes a Service Oriented Architecture layout including 5 layers that comes originally from Motorola (Figure 13).[68]

FIGURE 13
SERVICE ORIENTED ARCHITECTURE
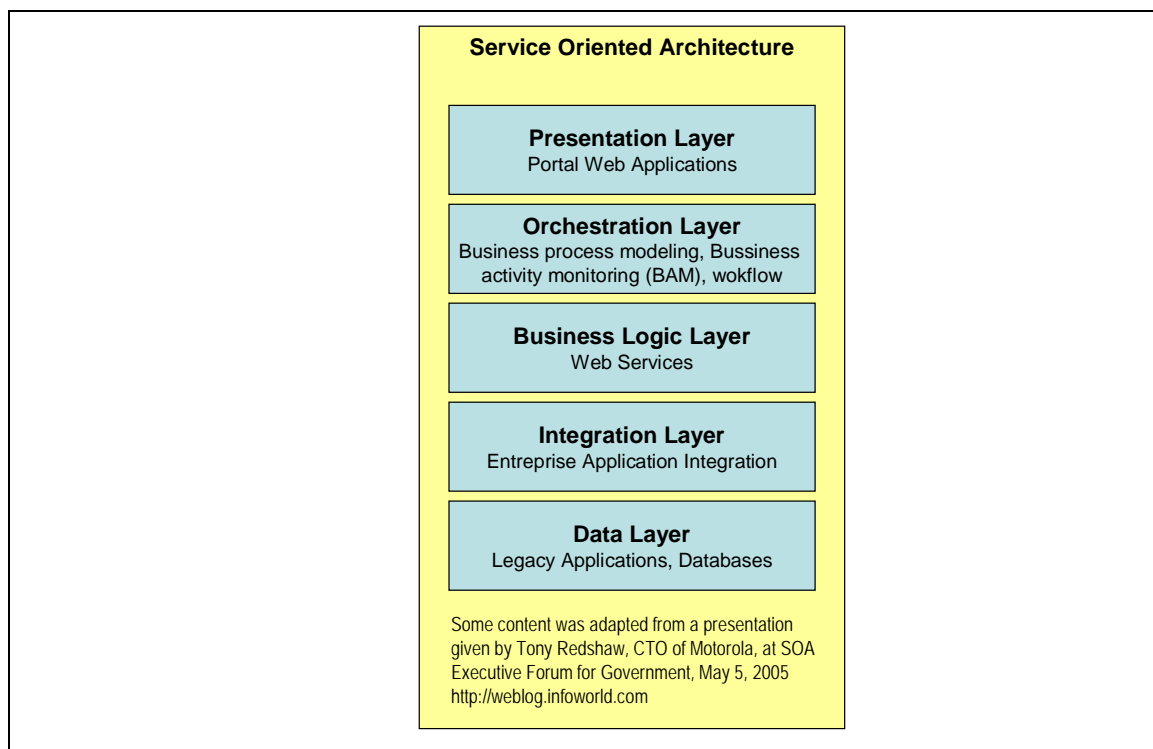
Source: Author's compilation.

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[66] http://media.centerdigitalgov.com/reg2view/Service_Oriented_Architecture.pdf

[67] http://www.centerdigitalgov.com/center/fileReg.php?file=Service_Oriented_Architecture.pdf&name=Service%20Oriented%20Architecture

[68] Page 5.

The paper overviews benefits of using SOA to help in data management, workflow management, service consolidation and numerous other areas of "doing the public's business." The paper also outlines action steps to get started and describes what a completed SOA project will look like.

The paper explains that governments can no longer justify unnecessary duplication of infrastructure and that SOA can provide governments and their leaders an opportunity to cultivate trust among citizens.

Main outputs

The paper develops a list of actions Steps for Moving Government towards SOA:

1. **"Service-Enable Data First:** *Look for the most heavily utilized databases with the most requested data elements and begin exposing this information first.*

2. **Utilize an Enterprise Service Bus:** *An ESB is software (a messaging engine) that makes services reusable and available to users, applications, business processes, and other services.*

3. **Identify Frequently Repeatable Processes:** *These will exist across agency boundaries and are candidates for re-use.*

4. **Establish Standards:** *Application developers need to understand, support and follow standards. Organizations need to provide developers with adequate training to successfully make the shift to utilizing Web services.*

5. **Just Start Experimenting:** *Develop SOA and Web services mindsets by experimenting with RSS (Really Simple Syndication) news feeds on agency Web sites. (…)*

6. **Create a Web Services Library:** *Develop a library of Web services that can be shared across states. Provide a broad range of data, from virtual travel services for state employees to citizen payment engines and citizen directories.*"[69]

2.7. Semantic architectures

2.7.1. Semantic Service Oriented Architectures for e-Government Platforms, Luis Alvarez Sabucedo, 2005

Dept. of Telematic – Universidade de Vigo Luis Anido Rifon Dept. of Telematic – Universidade de Vigo

Academic Paper[70]

Paper's relevance

They do an interesting link between SOA and semantic. This theoretical approach of semantic SOA seems to be unique in its approach.

There are some debates about the relevance of Semantic SOA approach.

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[69] Page 7.
[70] http://www.imu.iccs.gr/sweg/papers/Luis%20Alvarez%20Sabucedo.pdf

Main focus

This article proposes the use of a semantic platform to improve interoperability.

XML

"It seems to us that the battlefield for this problem is no longer the data level: we must aim it at the semantic level to address these problems with some guarantees of success." This article presents some relevant points about semantic applied to our field and how semantic plays a role in the definition of the architecture proposed. "By mean of semantic we can overcome the problem, or at least begin the process towards an interoperable platform where services can be used. The support for the semantic development in this case is mainly carried out by the use of ontologies".[71]

Ontologies are, as defined in the literature, "a formal and explicit way to define a conceptualization about a shared knowledge" (Gruber 1993). The idea behind the use of these technologies is to make computers capable of understanding data with little or no human intervention. Special attention must be paid to semantic applied to service descriptions. This is a major aspect of the problem in this environment as it will allow us to define, invoke and reuse services among different platforms by mean of semantic descriptions.

Service-oriented architecture

In order to design architectures, several approaches can be proposed. The authors decide to use a service oriented approach. They are going to refer to this approach, here after, as SSOA, Semantic Service Oriented Architecture.

Governance & coordination

The provision of e-Government solutions is, at the present moment, a high speed race that involves all countries in the so-called first world. This amount of projects fulfils solutions useful for the citizen but also brings some kind of shortcomings and drawbacks. One of the major problems is related to the interoperability among different solutions.[72]

Main outputs

The authors points out a lack of interoperability among applications even the same administration. They propose the use of a semantic platform to overcome these barriers in eGovernment applications.

2.8. Architectures and open source

2.8.1. Open Government Architecture: The evolution of De Jure Standards, Consortium Standards, and Open Source Software, F. Coallier, R Gérin-Lajoie, 2006

François Coallier, Department of Software and IT Engineering,

Robert Gérin-Lajoie, Executive Director, Center for Interuniversity Research and Analysis on Organizations (CIRANO)

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[71] Page 1.
[72] Page 3.

Study conducted for the Treasury Board of Canada Secretariat[73]

Paper's relevance

It is an interesting document because it is related to Open Government Architecture. This paper deals with interoperability, Open Standards and Free Software. These issues are not often documented in mainstream literature.

Main focus

The paper focuses service oriented open architecture.

It defines Open Architecture as being based on Open Standards. It defines interoperability, its importance and the various goals to achieve it.

It features several interoperability framework examples. For example the Massachusetts' framework that decided to evacuate the idea of commercial standards to promote open standards, and to mandate the use of ODF.

Following that document, "All prospective IT investments will comply with open standards" and "Existing IT systems will be reviewed for open standards compatibility and will be enhanced to achieve open standards compatibility where appropriate. Open standards solutions will be selected when existing systems are to be retired or need major enhancements."[74]

Conducted for the Treasury Board of Québec, this study seeks to present recent contributions to the evolution, within an enterprise architecture context, of de jure and de facto standards by various actors in the milieu, industrial consortia, and international standardization committees active in open source software.

The article refers to an Architecture Reference named "Enterprise Technology Reference Model".[75]

The authors recommend that the Government of Québec should:

- "*Pursue its endeavors to elaborate an interoperability framework for its computer systems that is based on open de jure and de facto standards. This framework should not only reflect the criteria enumerated in this study and apply to internal computer systems, but it should also extend to Web services supplied to organizations outside of the government. This framework should explicitly prioritize open source de jure and de facto standards and include a policy covering free software. The interoperability framework should initially draw on that of the state of Massachusetts. In the medium term, is should be as comprehensive as that of the British government.*

- *Integrate this interoperability framework into its enterprise architecture.*

- *Publish this interoperability framework with its enterprise architecture.*

- *Specify this interoperability framework in its calls for tenders.*

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[73] http://www.cirano.qc.ca/pdf/publication/2006RP-02.pdf

[74] Page 20.

[75] The State of Massachusetts has issued a set of recommendations regarding "Policies, Standards & Guidance". The most know of these is the "Entreprise Technology Reference Model". http://www.mass.gov/?pageID=itdtopic&L=2&L0=Home&L1=Policies%2c+Standards+%26+Guidance&sid=Aitd

- *Elaborate a policy of compliance with this framework for all new applications.*"[76]

Main outputs

This paper expresses a strong commitment to Open Standards and their impact on software.

"Open standards and de jure standards are at the core of governments' open architecture, since they allow users to choose between several competing platforms to accomplish a business function, while ensuring the longevity of the investments and selected solutions. Open standards are essential for protecting the economic interests and technologies of the users, public administrators, and the firms supplying IT services.

However, to fully benefit from open standards and interoperability frameworks, the governance of their selection and utilization must also involve integrating open source software. The synergy between open standards and open source software is, indeed, vibrant: Open standards require free software to ensure generalized dissemination, while free software that is based on open standards can be embedded in the architecture of large organizations. Consequently, the benefits arising from this synergy are reciprocal."[77]

2.8.2. Policies of United Nations System Organizations towards the use of open source software (oss) in the secretariats, LD Ouédraogo, 2005

United Nations Organization, Joint Inspection Unit

United Nations Report[78]

Paper's relevance

The Joint Inspection Unit (JIU) of United Nations review on OSS examined the extent to which the use of OSS for development could foster the achievement of some of the objectives set out in the Millennium Development Goals and the World Information Society Summit Plan of action.

It's the first time that UNO carries out a study on OSS.

Main focus

"The Plan of Action[79] approved by the 2003 World Summit on the Information Society (WSIS) called inter alia for promoting awareness of the possibilities offered by different software models including open source software (OSS)."[80]

The report issues recommendations. Among them, the Recommendation 2 expresses a strong commitment to Open Source regarding Interoperability issues:

"The Secretary-General, as Chairman of CEB, should take stock of the experiences of Member States and undertake the necessary consultations within CEB (United Nations System Chief Executives Board for Coordination) in order to establish a system-wide United Nations Interoperability Framework (UNIF) and report accordingly to the General Assembly at its sixty-

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[76]   Page 1.
[77]   Page 24.
[78]   http://www.unsystem.org/jiu/data/reports/2005/en2005_3.pdf
[79]   http://www.itu.int/wsis/docs/geneva/official/poa.html
[80]   Page 1 – Introduction.

first session. The proposed UNIF should take into account a number of elements including the following:

(a) UNIF should be based on open standards and open file formats to foster a unified approach to data encoding and sharing for the benefit of all stakeholders;

(b) Any new information system, software application and/or related upgrades or replacements should comply with UNIF except in such justifiable instances approved by the respective Chief Information Officer (CIO) or ICT manager of each organization;

(c) Customized or bespoke software should be owned by the organizations and be made available as appropriate to other system organizations and public administrations of Member States or licensed as OSS;

(d) Organizations should seek to avoid lock-in to proprietary ICT products or services and in that regard, they should level the playing field as a matter of policy by giving equal consideration to all appropriate solutions available on the market including OSS solutions, as long as such products and services comply with the requirements under UNIF."[81]

Main outputs

The report emphasizes the role of Open Standards and Open Source Software in ICT development in the world. It recommends also to undertake consultations in order to establish the UNIF (United Nations Interoperability Framework).

Based on a benchmark on more than 22 countries, this report is powerful and credible on its recommendations.

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[81]   Executive Summary – Page vii.

III. E-Gov Architecture – International Environment

The part focuses on the various on e-Gov technological strategies around the world:

It draws the lessons that countries have learned as they have pioneered e-Government initiatives: UK, Germany, France, USA, Hong-Kong

It looks in particular at how countries design e-Government architectures to organize the value of service delivery for both users (citizens and businesses) and for government.

3.1. e-Government architecture: an evolving approach in the last 20 years

3.1.1. Why historical perspective is important to understand e-GOV architecture

It is difficult to compare e-Gov architectures today because they were defined at different periods. Literature review show that many approaches are possible, and that similar concepts can be different in many cases.

One of the main reasons that explain the difficulty to deal with all these approach is the impact of evolving references during the last 20 years in IT Architectures. The first e-Gov architectures do not rely on the same principles as the most recent ones. It is needed to understand their evolution to be able to compare them.

At first, e-Government IT started out as a set of management instruments. And they were mainly focused on centralized applications dedicated to accounting and human resources.

But in the second half of the 90's, "e-Government" emerged as a strategic challenge for governments. It generated a new wave of "e-Government architectures" that were different from the first ones: user-focused, multi-channel, front office and back office applications.

Front office applications are mainly citizen-oriented and back office applications suppose exchanges with others IT environment. This requires the participation of programme, policy and

budget, as well as IT offices in the design and implementation of service and business architectures.

In the end, an e-Government architecture must depict how departments with various IT and management elements work together as a whole: business process, data/information, applications, and technology infrastructure.

3.1.2. General trend in architecture

The difficulties to manipulate the concepts that are used in architectures come from the fact that they can refer to different approaches. It is no longer a question of Technical Architecture but it reflects to cultural templates adopted by people in charge of architecture definitions.

Centralized Architectures

The centralized architecture which dominates 70's and 80's architecture refers directly to centralized systems like IBM (360 and 390 family). At that time, transactional applications were designed to be accessed by the passive terminals that were only used by employees.

The advantage of this architecture was:

- consistency of Databases,

- strong management of transactions including security, recovering …,

- consistency of architecture for all applications,

- easy exchanges between databases.

But on the other side, the centralized architecture was too heavy. Minor modifications were difficult to implement. In addition, IT Department was at the image of the architecture: centralized and heavy. This situation explains one of the main reason of the success of the PC when it appears.

Like other organizations, Administrations had implemented centralized applications and had to face to same critics regarding the applications and organizations.

Client-Server, 3/3 Architecture

The Client-Server Architecture in organization grew up with the concordance of two trends:

- the emergence of middle range server supporting Databases like Oracle, Informix … accessible from applications from the client side and the server side,

- the impact of decentralization in organization of companies. In this decentralized template, a Division or Department is responsible of its results and has to decide the resources it needs (investments, human resources…) to meet these results. On e of the major consequence was to decide of an own IT.

In the 90's, Departments or Divisions in all organizations invested in their own Client/Server systems and applications in order to answer to their own needs. The Host Server became progressively:

- the system which supported all legacy applications,

- a system available for all clients/servers applications to support common databases.

But organizations didn't avoid getting heterogeneous systems and applications. It is in that environment that emerged concepts of Middleware and Enterprise Architecture in order to structure interoperability and integration.

Web Services / XML

This new evolution was driven by the arrival of Internet and IP applications. This meant a common way to exchange data between every application, and not only between a selected set of interoperable applications sharing the same middleware.

This model is aiming at a real interoperability between architectures. Its goal is to provide integrated channels that enable to go from one service to another one, from one agency to another one.

Instead of only relying on architectures and interoperability of architectures, this model goes through the definition of common frameworks.

3.2. Technical Environment

3.2.1. A 4 layers model

Many models have been used in literature to describe e-Gov architecture. But they refer to concepts which are not clearly applicable to the approached adopted by countries.

That's the reason this document proposes a template with four layers. They have the advantage to correspond to:

- a technical domain clearly understandable independently of any conceptual approach,

- a environment that requires specific competences and which refers to cultural and historical trends independently of other layers.

The first layer is the network layer. It focuses on the technical constraints necessary to allow the other layers to communicate. In example, the network layer can rely on TCP/IP, UDP, DNS, etc.

The second layer is a middleware one. It focuses on the system architecture and the necessary components allowing the system to exchange together. Most of this layer relies on Java, .NET, etc.

These two layers are heavily connected with security issues.

The third layer is a data layer. The shift was to format the data layer in order to facilitate data exchange and communication among systems. When linked with web services, interoperable data formats allow systems to communicate and exchange together, even when they don't share their network or middleware layer.

The fourth layer is an application layer (Figure 14).

FIGURE 14
ARCHITECTURE GENERAL LAYOUT
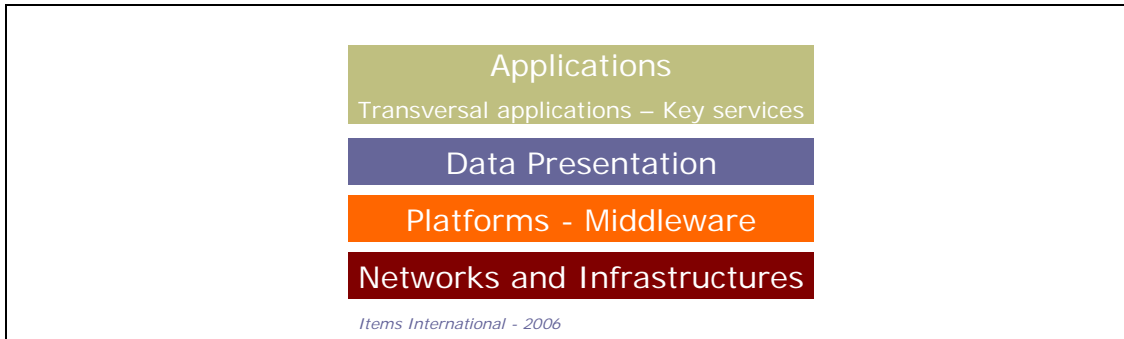
Source: Author's compilation.

One of the main objectives of defining e-Gov architecture is to permit to applications to "talk" each others. That the objective of Interoperability (Figure 15).

FIGURE 15
ARCHITECTURE LAYOUT – INTEROPERABILITY
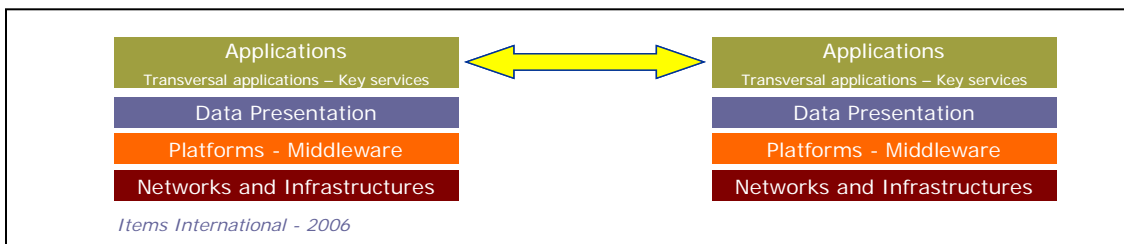
Source: Author's compilation.

To meet the objective, governments have decided to issue specifications to other layers. The questions are: 1-Which one? 2-How?

3.2.2. Case Analysis

Approach

For each country, a table will provide information on the characteristics of their e-Government project. The table below (Figure 16) presents a 4-layer model organizing these e-Government projects around 4 main areas: the applications layer, the data layer, the middleware layer and the infrastructure layer.

FIGURE 16
ARCHITECTURE LAYOUT – REPRESENTATION OF HOT ISSUES AND "CENTRE OF GRAVITY" OF ARCHITECTURE & INTEROPERABILITY ISSUES (CIRCLE IN RED)
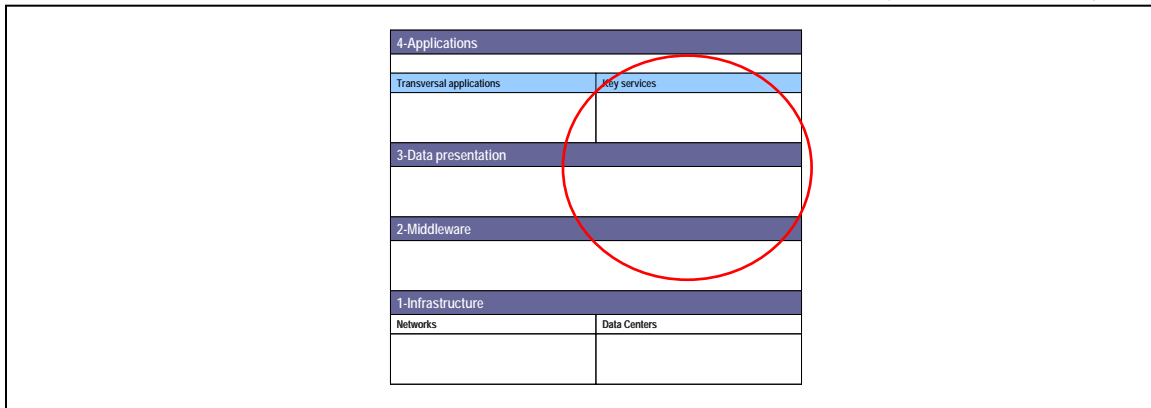
Source: Author's compilation.

Only Transversal project or key services which are developed by the e-Gov agency are addressed.

The e-Gov Agencies manage differently their priorities regarding the architectures & interoperability issues. These priorities are represented by the red circle.

UK

Interoperability framework

The first version of the e-Government Interoperability Framework (e-GIF) was published in October 2000.

e-GIF sets out the government's technical policies and standards for achieving interoperability and information systems integration across the public sector. In particular, it adopts XML (Extensible Markup Language) as the primary standard for data integration and presentation on all public sector systems. Defining the essential pre-requisite for joined-up and web enabled government, the e-GIF is a cornerstone in the overall e-Government strategy.

"Launched in March 2005 'Government Connect', a new service aimed at helping local authorities improve their efficiency and connect more effectively with their customers, with each other and with central government. Government Connect brings together a range of essential tools, from technical solutions to practical advice, which will enable local authorities to take advantage of their investment in electronic service delivery. Local councils across the country are invited to become members of Government Connect and to implement the system in a phased rollout. The ultimate aim is that all local authorities will use the system by the end of 2007, achieving efficiencies in service delivery and costs."[82]

XML

The UK Government adopted XML in 2004 (UKGOV XML).

Portals

"*Ukonline.gov.uk citizen portal, providing a "one-stop shop" to public services online. Information is presented on the basis of life-cycle events was launched in December*

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[82] Texts related to UK are extracted from http://ec.europa.eu/idabc/en/chapter/417

2000Direct.gov.uk is the UK Government's citizen portal provides, since March 2004, citizens with a single entry-point to online public services. Unlike its predecessor UK online, Direct.gov.uk is organized on the basis of major public services areas (e.g. health, education, employment, etc.) and of target customer groups (parents, disabled people, young people, etc.).

Since April 2004 the Directgov service is also available via digital TV, enabling the more than ten million UK households equipped with digital television to access public services information through their TV sets.

A separate e-Government portal for businesses, BusinessLink.gov.uk, was launched in November 2003, providing access to government information and services for businesses, business owners and managers."

Network: Government Secure Intranet (GSI)

"Initially launched in April 1998, the Government Secure Intranet (GSI) is the primary network infrastructure for connecting and joining up central government departments and agencies."

e-Identification infrastructure: Government Gateway

"*The Government Gateway, launched in February 2001, is a central registration and authentication engine enabling secure authenticated e-Government transactions to take place over the Internet. Users need to register with the Gateway in order to enroll for using online government services and subsequently transact securely with government departments. Built on open standards, the Gateway also enables the joined-up delivery of government services by allowing different systems in different departments to communicate with the Gateway and with each other.*"

e-Procurement infrastructure

"There is currently no central e-procurement infrastructure in the UK. However, the OGC operates (through its trading arm OGCbuying.solutions) Catalist, a catalogue-based electronic procurement scheme. Catalist provides public sector organizations with a simplified means of procuring and contracting for a wide range of products and services (information technology, telecoms services, professional services, facilities support), based on a series of Framework Agreements signed by OGCbuying.solutions with a number of suppliers. OGC and OGCbuying.solutions also have plans to set up an e-Procurement platform called Zanzibar. Zanzibar will consist in an e-procurement hub including 3 features: an electronic marketplace containing details of Public Sector supplier contracts, a Purchase to Pay solution, and a pan-Public Sector data warehouse. It will be available through a single point of access for buyers and suppliers."

Hot issues described for UK are summarized in Figure 17

FIGURE 17
UK E-GOV ARCHITECTURE HOT ISSUES

Applications	
Framework definitions and limited development of common services	
Transversal	**Key services**
Framework for: -eProcurement -OSS -Other under study (Customer Service Relation …)	-Government Portal (Direct.gov.uk) -Government gateway: Secure Transaction Hub (www.gateway.gov.uk) -Other understudy (National ID Management …)
DATA (Metadata, XML)	
"e-GIF Architecrture" includes: 1- the Framework, which covers high-level policy statements, technical policies and management, implementation and compliance regimes, 2-the e-GIF registry, which covers the e-Government Metadata Standard (e-GMS) and Government Category List (GCL), the Government Data Standards Catalogue (GDSC), XML schemas and the Technical Standards Catalogue (TSC) (previously e-GIF Part 2: Technical policies and specifications).	
Middleware	
N/A	
Infrastructure	
Networks	**Data Centers**
N/A Mobile e-Gov under study	N/A

Web Services
- SOAP V1.2

Source: Author's compilation.

Germany

The German e-Gov initiatives are very global. They concern every layer of the scheme.

Interoperability and architecture

"*At the data layer, Germany's Federal Ministry of the Interior has published on 19/09/2005 version 2.1 of its Standards and Architectures for E-Government Applications (SAGA), the German e-Government interoperability framework.*

SAGA examines common standards, procedures, methods and products of the modern information technology and gives clear recommendations for their use within the e-Government field. Interoperability, reusability, openness, scalability and security of e-government-applications are the key objectives of the SAGA standards, which are prepared by the Federal Government Co-ordination and Advisory Agency for IT in the Federal Administration (KBSt), an inter-ministerial agency located within the Federal Ministry of the Interior and aimed at ensure that the federal administration organizes its use of information technology.

SAGA 2.0 was published in December 2003. Standards that were suggested for inclusion since then were examined and taken over partially. In particular, a new section dedicated to Web forms was added to the document, incorporating the Xforms 1.0 standard. Other changes concern corrections, the adoption of previous proposals, and an updated description of basic infrastructure components.

The KBSt is already working on version 3.0 of the SAGA standards, which was expected to be released in the first half of 2006. Key work areas are: organizations and of process and data

models; more concrete architectural principles; and better consideration of the requirements of the states and municipalities." [83]

A SAGA online forum has been set up to enable all interested parties to participate in the technical discussion on the evolution of the SAGA standards.

Portal

"Bund.de is the German e-Government services portal, providing central access to the online services provided by the Federal Authorities and the Federal Administration, as well as an entry to German States and Municipalities. (…) Bund.de has recently been redesigned to better suit the needs of citizens and business users."

Network

"*The infrastructure supporting internal communications between the federal authorities is the Berlin-Bonn Information Network (IVBB), established in the 1990s when the German Parliament and the Federal Government moved from Bonn to Berlin. (…)*

It is currently being upgraded into an Information Network of the Federal Administration (IVBV), which will connect all the federal authorities across the country to a secure, closed network. The IVBV consists of three levels: IVBV services, IVBV network infrastructure (the Federal Administration Network – BVN) and IVBV intranet."

e-Identification infrastructure

"There is currently no central e-identification infrastructure in Germany. However, an electronic ID card project has been launched and pilots of electronic services cards were carried out in 2002."

e-Procurement infrastructure

"*Federal e-Procurement Platform (E-Vergabe), the Federal Government's e-procurement platform, launched in May 2002, allows authorities to publish and notify call for tenders electronically, and enables bidders to submit offers completely and bindingly over the Internet. This system is the result of the Public Procurement Online (Öffentlicher Eink@uf Online) Programme managed by the Office of Procurement of the Federal Ministry of the Interior, and which also comprises electronic catalogues enabling public bodies to procure goods and services electronically from a series of pre-concluded framework contracts and without the need for expensive calls for tender. In addition to the e-Vergabe platform, all public tenders are published online in the national gazette of public contracts (Bundesausschreibungsblatt).*"

Hot issues described for Germany are summarized in Figure 18.

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[83]   Information related to Germany are extracted from http://ec.europa.eu/idabc/en/chapter/396

FIGURE 18
GERMAN E-GOV ARCHITECTURE HOT ISSUES
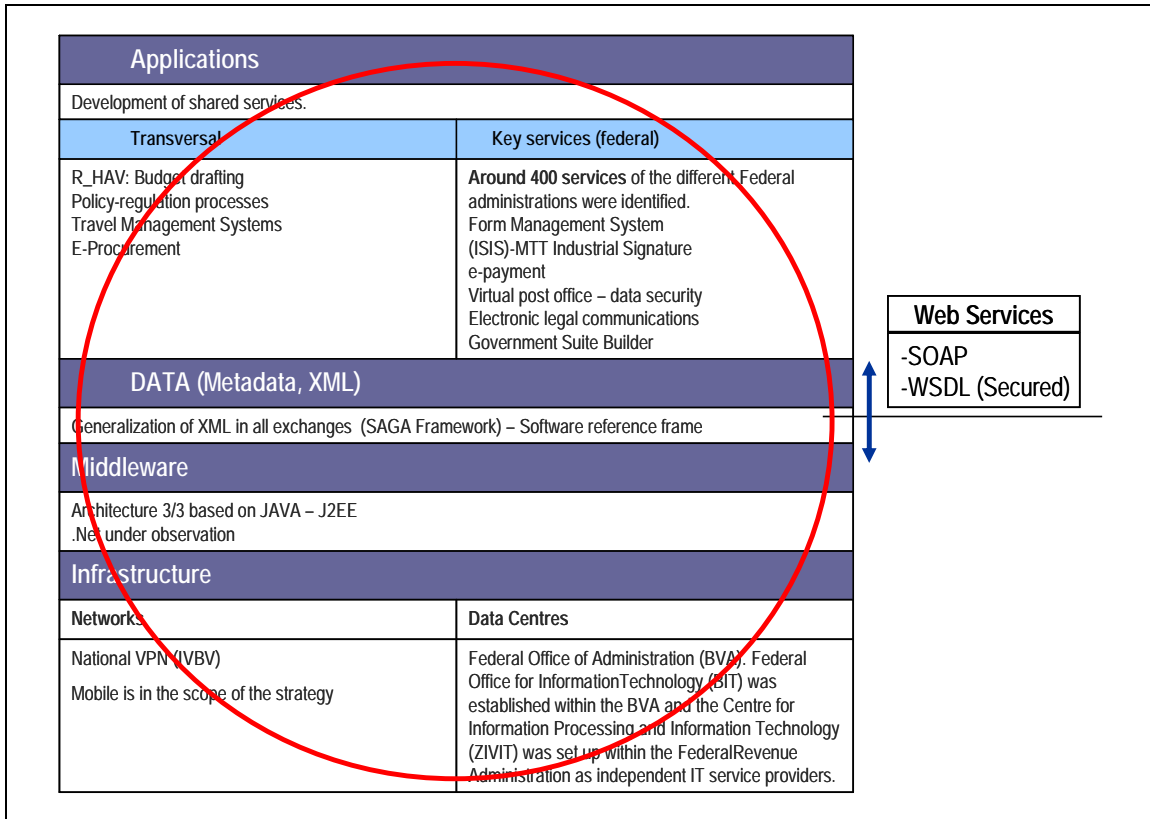
Source: Author's compilation.

France

Adele (Administration ELEctronique)

"*The ADELE programme (presented on 09 February 2004) provides a detailed roadmap for the coherent and coordinated development and implementation of electronic services that citizens, businesses and civil servants are entitled to expect. Covering the period 2004-2007, the programme comprises a strategic plan and an action plan.*

- *A single telephone number – "39 39" – for administrative enquirie (…)*

- *A organization administrative counter, called 'mon.service-public.fr" (…)*

- *The establishment of a national electronic identity card (CNIE) (…)*

- *The setting up of a organized online change of address notification service, enabling citizens to easily communicate their new addresses to the administrations of their choice.*

- The development of a "daily life card" ("Carte de Vie Quotidienne" or CVQ), delivered locally, which will make it possible to securely access public services from interactive kiosks in public places (in shops and public offices, or even in the street)." [84]

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[84]   Information related to France are extracted from http://ec.europa.eu/idabc/en/chapter/395

Interoperability Framework

The French strategy is completed by a Common Interoperability Framework ("Cadre Commun d'Interopérabilité"), transformed in 2005 into a General Interoperability Reference ("Référentiel General d'Interopérabilité"). It goes along with a General Security Reference and a General Accessibility Reference.

A RGI online wiki has been set up to enable all interested parties to participate in the technical discussion on the evolution of the RGI.

e-Procurement Platform

Until 2005, French administrations are formally obliged to accept bids submitted electronically. "All central government ministries – with the exception of the Ministry of Defence, which has its own platform – can meet the new requirement by using the new government-wide e-procurement platform Marches-Publics.gouv.fr. The platform allows public sector bodies to publish call for tenders online and receive electronic bids."

Network

"Launched in May 2000, AdER (Administration En Réseau) is an inter-ministerial Intranet launched in May 2000. (…)The four key components of AdER are: 1) the transport service SETI, a VPN based on infrastructure rented to a telecom operator; 2) the directory service MAIA; 3) the messaging interconnection service SIAM; 4) a number of applications and sites available over AdER. The AdER/SETI network is connected with the trans-European administrative network TESTA."

Hot issues described for France are summarized in Figure 19

FIGURE 19
FRANCE E-GOV ARCHITECTURE HOT ISSUES
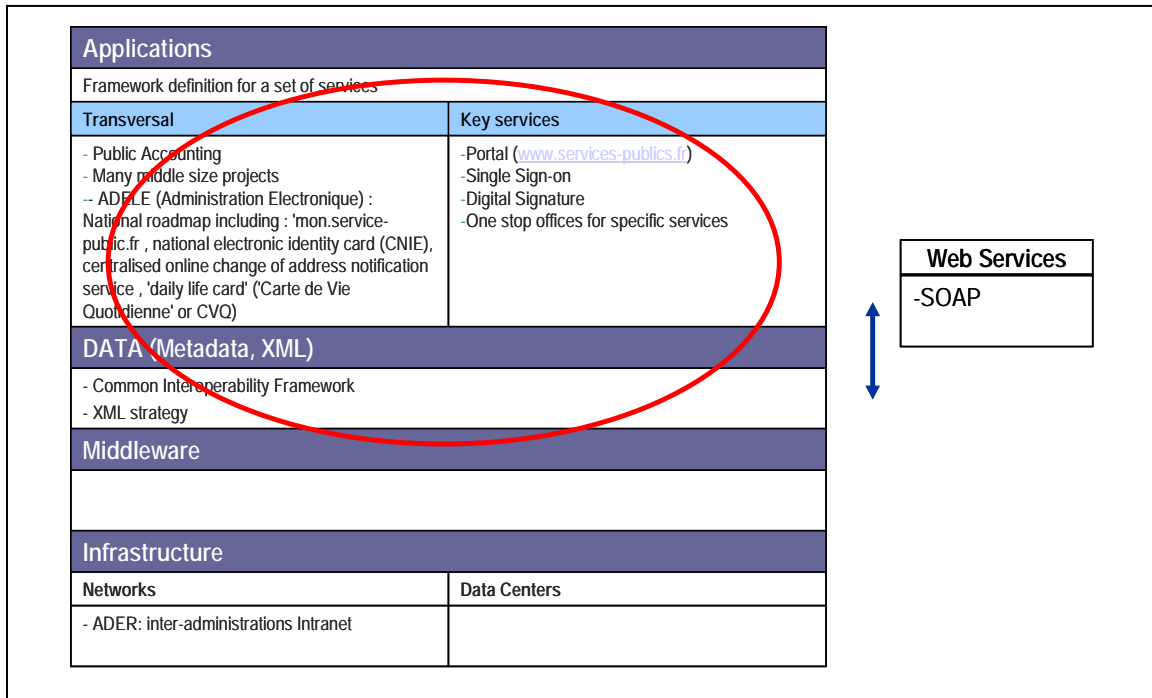
Source: Author's compilation.

USA

To transform the Federal government, the Office of Management and Budget (OMB) developed the Federal Enterprise Architecture (FEA), a business-based framework for government-wide improvement.

The Federal Enterprise Architecture (FEA) is constructed through a collection of interrelated interoperability frameworks called "reference models".

"They are designed to facilitate cross-agency analysis and the identification of duplicative investments, gaps, and opportunities for collaboration within and across Federal Agencies.

The Consolidated Reference Model (CRM) Version 2.0 contains the most current FEA reference model information. This version of the CRM will be used for the FY08 budget formulation process. It does not contain the most recent release of the Data Reference Model (Version 2.0)."

This document was released in June 2006.

"The CRM includes:

- *The Performance Reference Model (PRM) (…)*

- *The Business Reference Model (BRM) provides an organized, hierarchical construct for describing the day-to-day business operations of the Federal government.*

- *The Service Component Reference Model (SCRM) is intended for use to support the discovery of government-wide business and application Service (…)*

- *The Data Reference Model (DRM) describes, at an aggregate level, the data and information supporting government program and business line operations.*

- The Technical Reference Model (TRM) is a component-driven, technical framework used to categorize the standards, specifications, and technologies"

"FEA Reference Models (CRM Version 2.0): XML Document. This document contains the content of the FEA relating to the CRM Version 2.0. It includes the various layers of the FEA Reference Models with their detailed descriptions, as well as the codes for the BRM and SRM to be used in the FY08 budget formulation process. This document was released in June 2006."

The PRM, the BRM and the SCRM concentrates on specifications related to applications. The DRM and the TRM provides XML interoperability specifications so that various agencies can exchange and work together.

By concentrating on the specifications of the fourth and third layer, the goal of these initiatives is to go further than only providing online access to existing services. From the US point of view, the objective of e-Government should be mainly to eliminate redundant systems among agencies.

Hot issues described for USA are summarized in Figure 20.

FIGURE 20
USA E-GOV ARCHITECTURE HOT ISSUES
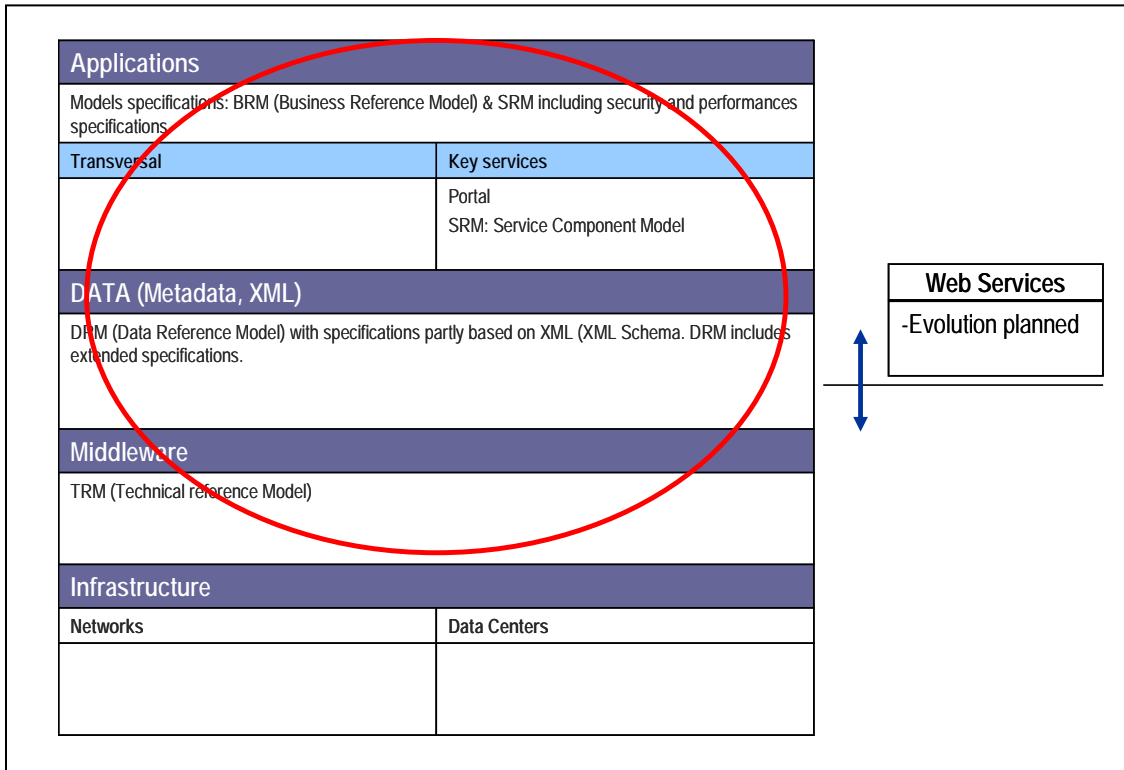
Source: Author's compilation.

Canada

The Government On-Line Action Plan

Government On-Line (GOL) was launched in 1999 and ended in 2006 after meeting its goals.

"The Strategic IM/IT Infrastructure initiative (SII) is the outcome of this process. The SII is based on input from technology, policy, and program specialists from 23 departments, the views of telecommunications suppliers and vendors, and the commitment of 16 deputy ministers. The SII sets out the underpinning of secure, citizen-centred electronic service delivery - technology components such as networks, telecommunications and systems, and information management components such as policies and information standards."[85]

"The SII has three objectives:

Develop a policy that provides a sustainable approach to managing the federal government's IM/IT infrastructure.

Adopt a framework that guides the government's investments in IM/IT infrastructure to support one-stop access with a common face to service delivery.

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[85] http://www.tbs-sct.gc.ca/fap-paf/index_e.asp. Information on this website is clear and exhaustive. Texts in this part of the document come from this website.

Create interoperability among government programs, both for information and transactions, to support citizen-centred service delivery.

Infrastructures are complex and contain many pieces, so a framework is essential to identify the critical elements - or domains - needed to meet the government's business vision. Stakeholders endorsed a federated architecture approach to infrastructure, which balances government-wide needs with those of individual departments and agencies."

The federated architecture

"*To achieve the required IM/IT infrastructure, the Government has adopted a federated architecture approach for the strategic IM/IT infrastructure. Under this architecture approach, infrastructure elements are planned, designed, co-ordinated and implemented into an integrated and cohesive infrastructure of common government-wide IM/IT capabilities. This flexible approach also allows for groups of departments and department-specific infrastructures to interconnect with the common infrastructure as appropriate.*

The Federated Architecture:

- *specifies standards for common and shared parts of the infrastructure*

- *facilitates inter-departmental information sharing*

- *optimizes total cost of ownership by levering common facilities*

- *enables access by all citizens, regardless of location.*"

Key government-wide components of the federated architecture

- Security (Public Key Infrastructure)

- Electronic directories

- Common look and feel

- E-mail and related attachments

- Co-ordinated channel management

- Network integration

Service Oriented architecture

"*The Government of Canada Service Oriented Architecture (GC SOA, Figure 21) is a comprehensive reference model that guides the use and adoption of Service Oriented Architectures (SOA) across the Government of Canada. By the end of 2005 there was already a significant groundswell of support for SOA throughout the private sector and in many government departments. This document encourages this adoption trend and provides guidance needed to foster consistency in the use of the GC SOA enhancing the benefits of SOA across the federal government landscape.*

FIGURE 21
THE GOVERNMENT OF CANADA SOA OVERVIEW
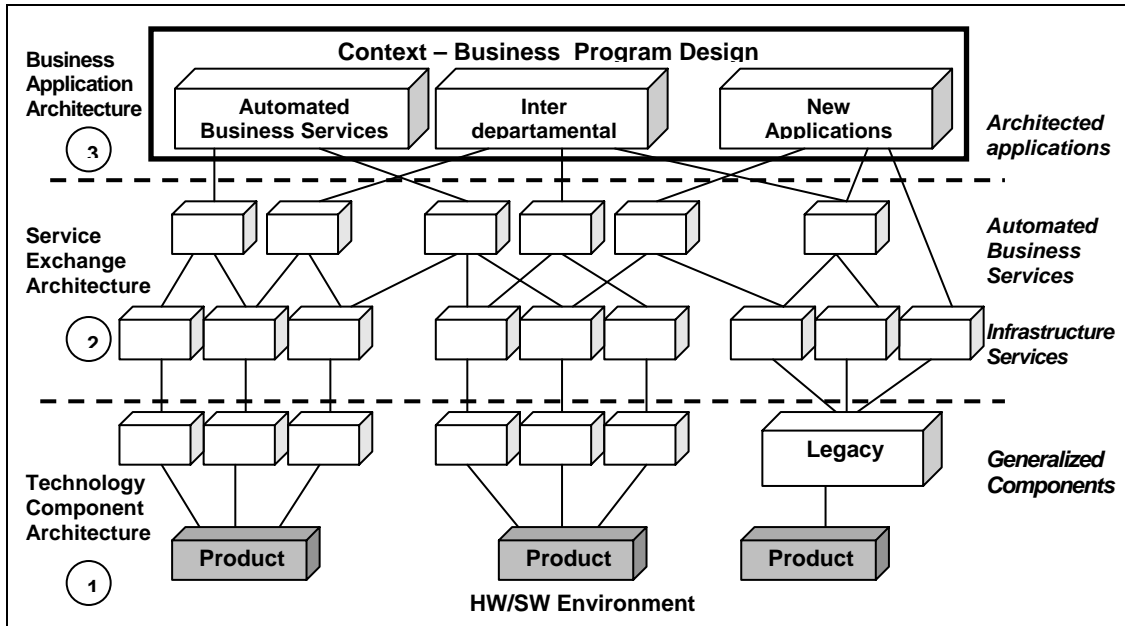
Source: Author's compilation.

- Layer 1 - Technology Component Architecture

The Technology Component Architecture (TCA) contains vendor specific products, services and their supporting architectures and identifies the lowest level components that can be re-used across the GC "out-of-the-box".

- Layer 2 - Service Exchange Architecture

The middle layer supports the one-to-one mapping of a component offering to infrastructure services (i-services) and also the construction ofservices composed of other services (composite services).

- Layer 3 - Business Application Architecture

The top layer allows business owners to package a tailored selection of GC (and non-GC) services to be used in alignment and support of specific business requirements."

The approach taken to the development of the Federated Architecture for the Government of Canada is to divide the work into technology domains and sub-domains. This provides manageable pieces of the federated architecture, which will be developed by working groups of departmental experts in each technology domain.

The technology domains for the Government of Canada's Federated Architecture are depicted in the Federated Architecture Domain diagram below (Figure 22).

FIGURE 22
TECHNOLOGY DOMAINS FOR THE GOVERNMENT OF CANADA'S FEDERATED ARCHITECTURE
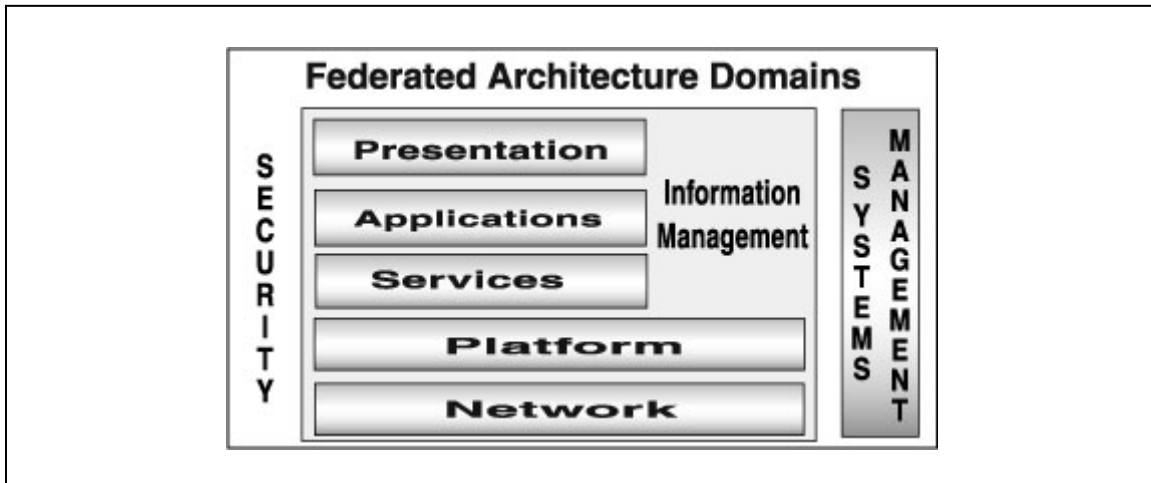
Source: Author's compilation.

IT solutions must use commercially viable standards-based technologies. The customization of purchased software must be avoided wherever possible. Priority will be given to products adhering to industry standards and open architecture. Where multiple standards apply, the following order of precedence shall prevail:

- Government of Canada approved and interim standards, and technical reports (e.g. CSE Common Criteria);

- National Standards of Canada and CSA standards;

- International (i.e. ISO) Standards and ITU recommendations;

- Other publicly-developed standards including IETF and industry consortia specifications; and

- De facto standards.

XML and Metadata

Management of information has a critical position in Architecture to ensure interoperability.

The IMRC[86] (Information Management Resource Centre) is in charge of maintaining the "Framework for the Management of Information" (FMI) in the Government of Canada.

That includes in particular Metadata and XML.

Gateways and Clusters

Gateways and clusters are a key point of the architecture related to a "citizen-focused engagement".

"The Canada Site, Gateways and Clusters are the most visible cornerstones of Government On- Line. As the Government of Canada's primary Web portal, the Canada Site undergoes continual improvement to advance the government's top priorities, which include

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[86] http://www.tbs-sct.gc.ca/im-gi/index_e.asp

better service to citizens, increased federal presence and visibility, and a tangible commitment towards public access to government services and programs.

The Gateways are the main points of entry to Government of Canada services. The key client segments are: Canadians and residents, non-Canadians, and Canadian businesses. Within each segment, information and services are organized by subject, audience or needs, rather than by program or department. The Canada Site is designed for intuitive navigation based on user needs. It is constantly evolving and development is based on client research (i.e. on-line comments, surveys and focus group testing of its users) and ongoing consultation with stakeholders and federal partners.

The Gateways and Clusters strengthen the Government of Canada's Web presence by:

- *practicing an enterprise-wide and horizontal approach to service delivery;*

- *promoting common principles of the Government of Canada vision for service delivery (i.e. client-centricity, horizontality and accountability);*

- *assuming a leadership role in establishing common standards, tools and supports that build on partner and stakeholder feedback so that practices can be implemented uniformly across government.*"[87]

Open-Source Software (OSS)

The Government of Canada included the Open Source Software issue in their approach.

"Licensed software including Open-Source Software (OSS) and methods are part of the corporate standards-based, Information Technology (IT) infrastructure of the Government of Canada (GoC). Acquisition and usage decisions must align with the GOC Federated Architecture, while respecting federal legislation, agreements, guidelines and maximizing the GOC IT investments and opportunities.

The Federated Architecture Program (FAP) has established a set of overarching principles to guide the development of information technology systems. Guidelines containing one or more of the principles are and will be made available on various areas of interest including Open Source Software. With regard to a guideline for use of Open Source Software the following four principles would be directly applicable:

- *Architecture Principle 1: Reduce Integration Complexity*

- *Architecture Principle 5: Security, Confidentiality, Privacy and Protection of Information*

- *Architecture Principle 6: Proven Standards and Technologies*

- *Architecture Principle 7: Total Cost of Ownership (TCO)*

The FAP does not differentiate among the diverse business models for software development and any software component developed or obtained for use within the government of Canada must engage viable and appropriate standards-based technologies. Integration complexity reduction and the contributing factors must be considered when making decisions so as to have an effective overall reduction of the total cost of ownership of the GoC's information technology infrastructure."[88]

Hot issues described for Canada are summarized in Figure 23.

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[87] Government On-Line 2006, http://www.ged-gol.gc.ca/rpt2006/rpt/rpt00_e.asp
[88] http://www.tbs-sct.gc.ca/fap-paf/oss-ll/position_e.asp

FIGURE 23
CANADA E-GOV ARCHITECTURE HOT ISSUES
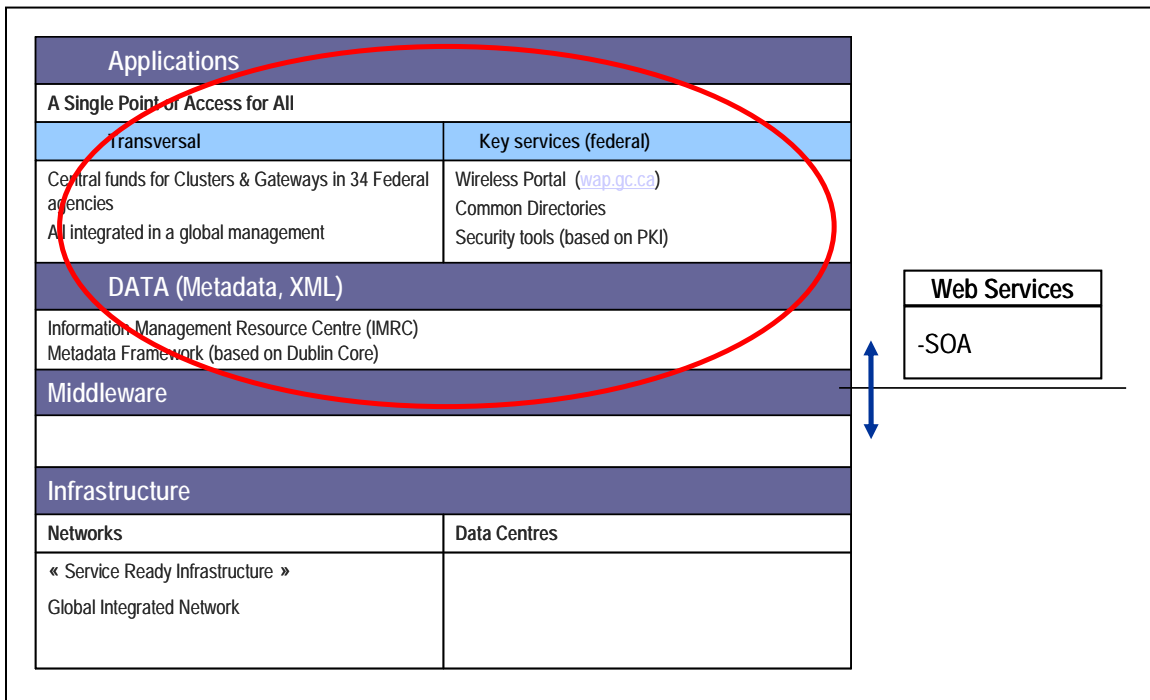
Source: Author's compilation.

Hong-Kong

Interoperability Framework (IF)

The Hong-Kong interoperability framework is named HKSARG. It aims to ensure interoperability between systems without imposing limits on hardware specifications. In order to achieve this goal, it concentrates on specifications related to applications and data. It also precise specifications related to Network Infrastructure in order to allow them to communicate.

"The overall IF, including the technical specifications, is managed by the Interoperability Framework Co-ordination Group (IFCG). An XML Co-ordination Group (XMLCG) has also been formed to develop strategies to facilitate more effective adoption of XML. In addition, specialist groups in some B/Ds are taking the lead in specifying interoperability standards for their respective business areas. The IFCG will liaise closely with these specialist groups." [89]

The technology infrastructure strategy is progressively evolving to an architecture based on open and interoperable standards that support easy interfacing within Government and with the private sector.

Specifically, a Service-Oriented Architecture is adopted to facilitate service agents to develop front-end applications and connect them to the back-end systems in Government.

Infrastructure

The government launched different initiatives:

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[89] Information related to Hong-Kong are extracted from http://www.ogcio.gov.hk/eng/infra/eccc.htm

- Central Cyber Government Office (Intranet)
- Central Computer Centre
- Government Communication Network
- Central Internet Gateway System
- Government Backbone Network (GNET).

Government Directory Service (portal)

"*The GDS provides the contact information of bureaux and departments in electronic form, which is similar to that available in the then paper-based government telephone directory. An intranet website is set up for government staff to search this information in an online manner. The information there is kept up to date by the respective bureaux and departments.*"

e-Government Infrastructure Service

"This common infrastructure platform, code name e-Government Infrastructure Service or EGIS in 2004, was established to develop and deploy next generation citizen-centric joined-up e-Government services. The EGIS offers centrally-managed infrastructure service to complement the existing central IT infrastructure of the Government through a service platform for Government-to-Citizen (G2C) and Government-to-Business (G2B) transactions."

Hot issues described for Honk-Kong are summarized in Figure 24.

FIGURE 24
HONK KONG E-GOV ARCHITECTURE HOT ISSUES
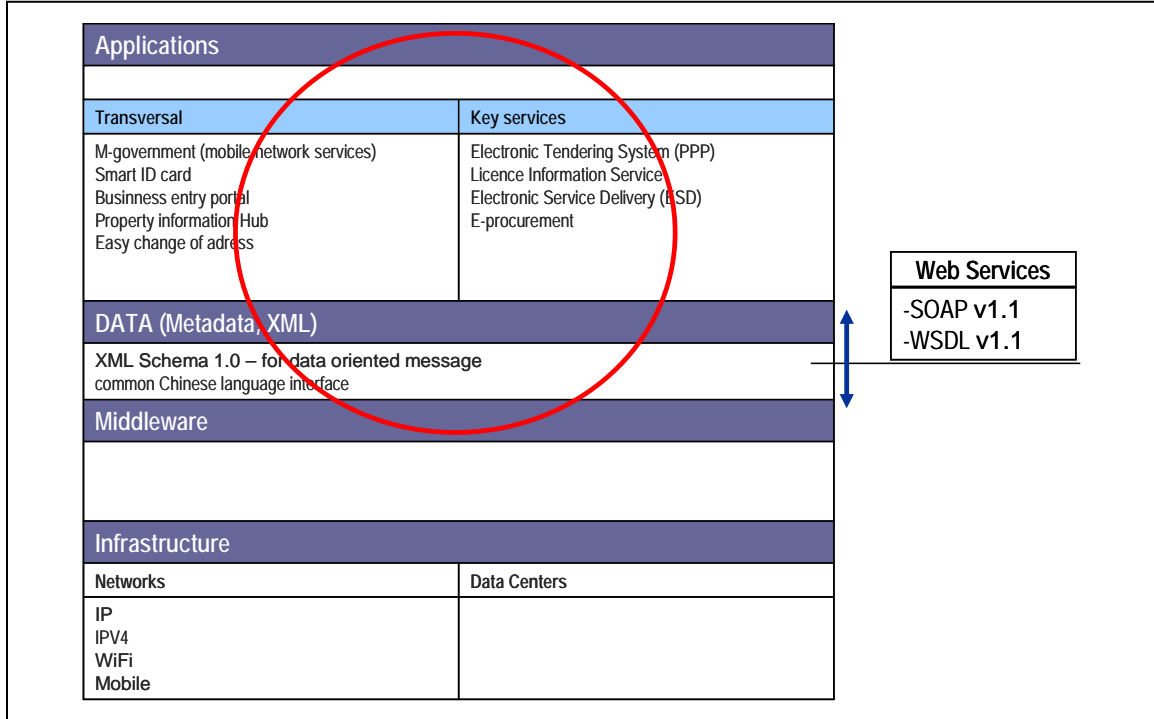
Source: Author's compilation.

Singapore

Singapore is one of the best known reference in of e-Government initiative. However, only some key points of the strategy have been gathered.

From eGAP (eGovernment Action Plan) to iGov2010

- Under the names of eGAP I (2000-2003)90 then GAP II (2003-2006)91, the key programmes were:

- SingPass: Singapore Personal Access,

- Government Electronic Business (GeBIZ): integrated, end-to-end online procurement system for the Public Sector,

- Construction and Real Estate NETwork (CORENET),

- CitizenConnect: to help citizens and residents to transact online with the Government,

- Singapore Government Online Portal,

- Web Services"

With iGov2010, the strategy is to develop a more integrated and multichannel architecture including:

- Singapore Government Enterprise Architecture (SGEA),

- Unique Establishment Identifier (UEI)

- M-Government.

Singapore Government Enterprise Architecture (SGEA)

"*SGEA is a set of blueprints comprising the Business Architecture (BA), Information Architecture (IA), Solution Architecture (SA) and Technical Architecture (TA) of the Singapore government. It provides a holistic view of business functions, common data standards, and shared ICT systems and infrastructure.*

This programme facilitates the identification of opportunities for collaboration among agencies, encouraging greater sharing of data, systems and processes across agencies."

The SGEA has four reference models which are the same than in FEA Architecture from USA:

- Business Reference Model (BRM)

- Data Reference Model (DRM)

- Solution Reference Model (SRM)

- Technical Reference Model (TRM)

- The SGEA reference models are being developed from August 2005 to March 2007.

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90 http://www.igov.gov.sg/Programmes/eGAP_I/KeyProgrammes_eGAPI.htm
91 http://www.igov.gov.sg/Programmes/eGAP_II/KeyProgrammes_eGAPII.htm

M-government

M-Government makes Government e-services more accessible to a wider customer base, and convenient for those who need to transact on the move.

The programme seeks to:

- drive the implementation of m-services and the deployment of central infrastructure for m-services,

- ensure a coordinated approach by government agencies to accelerate the implementation of mobile services (m-services), and

- ensure cost effectiveness in the deployment of m-services in the government.

Key components in Architecture Management

The key components are:

- "*Public Sector Infrastructure (PSi) that allows speedy deployment of large-scale, sector-wide e-services;*

- *Service-Wide Technical Architecture (SWTA), which is a set of principles, standards and guidelines prescribed to ensure interoperability of ICT systems (…);*

- *IT Portfolio Management (ITPM) that provides agencies a set of management tools to systematically evaluate, prioritise, select and manage new and existing ICT project (…);*

- Singapore Government Metadata Standards (SGMS) which will enhance users' navigation and search experiences on all Government websites by implementing a service-wide.

The Government Web Services Exchange (GWS-X) is a central platform that enables the real-time sharing of information and services among government agencies via web services. It also opens up the possibility of similar collaboration with the private sector in a secured environment. The Knowledge Enterprise Network (KEN) on the other hand is an integrated knowledge sharing and management platform. It will provide a suite of web-based document management, collaboration and workflow tools. This initiative will help build the Singapore government into a knowledge enterprise and enhance inter-agency collaboration as a Networked Government. "[92]

In sum, the commitment of Singapore Government towards an Enterprise Architecture seems to be the main trend for the next few years. However, the available documents do not detail the technical architecture framework that would be implemented in order to meet this objective.

3.2.3. Trends

Most governments insist on interoperability. They create general interoperability frameworks rather than sectored architecture projects. These frameworks can be technical, but they are increasingly used to stress out the importance of Open Standards and Open Source Software. They have a political impact as well as a technical one.

Architectures are organized around projects and can be very effective. But they are described as being monolithic and department-centered. They can provide extreme efficiency but

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[92]   http://www.igov.gov.sg/NR/rdonlyres/C586E52F-176A-44BB21E2DB7E4FA45D1/11228/2005Reporton SporeeGov.pdf

they will not allow the development of a common infrastructure at a national level, nor at an international level.

Thus, architectures are often shown as being secondary to, and dependant of the relevant frameworks. This strategy is especially developed amongst IDABC[93] who went from supporting projects and architectures at the end of the 90's to promoting frameworks today. The importance they placed on interoperability was first due to the need to provide applications that could be functional at international level amongst the EU. But then IDABC extended this vision to developing applications that could be functional amongst the various EU administrations.

This view is now shared by Europeans national governments with various balances between projects and frameworks. Most of them also have to deal with previous projects that were launched a few years ago.

The US strategy could be described as going further with various interoperability frameworks completing one with each other. They are sectoral and evolve semi-independently at a different pace. The goal of this approach is to enhance the efficiency of administration by taking care of one aspect after another, rather than developing a global and general framework.

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[93] http://europa.eu.int/idabc/

3.3. Institutional environment

3.3.1. Aspects of e-Gov governance

E-Government organizational arrangements in the different countries are generally related with the broad organizational structures and approaches of their national administrations.

However, this is not always the case. Federal countries may employ centralized or mixed approaches and unitary countries may employ decentralized or mixed approaches.

"The widely perceived dichotomy between decentralized and centralized approaches to e-Government that has characterized many of the choices that countries have made for organizing their e-Government initiatives often ignores or obscures the fact that most countries are somewhere in the middle, with elements of centralization and decentralization coexisting in national e-Government arrangements. In fact, the centralization of some aspects of e-Government (e.g. technical standards) can support the decentralization of other aspects (e.g. local decision making on programme delivery)".

The distribution of the e-Government portfolio reflects the cross-cutting nature of e-government.

Top level responsibility for e-Government often resides within the centre of government or a ministry with responsibility for broader public administration issues, from which it is increasingly hard and/or undesirable to separate e-government.

3.3.2. Case study

Different approaches can be exemplified. UK, Germany and France are good examples of European governments who decided to provide a centralized plan for electronic administration. USA preferred to choose 24 goals launched as a presidential initiative. Honk Kong decided to rely on a few identified projects controlled by the government itself.

United Kingdom

The UK's current e-Government strategy is set in the document 'Transformational Government – Enabled by Technology' published on 02 November 2005.

eGovernment Actors Main roles and responsibilities

Cabinet Office

"The Cabinet Office holds political responsibility for government reform and the UK's e-Government policy. The Cabinet Office is a government department which role is to support the Government's delivery and reform programme. (…)

CIO Council

The CIO Council meets three times a year and is in charge of working with the e-Government Unit to produce a new IT strategy for Government for the period beyond 2005. It is also aimed at promoting the role of CIOs in the public sector and at increasing the success rate of Government IT projects.

Coordination

e-Government Unit (eGU)

The Cabinet Office e-Government Unit is in charge of coordinating e-Government developments in government departments. It is also in charge of promoting best practice across government.

Implementation

e-Government Unit (eGU)

The eGU is in charge of developing, implementing and operating the main components of the national e-Government infrastructure (such as the Direct.gov.uk citizen portal and the Government Gateway secure transaction hub).

Central government departments and agencies are in charge of implementing departmental or sector-specific information systems and e-Government projects.

Support

e-Government Unit (eGU)

The eGU provides support and guidance to Government departments and agencies for the implementation of their e-business strategies.

Office of Government Commerce (OGC)

The OGC is an office of the Treasury, which role is to help central civil government and the wider public sector to achieve value for money from their procurement and commercial activities. Its remit also includes providing government departments, their executive agencies and NDPBs with programme and project management support. In particular, the OGC provides information and guidance to help government bodies achieve successful IT-enabled business change.

The OGC also performs the Gateway reviews, designed to examine projects at critical stages in their lifecycle to provide assurance that they can progress successfully to the next stage. The OGC is in charge of driving forward the Government's Efficiency Programme, aiming to deliver the Government's target of achieving £21.5 billion

(EUR 32.3bn) efficiency gains a year by 2007/08."[94]

Germany

"*The German Federal Government's e-Government strategy is defined in the BundOnline 2005 initiative, launched in on 18 September 2000 by Chancellor Gerhard Schröder. The central objective of BundOnline 2005 is to make available online by 2005 all services of the federal administration capable of electronic delivery.*

In December 2001 the Federal Government adopted an Implementation plan for the BundOnline 2005 eGovernment initiative.

This implementation plan is updated each year in the shape of an annual report by the Federal Ministry of the Interior to the Federal Cabinet: report 2002, report 2003, report 2004. With 379 services e-enabled in August 2005 – more than the originally planned 376 services – the BundOnline 2005 target was reached before the final deadline." [95]

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[94] Texts related to UK are extracted from http://ec.europa.eu/idabc/en/chapter/417
[95] Information related to Germany are extracted from http://ec.europa.eu/idabc/en/chapter/396

eGovernment Actors Main roles and responsibilities

"The responsibility for Germany's e-Government strategy/policy lies with the Federal Ministry of the Interior. The Ministry has set up in 2002 an office of the IT Director, which pools the tasks of the Federal Ministry of the Interior relating to IT policy and strategy, IT Management and IT security. It brings together the BundOnline 2005 Project Group, the Coordination and Advisory Agency for IT in the Federal Administration (KBSt), the Federal Information Security Agency (BSI), and the team in charge of the biometry projects for identification and travel documents.

Coordination: The Federal Ministry of the Interior coordinates the combined implementation efforts of all federal ministries and agencies. Within the Ministry, a BundOnline 2005 Project Group has been set up and is in charge of cooperating with the Federal Ministries for drafting the BundOnline 2005 implementation plans, and of coordinating efforts to carry out and monitor the implementation. The Coordination and Advisory Agency for IT in the Federal Administration (KBSt) also plays an important coordination role.

Implementation

German Federal Office of Administration (BVA)

The German Federal Office of Administration is Germany's central public service agency. It performs more than 100 different tasks for all federal ministries. Among these is the development of some of the country's e-Government infrastructure components such as the government portal Bund.de or the Content Management System Government Site Builder.

Federal Coordination and Advisory Agency for IT in the Federal Administration (KBSt)

The KBSt's tasks include designing and implementing and running central pilot projects and infrastructure components, such as the the Berlin-Bonn Information Network (IVBB), which since 1999 has provided secure communication between the offices of constitutional bodies located in Berlin and Bonn. The IVBB is currently being expanded into the Federal Administration Information Network (IVBV), which will give federal authorities throughout Germany access to this federal network.

Government ministries and agencies

Government ministries and agencies are responsible for the implementation of their departmental ICT projects. The Federal Ministry of the Interior coordinates the combined implementation efforts of all federal ministries and agencies.

Support

Federal Ministry of the Interior

The BundOnline 2005 Project Group in the Federal Ministry of the Interior supports the Federal Ministries and authorities in the strategic planning, coordination and implementation of the BundOnline 2005 initiative.

Federal Coordination and Advisory Agency for IT in the Federal Administration (KBSt)

The KBSt advises federal authorities on their IT strategies and publishes recommendations on IT strategy and methodological guidelines for implementing such strategy. The KBSt also deals with issues of software architecture and its standardization and with the definition of interfaces. The KBSt also monitors developments in the IT industry. Together with the Federal Office for Information Security, the KBSt puts out an annual analysis of industry trends as well as a best-practice report identifying especially successful IT solutions.

Federal Information Security Agency (BSI)

The Federal Office for Information Security is the central IT security service provider for the German government. One of its key tasks is to provide support to federal authorities on IT

The BundOnline 2005 initiative provides the policy framework for the development of e-Government in the federal administration. Next phase will focus on integration and organization of administrative processes – on and across all administrative levels. The obstacle here is the heterogeneous IT landscape of the federal government, 16 federated states, over 300 districts and far more than 13,000 municipalities in Germany.

Political coordination of the implementation of Deutschland-Online is carried out by a Conference of State Secretaries for e-Government in federal and Land governments, in which national associations of local authorities also take part, and which reports annually to the heads of government."

France

"The ADELE strategic plan provides a detailed framework for e-Government development. It defines qualitative and quantitative objectives to attain, the mechanisms and the means allocated to achieve them. The strategy will be implemented through 140 concrete initiatives, which are described in the ADELE action plan." [96]

eGovernment Actors Main roles and responsibilities

"*Responsibility for coordinating e-Government policy was given to an agency: ATICA, renamed Agency for the Development of Electronic Administration (ADAE). ATICA as ADAE were placed under the responsibility of the Prime Minister and put at the disposal of the Minister in charge of State Reform.*

In the new French Government appointed in June 2005, political responsibility for State Reform and e-Government strategy/policy has been transferred from the Ministry for the Civil Service to the Minister Delegate for the Budget and Administrative Reform within the Ministry of Economy, Finance and Industry."

ADAE, now SDAE-DGME is in charge of coordinating e-Government and ICT developments across the whole public administration with a view to implementing the ADELE e-government programme. The agency provides the impulsion, the support and the evaluation of the services developed by adopting with the administrations a gradual procedure respecting their independence. It also provides structural inter-ministerial services in terms of coherence of the information systems of the administrations dedicated to users, public servants and the administrations themselves. The ADAE's coordination role is based on a systematic and continuous consultation with all concerned administrations.

All central government departments are responsible for projects in their field of competence.

USA

In 2002, President Bush outlined a management agenda for making government more focused on citizens and results, which includes expanding Electronic Government – or E-Government.

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[96] Information related to France are extracted from http://ec.europa.eu/idabc/en/chapter/395

The President's E-Government Strategy has identified 24 initiatives to integrate agency operations and information technology investments. The goal of these initiatives will be to eliminate redundant systems and significantly improve the government's quality of customer service for citizens and businesses.

"The 24 are divided among four key portfolios: Government to Citizen, Government to Business, Government to Government, and Internal Efficiency and Effectiveness. E-Authentication is a separate initiative that provides secure and robust authentication services to the 24 Initiatives"

The government has issued important acts that foster e-Government services developments:

- The E-Government Act of 2002

- Government Paperwork Elimination Act (GPEA),

- Paperwork Reduction Act (PRA),

- Government Performance and Results Act (GPRA),

- The Information Technology Management Reform Act of 1996 (ITMRA).

eGovernment Actors Main roles and responsibilities

U.S. Office of Management and Budget (OMB) [97]

Global organization is summarized in Figure 25.

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[97] http://www.whitehouse.gov/omb/inforeg/egovstrategy.pdf

FIGURE 25
USA GOVERNANCE STRUCTURE

PRESIDENT'S BUDGET - FINAL FUNDING APROVAL – OMB DIRECTOR

OMB Associate Director For Information Technology and E-government

PORTOFOLIO MANAGEMNET OFFICE

CIO COUNCIL	STEERING COMMITTEE	STEERING COMMITTEE	STEERING COMMITTE	STEERING COMMITTE
OIRA IPT LEADER	GOVERNMENT TO CITIZEN PORTOFOLIO MANAGER	GOVERNMENT TO BUSINESS PORTOFOLIO MANAGER	GOVERNMENT TO GOVERNMENT PORTOFOLIO MANAGER	INTERNAL EFFECTIVENESS & EFFICIENCY PORTOFOLIO MANAGER
• E-AUTHENTICA-TION • ENTERPRISE ARCHITECTU-RE	• USA SEVICE • EZ TAX FILING • ONLINE ACCESS FOR LOANS • RECREATION ONE-STOP • ELIGIBILITY ASSISTANCE ONLINE	• FEDERAL ASSESTS SALES • ONLINE RULEMAKING MANAGEMENT • EXPANDING TAX PRODUCTS FOR BUSINESSES • ONE SOTP BUSINESS COMPLIANCE • INTERNATIONAL TRADE PROCESS STREAMLINING • (CONSOLIDATED HEALTH INFORMATICS)	• GEOSPATIAL INFORMATION ONE- • STOP • DISASTER ASSITANCE • E-GRANT • WIRELESS • E-VITAL	• RECRUITMENT ONE-STOP • ENTERPRISE HR INTEGRATION • INTEGRATED ACQUISITION SYSTEM ENVIRONMENT • E-RECORDS MANAGEMENT • E-TRAINING • E-PAYROLL HR • E-TRAVEL

(CIO: Chief Operation Officer, HR: Human Resources, IPT: Integrated Project Team)
Source: Author's compilation.

The Chief Information Officers Council

Established in 2002, the Chief Information Officers Council (the CIO Council) is the principal interagency forum to improve agency practices for the management of information technology.

"The CIO Council is a forum to improve agency practices related to the design, acquisition, development, modernization, use, sharing, and performance of federal government information resource".

Other actors

- National Institute of Standards and Technology Act

- Office of Personnel Management

- Archivist of the United States

- Chief Financial Officers Council

- Federal Acquisition Council,

- Chief Human Capital Officers' Council,

- Budget Officers Advisory Council

Canada

The Government On-Line Initiative was launched in 1999 and was planned for lasting 6 years. It ended in march 2006.

A report has been issued at the end of the Programme: "Government On-Line 2006"98. Texts below are extracted from this report.

"The project coordination was first performed from the Secretariat of the Treasury Board, then from the Department of Public Works and Government Services following the transfer of responsibilities in December 2003. Departments and agencies submitted proposals to obtain funding for their projects in order to complement internal and partners' funding."

eGovernment Actors Main roles and responsibilities

Among the different structures represented in Figure 26, "*the Chief Information Officer Branch (CIOB) sets strategic directions for information management (IM), information technology (IT) and service delivery in the Government of Canada.*

FIGURE 26
GOVERNMENT ON-LINE ROLES AND RESPONSIBILITIES
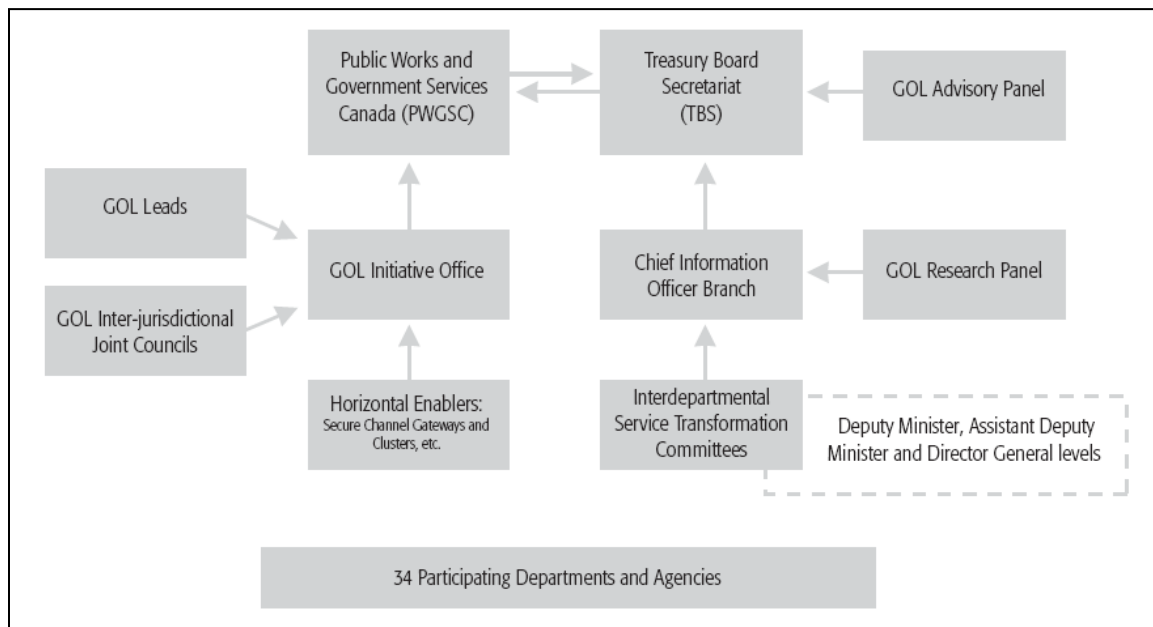
Source: Author's compilation.

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98 http://www.ged-gol.gc.ca/rpt2006/rpt/rpt00_e.asp

Management of Information

"The Treasury Board Secretariat has led several Government On-Line-driven initiatives to guide federal departments and agencies on effective information management practices. These initiatives support the government's ongoing improvement in service delivery to Canadians via multiple channels, including on-line".[99][100]

A specific sub-group is in charge of Syntax and Languages, including Metadata and XML.

"The main tasks of the Syntax and Languages Sub-group are:

- *To advise the GOL Metadata Working Group on metadata language and syntax issues;*

- *To advise the GOL Metadata Working Group on metadata language technologies ex. HTML, XML, RDF;*

- *To provide industry trend awareness through the Working Group's listserv;*

- *To liaise with Search Engines and Thesaurus Sub-groups on metadata language and syntax issues;*

- *To provide guidance and best practices related to metadata language and syntax;*

- *To investigate the language and syntax technologies in the development of Metadata Architectures*."[101]

Architecture Management

"The Enterprise Architecture and Standards Division leads the design, development and implementation of the Government of Canada's (GC) enterprise architecture (EA), a framework of principles, standards and practices used to guide the design and implementation of service transformation and IM/IT initiatives. In addition, the Enterprise Architecture and Standards Division supports the stewardship and comptrollership functions of the Treasury Board Secretariat by providing architectural reviews of key projects, coordinating identification of new common components and services within the Government of Canada EA, and developing migration and implementation plans."[102]

Hong-Kong

The next wave of e-Government (2004) emphasizes the need to adopt a top-down approach in driving e-Government initiatives. Top-level commitment from the heads of bureaux/departments (B/Ds) to planning and implementing the e-Government initiatives as well as initiating the necessary changes in the organization, culture business processes and internal resource allocation is of paramount importance.

eGovernment Actors Main roles and responsibilities

"The e-Government Steering Committee (EGSC) was set up in September 2004. Chaired by the Financial Secretary (FS), the EGSC steers the further development of the e-Government programme and approves measures to facilitate the implementation of the programme. Since its establishment, the EGSC had considered and endorsed the vision, mission and key priorities of

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[99] http://www.tbs-sct.gc.ca/im-gi/index_e.asp , http://www.informationmanagement.gc.ca/index_e.asp
[100] Government On-Line 2006, Page 62.
[101] http://www.tbs-sct.gc.ca/im-gi/mwg-gtm/syn-lan/intro_e.asp
[102] http://www.tbs-sct.gc.ca/inf-inf/index_e.asp

the next wave of e-Government as well as provided policy steer for a number of new e-Government initiatives."[103]

"*The Office of the Government Chief Information Officer (OGCIO) (…) set up on 1 July 2004 to provide leadership for the development of information and communications technology (ICT) within and outside the Government. Headed by the Government Chief Information Officer (GCIO), the OGCIO was formed by merging the functions of the former Information Technology Services Department and the IT-related divisions of the Communications and Technology Branch (CTB) of the Commerce, Industry and Technology Bureau (CITB).*"[104]

Singapore

The strategy is under the responsibility of the Infocomm Development Authority (IDA).

"*The strategic goal of the Infocomm Development Authority (IDA) is to cultivate a vibrant and competitive infocomm industry in Singapore - one that attracts foreign investment and sustains long-term GDP growth through innovative infocomm technology development, deployment and usage in Singapore - in order to enhance the global economic competitiveness of Singapore.*

IDA seeks to achieve this objective in its roles as the infocomm industry champion, the Government CIO, and the national infocomm master-planner and developer.

Backed by its strong domain knowledge of the government sector and how infocomm technology can be applied to the vertical sectors of the economy, IDA is well placed to function as the infocomm technology industry champion. IDA's regulatory role works in tandem with its industry development arms to help infocomm companies roll out new technologies for widespread adoption in Singapore and beyond.

IDA also functions as the Government CIO for the public sector. In this capacity, it helps in the running of an effective and efficient government, (…). As the infocomm master-planner and developer for Singapore, IDA provides the necessary infocomm infrastructure and technology standards, and promotes the adoption of infocomm technology as a key enabler to enhance Singapore's economic competitiveness as well as for innovation in key sectors. IDA has an excellent track record for master-planning and implementing the national infocomm infrastructure and other sectoral projects, as well as an international reputation for effective use of infocomm technology in government."[105]

3.3.3. Trends

Governments publish organizes themselves to be able to publish and update reference papers. They must provide technical information as well as general rules on the goals of the administration. Their action must be driven by rules that can be developed ad hoc, or organized within legal boundaries.

With regards to legislation work, countries like the UK or Germany seem to concentrate on projects-driven legislations. They can address specific issues like privacy or ecommerce. On the other side, France is debating the benefits of enacting a global legislation when the US already passed such an act. The goal is to study a broader agenda and develop a common ground for future projects.

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[103] http://www.info.gov.hk/digital21/e-gov/eng/strategy/index.htm
[104] http://www.ogcio.gov.hk/eng/about/ewelcome.htm
[105] http://www.ida.gov.sg

IV. Latin-American Environment

This part aims to describe and analyse some Latin American experiences and their different approaches towards the technical and structural development of e-Government architectures. Given the heterogeneous scenario around this issue in the region, comparisons and specificities from each experience will be considered in the following analysis.

4.1. General considerations

4.1.1. A pro-active approach

For Latin-American countries, e-Gov strategies seem to be strongly linked to the development of democracy.

The e-Gov Agencies however, manage differently their priorities depending of the context and the strategic objectives assigned. Something that can be strategic for a country could be completely irrelevant for another. Some countries handle Interoperability under a "project approach" (Chile), others under technical norms (Brazil' e-ping).

Given this particularity, a pro-active approach has been proposed in order to understand and describe the four country-cases chosen in the region. In the first part, the study will look at the main technical definitions of e-Gov architectures. Each country will be analysed through five elements: A historical background, the interoperability framework currently used (if possible), XML's relevance in the national strategy, examples of Portals, Agents and Projects (given the case) and finally a brief discussion of the e-procurement infrastructure (if existent).

In the second part of the study, an institutional analysis comprising the main strategic and operational guidelines, agencies, actors and policies around e-Gov architectures will be made.

Particularities and differences for each country in terms of technical approaches will be also taken into account.

4.1.2. The relevance of the 4Layers template

Strategies adopted by countries in Latin America are different regarding e-Gov architecture. Priorities change depending on each domestic policy and national challenges.

Given this trend and following the same line as the previous report, each country will provide information on the characteristics of their e-Government project illustrated in the four layer template model which seems the most adequate when describing such complex structures. It organizes the e-Government projects around 4 main areas: the applications layer, the data layer, the middleware layer and the infrastructure layer.

Priorities (represented by the red circle) can be placed at the network and infrastructure level. Some countries consider that they have to built up or to improve communication by developing infrastructure and access. In other cases, e-Gov Agencies find important to decode or set-up common Data Centres to centralize data coming from different public administrations. In addition, it can be a relevant strategic to improve the use common applications in different administrations.

At the application level, there is an important difference to understand:

- either the e-Gov agency has to issue common rules and recommendations (Global policy for architecture, Interoperability framework …), Brazil

- either it looks to set-up transversal applications and key services. Chile, Colombia

4.1.3. The key role of Transversal Projects

An important aspect of Latin American countries is the role that transversal projects play in e-Gov architectures. In the region, projects are often structured as potential examples "de facto" of interoperability and in other cases as the building blocks of many e-Gov architectures.

The development of Transversal projects (applications) thus determine in some cases interoperability frameworks, and help structure e-Gov architectures by deciding what sort of WebServices, or Metadata Language to be used and moreover help build solid and interoperable infrastructures in the lower layers of the architecture.

Since transversal projects are vivid examples of applications in practice, countries in the region prefer to draw their technical agendas by basing themselves on such transversal projects. In other words, transversal projects play a double role: they structure national agendas in the political level as well as e-Gov architectures in the technical level in the form of applications and services.

4.2. e-Gov Architectures in Latin America

Four countries have been investigated in this study: Brazil, Mexico, Colombia and Chile.

4.2.1. Brazil

Background

The SLTI (Secretaria de Logistica a Tecnlologia da Informaçào) is the structure within the Ministry of Planning in charge of the e-Government strategy.

It is organized in 4 Directions: 1-eGov, 2- System Integration, 3- Networks,, 4-b ics and General Services

The SLTI relates to the Architecture through three different strategies:

- e-Ping as the Interoperability framework,

- Horizontal projects between administrations,

- Open Source.

Only 35% of the population in Brazil is connected by a fixed line. Given this precarious figures, the government is interested in developing a strategy to improve broadband fix and wireless. In this sense, M-Gov (Mobile government applications) could be an interesting topic in Brazil in the mid-term.

Interoperability framework

Known as the e-ping strategy, the framework consists in giving a series of technical recommendations on Interoperability.

e-Ping is now adopted by:

- The states. An agreement has been signed with ABEP (Associação Brasileira de Estudos Populacionais, www.abep.org.br),

- Local Authorities,

- The "Carterios" which are organizations who validate all official data coming from citizens or companies (accounts …).

SERPRO (www.serpro.gov.br) is the public company and the main contractor to develop the projects of the e-ping strategy.

e-Ping is "an architecture that defines a minimum set of premises, politics and technical specifications that rule the usage of ITC in the Federal Government, establishing the conditions of interaction with the other Powers of the State (Legislature and Judiciary), spheres of government (states and municipalities) and with society". -Ping fosters an Integration of systems that provides an Integration of services. The general model is summarized in Figure 27.

FIGURE 27
BRAZIL: MODEL OF E-GOVERNMENT
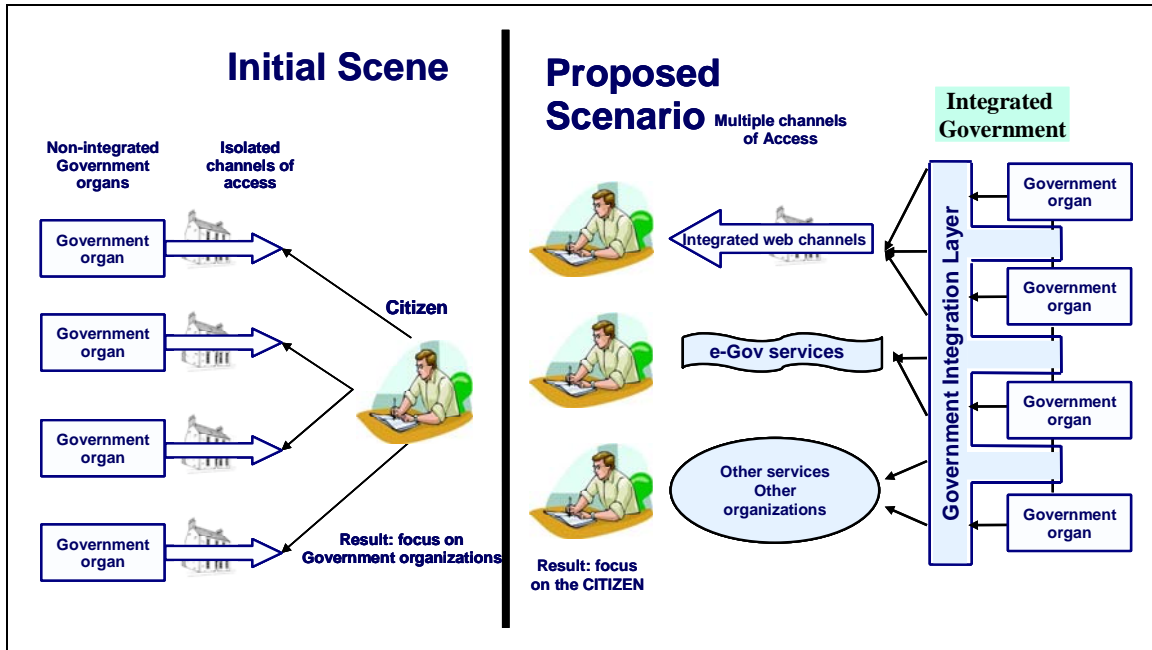
Source: Author's compilation.

5 segments have been defined in the e-ping strategy

1. Interconnection

This segment defines general set of protocols:

- IP including the work on Ipv6 and Network specifications (Infovia which is the national infrastructure network for e-Gov applications and services),

- SIP,

- XML,

- Web services including SOAP, UDDI, WSDL,

- eMail (access, security …),

- FTP …

2. Security

It includes: IP security, eMail security, Cryptography, Development rules, Web services…

3. Means of Access.

This segment refers to the Format of documents and all tools used to access applications and data.

In addition it includes the access to the usage of Smart Cards.

4. Organization and Information Exchange

This segment includes:

- the MetaData definitions: Government Metadata Standards – e-PMG

- the List of Government Themes: Taxonomy for Browsing (LAG)

- languages to access or interchange data.

5. Areas of Integrations for the e-Government

This segment is a strategic and operational follow-up of e-Ping's implementation.

It includes:

- scans, analysis and mapping of integration themes in areas dealing with e-Government,

- identification of the main organs and entities involved in each issue,

- XML reference catalogue management of shared use for e-Government services,

- Adhesion Assessment to the e-PING standards.

Officially, the current release of e-Ping is version 1.5. However, a new release (V 1.9) has been issued but not yet formally adopted. The release 1.9 is currently submitted to public consultation (opened to all public organizations). After comments and modifications, this consultation will become V2.0.

Open Source

Open Source is a strategic pillar of the e-Government Program. That does not mean that the Government wants to exclude proprietary applications. It is more a question to foster when it is possible the use of Open Source to guarantee the possibility to disseminate as far as possible and with the minimum of constraints the applications developed with public funds.

The Brazilian position is pragmatic. Both Open Source and proprietary softwares are used in IT systems. As an example, some projects under the Ministry of Planning's responsibility are developed by using proprietary applications. However, SLTI tends to formalize in all tenders the 4 conditions (which are actually the 4 basic requirement of Open Source license) 1- the right to use, 2- the right to access, 3- the right to modify, 4- the right to redistribute.

SLTI has developed a Guide to Migration to Open Source. he new servers are based on an Open Source architecture and workstations are supposed to migrate to Linux with Open Office available on them.

Some specific software is proposed. The most interesting example is CACIC, an Inventory Application of Hardware and software which is developed as an internal initiative. CACIC's architecture lays on agents which are installed in all systems. These agents detect automatically all hardware components and applications and transmit this information to a server.

Today, some other public entities have adopted CACIC and private companies have also developed business services on CACIC.

ABEP (Associação Brasileira de Estudos Populacionais) is now an important partner of SLTO in the promotion of e-Ping, Open Platforms and Open Source towards all States.

XML

Exchanges are based on XML and Web Services such as SOAP and WSDL and the new servers are based on an Open Source architecture

Brazil develops transversal applications (one of them being e-procurement) as well as key services for central and local governments

Portals and Transversal projects

SLTI has the responsibility of very large transversal projects between administrations.

The budgets of these projects are mainly controlled by the Ministry of Planning. This means that the Ministry not only has the possibility to define specifications for interoperability, but it has the power to implement them on one of the most important projects in central administration.

The 7 projects that involve the e-ping strategy are:

- Finance,

- e-Procurement,

- Human Resources (2 different projects),

- Planning,

- Budget,

- Administrative organization.

All these projects are very complex due to their size and to the constraints related to the integration of Legacy Systems and Applications. These ones are based on ADABAS which was very popular in the 80's. But Adabas depends on a centralized architecture historically supported by mainframes systems (principally IBM). It's important to understand that the Ministry of Planning has in charge a huge and complex program including: Management of 7 projects, Change of architecture, change of functional procedures, adoption of common rules regarding interoperability, integration of Open Source as far as possible …

Others important projects are driven by Ministries following e-Ping specifications. Two of them are hereby presented.

Ministry of Justice

In Brazil, Justice Administration and Home Security are comprised in the same Ministry. However this doesn't concern the judges and courts which depend on the Court Institution as this institution is independent from the Ministry.

Regarding police and justice administration, each State is independent.

In November 2003, an audit showed that the Information Systems INFOSEG was facing a lack of trust as data was not updated and users had a lot of problems to access.

Given this fact, the central government decided to build up an integrated system known as the REDE INFOSEG (www.infoseg.gov.br). This network gathers information on three domains: justice, taxes and security. REDE INFOSEG is based on e-Ping recommendations. Up to June 2006, 26 states were connected.

Each state manages its own information (Justice, Tax, Security) and are able to access the national platform. SINIVEM is an example of an application that uses REG INFOSEG for the vehicle control. This application should be implemented for the Pan American games in Rio in 2006.

Ministry of Transports

One of the main concerns of the country has been Port Process Management. Today all ports have their own process management. Nevertheless, in Brazil it takes about 40 days for a ship to complete an overall process whilst in modern countries it takes between 5 and 8 days.

That is the reason for creating the SISPORTOS, a project for Importation, Exportation and "Cabotage".

SISPORTOS doesn't tend to replace their own solutions of operations in ports. The application provides a national gateway between all ports and all administrations involved in the process. Ie, SISPORTOS is interconnected with other major applications (Figure 28) like SISCOMEX (Import Export application managed By the Ministry of Finances).

FIGURE 28
BRAZIL: SISPORTOS PROJECT

Source: Author's compilation.

The e-Ping specifications have been adopted.

The applications continue to adopt EDIFACT standards for products descriptions between ports. Therefore SISPORTOS uses the International Code used by EDIFACT.

e-Procurement infrastructure

81% of Procurement transactions are already performed by the e-Procurement system. This system maintains a database of 250.000 suppliers. In Brazil 90 different databases are managed and is the SLTI that controls the quality of all information.

A new project developed by SLTI together with the University of Minasgerias (www.ufmg.br) is the Datamind application called TAMANDA.

This project is based on a Grid Architecture that has the advantage of having a low-cost distribution.

Conclusions

Brazil has set-up a global strategy which includes project on all layers of the layout.

The strategy lays on 3 pillars: e-Ping Framework based on XML, Transversal applications (including centralized budgets[106] managed by SLTI) and Open Source. It's different from an architecture which would have as a main objective, to provide directly all procedures on line. In the end, all Ministries should be able to provide procedures but it's not the primarily approach.

Hot issues described for Brazil are summarized in Figure 29.

FIGURE 29
BRAZIL E-GOV ARCHITECTURE HOT ISSUES
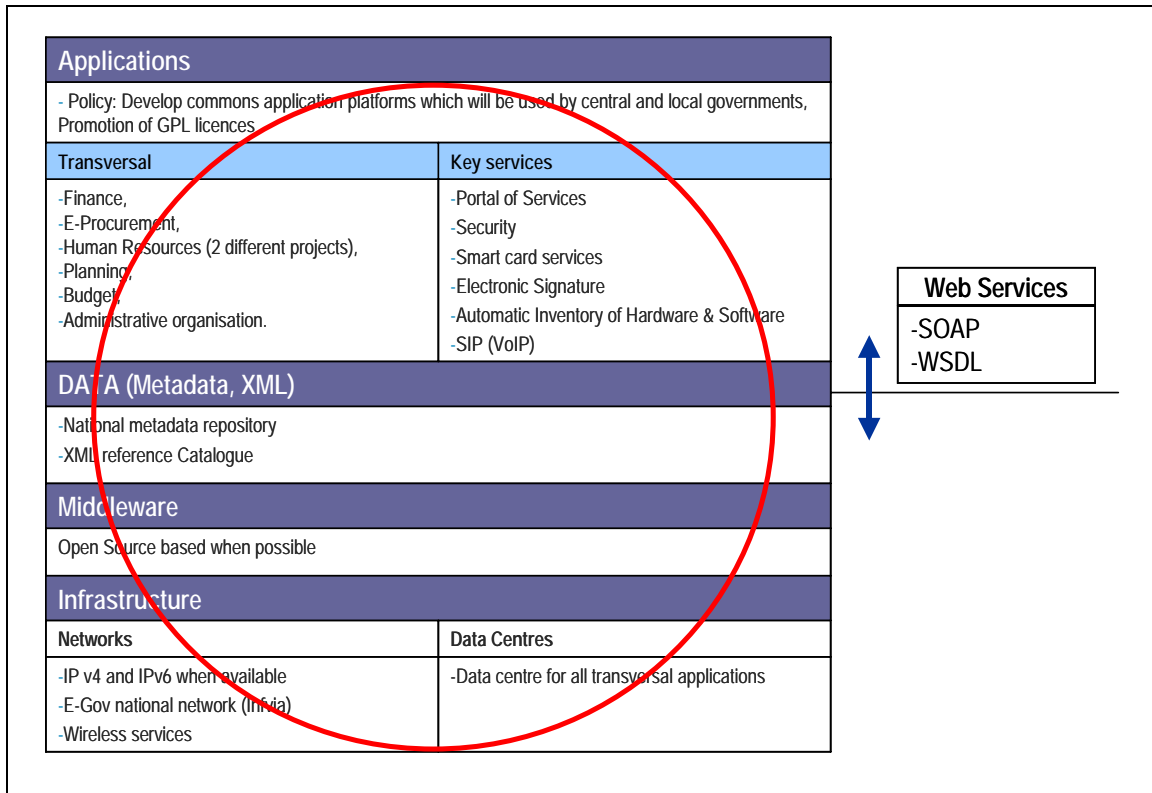
Source: Author's compilation.

4.2.2. Chile

Background

After an Agenda that was defined in 2002, the objective was to develop interoperability between administrations.

Before 2006, the global environment was described as a whole set of independent applications including specific exchanges when needed. Today, different projects have been launched. The main one is known as the "Plataforma Integrada de Servicios del Estado".

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[106] The centralization refers in this case, to the organisation of Transversal applications - development and operations - between Federal Ministries (and not between the Ministry of Planning and Regions or other local authorities)

The objectives of this project are:

- to provide an access to update information,

- to facilitate administrative procedures by avoiding to ask information to the citizen many times,

- to facilitate exchange of data between administration in respect of constraints of privacy.

The result is an integrated platform that can be interfaced with all governmental applications (Figure 30).

FIGURE 30
CHILE: E-GOV AFTER 2006
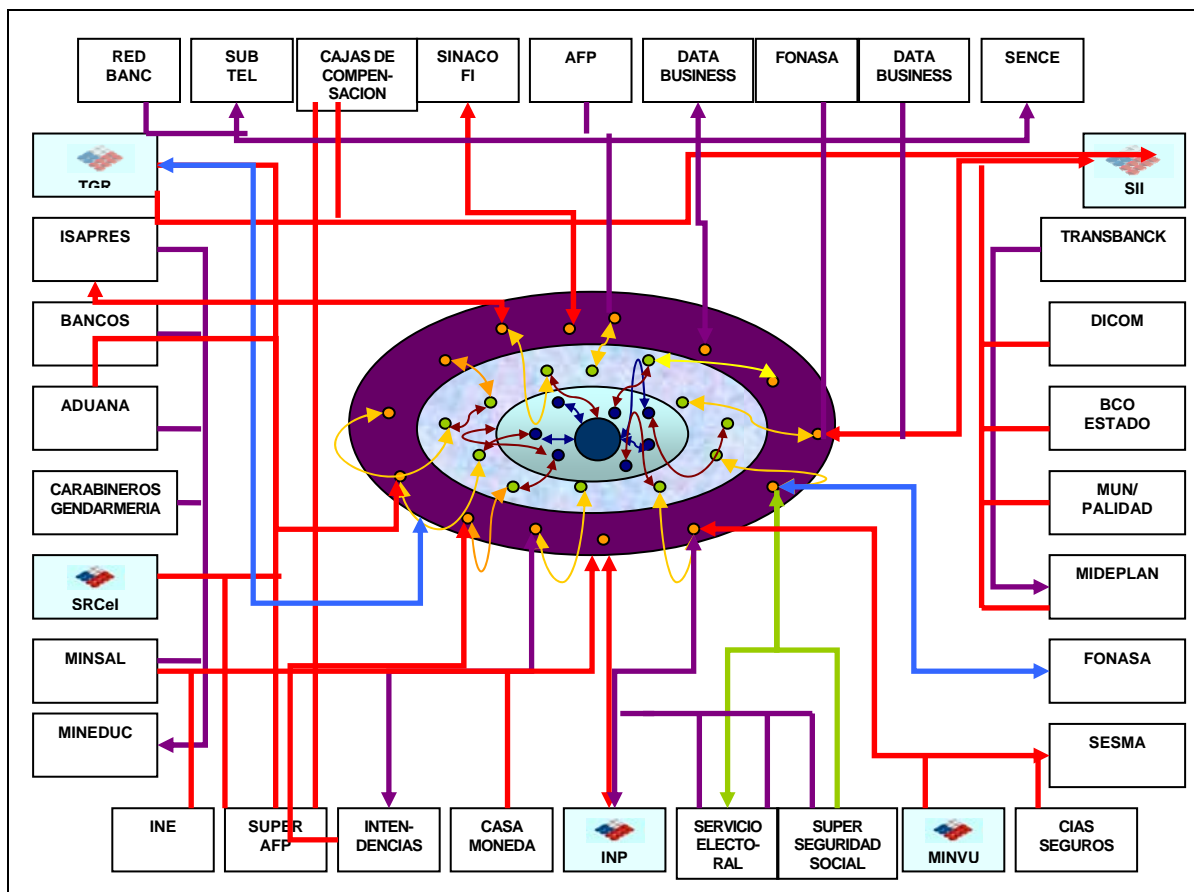
Source: Author's compilation.

This platform is under the responsibility of the "e-Gov Coordination". It is neutral. Everything is supposed to be interoperable through Webservices and XML.

In 2003, a Digital Action Group was set-up were two Committees were created:

1. e-Gov Committee

2. Standard Committee

3. The main projects within this action group were:

4. Plataforma de Servicios Integrada del Estado (Integrated Service platform for the   State)

5. Ventanilla comercio exterior

6. Payment for public services

7. Portal of Public Sector

8. Healthcare Infrastructure (included in National Digital Agenda)

In 2005, a Decree was issued in order to impose XML in all exchanges between administrations.

20% of the population is connected on PSTN whilst 70% own a Mobile phone. Given the above, administrations should try to find the best solutions in a pragmatic approach (as opposed to develop a centralized architecture that risks to control everything).

Interoperability framework

The government's interest for interoperability was not a priority up to now. Interoperability is not based on an One-to-One approach as all exchanges are performed through a Gateway. Today all Ministries have to adapt their interfaces to the format of the exchanges. In Chile the way to meet Interoperability is to develop strategic horizontal projects between administrations. Among the main projects, we find the Platform for Integrated Services and the Pensions platform gateway as two examples for Interoperability.

The pensions platform involves entities such as:

- Registro Civil e Identificacion (www.registrocivil.cl),

- Impuestos (www.sii.cl),

- Tesoreria General,

- Subsidio vivienda,

- Pensiones (www.safp.cl).

It results important to highlight that the first 3 are information providers.

Portals and Transversal projects

Portal Trámite Fácil

The portal for Administrative procedure is named "Portal Trámite Fácil" (www.tramitefacil.gov.cl). Launched in 2001, this project aims to provide easily and quickly all information on procedures to citizens.

Ventanilla Única de Empresas

This portal is dedicated to administrative procedures for companies.

Ventanilla Única de Comercio Exterior

This portal gives the possibility to companies to automatize all procedures regarding exportations and importantions.

Servicio de Impuestos Internos

The Tax On Line Service is very developed in Chile. The RUT (..) that plays the role of National identification number is defined by the Tax administration.

Because the RUT is used for a lot of operations, that bring the Tax Administration in interoperate with others administrations or others organizations like banks.

Customs Office

The customs IT is one of the first IT facilities that was implemented in the country.

The service of "Declaracion Electronica de Importacion" was installed in 1997. In 2001, the electronic payment was introduced and in 2005, payments by Card and by cellular became available.

When a product is submitted for importation, the Customs administration initiates a process with the public organizations which are supposed to deliver an authorization. For example with the health administration, these exchanges are performed through the Ministry of Health and the "Instituto de Salud Publica" (ISP).

All exchanges respect the XML format. The products and services are identified by a 5 digit code (whilst UNSPC[107] codification adopted by ChileCompra works under 8 digits). However the custom administration is interested on the details of the product. In this sense, the exchange can be considered as a mail that respects some basic specifications.

The Customs administration has developed some common operations with Bolivia and with Argentina. Some other projects are studied in relation with Mercosur.

XML

In Chile all exchanges in Governmental Platforms are defined now to be performed through WebServices (SOAP). A repository of XML Formats was defined.

The platform is neutral and everything is supposed to be interoperable through Webservices and XML. Chile focuses its architecture in the upper layers (Applications and data) mostly developing transversal services.

e-Procurement

Chilecompra is an independent agency with its own budget.

The philosophy of Chilecompra is to develop and operate a complete decentralized eProcurement system. It can be implemented in a centralized administration or in any entity of an administration or local authority.

All procurements purchased over $200US have to use the system Chilecompra. Some public procurements related to specific big purchases are not included for the moment. Different subsystems have been developed.

The general synopsis of Chilecompra is presented below (Figure 31).

All providers have to be registered in a national database: "Chile Proveedores". They don't need to be registered to compete, but it's mandatory to be registered before signing

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[107] www.unspsc.org

contracts. The companies need to satisfy all ordinary requirements (taxes …). 170.000 companies are registered. 23% are currently providers of public sector.

1 million transactions are performed every year for a turnover of $13billion.

The system uses the UNSPC nomenclature for products and services.

All standards are based on:

- xCBL for eCommerce exchanges (xCBL is the XML component library for business-to-business e-commerce, www.xcbl.org),

- XML standards defined by OASIS (www.oasis-open.org),

- XML for national exchanges with respect to the Chilean XML definitions (XML Scheme – Figure 31).

FIGURE 31
CHILE: E-PROCUREMENT XML SCHEME
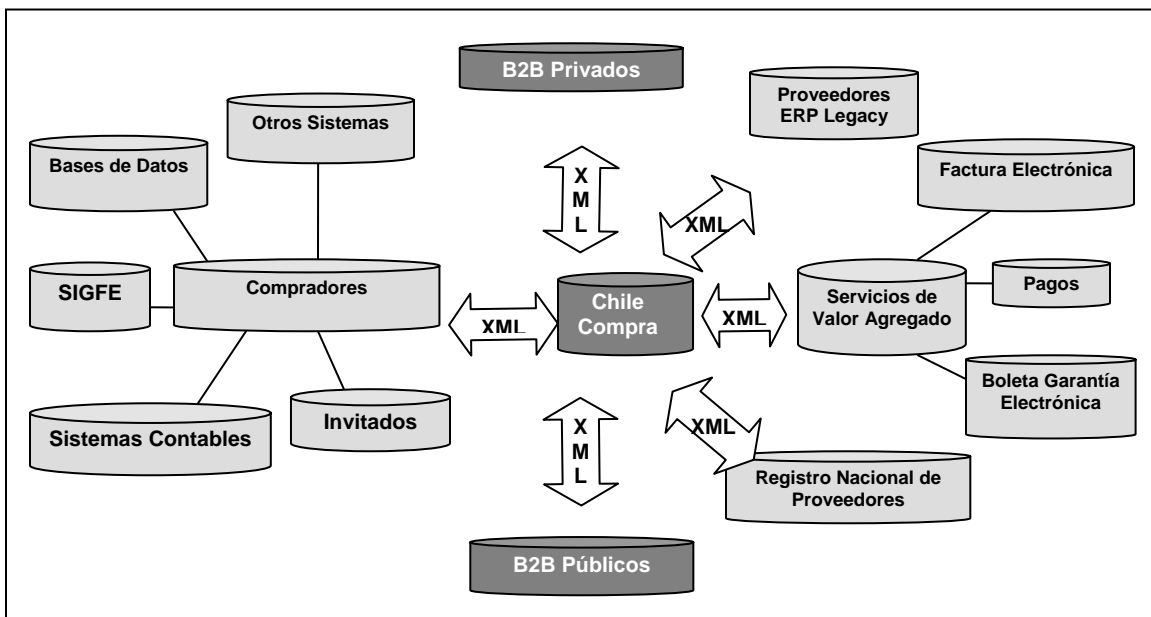
Source: Author's compilation.

All exchanges are supported on Web Services including Service Level Agreements (SLA).

The Chilecompra platform (Figure 32) is based on Microsoft technology. A Microsoft client solution is proposed to customers (Administrations or Companies). A free solution is proposed to small or single customers. In any case, all of them are free to use any software that respects interface specifications.

FIGURE 32
CHILE: E-PROCUREMENT LAYOUT
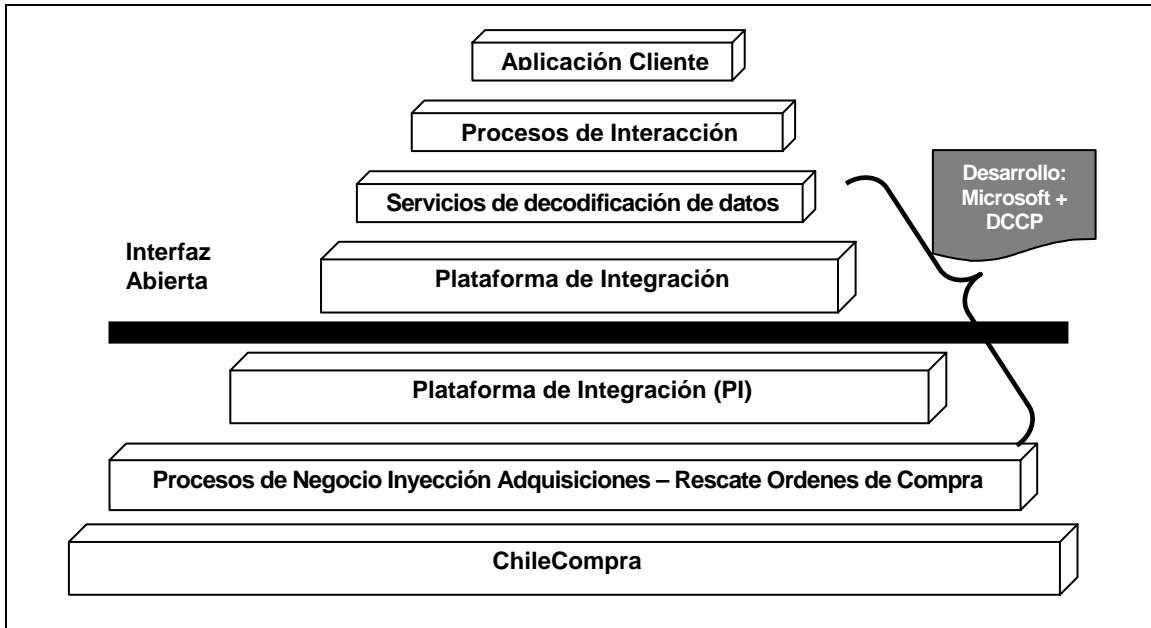
Source: Author's compilation.

The systems should evolve in order to provide an ASP service to administrations and local authorities.

Chile has probably one the of most powerful platform for e-Procurement in the world.

Conclusions

The Transversal projects (Platforms) represent the main drivers of architecture and interoperability in Chile.

With the generalization of the RUT (Rol Único Tributario) defined by the Tax Administration, Chile is able to develop these platforms. In addition, some questions related to privacy seem to be more important.

Hot issues described for Chile are summarized in Figure 33.

FIGURE 33
CHILE E-GOV ARCHITECTURE HOT ISSUES
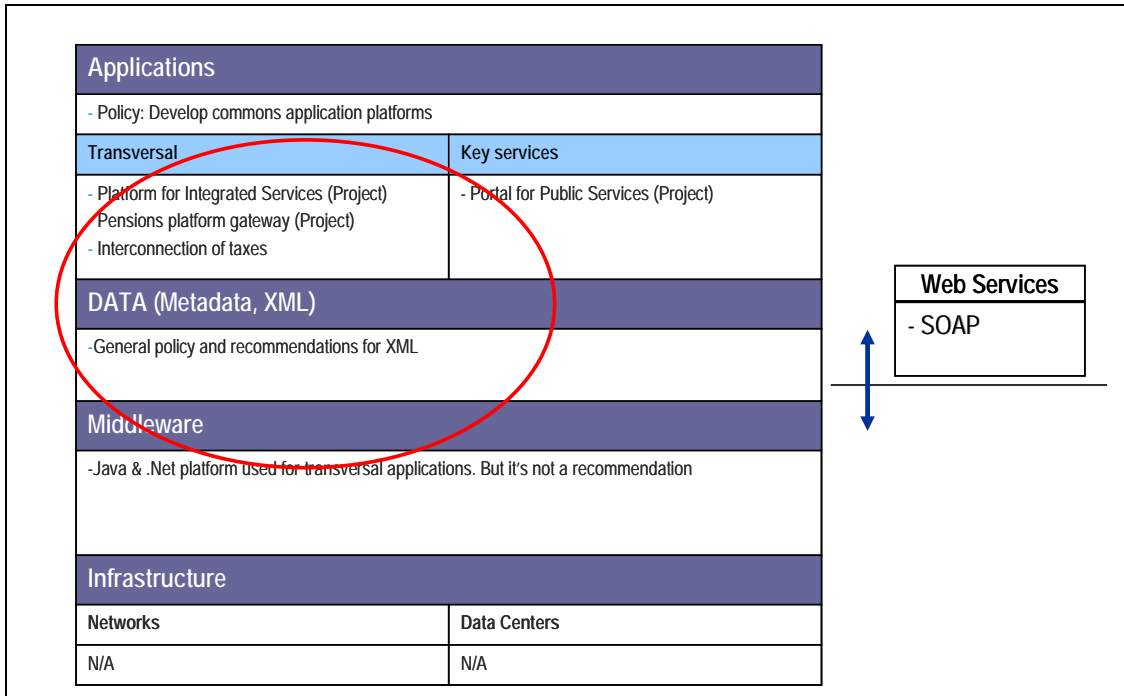
Source: Author's compilation.

4.2.3. Colombia

"Agenda de Conectividad" is a program driven by the Ministry of communications. It was launched in 2000 after issuing a strategic document (CONPES 3072/2000). http://www.agenda.gov.co/ It is neither a Direction nor a Department; hence, the structure could be compared to a project.

6 actions were decided for the "Agenda de Conectividad":

1. Access to infrastructure (Telecom and PC Penetration) in relation with two other programs which are at the same level than the Agenda de Conectividad.

2. COMPARTEL: to create infrastructures and telecentres in rural areas,

3. COMPUTADORES PARA EDUCAR.

4. Education and Training

5. Companies on Line with a specific focus on SMEs (Managed by the Ministry of Industry)

6. Development of ICT Industry

7. Contents

8. Government On Line.

 "Agenda de Conectividad" has worked four main themes:

- Transparency,

- Education (with national network, interconnection with CLARA/GEANT),

- Security,

- Productivity (SMEs)

FIGURE 34
COLOMBIA: ARCHITECTURE ON LINE
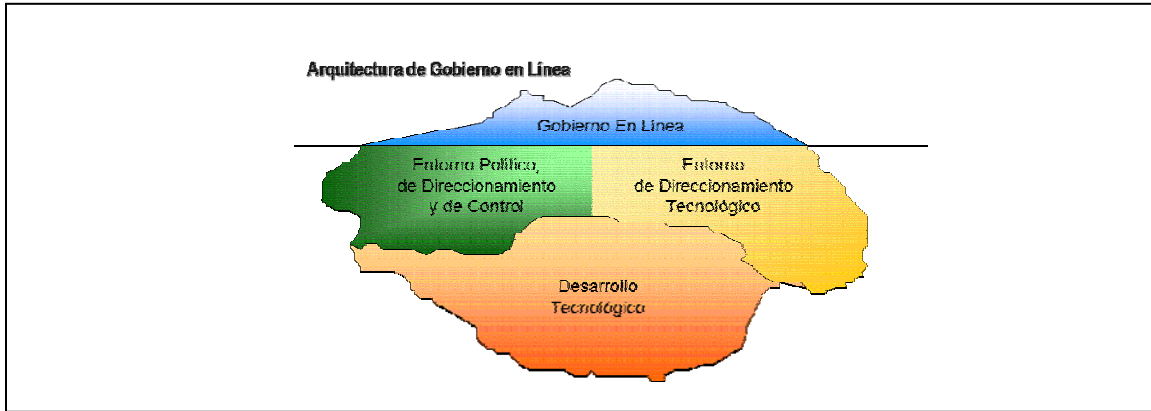
Source: Author's compilation.

Government On live Architecture could be compared to an Iceberg (Figure 39) where there is a small visible part on the top and an undersea part which is bigger

Projects are sponsored by the "Fondo de Communicaciones" and by the BID. The "Fondo de Communicaciones" is sustained by operators (by means of a tax for Universal Service). Since the "Agenda de Conectividad" doesn't have any legal existence, the funds coming from the BID are contracted through public structures like FONCOM, FONADE and FNUD.

The "Agenda de Conectividad" has structured the main guidelines of an Interoperability Framework in the country since projects tended to generalize Interoperability.

e-Government architecture in Colombia

The platform aims to simplify administrative process for citizens in order to avoid redundancies in many administrations. One of the objectives is to go from bilateral exchanges between administrations to global standardized interexchanges (Figure 35).

FIGURE 35
COLOMBIA: FROM BILATERAL EXCHANGE TO INTEREXCHANGE PLATFORMS
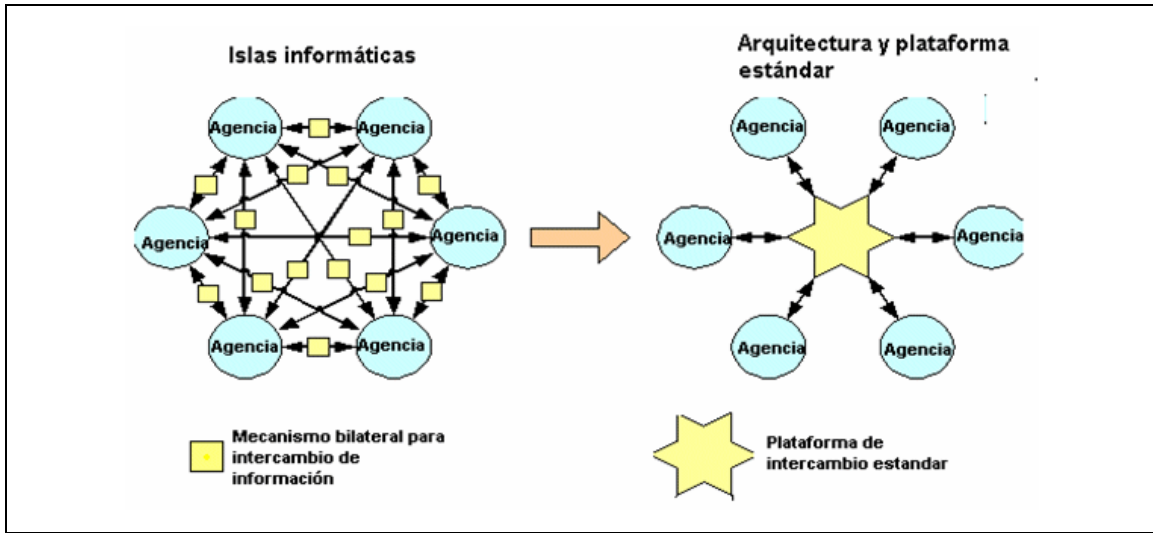
Source: Author's compilation.

In general, Infrastructure and access are two core issues for the country. Therefore an important place is given to the infrastructure level.

As a result, the whole architecture is represented as follows (Figure 36):

FIGURE 36
COLOMBIA: ARCHITECTURE
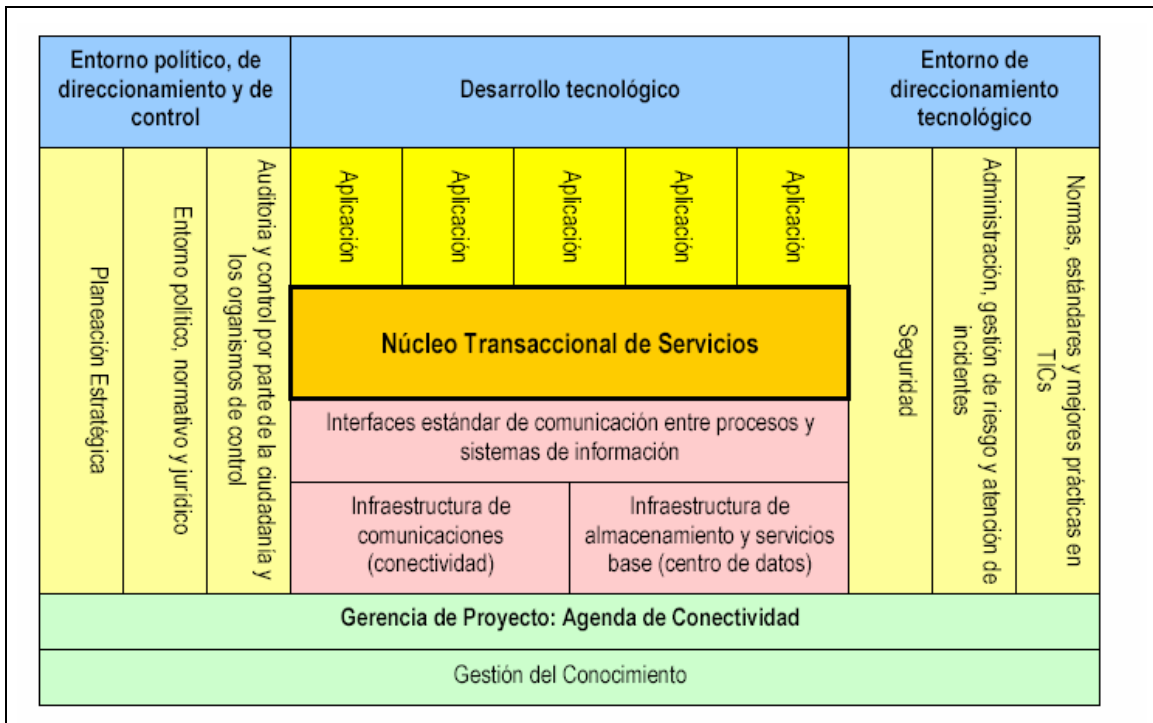
Source: Author's compilation.

The platform of Interoperability lays on a set of standards inspired from e-GIF (UK).

Interoperability framework

The core of the e-Government architecture includes:

- Infrastructure for Connectivity (RAVEC: Red de Alta Connectividad del Estado Colombiano),

- Infrastructure of Data Centres (Centro de Datos),

- Standards for Interfaces,

- Kernel of Transaction Services (ex: Electronic Payment, Mobile transactions, Electronic signature …)

These 4 components constitute the Platform for Interoperability (Figure 37).

FIGURE 37
COLOMBIA: INTEROPERABILITY FRAMEWORK
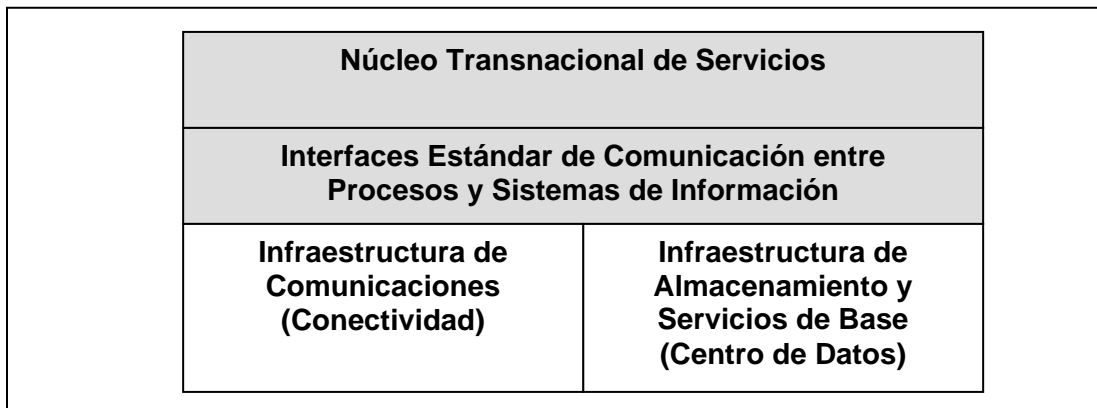
Source: Author's compilation.

The Transactional Gateway (Enrutador transaccional) controls and regulates the interoperability with different levels of security. It provides indicators and statistical results besides coordinating information exchange in order to guarantee the quality and coherence of administrative procedures. The Transactional Gateway can be understood as a kind of middleware centred on procedures and applications more than centred on technical components.

The standards for Interfaces are based on XML. Moreover, applications develop transversal services as well as key independent services. It results important to clarify that in terms of specifications on architecture and especially regarding Interoperability, Colombia focuses its strategy on XML and on the Transactional Gateway.

Nevertheless, there can be general recommendations on principles that concern technical middleware platform but the choice between providers rest always open (I.e., Microsoft, Sun, HP, Linux or others).

XML

The Agenda de Conectividad has defined a language for e-Gov: I.e., GEL-XML. (GEL:Gov Electronic) and only defines standards when they don't exist elsewhere on the market.

One of the main points of the "Agenda de Conectividad" is the definition of GEL-XML.

A specific organization has been set-up to meet this purpose including:

- COINFO,
- The Ministry of Social Care,
- DNP (Departamento Nacional de Planeación, www.dnp.gov.co)
- DANE (Departamento Administrativo Nacional de Estadística, www.dane.gov.co)
- The Ministry of Economy,
- The Ministry of Education,
- The Institution for Families (Bienestar Familiar, www.icbf.gov.co),
- The Superintendency for Finances (Superintendencia Financiera de Colombia),
- UIAF (Unidad Administrativa Especial de Información Análisis Financiero, www.uiaf.gov.co),
- DIAN (Dirección de Impuestos y Aduanas Nacionales, www.dian.gov.co).

GEL-XML (Figure 38) is managed by the "Agenda de Conectividad", but this situation should evolve. The DNP should be getting more involved in the months to come and a contract will probably be signed with an external company.

GEL-XML lays on international standards defined by:

- OASIS,
- ebXML,
- Health Level Seven,
- GS1 / GSMP (www.gs1.org),
- SDMX (Statistical Data and Metadata Exchange, www.sdm.org),
- XBRL (Extensive Business Reporting Language),
- Dublin Core Metadata Initiative that is recognized now as the International reference for Metadata and which is a European Initiative.

With GEL-XML, Colombia participated on international discussions with:

- United-States
- OSCI, Germany
- UKGovTalk, UK,
- Informatioon Management Office, Australia,
- Hong-Kong.

FIGURE 38
COLOMBIA: GEL XML
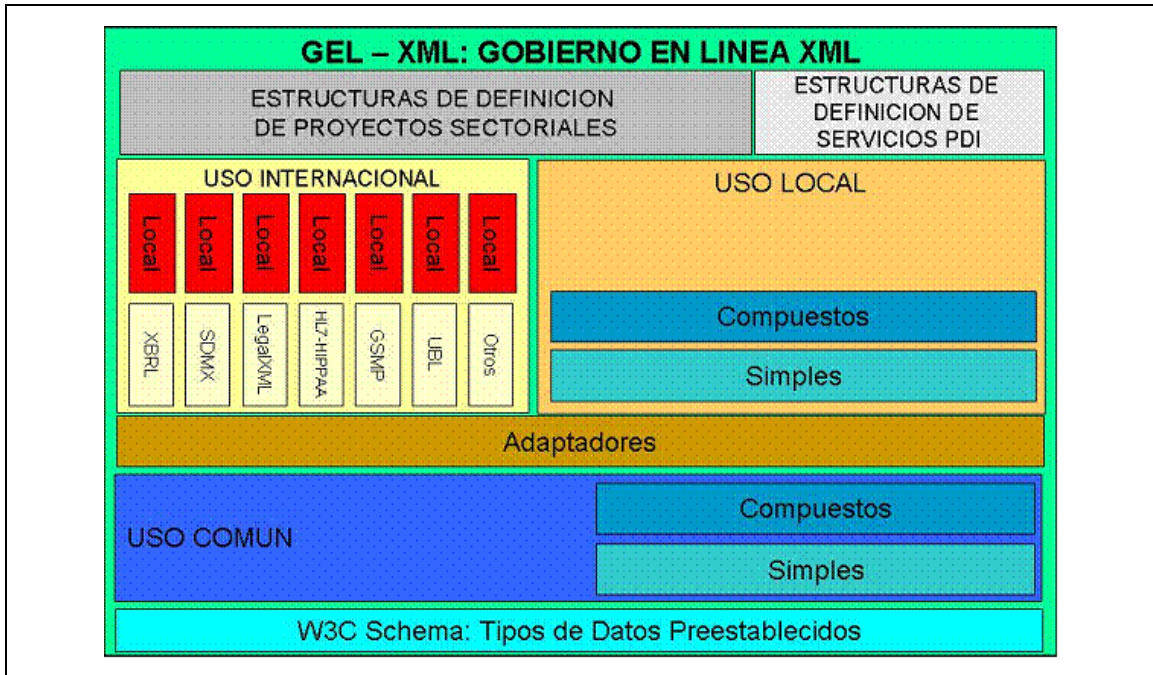
Source: Author's compilation.

With this strategy, all administrations should exchange data through the Platform of Interoperability based on WebServices (SOA).

Portals and Transversal projects

The projects managed by the Agenda de Conectividad (Figure 39) are represented below:

FIGURE 39
COLOMBIA: "AGENDA DE CONECTIVIDAD" EGOV PROJECTS
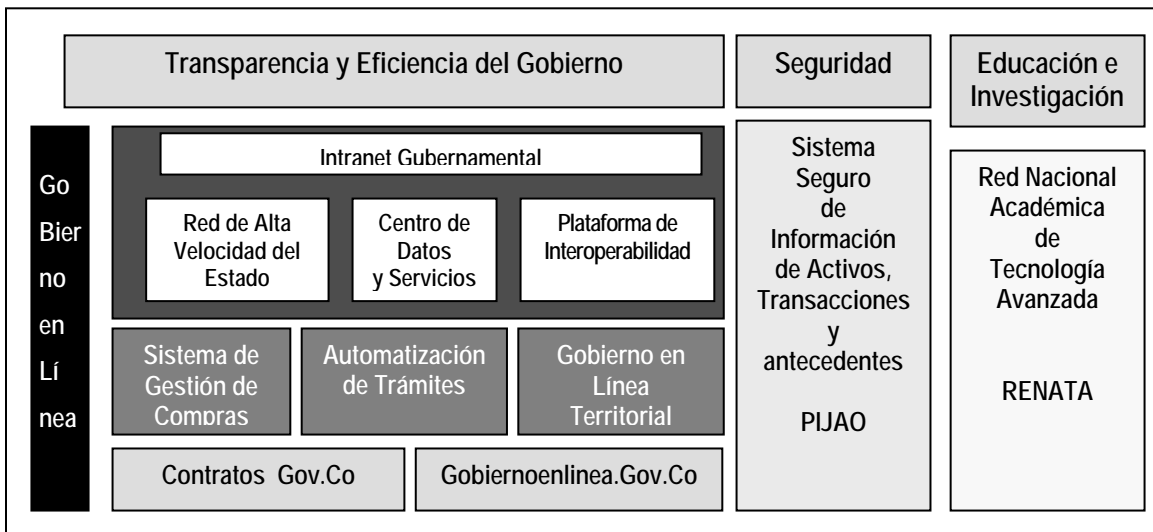
Source: Author's compilation.

A general portal has been developed for citizens, companies and for public services.

This portal (www.gobiernoenlinea.gov.co) allows users to access to information on all administrative procedures.

Other strategic projects are:

- e-Procurement

- Electronic Procedures (some projects are co-financed by "Agenda de Conectividad" and others are under the responsibility of other agents)

- Local Authorities on Line (Phase 1 in 2006: 624 Local authorities connected, Phase 2 in 2007: others 427)

- PIJAO: Security of Information

For these projects, the budget can depend directly on the "Agenda de Conectividad" or can be shared with other administrations.

In addition, "Agenda de Conectividad" is in charge of the specifications of RENATA: the national network for research. RENATA is connected to CLARA developed within the @LIS program and in turn, interconnected to GEANT, the European Network for Research.

The Network between administrations known as RAVEC is currently in operation. 48 public entities are connected. Five local Authorities should be connected to RAVEC by 2007.

The Data Centre is currently in operation and a Price Model is under study and will be applicable in 2007. As for 2007, all costs are supported by the "Agenda de Conectividad".

9 applications are already in operation:

- Government portal,

- Systems on identification procedures,

- Portal de Contratacion,

- RUAF,

- Copyright register,

- On line government for municipalities,

- Vallejo plan,

The Platform of interoperability should be completed in October 2006. GEL-XML specifications will be published on Sept 15, 2006.

Regarding other punctual projects, some implementations have stared to take place. All these projects evidence how the "Agenda de Conectividad" is involved in many transversal projects or dedicated to one administration. In addition, the "Agenda de Conectividad" has started working on Mobile Services for e-Government:

- "Ventanilla del Commercio Exterior" (VUCE[108]) is in operation (since Sept 2006) and that becomes progressively mandatory to be used by companies.

- "Tramites de Importacion de Medicamentos" is a project funded by a World Fund for Narcotics. This project will be completed by the end of 2006.

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[108] http://www.vuce.gov.co/

- The use of RUAF by all companies will be mandatory too at the end of this year. All the process with all Colombian companies will be completed in February.

- The National Registry (SISPRO) in under study.

- Other projects are planned to be accomplished by 2007: "Registro Sanitario", "Autorización de Servicios de Salud", "Solicitud de Citas Médicas".

Other strategic projects are carried out by other administrations related to the "Agenda de Conectividad":

National Department of Planning

DNP is involved in many transversal projects.

A portal (www.sico.gob.co) covers all the policies and programs launched by the government. It includes a system of indicators.

One project which is considered strategic for DNP is the "Archivo General de la Nacion" (www.archivogeneral.gov.co). This project tends to implement a global system of archives that suppose to generalize a global Documentation Management System in the whole administration. Through this project, DNP wants to improve common rules and the sustainability of public documents.

DNP is responsible for the implementation of other important Information Systems such as:

- SUIFP (Sistem Unificado de Inversiones y Financia Publica). This system is in charge of the definition of budgets including 4 stages:

- Formalization of project de investments,

- Inscription of these investments,

- Selection,

- Planning

- SISBEN for Social Programs.

In addition, DNP has developed SITI which is an Information system that is supposed to make an inventory of all hardware and software components of the administration. This system needs to be fed manually. Besides, the reliability on the system is weak.

DNP would like to simplify the codification of Products. Many definitions regarding codification are in use in different ministries:

- SICE : "Sistema de Identificacion de Contratacion",

- CUP : "Codigo Unico de Productos",

- DIAN (Customs)

- UNSCP (International Code from United Nations).

DNP supports strongly the "Agenda de Conectividad" and thinks that the creation of a real institution would be appropriate.

DNP is ready to play a major role in this process according to the decisions taken by the President and Government.

Ministry of Education

The education system is decentralized on 3 levels: Government, Regions, Municipalities.

An integrated strategy has been initiated to modernize the administration. A law was issued defining the responsibilities of the three levels as well as the responsibilities on data. Therefore, data and the exchange rules between the three levels have been defined.

Many exchanges are performed between applications within the Data Centre (Figure 40). In this case, it's a one-to-one exchange. Exchanges between the 3 levels respect XML formats and WebServices. In addition, exchanges with others administrations (Finance, Social Affairs …) have been developed in a One-to-One channel approach.

FIGURE 40
COLOMBIA: DATA CENTER
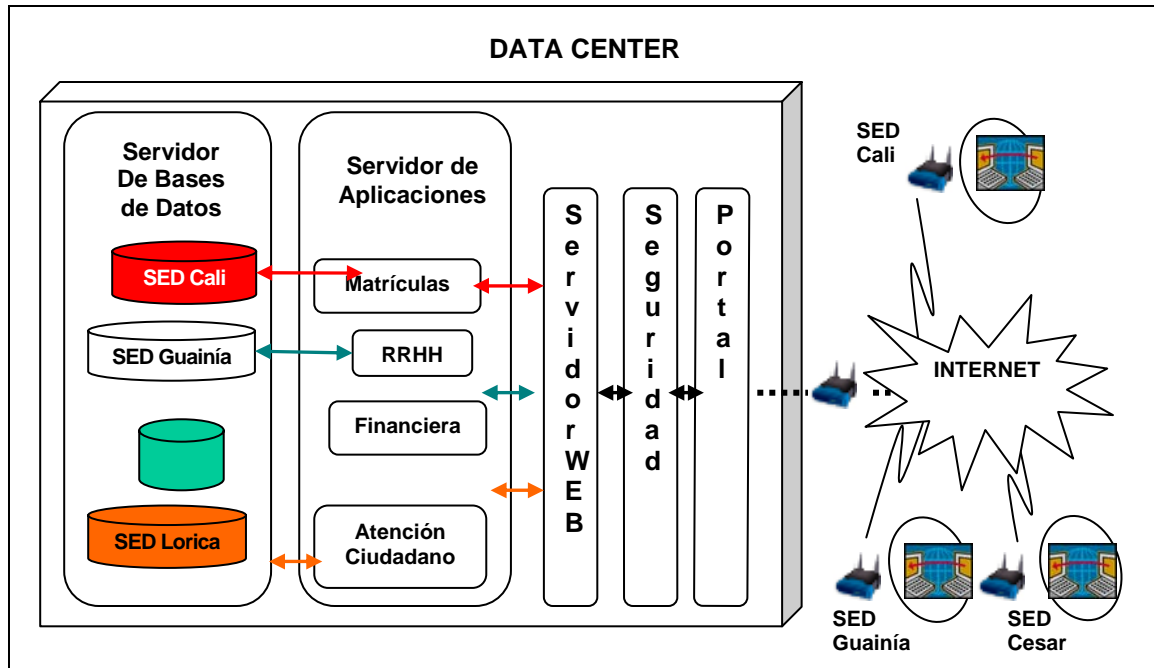
Source: Author's compilation.

All the systems have been developed under the specifications issued by the "Agenda de Conectividad".

The platforms for servers are all based on Linux and Oracle. The workstations work all under Windows.

The Ministry works now closely with the "Agenda de Conectividad" for the new release of exchange service which will be provided by the forthcoming RENATA. In addition, the Ministry of Education participates in a Latin American initiative related to content exchange called RELPE (Red Latinoamérica de Portales Educativos). It gathers 14 Ministries, (www2.relpe.org) and is based on XML exchanges. RELPE works to improve the standardization of these exchanges.

Ministry of Economy and Public Funds

The Ministry decided a few years ago to manage all processes through an Integrated Information system including all phases from budget definition to execution and payments.

The core application is SIIF-NACION (Sistema Integrado de Información Financiera SIIF Nación). It is connected to all internal and external entities such as:

- Systems for Taxes and Customs (MUISCAS),

- National Treasury,

- All Ministries,

- Debt Management System …

The whole process is currently automatic and all agreements are made electronically.

All applications (107 different Information Systems) are integrated in the Data Centre and implemented by the Agenda de Conectividad using the RAVEC network.

They support the Interoperability framework defined by the "Agenda de Conectividad" and especially the use of GEL-XML.

Some improvements are developed under the following premises:

- The migration of SIIF-NACION from a Client-Server architecture to WebServices architecture,

- the introduction of the e-Procurement application in the process,

- the development of a new application FED-ACH (Federal Automatic Clearing House) in order to execute payments directly from the National Treasury to the beneficiary without any transit through administrative levels. That concerns only the payment and not the allocation of budgets.

Regions in Colombia are independent. They execute their budget according to their processes. In order to control the transparency of the process, the Federal government has defined some rules. Each Region is granted a colour that serves as indicator: green, yellow or red which in turn has a consequence on the allocation of the budget. In the future, a law should be issued in order to give the central government the possibility to interfere in the execution of the budget.

Some members of the ministry are related to COINFO (Comisión Intersectorial de Políticas y Gestión de Información para la Administración Pública)

COINFO issues some recommendations on the Modernization of the Administration. It gives as well recommendations on projects that are supposed to be launched by Ministries.

SIIF-NACION has a particular place in Colombia's ICT projects as it is the most important transversal project in the administration. In consequence, a lot of orientations are influenced by what happens with SIIF-NACION.

Ministry of Social Protection

The Ministry is a result of the merge of the Ministry of Health and Ministry of Work in 2002. Thus, the culture of Interoperability has been understood as a natural constraint for a long time.

Several important applications have been launched.

- SISPRO (Sistema Integrado de Informacion de la Proteccion Social).

- RUAF (Registro Unico des Afiliados). A law issued in 2003 formalized this registry. RUAF is interconnected to the statistical national database RIAN.

- PILA (Planilla Integrada de Pagos de Aportes a la Seguridad Social y Parafiscales).

- SISSUB (Sistema de Información para la Operación Territorial del Regimen Subsidiado en Salud) which concerns the operations in Regions.

- SIMED (Sistema de Información para la Modulacion del Mercado de Medicamentos).

SISPRO and RUAF concern the whole population.

The «Agenda de Conectividad» develops all these projects respecting all recommendations issued by the "Agenda de Conectividad".

The Ministry is also strongly involved in the work on GEL-XML. It is an ad-hoc project by itself within the Ministry. There is a specific working group that gathers different organizations in the domain of Health and Social Care.

e-Procurement infrastructure

The e-procurement strategy exists as one of the core projects of the "Agenda de Conectividad". E-Procurement in the country means the Interconnection with Control of Public Expenses and the Registry of Companies. $13.4 Millions have been expended in Software. The hardware is in the Data Centre. Although the projects have long been structured, phase 1 is due to begin in July 2007 and phase 2 is planned to be accomplished by the end 2007. The project will be totally completed in June 2008.

Digital TV is now in the country's scope. A study should be issued to define the standard.

Conclusions

The strategy of Colombia regarding e-Governement architecture is characterized by a global approach including:

- a strategic plan,

- a clear approach of a common architecture with a specific focus on the Transactional Gateway and on XML standards (GEM-XML),

- a lot of transversal applications driven by the "Agenda of Conectividad" (under the responsibility of the Ministry of Communications) and by the DNP.

The dual approach Transactional Gateway and GEM-XML seems very powerful and innovative. It is representative of the general trends in e-Government architectures at the international level.

Hot issues described for Colombia are summarized in Figure 41.

FIGURE 41
COLOMBIA EGOV ARCHITECTURE HOT ISSUES
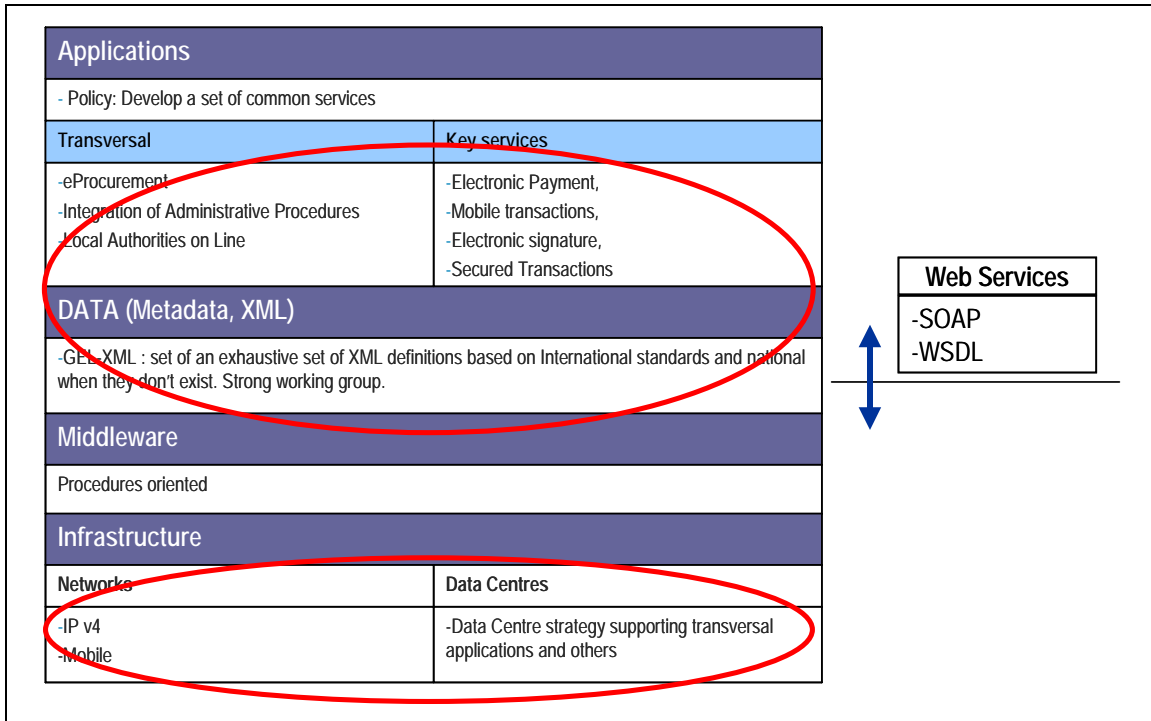
Source: Author's compilation.

4.2.4. Mexico

Background

In 2000, 170 procedures were available on Internet but it was only for information and documents. In 2006, more than 1700 procedures were on line in a transactional mode. In average, Mexico holds 800.000 accesses per month.

There is, however, a necessity to have a clear view of the different ICT strategies issued by the government:

- e-Mexico for services for citizens,

- e-Gov for the modernization of Administration organization,

- e-Education,

- e-Salud for Health services

- e-Economy to improve the competitiveness of Mexican companies.

The portal of Administration services and procedures, e-Mexico, is not an Integrated system. It's a Portal that provides access to all procedures with no interconnection between them, nor interoperability.

Interoperability framework

Interoperability is one of the most important priorities for the new Commission (Comisión Intersecretarial para el Desarrollo del Gobierno Electrónico) setup in 2006.

After succeeding in putting all procedures on-line, Mexico pointed out the necessity develop a "Framework of services". The following objectives have been defined:

- To obtain the general inventory of e-services that the office brings to citizens in general.

- To identify the WebServices to be created in each e-service as well as to identify where other offices should also intervene.

- To boost the usage of WebServices and/or processes to be used by other offices and/or services

- To improve the analysis and design of WebServices that could be used by other e-services.

- To establish procedures in order to promote e-services as well as data model definition.

- To consider market development as well as standards (cost & risk reduction)

- To lower the impact in terms of volume and frequency transaction (scalability)

- To lower the impact in the sub-processes under WebServices without altering the functionality of the e-service. (flexibility)

The options that the Secretary of Public Services has chosen to meet this objectives are:

- to define an architecture based on dual platform (Figure 42): Java/J2EE (originally SUN but used by many companies (in an Open Source environment or not) and .net (Microsoft),

- to base all exchanges on Web Services SOA (Services Oriented Architecture).

FIGURE 42
MEXICO: THE DUAL PLATFORM
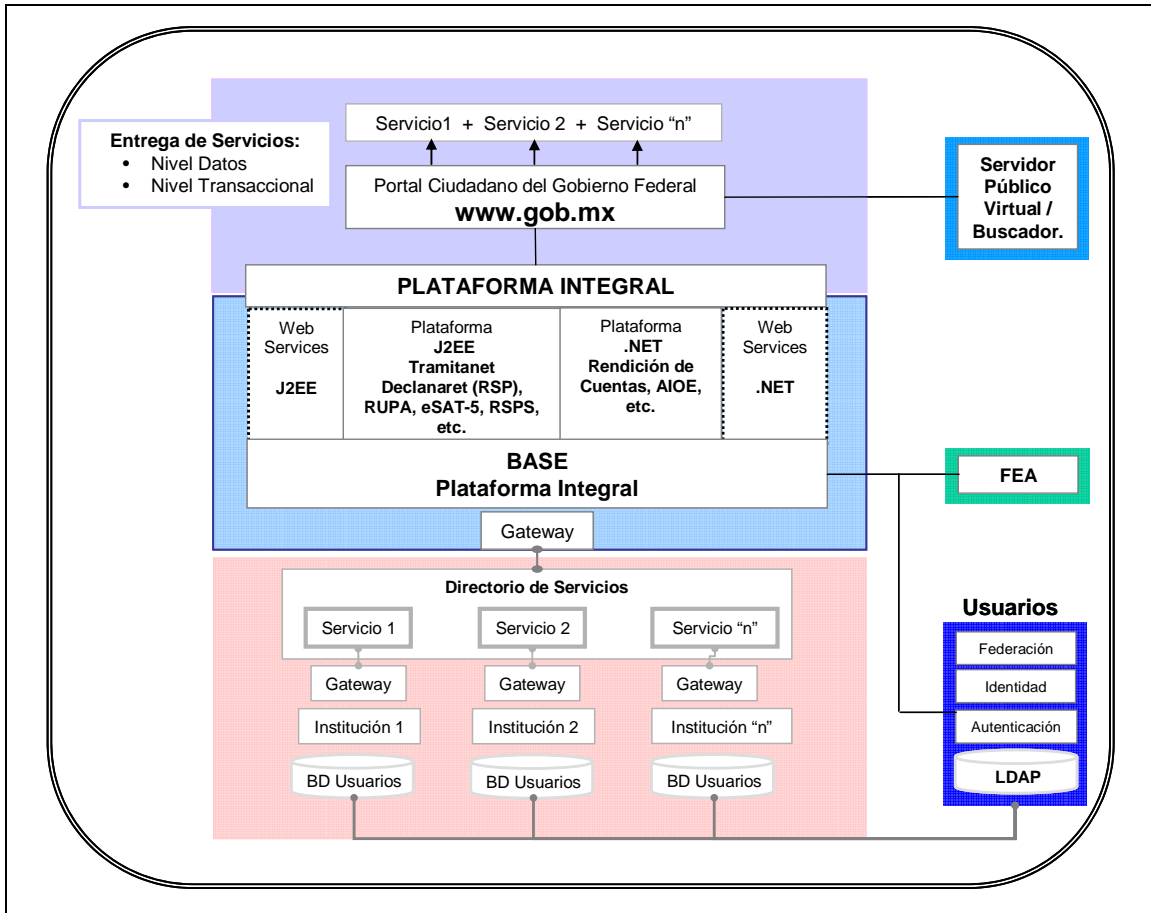
Source: Author's compilation.

FEA: Electronic signature (Firma Electronica Avanzada).

The Gateways are in charge of the translation of data.

XML is used for these exchanges but there is not a global strategy that defines unified XML formats in all e-Gov sectors.

Benefits expected from the common architecture are:

- a rapid growth of low cost common architectures in different administrations,

- standardization of interoperable exchanges through WebServices,

- integration of administrative procedures (from aggregation to integration of procedures),

- allow the creation of a Single Office

Currently the country is working on a document in order to define:

- a methodology of analysis of e-Gov services,

- a methodology of definition of Web services,

- Development guidelines

- Publication guidelines

- Security and Standards guidelines

- Guidelines for a reliable delivery of messages and requests I

- Identification and Authentication of Users

- Guidelines for Information exchange and Data Structure

- Standard gathering

XML

Mexico has put more emphasis in developing the platform layer hence considering infrastructure as a core issue. In other words, their interoperability's centre of gravity lies on Networks and national Data Centres for supporting transversal applications. Middleware is an important issue as well, as they have decided on a dual platform for WebServices (J2EE/Java, .NET).

Portals and Transversal Projects

For President Vicente Fox, Administration innovation is a priority. Citizens and Society have been placed at the centre of the government's daily activities in order to regain their trust.

The national challenge was that every public institution had to contribute in building a government that would work like all Mexicans desire. Therefore, there was a need for methods, procedures and a new culture to drive the changes.

e-Mexico proposes the Procedures on Line to citizens through a global portal (www.e-mexico.gob.mx). The e-Mexico strategy is involved in 3 Technical Committees:

- Interoperability Committee,

- Architecture Committee,

- Strategic Management.

- These technical committees are part of the new Commission.

The strategy is in close collaboration with other countries:

- Central American countries,

- Korea,

- Chile and Brazil in relation of the e-Procrument system (CompraNet),

- Brazil on Portal Generation System,

e-Mexico is either in charge of many strategic projects, or involved in them. Such projects are:

- The Observatory on Information Society,

- Capacinet (Training On Lie),

- IFAI (Instituto Federal de Accesso a la Informacion, (www.ifai.org.mx),

- CURP (Codigo Unico de Registro de la Populacion),

- CompaNet which is based on the Chile Compra,

- Correo Digital in order to provide a mail address to any citizen,

- Mobile e-Services (Penetration of Mobile is 50%, penetration of internet is 20%)

The portal of e-Gov (www.gob.mx) integrates all high-impact services of the Federal Government, with links to services of State and Municipal governments:

- Organization and clustering of contents by topics

- Interrelationship of topics using Semantic Web technology

- Tool for transparency and citizen participation

- Growing recognition and popularity

- >600,000 unique users/month

The "Secretariat" is involved in other initiatives especially with all related to the transparency law.

- IFAI- The Federal Institute for Information Access (IFAI) operates and manages the unique system to handle information requests made by citizens (SISI) based on the Freedom of Public Information and Transparency Act (2002)

  General public information is also posted on government web sites (Budget, salaries, organizational issues, directory, contracts, regulations, mechanisms for citizen participation, main programs and objectives, services, formats, auditing activities, … .). Since June 2003, more than 100,000 citizen requests have been placed. More than 95% were handled on-line.

- Citizen Relationship Management (CiRM): e-Petitioning

- Foundation of the Federal Network for Citizen Participation

- e-Government and Training (e-Learning and Knowledge Management platform for public servants)

- ICT for Education

- Social Security with IRSE

- Services for Business with the RUPA

- Employment in Cooperation with professional institution (professional chambers) with the ChambraNet and Chambratel (Chambranet available on a call centre) services,

- DeclaraNet for declaration of personal assets,

- CompraNet for e-Procurement Services,

- eSAT (Servicio de Administracion Tributaria www.sat.gob.mx) for tax filling and payments …

e-Procurement infrastructure

Regarding the e-procrument system, CompraNet Plus has been the latest of CompraNet's releases. The public expenses of CompraNet Plus represent $20 billions a year. CompaNet Plus will perform all the procurement process. This system is inspired by Chile Compra, but it differs from the Mexican model, in terms of technical solutions. CompaNet Plus is based on a SAP architecture (Figure 43).

FIGURE 43
MEXICO: E-PROCUREMENT ARCHITECTURE
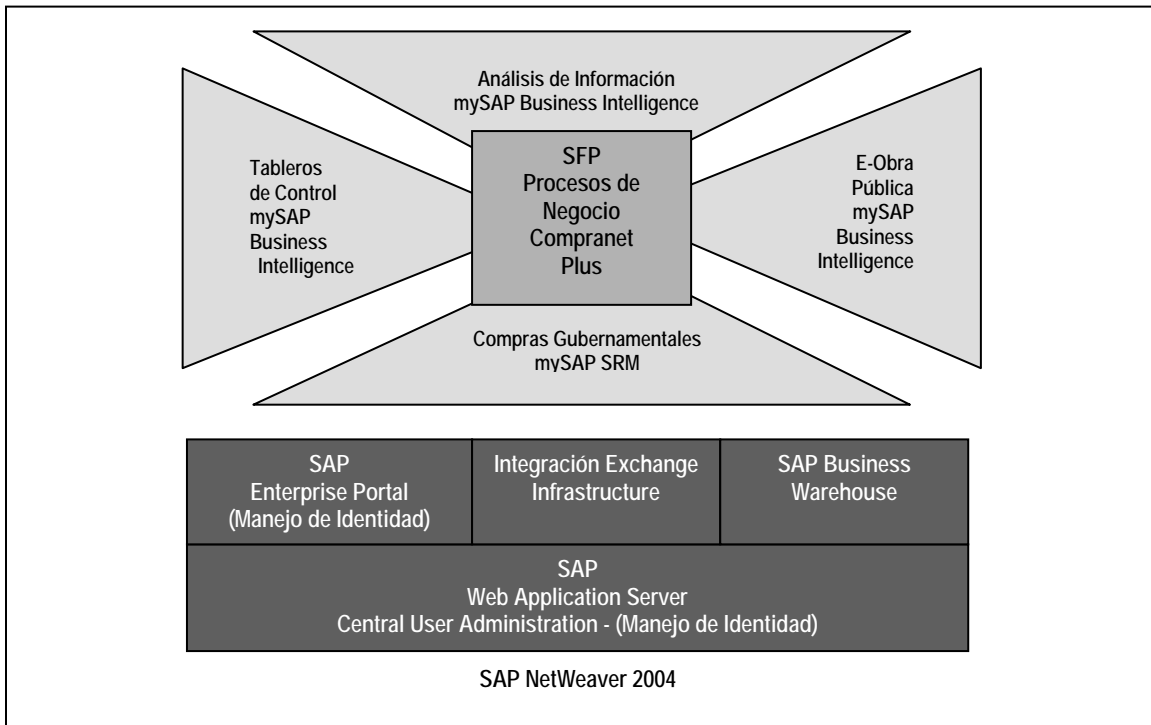
Source: Author's compilation.

Public tenders represent 80% and others are submitted to direct orders.

100% of public tenders use CompraNet (more than 30.000 tenders a year with #50.000 companies).

Interconnections with others administrations are limited.

Conclusions

Mexico has developed a powerful set of online procedures being one of the most efficient in the world according to OECD.

Common architectures and interoperability have progressively appeared as a new priority: applications have to communicate and data needs to be exchangeable.

Like most of the countries observed, Mexico aims to develop an architecture based on WebServices. However, the Mexican strategy differs from other countries by pointing out the importance of a middleware platform (based on Microsoft .net or Java) rather than emphasizing on the role of XML.

This interesting approach aims to organize technical platforms in order to be easily used by any administration central or local (including interesting prices, maintenance, scalability …).

Hot issues described for Mexico are summarized in Figure 44.

FIGURE 44
MEXICO EGOV ARCHITECTURE HOT ISSUES
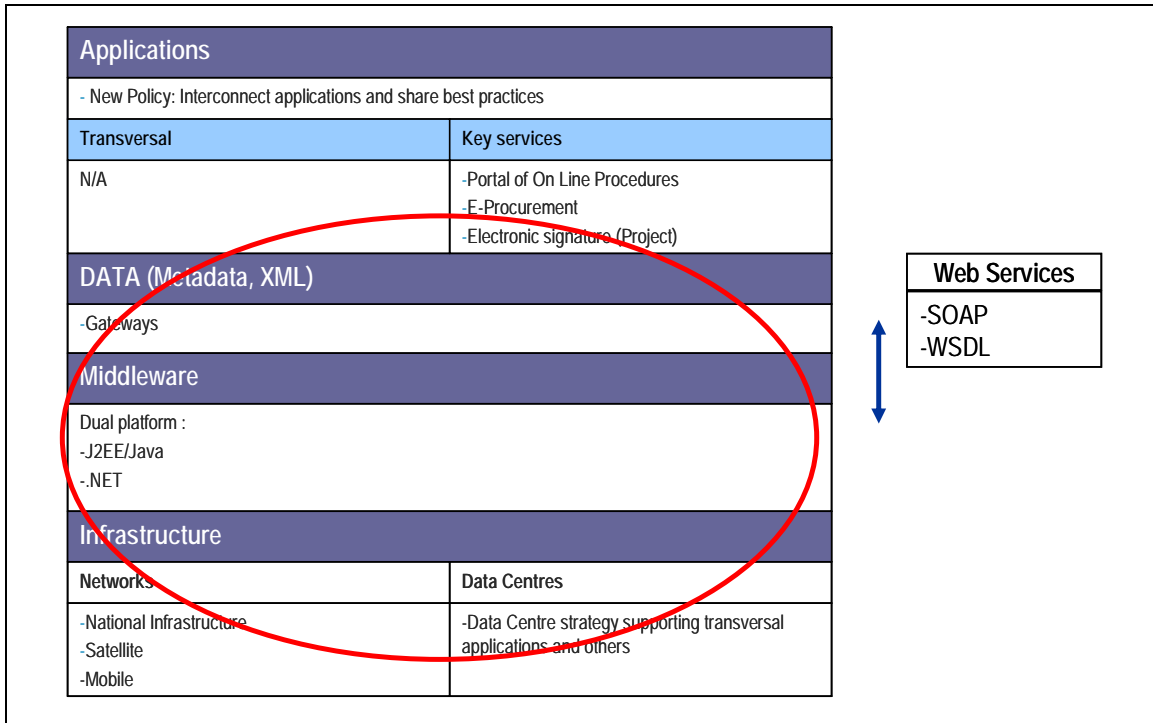
Source: Author's compilation.

4.3. eGov Institutional environment in Latin America

4.3.1. Brazil

CEGE

CEGE (Comitê Executivo do Governo Eletrônico) is the Executive Committee for e-Gov and is attached to the Presidency. 18 technical committees are defined in CEGE.

The CEGE is presided by Dilma Vana Rousseff, Chief Ministry of the "Casa Civil" attached to the Presidency.

SLTI

As already mentioned, the SLTI (Secretaria de Logistica a Tecnlologia da Informaçào) is the structure within the Ministry of Planning in charge of the e-government strategy.

ITI – Presidencia – Casa Civil

ITI defines the policy on four strategic issues. The most relevant are:

- Free Software

- Technology knowledge dissemination

- "PC for everyone"

- Digital signature

CDTC (Centro de Difusão de Tecnologia e Conhecimento) has a strategic role to promote and disseminate technology.

ITI considers that some technologies can be proprietary but some others no longer can. People should access them without any barriers. ITI promotes the appropriation of Open and free technologies by the population. However, it is not contradictory that ITI recognizes the Intellectual property rights on the products or standards developed by the industry.

The program "PC for everyone" is developed in association with MIT where this program was initiated by Nicholas Negroponte.[109]

Regarding the Free Software strategy, the concept of "Public Software" has been defined. It strongly promotes the use of the GPL Licence.

ITI works closely with Universities that play a key role in:

- developing advanced software,

- proposing them on free access,

- implying students in using and developing free software,

- working in large communities.

Department of System Integration of SLTI

The department of System Integration is responsible to develop the 7 Projects driven by the Ministry of Planning. Six of these projects are managed by a Project Manager coming from the Functional Direction of the Ministry (Human Resource, e-Procurement …).

The Finance project is managed by a Project Manager coming from the Ministry of Finances.

Today, all exchanges are based on XML and Web Services (previously, all the exchanges were defined in a one-to-one approach). New system specifications are based on an Open Platform and they adopt the e-Ping specifications.

However, a lot of legacy systems lay on Mainframes and Natural Adabas which was the most common Database in the Brazilian administration. Some gateways were developed to access these systems.

Associação Brasileira de Estudos Populacionais (ABEP)

The Government and the State are committed in a program of Modernization of Administrations. This program is funded by the BID. Hence, there is a trend, to adopt the same specifications and the same solutions by States. All this coordination is driven by ABEP.

PRODERJ (with currently 900 employees) has the responsibility to:

- define the strategy,

- implement architectures and applications,

- maintain all systems and applications,

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[109] Nicholas is founder and chairman of the One Laptop per Child non-profit association. He was co-founder and director of the famous MIT Media Laboratory

- promote ICT in the state of Rio.

PRODERJ has adopted e-Ping specifications strongly supporting the Open Source Software policy. All servers are now under Linux. There are currently 32.800 workstations and the program "migration to Linux and Open Office" has begun. There are a lot of cultural resistances but positive results may come after migration.

A cheap workstation has been developed by PRODERJ in order to promote the e-Inclusion Program.

Naturally, PRODERJ is a strong supporter of e-Ping and Open Source Software promotion in ABEP. In general, the State (I.e, Pernabuco, Parana …) agrees on that policy. Others however, are more independent such as the State of Sao Paulo. The public administration in charge of ICT is PRODESP (2000 employees) and they have their own Interoperability strategy. PRODESP is not a promoter of Open Source solutions.

Some applications developed by SLTI have been adopted. That is the case of CACIC developed by SLTI for DATAPREV (Ministry of Social Security) at its origin.

ABEP intends to promote the Governmental Applications developed by SLTI. However, the cooperation with SERPRO which in turn, is in charge of the technical architecture development and implementation is not optimum in some domains. This could be a reason for some States to prefer promoting independent solutions.

4.3.2. Chile

In 2000, a decision was taken by the President known as: "Modernizacion del Estado con la Informatizacion".[110]

It's important to understand that the Modernization of the State is closely linked to the Democratic process as it represented a way to give up old rules of the former regime.

This process started in 2001 giving birth to an agenda in 2002. The objectives defined at the time were:

- To improve democratic process,
- To develop transversal projects (Chilecompra, Gestion financiera del Estado, Tramite Facil …)

The "directorio de Gobierno Electrónico" was setup in 2003 in order to organize the coordination and the management of transversal projects. This structure included:

The governmental coordinator of ICT, The executive director of PRYME and other several chiefs in the public service that helped in the incorporation of ICTs on the business environment (Ie, National tax services, General treasury, Institute of Normalisation, ID service and Chilecompra). The coordination is responsible of the Modernisation project of the country.

Attached to the Presidency, a CIO was appointed in 2003 to develop the strategy.

Two Committees were created:

- e-Gov Committee
- Standard Committee

Different projects were defined:

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[110] www.modernizacion.cl - Proyecto de Reforma y Modernización del Estado (PRYME)

- la "5 Vertical": In Chile, the number "5" is closely linked to the "Road 5" that goes from North to South (5000 km). "5 Vertical" refers to a National Network Infrastructure Initiative,

- Info Educacion,

- Government on line

- Productividad del Estado,

- Desarollo del sector Publico …

A diagnostic was issued pointing out the necessary improvement for interoperability.

A law was acted at the same time specifying the obligation:

- for each administration to be responsible of gathering all administrative document, anywhere they are, when a citizen makes an administrative request,

- to answer in a maximum delay of 70 days. If the administration doesn't answer, the request is considered as accepted.

Agenda Digital

On march 17, 2004, the president make issued officially the Digital agenda (http://www.agendadigital.cl). In the country. The main actions in the agenda contain 34 initiatives within six areas. The agenda is available in the portal www.agendadigital.cl as well as a work plan with defined indicators that help the follow-up of all compromises.

The main goals achieved by the "Grupo de Acción Digital" have been the ample public-private agreement for national strategy for 2010 as well as an action plan 2004-2006. In addition several compromises were established with an allocated budget for assessing, controlling and managing its impact.

Up to October 2005 goals were advancing as planned. As an example there is the broadband installation in educational establishments. Also strengthening Research and Development on ICTs as well as the approval of the "Royalty" law that assures a fund for the innovation for competitiveness. Some rules for budget allocation have also been drawn and the Sub secretariat of Economy will survey the national strategy for Innovation and competitiveness

The role of Tax Administration

In 1995, the Ministry launched a Web Server to propose general e-Government information. In 1997, the first transaction was available for companies to declare their revenues.

Today, all companies are connected and 97% of the population declares revenues on Internet.

The RUT (Rol Único Tributario) is the national identification number and it is now used everywhere.

Companies declare revenues of all employees by using the RUT. Banks have to identify all accounts with their RUT number and have to declare all revenues. All personal financial transactions (houses, cars and often small expenses are declared by using the RUT). All children are identified as well as their specific expenses or revenues before they declare to be independent …

In the end, the Tax administration prepares all declaration of revenues. If they are differences with what the citizens propose to declare, they can be asked to justify themselves.

For companies, the Tax Administration proposes a system to issue invoices. If companies adopt this service they will be able to manage all process related to revenues.

Many relations exist with others administrations.

The Tax Ministry is one of the key players of the project "Plataforma Integrada de Servicios del Estado". This ministry is the one that defines standard adoption.

The Ministry participates actively on international exchanges and discussions such as the OECD and with several European countries (Ie, Spain, The Netherlands, Denmark …) and/or Asian countries (China, Singapore …).

4.3.3. Colombia

Agenda de Conectividad

The objective of the Colombian Government is to reduce the Digital Divide. To meet this goal, the Ministry of Communication, through the program "Agenda de Conectividad" (Figure 45) structures the national strategy. The Ministry is mostly concerned by access. 17% of the population is connected to PSTN. Internet penetration covers only 12% and only 4,3% have access to broadband. By now, 57% of the population uses a Mobile phone, thus having the most important growth of Mobile penetration in Latin America.

FIGURE 45
COLOMBIA: "AGENDA DE CONECTIVIDAD"

Source: Author's compilation.

Within this strategy five principles have been defined:

- Support convergence,
- Create the conditions to face to globalization ,
- Develop access and a universal service,

- Develop competitiveness in the country,

- Accompany the development of the market at the institutional level.

In the same time, a strategic plan is driven by COINFO (Comisión Intersectorial de Políticas y Gestión de la Información para la Administración Pública, www.coinfo.gov.co).

The "Agenda of Conectividad" has 3 missions:

- To manage strategic projects which are defined according to 3 criteria:

- They are related to strategic priorities by the central government,

- They have a socio-economic impact,

- They should have a significant coverage

- To promote and coordinate e-Gov policies,

- To promote policies on Information Society.

Parallel to the creation of the "Agenda de Conectividad", the "Departamento Nacional de Planeacion" (DNP) issued a plan to be completed by 2019 for the 200th anniversary of the Nation of Colombia under the name of "Colombia 2019".

Colombia was deeply involved in the World Summit on the Information Society. The country strongly supports ELAC 2007 besides being very active on two working groups: Teleworking and Alternative Technologies.

Other priorities in the Ministry of Communication such as Appropriation, Education, Indicators (www.sigob.gov.co) are also taken into account. With regards to the Open Source issue, Colombia prefers to stay neutral. As an example, the Program "PC para Todos" is supported by Microsoft, at the same time that an agreement with China was signed to purchase cheap PC.

The Ministry of Communication wants to develop new areas of interest, not only on Telecommunications infrastructures, but on developing Internet services and ICT Industry.

4 ideas drive this new strategy:

- all Colombians must be able to access Internet and information,

- Colombia needs to develop the ICT sector,

- ICT should contribute to develop and modernize the economy,

- The government has to develop a policy in favour of Digital TV and Radio.

Hence, two consequences result from the above:

- the Ministry of Communications becomes more transversal. That supposes the improvement of relations with other ministries. This will be a long-term strategy initiated by the Ministry,

- the e-Gov policy rest as an important issue, but not exclusively. Therefore, the Ministry has to face new strategic issues with the same budget as before.

Some discussions took place last year on budget cuts in the Ministry of Economy. However, the Ministry was able to keep its budget.

The institute in charge of improving the Innovation in Science and Technology is called COLCIENCIAS (Instituto Colombiano para el Desarrollo de la Ciencia y la Tecnología

zulia.colciencias.gov.co/portalcol). The Ministry has close relations with this Institute as it wants to improve the innovation on ICTs.

National Department of Planning

The National Department of Planning (DNP in Spanish) is an independent administration. In order to make the most appropriate recommendations, the DNP needs to understand the whole reality of the country and of the administrations.

It is involved in the Modernization of the Administration. Besides, ICT is a strategic issue for DNP.

One of the main objectives of DNP is to improve coherence and rationalization on ICT Investments. DNP wants to promote the exchange of best practices and solutions. DNP is at the same time an active member of COINFO and a strong promoter of Colombia 2019.

4.3.4. Mexico

e-Mexico

The first political strategy that was initiated in Mexico was expressed in a document named "Plan Nacion de Desorollo Economico 2000-2006".[111] This document was issued by President Fox. It points out the necessity to develop competitiveness on the country. The modernization of the Administration appears in the Plan as a strategic point in order to provide efficient services to citizens. The name and political objectives of "e-Mexico" are explicitly defined[112] including 5 families of services:

- Education
- Health,
- Economy,
- Administration,
- Services to citizens.

After issuing this strategic Plan, the Ministry of Communications & Transport (Secretaria de Communicaciones y Transportes) defined a specific strategic plan: "Programa Sectorial de Communicaciones y Transportes" for 2001-2006.[113]

This Program detailed specific actions. The two mains lines of these actions were:

- Access for all the population with Infocentres. There are 10.000 now in Mexico. Many are connected by satellites (256 uplink, 512 downlink),

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[111] pnd.presidencia.gob.mx

[112] En términos de la infraestructura de la nueva economía, el gobierno desempeña un papel importante en la adopción generalizada de tecnología digital del país. Para ello, el gobierno desarrollará un sistema nacional para que la mayor parte de la población pueda tener acceso a las nuevas tecnologías de la informática, y que éstas sean el vehículo natural que intercomunique a los ciudadanos entre sí, con el gobierno y con el resto del mundo. Este sistema, llamado "e-mexico", incluye servicios de educación, salud, economía, gobierno y otros servicios a la comunidad.

[113] dgp.sct.gob.mx

- Contents with the objective to propose all administrative procedures on line through a global portal. I.e., e-Mexico.

e-Mexico was pointed out by OECD[114] and United States as the most efficient set of public services to citizens.

e-Mexico drives the IFAI (Instituto Federal de Accesso a la Informacion, www.ifai.orgmx) program and service. This service was a result of the law on transparency (LEY FEDERAL DE TRANSPARENCIA Y ACCESO A LA INFORMACIÓN PÚBLICA GUBERNAMENTAL, Nueva Ley publicada en el Diario Oficial de la Federación el 11 de junio de 2002, www.ifai.org.mx/transparencia/LFTAIPG.pdf)

e-Gov

On its side, UGEPTI (Unidad de Gobierno Electrónico y de Política de Tecnología de Información) the structure within the "Secretaria de la Función Publica", is in charge of Architecture & Interoperability within the Administration.

Considering that the e-Government applications have been developed in an heterogeneous way, the UGEPTI is in charge of the New Commission's Technical Committee.

Their objective is therefore: "the creation of a technological architecture for the development, coordination and administration of electronic governmental services, that can guarantee interoperability in an informational level as well as the transaction between different e-services that will be developed in several dependencies of the Federal Public Administration including the one from TRAMITANET".

Access

The "Secretaria de la Gobernacion" is involved in all Technical Committees, considering Interoperability as a major issue for request access. A national network was built over the national electricity network.

In a country like Mexico, interoperability is considered basically by the Secretary as a question of access. Taking this into account, a national plan has been defined to develop a network for the whole administration. An agreement has been signed with the National Commission of Energy in order to use a fibre infrastructure over their own network.

The Ministry has developed a strategy for 2002-2006 in 3 phases:

- creation of infrastructures (2002-2003),
- creation of solutions (2003-2005),
- consolidation (2005-2006).

IT architectures and applications are designed and implemented to meet exclusively the Ministry's needs.

They are mainly based on UNIX and LINUX with Oracle and MySQL databases.

Open Source is an important issue for the Ministry. However, it is not a question of policy but of financial considerations. Interoperability is thus, the new challenge.

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[114] www.oecd.org/document/29/0,2340,fr_2649_37441_35249437_1_1_1_37441,00.html

A new Commission

A new Commission known as the "Comisión Intersecretarial para el Desarrollo del Gobierno Electrónico" is now supposed to work on common topics between different administrations.

Some of the challenges for Mexico in the near future are:

- *Enable additional change by strengthening leadership and enhancing communication with key stakeholders involved in the eGovernment effort*

- *Adoption and institutionalisation of a National/Federal CIO (Chief Information Officer) and Agency/Department CIO´s*

- *Better integration of horizontal components of e-Government across the Good Government Agenda (cooperation opportunities)*

- *Further reinforce efforts to assist local and state governments with the development of their e-Government initiatives*

- *Work together around shared customer groupings in order to promote seamless service delivery.*

- *In a way, these new challenges point out the fact that after the successful development of On Line services, these services need to better Interoperate.*

The "Comisión Intersecretarial para el Desarrollo del Gobierno Electrónico" is the structure in charge to find the answer to these challenges. It was officially created in December 2005.

4.4. General Trends

XML and WebServices took the lead in Latin America. In a way, Latin American countries could be considered as more modern than countries in other regions. This could be due to the fact that legacy systems are more flexible than in other countries. However, there are some differences in the region as well. For example, in a country like Brazil, the legacy systems are important.

There are three kind of strategies for platforms:

- Total official neutrality (Colombia and Chile): it can be considered by looking at the strong positioning of Microsoft .net platform,

- Neutrality among two families of platforms (Mexico): .net (Microsoft) and Java

- Open Source Platform as far as possible and project by project (other cases, i.e. Brazil).

In all countries, the role of transversal projects is fundamental. They are used as a key point to develop strategies directed at promoting common architecture and interoperability.

We can try to point out the key points for Architecture and Interoperability in each country (Figure 46):

FIGURE 46
EGOV SYNTHESIS OF ARCHITECTURE KEY ISSUES

Brazil
e-Ping Interoperability Framework based on XML
Open Source Architecture including dissemination by appropriation of softwares by any local player
Transversal national projects.
Chile
Common platforms on critical inter-administration services
Integrated portals
XML and WebServices
Colombia
Transactional gateway of procedures
XML (GEM-XML)
Transversal projects
Mexico
Integrated Portal of Procedures
Common platforms based on Microsoft .net and Java
Gateways
Items International

Source: Author's compilation.

This table simply intends to show a series of priorities in architecture and interoperability at the national level, country per country. It must be interpreted carefully. Hence, mentioning the main trends per country in the table above does not necessarily exclude others that are not mentioned.

In addition, it is important to notice that eServices on Mobiles are considered as a key point in all countries for the near future. Even in countries where fixed lines penetration is < 20%.

V. Recommendations

5.1. A favorable environment for improving e-Gov in Latin America

5.1.1 Latin American countries on line with the general trend

Latin American countries have strongly developed e-Gov applications in the last few years and especially after 2000.

Regarding architecture issues, LA countries seem to be more pro-active than many other countries in the world. In a way, e-Gov services appear as one of the most visible examples of Government reform and modernization in order to improve transparency and democracy.

Moreover, most of LA countries have developed strategies that foster the use of XML and WebServices. The level of implementation of these technologies and standards differs from one country to another, yet the commitment towards XML and Web Services appears globally as a strong target.

5.1.2. Applications needs interoperability

Interoperability appears as one of the most strategic objectives of e-Gov implementation, yet this issue was not necessarily a priority in all countries. The case of Mexico illustrates this trend: On line procedures are considered by OECD as one of the most efficient in the world, but the need to interoperate has been a more recent concern.

All countries have developed Portals or Transversal applications. Interoperability, therefore appears now as the next step in e-Gov implementation process.

Latin American countries have engaged processes to develop Interoperability Frameworks. Some countries like Brazil and Colombia have developed advanced results.

Most of Latin American countries pointed out the importance of international relationships. Moreover, the UK e-GIF framework is usually referred.

It seems natural that the regional level of international relationship could be improved regarding interoperability issues.

5.1.3. The importance of Multi-Channel Architectures in Latin America

The World Bank has stressed the importance of M-Government in emerging countries.

This issue appears as crucial for the future of e-Government applications in Latin America where penetration of fixed lines is substantially inferior than mobile penetration.

In this sense, mobile access has important implications for E-Gov architectures.

The improvement of m-Governement applications could take advantage of common interoperability rules taking mobile architectures into account, as opposed to the risk taken when facing developments to all e-Gov applications.

A strategic objective could be for Latin American countries to transform this risk into an opportunity (Figure 47):

FIGURE 47
OPPORTUNITY TO INTEGRATE M-GOVERNMENT
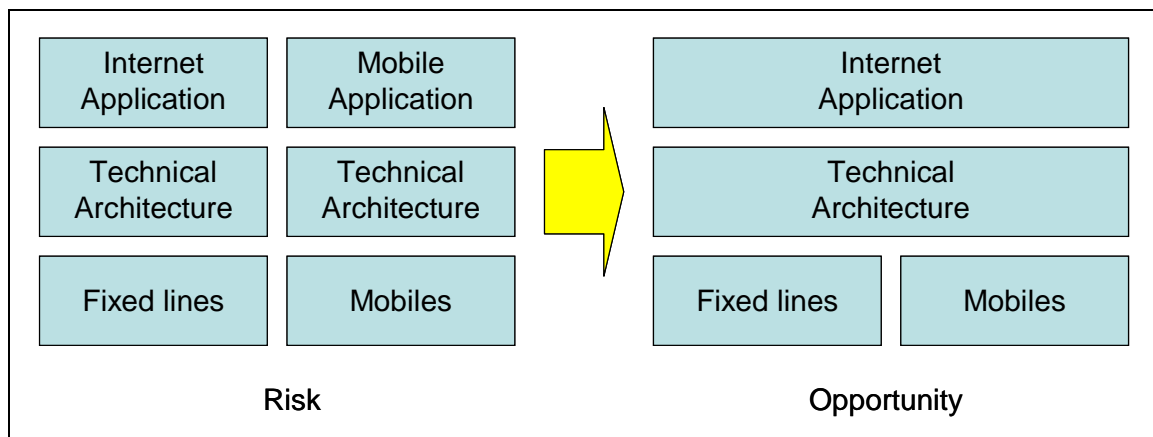
Source: Author's compilation.

There is no strong initiative of m-Gov in the world at this moment:

- In Europe and in North America, there is no strong incentive for M-Government with a high penetration of fixed lines

- in other emerging countries, the development of E-Government is not so high as it is in Latin America.

- However, organizations like ETSI, could support such kind of initiatives.

5.2. Promoting transnational e-Gov applications & services

5.2.1. Difficulties to develop common applications within Latin American organizations

An important characteristic to withdraw before going on is that e-Government applications are mainly applicable in national environments. Procedures for citizens are specific according to the global administrative organization within countries and their national laws. There is therefore, no specific interest to develop common applications aiming to provide common services to citizens.

The study has pointed out that the pillars of interoperability are made of transversal applications in LA countries. In the same way, these applications are very specific to each country, especially regarding the organization and responsibilities of individual administrations.

5.2.2. Needs between countries

The development of e-Gov Web services is easily hindered by the lack of financial, political and legal support. National governments have difficulties to gather the necessary expertise or infrastructure to address crucial security and technical issues.

Still, the development of transnational e-Gov applications and services can open the way to overcome barriers in a cost-effective way to exchange information. It is possible to develop standard yet organised e-Gov platforms.

For example, it can be difficult to exchange data between governments unless this issue had been addressed first. That is even the case when they are geographically close, and even if they actually intend to work together.

In this sense, key services often provide "de facto" interoperability. As soon as they are adopted by other countries, they set up the common rules for their family of applications.

It is also possible to develop them as basic building blocks for local e-Gov architectures.

The development of such transnational applications and services has now become a priority item for major e-Gov agencies throughout the world.

5.2.3. Difficulties and risks to develop common services

The main risk of developing common services is to draw the difference between problems that need a local answer, or that can be answered more efficiently through local institutions, and problems that could be solved once and for all through a common (regional) platform.

For example, there is no real need in a key service designed to enable Electronic Signature and to dematerialize administrative procedures. Most of them rely too much on local administrative specifications.

In the same way, the development of transnational key services is often difficult due to the fact that they are very much project-oriented. As we explain below, this particularity of key services can foster their development, but it also means that they are often developed without much planning. As a result, it could be possible to develop a key service for an application that is already being developed, or that has already been developed, by a local government.

It is also important to mark the limits of key services, and their differences with other means of e-Gov. Under some circumstances, sharing best practices and developing interoperability frameworks can be a better way to ensure the growth of e-Gov.

But the role of key services is fundamental in e-Gov architectures, as they already are an important part of the strategy chosen by Latin American countries. Eventually, they often lead to the development of an interoperability framework.

The development of key services can also help to structure e-Gov architectures by deciding what sort of WebServices, or Metadata Language will be used. That means that these key services will set up the data structure for the future. They will create the conditions allowing different countries to exchange information together. As we explained before, key services can help to build a solid and interoperable infrastructure at the lower layers of the architecture.

Contrary to other forms of e-Gov cooperation, key services are more practically-oriented. They offer a direct approach. And they can address multilateral agendas. This is one of the reasons why IDABC concentrated on their development.

In other words, key services play a double role: they structure e-Gov architectures at the technical level through the development of applications and services. And they structure national agendas at the political level by leading to Interoperability Framework.

Practically speaking, key services can be used to define technology solutions.

They can address the very basic and common requirements of many Governments: maximising synergies through interoperability to achieve greater efficiency and economies of scale at Community level.

They can be especially efficient for primary types of interoperable technology solutions:

- network services

- hosting services

- middleware

- security services

This is directly leading to what we called "de facto" standardisation. Such key services will be used by different countries at once. They will define the standards to be used by business and citizens. Once again, this logically leads to the eventual development of an interoperability framework.

But besides infrastructure needs, it is also possible to develop key services for business applications.

Specific solutions can be designed for the particular "business" needs of different policy areas.

- Workgroup tools

- e-procurement

- Translation support

- Guides to legislation

- Portal to Services of Public Administrations

- Policy-Making

This open strategy seems greatly beneficial to key services development. Instead of relying on local or proprietary choices, it becomes possible to propose a solution, and to offer others to build upon it. As long as it takes place in a field that is prone to use key services, the choice of openness can be a good way to ensure the development of the proposed solution.

This promotion role seems extremely important. It evidences that transnational key services are not always a matter of planning, but also a problem of re-use conditions. In that sense, promoting a solution is not only a question of spreading the word. It also means that it is necessary to organize the conditions for its adoption.

Once adopted as a transnational key service, the following step naturally seems to be centered around policy and interoperability frameworks.

5.2.4. Domains of Transnational cooperation

As a result of the above, there are some domains where cooperation could be appropriated:

e-Procurement

All countries have enabled processes in order to develop e-Procurement services in administrations. Chile has probably the most advanced application including a national repository of all private vendors.

This example has been analyzed by other countries as a "model" of good practice. It shows how Latin American countries can collaborate either by adopting the same technical architecture or not. In this case, the functional architecture is the key point and the implementation can be set-up on one or another technical platform.

Customs

There are several actors involved in international commerce operations, such as customs authorities, forwarders, carriers, banks, insurance institutions, traders, warehouses, manufacturers, truckers, etc.

These actors need to improve trade procedures by reducing trade processing time and costs through trade automation, trade administration and foreign exchange.

The lack of cross-border customs clearance and paperless trading among Latin American countries evidences the need to establish secure cross-border transaction services.

It also underlines the need for technical standards for interconnection (interoperability):

- Trade Automation: Export and Import License, L/C opening and arrival notice,

- Logistics Automation: Export and Import permit, Declaration of Goods, Duty back, etc

- Customs Automation: Declaration of Arrival and Departure, Transportation of

- Shipments, Customs Clearance, Cargo Management, Duty draw back, etc.;

The objective to integrate, progressively, the trade-chain integration: Query – Quotation – Ordering – Issuing L/C – Shipment transportation – Export document licensing

Goods and services nomenclature

Linked to customs process, the nomenclature of goods is a critical issue that hinders the possibility of cooperation.

Within a country, the nomenclature can differ between tax administration and customs. This evidences the complexity to solve the issue especially because of the weight of legacy

systems. (E.g., Some nomenclatures are defined regarding specific national classification and others respect for example UNSPC[115] formats).

Without any cooperation on this issue, the difficulty to develop critical applications such as custom-exchange data between countries grows bigger.

Security

There is an important need to begin programs of data-exchange related to dangerous people. For the moment this issue has not been of relevant importance.

Other exchanges

It is clear that Inter-banking exchanges do not relate to e-Gov services. Nevertheless, administrations are not neutral regarding this issue. As economical stakeholders, they have the responsibility to control financial exchanges. Therefore, the lack of international standards is a barrier regarding the efficiency of these controls. Banks use standards but in reality it is often difficult to trace the end to end chain in an international inter-banking exchange.

5.3. Sharing Architectures best practices & specifications

5.3.1. Centralized and decentralized architectures

Given that each administration is generally in charge of modernizing their own procedures (internal or towards citizens), it results in organizations architectures depending of each administrations.

Moreover, transversal applications behave differently as they are generally centralized. Therefore, the key point to consider in order to progressively develop common services and various interactions between administrations, is Interoperability.

In a decentralized architecture on one hand, it implies that all systems need to develop either ad-hoc gateways between applications or "standard gateways" where each application interacts with another through standardized interfaces (Figure 48).

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[115] www.unspsc.org

FIGURE 48
FROM BILATERAL AD-HOC EXCHANGES TO STANDARDS GATEWAYS IN A
DECENTRALIZED ENVIRONMENT
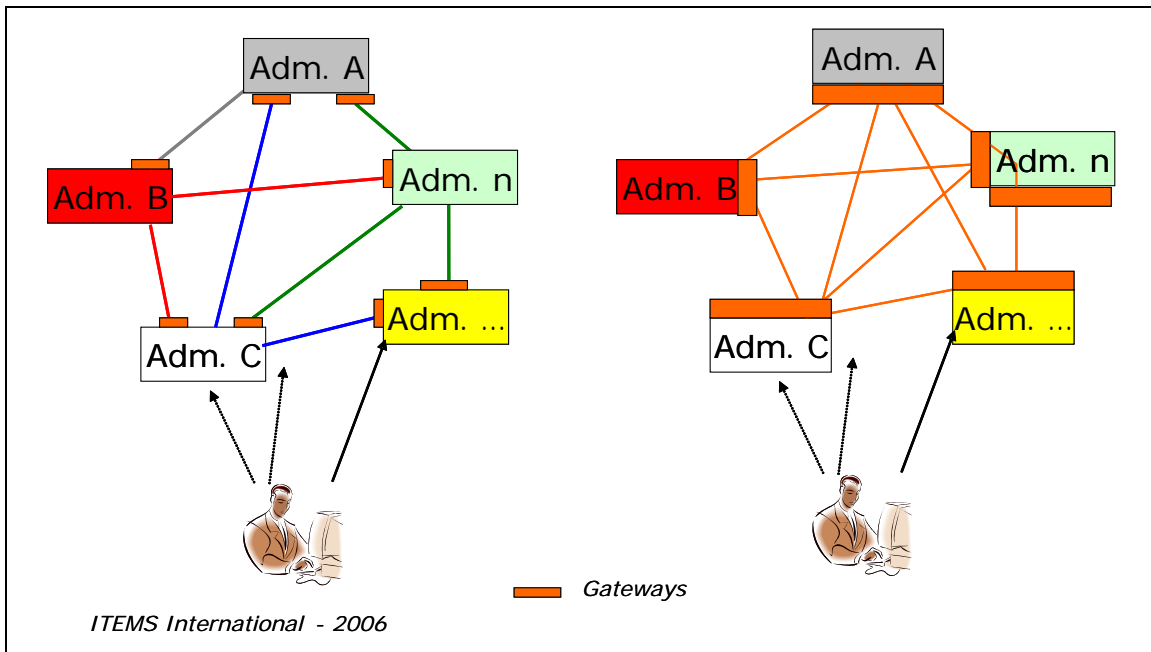
Source: Author's compilation.

Comments:

- *ad-hoc gateways (in orange) developed by one administration to communicate with another one (left side of the graph),*

- *standard gateways developed by all administrations to exchange data in respect of standards only (right side of the graph).*

On the other hand, in a centralized architecture either the central application supports ad-hoc gateways, or the other applications have to adapt to the specifications of the central application (Figure 49). In this case, we can imagine that it could be appropriate for this application to adopt standard interfaces.

FIGURE 49
FROM AD-HOC EXCHANGES TO STANDARDIZED EXCHANGES TOWARDS
CENTRALIZED PLATFORMS

ITEMS International - 2006
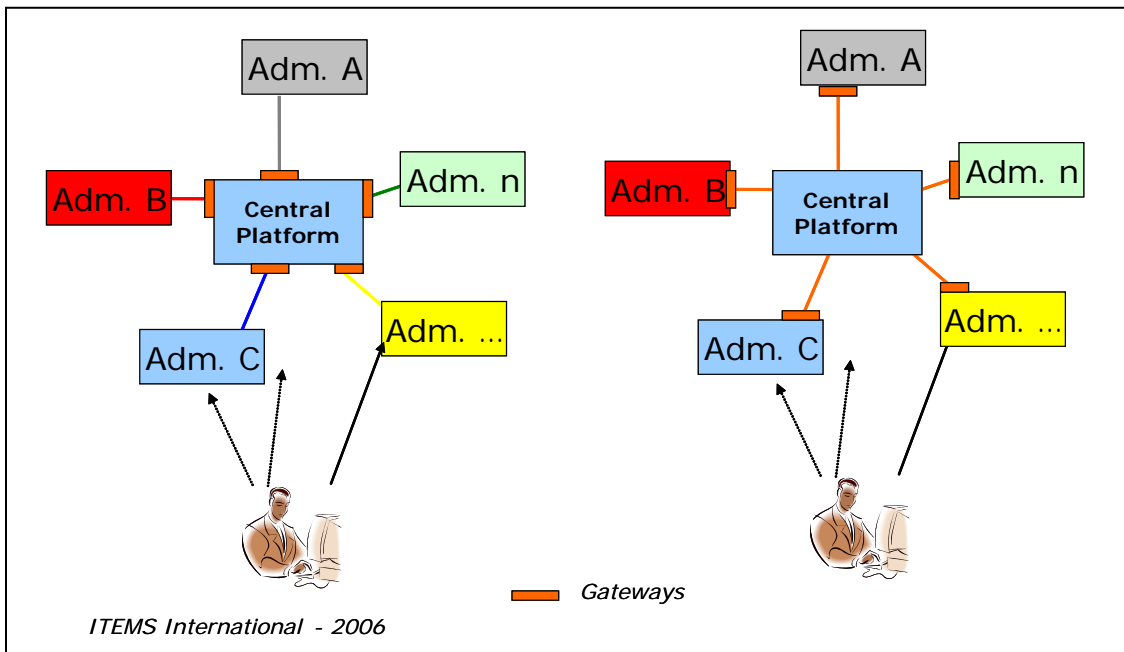
Source: Author's compilation.

Comments:

- *ad-hoc gateways (in orange) developed on central platforms to communicate with all administrations (left side of the graph),*

- *standard gateways developed by all administrations to exchange data in respect of standards only (right side of the graph).*

The study evidences that centralized and decentralized architectures coexist. We can observe as well, the importance of transversal applications as they reinforce the role of centralized architectures.

Regarding interoperability, the countries aim to develop standards interfaces based on XML / Web Services. An important number of applications however, run by using specific data formats.

It's not realistic to adapt all formats and services to XML / WebServices. Nevertheless, it is critical to adopt measures that foster administrations in order to move on regarding XML/WebServices.

We have observed that most of the countries have implemented Data Centers for e-Government applications. The existence of these Data Centers is an opportunity to improve independency of DATA. Thus, by developing "data centers", Latin American governments move towards "data-centered architectures" where data is independent from applications. The key is to ensure that the data can flow between systems and agencies in a format that can be easily understood by all. As the Propylon White paper explains, " *the only way to build an integration infrastructure to last is to base it on the one thing least likely to become obsolete: the data. E-*

Government Infrastructure should be based on the data that it needs to store and process. Applications and specific technology implementations should be considered expendable, and should in no way determine the integration infrastructure. "

These data-centered architectures – even if they aren't based on XML – lead to the next step: adopting XML and "service-oriented architectures".

From this point of view, Latin American e-Government strategies converge with the three major e-Government architectures trends identified in the Literature review:

- Web services: The purpose of any distributed computing architecture such as CORBA, EDI, etc, is to enable programs in one environment to communicate and share data/content with programs in another one.

- "service-oriented architecture" (SOA) is associated with a pioneering integration concept based on a coordinated set of international standards that already presents wide acceptance. The aim of this standard is to improve the interoperability of heterogeneous software systems whilst also significantly cutting the current high level of integration costs. SOA is based on established internet protocols and data models like http and XML supplemented by other standards.

- XML: there is widespread global consensus on XML as the best way to exchange information. XML is the obvious choice because unlike other formats, humans can read it, all computer systems can be modified to understand it and it can contain not only raw data, but information about what the data means through embedded data-description tags.

5.3.2. Best practices

Different organizations have encouraged the promotion of "Best practices" in e-Government applications. Some of these initiatives already exist in Latin America (ELAC, "Partnership for Effectiveness in Latin America & Caribbean", RED GEALC, CARICAD, UNPAN …). However, they are not specially focused on Architecture or Interoperability.

The exchange of experiences is important in e-Gov Architecture building as it has been done in Europe through IDABC. Hence, it seems relevant to set-up an observatory of best practices in Architectures in LA.

5.3.3. Pooling e-Government specifications, components and software

An important amount of specifications, components and applications has been developed for and by Latin American administrations. Some of these applications have been specifically developed and have advanced their technical or functional characteristics in specific domains such as internal management, electronic exchanges with citizens, enterprises or other services.

Facing similar needs, national and local governments are developing "from scratch" applications already made elsewhere.

Hence, re-using what has been already done by another government could lead to a better use of public funds by allowing countries to benefit from other country's advances.

This "re-use" approach (code) covers a spectrum of practices: reuse of specifications (often the most expansive and most valuable part of a solution), reuse of components, reuse of software.

The pooling software project could use the "Pooling Open Source" study developed by the European IDA program[116] in order to draw its main lines of action.

5.3.4. A e-Gov Architecture & Interoperability Observatory for Latin America

The best way to share relevant information including standards, components of architecture … and to take profit from best practices could be to launch a strong initiative related to an "e-Gov Interoperability Observatory for Latin America".

The **eGovernment Architecture & Interoperability Observatory** would be set up to position the regional trends and latest developments on eGovernment interoperability in Latin America, and to serve as a reference for stakeholders in eGovernment interoperability in the region. The eGovernment Interoperability Observatory would aim to cover local and regional governments. It would be open to all stakeholders and offers them opportunities for discussing experiences and needs, developing recommendations for future research, and establishing synergies.

ETSI who was in charge of the "Dialogue on Standardization" within the @LIS Programme[117] is ready to collaborate with Cepal in this perspective.

5.4. Policy for Architecture in e-Government

5.4.1. Interoperability Framework

Interoperability frameworks define a set of "open standards" and guidelines which describe the way in which organizations have agreed, or should agree, to interact with each other. It addresses interoperability at different levels, including technical interoperability and data interoperability.

Recent policy initiatives have brought interoperability to the centre of governance framework. And the existence of a strong interoperability framework is considered as the central key point of architecture in e-Gov applications.

Developing an interoperability framework can be done at a national level, or at an international level. For example, The European Interoperability Framework was developed under the Interchange of Data between Administrations program. As stated in its first draft, it focused on "supplementing, rather than replacing, national interoperability guidance by adding the pan-European dimension".

In addition, interoperability frameworks can be a tool for national and international uses. They offer several levels of regulation, and can be updated regularly.

Regarding the layers model we described in our template, we can try to define some approaches with regards to Interoperability framework.

- Access: This layer is critical regarding the Multi-Channel issue. Application needs to be accessible by Internet today and from mobile as soon as possible.

- Platforms: It is important to insist on the importance of technological neutrality regarding implementations of applications and services. In the same time, different

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[116] (Interchange of Data between Administrations). http://ec.europa.eu/idabc/en/document/2623/5585# feasibility

[117] http://www.alis-etsi.org/

countries have developed process to validate e-Gov application on .net and Java platforms.

- XML and WebServices: Probably the key point of an up-to-date interoperability. Organizations like OASIS have developed a set of XML formats. But many problems are still unsolved in most e-Gov applications. Just like the problem we addressed with mobile, XML and WebServices are the most appropriate issues for improving collaboration between Latin American countries.

- Key services and Applications: Regarding the questions of defining an Interoperability Framework, we think that collaboration at this layer could be limited to some specific issue like Security, Electronic Signatures.

5.4.2. Privacy

eGovernment heavily relies on the reuse and exchange of personal data.

Interoperability raises the technical barriers to this reuse and exchange. From this point of view, interoperability-based architectures should be balanced by privacy regulations. However, the application of these rules needs to be controlled by independent authorities.

E-Government architectures involve digital identity and access management infrastructures for access to government services by citizens and businesses.

This architecture challenges cannot be solved by simply adopting modern enterprise architectures for identity management. Namely, these architectures involve a central server that houses the capability to electronically trace, profile, impersonate, and falsely deny access to any user. In the context of an e-Government infrastructure, the privacy and security implications for citizens of such a panoptical identity architecture would be unprecedented.

The Liberty Alliance ID-FF architecture[118] (the leading industry effort for so-called "federated" identity management) has been proposed in this privacy protection perspective by major vendors (Sun, IBM …) in collaboration with some e-Gov national agencies. This approach is argued by privacy advocacy groups.

5.4.3. Security

The security issue is part of the Interoperability Framework. Its implementation is generally based on a PKI architecture.

It is important to notice that the key point of the debate is here to define who manages this PKI Architecture:

- delegation to private player ,

- direct management by administration.

This issue is very complex and goes further than the architecture issue.

5.4.4. Sharing and distributing Source code

Governments have to observe technical neutrality regarding implementation of applications. In this perspective, the Interoperability framework defines standards but let an entire liberty to administrations to choose vendors and services providers.

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[118] www.projectliberty.org

In the same time, we think that governments can request in some cases:

- the right to access the code in order to adapt software to their specific needs,

- the right for an administration to redistribute the software to other administrations or local authorities,

- the right to use as they want the software they have bought.

Example of application of these obligations shows how national administrations and local authorities can take benefit of such an open environment. One of the key points is the ability to any local software engineering company to implement applications 1-to the benefit of local authorities, 2-by improving conditions of local economic development for this kind of companies.

Annexes

Annex 1 - Glossary

This glossary gathers information from:

- ITEMS International
- IDABC Programme (European Commission),[119]
- Wikipedia[120]
- The Computer Dictionary[121]
- Various publications or Websites (W3C, OASIS …)

A2A, A2B, A2C	In analogy with B2B and B2C, A2A, A2B and A2C refers to transactions between Administrations and others administrations, business organizations or citizens. Similar to G2G, G2B, G2C
ACCESS (to a system, to data, to a software process)	In general, the right to enter or make use of. In a computer context, entry granted to a software path that establishes the right to use a system and its resources; to read, write, modify, or delete data; and/or to use software processes with various capabilities, (v.) to achieve the status of having access.
ACCESS CONTROL	The granting or denying to a subject of certain permissions to access a resource (e.g., to view a certain file, to run a certain program).
API	Application Program Interface. An interface between the operating system and application programs, which includes the way the application programs communicate with the operating system, and the services the operating system makes available to the programs. For example, an API may make it possible for programs that run under it to open windows and display message boxes. (filename extension)
APPLET	Small application. For example, a Java interactive animation applet could be included within a web page or television enhancement if the user platform includes a Java run-time engine.
APPLICATION SERVER	Program that handles all application operations between users and an organizations' backend business applications or databases. Application servers are typically used for complex transaction-based applications.
ASP	Application Service Provider that provides computer-based services to customers over a network.
ASSURANCE	Confidence that a system design meets its requirements, or that its implementation meets its specification, or that some specific property is satisfied.
AUDIT TRAIL	The results of monitoring each operation of subjects on objects; for example, an audit trail might be a record of all actions taken on a particularly sensitive file or a records of all users who viewed that file.
AUDITING	The process of making and keeping the records necessary to support accountability. See audit trail.
AUTHENTICATION (OF IDENTITY)	An adjunct step to identification that confirms an asserted identity with a specified, or understood, level of confidence. Authentication can be used to provide high assurance that the purported identity is, in fact, the correct identity associated with the entity that provides it. The authentication mechanism can be based on something that the entity knows, has, or is (e.g., a password, smart card that uses some encryption or random number for a challenge-response scheme, or a fingerprint).
AUTHORISATION	Determining whether a subject (a user or system) is trusted to act for a given purpose, for example, allowed to read a particular file.
AVAILABILITY	The property that a given resource will be useable during a given time period, for example, that an encrypted file can be decrypted when necessary.
BACK DOOR	An aspect of a system's mechanism that can be exploited to circumvent the system's security.
BACK OFFICE	Computer infrastructure within organization, which supports core business process

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[119] http://europa.eu.int/idabc/

[120] http://www.wikipedia.org/

[121] http://computing-dictionary.thefreedictionary.com/

SYSTEM (or BACK END)	applications but has no external interface with costumers (unlike a Web site or portal)
BANDWIDTH	A measure of the amount of electronic data that can be transmitted, either down a telephone line or through an individual radio channel. In analogue systems, it is measured in cycles per second (Hertz) and in digital systems in binary bits per second. (Bit/s). The broader the bandwidth, the quicker the information can be transmitted (see also broadband).
BENCHMARKING	A detailed analysis of an electronic reporting program to determine whether it can be used in whole or in part in another state or agency.
BEST PRACTICES	Methodologies that provide beneficial results. Some best practices are general in nature and can be applied to almost every industry; other best practices are industry-specific.
B2B	Business to Business. Refers to electronic commerce transactions between organizations
B2C	Business to Consumer. Refers to electronic commerce transactions between the costumer and an organization.
BPEL	In computing, Business Process Execution Language (or BPEL, pronounced 'bipple', or 'bee-pell'), is a business process language. It is serialized in XML and aims to enable programming in the large. The concepts of programming in the large and programming in the small distinguish between two aspects of writing the type of long-running asynchronous processes that one typically sees in business processes.
BROADBAND	A transmission medium that can carry signals from multiple independent networks carries on a single cable, by establishing different bandwidth channels. Broadband technology is used to transmit data, voice, and video over long distances and, because many different frequencies operate concurrently, more information can be transmitted more quickly that conventional telephone lines (in the same way that more traffic can flow on a motorway than a single lane road).
CERTIFICATION	The administrative act of approving a computer system or component for use in a particular application.
CERTIFICATION AUTHORITY	A specially established trust organization or part of a large organization that accepts the responsibilities of managing the certificate process by issuing, distributing, and verifying certificates.
CGI (common gateway interface)	An application that enables an HTML document to call an executable program, pass information to it, and display the output in a dynamically created document. CGI scripts are used to count Web site hits, handle database queries, etc.
CLASS LIBRARIES	A collection of software object classes, or a set of pre-built and pre-tested software components that can be used as building blocks to develop applications. Class libraries are often provided by development tool vendors and may also be purchased from third-party vendors.
CLIENT	A computer program that relies on services provided from another software module to complete its intended function. A client, as it relates to an n-tier client/server programming environment, is not a computer or a human being. (2) A human user of a computer application (3) A workstation attached to a server on a network
COMMUNITY	A constantly changing group of people collaborating and sharing their ideas over an electronic network (e.g., the Internet). Communities organize their collective power by affiliation around a common interest, by the compression of the time between member interactions (i.e., communicating in real time), and by asynchronous "postings" which potentially reach more participants and allow for more reflection time than real-time interactions.
COMPONENT	Piece of set of piece of Hardware or Software that is supposed to integrated in a system, an application or a service. (See Service Component and Component Architecture).
CONFIDENTIALITY	The protection of information against interception or receipt by third parties.
CONTENT MANAGEMENT SYSTEM – CMS	A tool used to organize data. Some are very elaborate and expensive; some are free and easy to used.
CONTENT PROVIDERS	People or sections within organization who contribute materials (in the form of HTLM pages, forms, documents, graphics files or PDF files) to organization's Web site or Intranet, controlled by a central unit.
COPYLEFT	Copyleft is a concept drawn by Richard Stallman and the Free Software Foundation as a license that reiterates the four freedoms of the Free Software philosophy to be reproduced in identical terms in the case of redistribution. This avoids the distribution of the modified software restricting the initial rights.
COPYRIGHT	A copyright is a set of exclusive rights granted for a limited period of time to protect the particular form, way or manner in which an idea or information is expressed.
CORBA	The Common Object Request Broker Architecture (CORBA) is a standard defined by the Object Management Group (OMG) that enables software components written in multiple computer languages and running on multiple computers to interoperate.

	One considers that IT architects can forget CORBA in WebServices / SOA approaches. Others do not agree and defend the key role of CORBA to adapt middleware architecture to WebServices. At the end, it is a reality that CORBA was more important in Entreprise Architecture in the late 90's that it is now with EAI driven by WebServices.
CUSTOMER RELATIONSHIP MANAGEMENT (CRM)	Customer relationship management (CRM) is a broad term that covers concepts used by companies to manage their relationships with customers, including the capture, storage and analysis of customer information. There are three aspects of CRM which can each be implemented in isolation from each other: 1- Operational CRM- automation or support of customer processes that include a company's sales or service representative 2- Collaborative CRM- direct communication with customers that does not include a company's sales or service representative ("self service") 3- Analytical CRM- analysis of customer data for a broad range of purposes
CYBERSPACE	This term is currently used to describe the whole range of information resources available through computer networks.
DATABASE	Information maintained in a computer storage system.
DATAMINING	Data mining (DM), also called Knowledge-Discovery in Databases (KDD) or Knowledge-Discovery and Data Mining, is the process of automatically searching large volumes of data for patterns using tools such as classification, association rule mining, clustering, etc.. Data mining is a complex topic and has links with multiple core fields such as computer science and adds value to rich seminal computational techniques from statistics, information retrieval, machine learning and pattern recognition.
DIGITAL SIGNATURE	A digitized analogy of a written signature, produced by a cryptographic procedure acting (commonly) on a digest of the message to be signed.
DIGITAL CERTIFICATE	An electronic device, which is issued by a third party to attest to the authenticity of the issuer of a document. The combination of encryption techniques and the use of an independent third party prevents fraudulent documents from being accepted as genuine facilities secure transactions between, for example, a government agency and citizens using its services or a bank and its costumers.
DOMAIN	A domain is part of the naming hierarchy of the internet. A domain name precisely locates organization or other entity on the internet.
DOWNLOAD	Transfer of data from a server to a personal computer hard disk. You can use your browser or an FTP program to download files to your computer.
EAI (sometimes contracted in EA)	Enterprise Application Integration. EAI is the unrestricted sharing of data and business processes throughout the networked applications or data sources in an organization. Early software programs in areas such as inventory control, human resources, sales automation and database management were designed to run independently, with no interaction between the systems. They were custom built in the technology of the day for a specific need being addressed and were often proprietary systems. As enterprises grow and recognize the need for their information and applications to have the ability to be transferred across and shared between systems, companies are investing in EAI in order to streamline processes and keep all the elements of the enterprise interconnected.
ebXML	ebXML is an XML-based open framework for e-business transactions. ebXML not only defines architecture, but also views business with a new idea. It is a set of specifications to reach specific business objectives and covers Business Processes, documentation of a company's capabilities and transfer of documents among new and existing trading partners. ebXML was started in 1999 as a joint initiative between the United Nations Centre for Trade facilitation and Electronic Business (UN/CEFACT) and OASIS. The original project envisioned five layers of data specification, including XML standards for: Business processes, Collaboration protocol agreements, Core data components, Messaging, and Registries and repositories The freebXML.org initiative was established to promote development and adoption of ebXML-based open-source software.
ELECTRONIC DATA INTERCHANGE (EDI)	The transfer of structured data, by agreed message standards from computer to computer by electronic means.
E-FORMS	Electronics Forms available on a Web site or Intranet, which a user can complete on the

	screen and then either print off and post back, or submit on-line.
E-GOVERNMENT	The carrying out of government business transactions electronically, usually over the Internet, but including all the related real-world processes. In our information society, customers increasingly expect government to be accessible and convenient. As customers' expectations increase, governments must adopt eGovernment strategies.
E-GOVERNANCE	1- process of using information technology for automating both the internal operations of the government and its external interactions with citizens and other businesses 2- use of advanced Information and Communications Technology to improve the quality and efficiency of all phases in the life cycle of legislation (Fraunhofer)
ELECTRONIC TRANSACTIONS	In ordinary language, dealings between people a organizations (such as finding out a piece of information, filling out a form, or making a payment) that take place using Internet and the Web.
ENCRYPTION	A mechanism for coding or 'scrambling' electronic documents or messages, to enable them to travel between networks securely without risk of them being read by third parties.
ERP	Enterprise Resource Planning systems (ERPs) integrate (or attempt to integrate) all data and processes of an organization into a unified system. A typical ERP system will use multiple components of computer software and hardware to achieve the integration. A key ingredient of most ERP systems is the use of a unified database to store data for the various system modules. The term ERP originally implied systems designed to plan the utilization of enterprise-wide resources. Although the acronym ERP originated in the manufacturing environment, today's use of the term ERP systems has much broader scope. ERP systems typically attempt to cover all basic functions of an organization, regardless of the organization's business or charter. Business, non-profit organizations, non governmental organizations, governments, and other large entities utilize ERP systems.
ETHERNET	A method for connecting computers to a network using coaxial cable.
ETSI	European Telecommunications Standards Institute
EXTRANET	A system for regular communication between organization and its main suppliers or implementation partners. Typically extranet are closed private computer networks that function at least partially over the public connections of the Internet, using encryption to ensure privacy. They are designed to give authorized outsiders access to organization's Intranet from outside its network by direct telephone dial-up from PC or by coming in from the Web trough a firewall.
FILE TRANFER PROTOCOL – FTP	The standard Internet protocol for transferring files from one computer to another.
FIREWALL	Computer gateway (including hardware, software and procedures) that protects a company's computer network by filtering connections and transmissions between the local system and the Internet.
FLOSS	Proponents of the Free Software or the Open Source movements often prefer to use the term Free/Libre Open Source Software.
FREEWARE	Software that is openly available to the public without any IPR.
FRONT OFFICE	Set of application and services proposed directly by organization to the final user (in opposition with Back Office).
FSF	Free Software Foundation (FSF) is a non-profit organization founded in 1985 by Richard Stallman to support the free software movement (free as in freedom), and in particular the GNU project. The FSF holds the copyrights to most GNU software and some non-GNU Free Software as they require copyright assignment papers from each contributor to GNU packages, so that they can defend the software in court if a dispute arises or if there is a need to change the license of a work.
FUNCTIONALITY	The functional behavior of a system. Functionality requirements include, for example, confidentiality, integrity, availability, authentication the safety.
G2G, G2B, G2C	See A2A, A2B, A2C
GATEWAY	The technical meaning is a hardware or software set-up that translates between two dissimilar protocols or formats. Another, sloppier meaning of gateway is to describe any mechanism for providing access to another system.
GIS	Geographic Information System
GNU	GNU is a recursive acronym for "GNU's Not Unix". The GNU project was launched in 1983 by Richard Stallman with the goal of creating a complete free software operating system – called the GNU system or simply GNU. Its principles are that users are allowed to copy, modify and redistribute it. The GNU project is now carried out by the Free Software Foundation.
GPL	The GNU General Public License (GNU GPL or GPL) is a free software license, originally written by Richard Stallman for the GNU project (a project to create a complete free software operating system). Released in 1991, the version 2 became the most popular

	licenses for free software.
GovML	Governmental XML. Initiative funded through the European Commission to "specify, develop, deploy and evaluate an integrated platform for organizing one-stop government." One aspect of the eGOV project is development of the Governmental Markup Language (GovML), to be introduced "s an XML vocabulary that "will support the delivery of content and services to citizens (businesses) in terms of life-events, or business episodes.
GSM	Global System for Mobile Communication. Standard developed by ETSI.
HACKING	The term used to describe gaining access to private data or systems, without permission from their owner, typically using the internet.
HTML	HyperText Markup Language, the main language used to create Web documents. Secure HyperText Transfer Protocol (S-HTTP) employs public key technology to protect sensitive data.
HYPERLINK	Highlighted words or images on a web page that allow you to jump to another page.
HYPERTEXT	Text containing internal and external links or pointers to other texts or services.
IDA	Interchange of Data between Administrations. IDA is a European Commission driven strategic initiative using advances in information and communications technology to support rapid electronic exchange of information between Member State administrations. The objective is to improve Community decision-making, facilitate operation of the internal market and accelerate policy implementation.
IETF	Internet Engineering Task Force
IMPLEMENTATION	The mechanism that is supposed to organize the specified design
INFORMATION & COMMUNICATION TECHNOLOGIES – ICT	The application of computer science to ways of organizing and storing information and facilitating its transfer amongst users.
INFORMATION SYSTEM	A discrete set of information resources organized for the collection, processing, maintenance, transmission, and dissemination of information in accordance with defined procedures, whether automated or manual.
INFORMATION TECHNOLOGY	Any equipment or interconnected system or subsystems or equipment used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, reception or information.
INTEGRITY	The property that an object meets an established set of expectations. One example of integrity is that changes must be accomplished in a specified organized manner. Data integrity, program integrity, system integrity and network integrity are all relevant to consideration of computerized system security.
INTERACTIVITY	The extent to which someone can provide information to organization's Web site, as well as receiving information from it.
INTEROPERABILITY	Ability of information and communication technology (ICT) systems and of the business processes they support to exchange data and to enable sharing of information and knowledge.
INTRANETS	A network linking computers within a given organization, which is closed to outsiders. Its structure and user interface are based on those of the Internet.
LAN	Local Area Network
IP	1- Internet Protocol 2- Intellectual Property
IPR	Intellectual Property Rights are the rights weighing on one's creations: patents, copyrights, trademarks, etc.
ISO	International Standards Organization
ITU	International Telecommunications Union
JAVA	A platform independent object-oriented programming language that enables software developers to create interactive elements (Applets), which can be attached to a Web page (or used in native mode).
J2EE	J2EE (Java 2 Enterprise Edition) is a Java platform designed for the high-volume computing typical of large enterprises. J2EE was designed to make application development in a thin client multi-tiered environment easier. J2EE development decreases the need for programming and training by creating standards based, modular components that are reusable.
KEY	A sequence of easily changed symbols that, used with a cryptographic algorithm, provides a cryptographic process.
KEY DISTRIBUTION	A secure method for two distant parties to exchange keys or to receive keys from an authoritative source.
KEY	The overall process of generating and distributing cryptographic keys organized recipients

MANAGEMENT	in a secure manner.
KIOSK	A booth or stand alone terminal in a public place such as a library or supermarket, where citizens can access the internet, including government services and information, via a touch sensitive screen or keyboard.
KNOWLEDGE-MANAGEMENT	Techniques for organizing the ability of people within an organization to find the critical information they need for intelligent decision-making in the most speedy, reliable and cost-effective ways. In the current period most knowledge-management focuses on providing improved ICTs and better training for staff.
LDAP	Lightweight Directory Access Protocol. Protocol for querying and modifying directory services running over TCP/IP. A directory is a set of information with similar attributes organized in a logical and hierarchical manner. The most common example is the telephone directory, which consists of a series of names (either of a person or organization) organized alphabetically, with an address and phone number attached. An LDAP directory often reflects various political, geographic, and/or organizational boundaries, depending on the model chosen.
LEGACY SYSTEMS	A legacy system is an existing computer system or application program which continues to be used because the user (typically an organization) does not want to replace or redesign it for many reasons: The costs of redesigning the system are prohibitive because it is large, monolithic, and/or complex. The system requires close to 100% availability, so it cannot be taken out of service, and the cost of designing a new system with a similar availability level is high. The way the system works is not well understood. Such a situation can occur when the designers of the system have left the organization, and the system has either not been fully documented or such documentation has been lost. The user expects that the system can easily be replaced when this becomes necessary. * The system works satisfactorily, and the owner sees no reason for changing it – or in other words, re-learning a new system would have a prohibitive attendant cost in lost time and money.
LGPL	Released in 1991 and updated in 1999, the GNU Lesser General Public License (LGPL) is a commonly used software license. It is originated from a modified version of the GPL in order to apply to software libraries.
LINUX	Linux is open source software, which is freely available. Due to its stability, Linux has gained popularity with ISPs as the OS for hosting Web servers. Its usage is expected to grow as a server OS as well as for the desktop (see KDE and GNOME). In 1990, Finnish computer science student Linus Torvalds turned Minix, a popular classroom teaching tool, into Linux, which is closer to the real Unix. Torvalds created the kernel, and most of the supporting applications and utilities came from the GNU project of the Free Software Foundation. Many programmers have contributed to the Linux/GNU system.
LOGIN	This is the process of registering your session on a multi-user computer operating system.
MAIL-LIST or MAILING-LIST	A (usually automated) system that allows people to send e-mail to one address, whereupon their message is copied and sent to all of the other subscribers to the mailing-list. In this way, people who have many different kinds of e-mail access can participate in discussions together.
METADATA	Data that describes information about either online or offline data. Information that characterizes the who, what, where, and how related to data collection. Often, the information refers to special tagged fields in a document that provide information about the document to search engines and other computer applications.
MIDDLEWARE	Software that mediates between an application program and a network. It manages the interaction between disparate applications across the heterogeneous computing platforms. It includes Transaction Management and Integrity, Database Access, Network access …
MONITORING	Recording of relevant information about each operation by a subject on an object, maintained in an audit trail for subsequent analysis.
MULTIMEDIA	Sound and graphics files. Much of the popularity of the WWW is due to the easy integration of text and multimedia.
MULTICHANNEL SERVICE DELIVERY	A channel refers to a particular technology: telephone, internet access, mail, sms, paper mail… "Multichannel service delivery" refers to services that can be accessed or delivered through different channels. It is generally associated "Citizen Focused" approaches.
NETWORK	A group of computers and peripherals connected to share files and devices.
NETWORK INTERFACE	Where two operators networks are interconnected, each must be able to understand the technical operation of the other in order for services to interoperate across the interconnection boundary. The technical characteristics that allow for that understanding

	are the network to network interface. Each network must provide an interface at the point of connection and only where these interfaces are compatible will there be interoperability.
NREN	National Research Educational Network
OASIS	Organization for the Advancement of Structured Information Standards. Global consortium that develops XML standards
OECD	Organization for Economic Cooperation & Development
ONE-STOP GOVERNMENT	Important development within the current initiatives of e-Government. It refers to a single point of access to electronic services and information offered by different public authorities. Online one-stop Government requires all public authorities to be interconnected and that the customer (citizen, private enterprise or other public administration) is able to access public services by a single point even if these services are provided by different public authorities or private service providers. It further requires that the customer is able to access these services in a well structured and understandable manner meeting his/her perspectives and needs.
ONLINE	Processes running on the computer system, and specifically, on the Internet.
OPEN NETWORKS	Networks which can be accessed openly and interface with other networks
OPEN SOURCE	A source code license grants access to source code for the licensee. Open Source licenses can be defined as a specific set of terms and conditions that meet the requirements summarized by the Open Source Initiative that were first set by Bruce Perens in June 1997. Similarly, Free Software licenses were defined by the Free Software Foundation and they essentially include four requirements: the right to access the source code the right to modify the source code the right to redistribute the right to use. By assimilation, these 4 conditions are considered as the Open Source basics. Each Open Source license is a different combination of these four elements according to specific legal provisions and industrial objectives. Free Software can be defined as software distributed with a license that will implement these four rights. For example, the IBM Public License and the Mozilla Public License are Free Software licenses. Copyleft (See Copyleft) Software can then be defined as software distributed with a license that will mandate licensees to publish derivative works under the same terms. For example, the GPL and the LGPL Licenses are Copyleft Software Licenses.
OPEN SOURCE INITATIVE	Open Source Initiative (OSI) is a non-profit corporation delivering the OSI Certified Open Source Software certification mark and program. Open Source Initiative (OSI) provides a more detailed framework describing an Open Source License: Free redistribution Program includes source code and allows distribution License allows modifications and derivative works. License explicitly permits distribution of software built from modified source code License does not discriminate against any person or group of persons No discrimination against fields rights attached to the program must apply to all to whom the program is redistributed License must not be specific to a product License must not restrict other software License must be technology-neutral
OPEN STANDARDS	Very controversial issue regarding the consequence on IPR rules of a definition made by organization vs another one. For ITU, Open Standards are "Standards made available to the general public and are developed (or approved) and maintained via a collaborative and consensus driven proces". "Open Standa"ds" facilitate interoperability and data exchange among different products or services and are intended for widespread adoption". For W3C, an Open Standard is Free of charge (Royalty Free). For most of standardization bodies, they respect a FRAND (Fair Reasonable And Non Discriminatory) policy. Oth organizations like OASIS adopt a dual policy (Royalty Free + FRAND).
OPERATING SYSTEM	A program that runs on a computer whose purpose is to provide basic services that can be used by applications running on that computer. Such functions might include screen displays, file handling and encryption. MS-DOS and Windows 2000 are examples of operating systems that run on Intel microprocessors.
OSS	Open Source Software (See Open Source)

P2P : PEER TO PEER	Decentralized file sharing, computation, communication and more.
PKI	Public Key Infrastructure. A system of public key encryption using digital certificates from Certificate Authorities and other registration authorities that verify and authenticate the validity of each party involved in an electronic transaction.
PLATFORM	A combination of computer hardware and operating system software
PORTAL	Any well-used gateway to the Internet, especially those sites designed to serve as a 'front door' and thus the first page that users see when accessing the Web. Portals typically provide large catalogues of other sites, powerful search engines for locating information, and e-mail facilities or other attractive Web services.
PLUGS-IN	Programs that can easily be installed and used as extensions to a web browser to provide additional functions such as audio, video and support for flashy graphics.
PRIVACY POLICY	A statement about what information is being collected; how the information being collected is being used; how an individual can access his/her own data collected; how the individual can opt-put; and what security measures are being taken by the parties collecting the data.
PROCESS	(1) A standardized method of performing work that is broken down into specific or detailed tasks (2) An instance of a software program during execution
PROCESS ORIENTED	A concept describing software or services that are adapted to the processes needed to complete a business function
PROTOCOL	Rules governing the exchange of data between computers networks.
RE-ENGINEERING	The examination and modification of a system to reconstitute it in a new form and the subsequent implementation of the new form.
REPOSITORY	1- Database of information about applications software that includes author, data elements, inputs, processes, outputs and interrelationships. A repository is used in a CASE or application development system in order to identify objects and business rules for reuse. It may also be designed to integrate third-party CASE products. 2- Database of digital certificate information. The repository is maintained by the certification authority (CA) and is queried to find out if a certificate is valid, has expired or has been revoked
SAFETY	The property indicating that a computer system or software, when embedded in its operational environment, does not cause any actions or events that create unintended potentially or actually dangerous situations for itself or for the environment in which it is embedded.
SEARCH ENGINE	A service that provides access to a searchable da abase of websites addresses and descriptions. Example : www.google.com
SECURITY	The collection of safeguards that ensures the confidentiality of information, protects the system(s) or network(s) used to process it and controls access to it. Hence, security safeguards impose appropriate access rules for computer information.
SEMANTIC WEB	The Semantic Web is a project to create a universal medium for information exchange by putting documents with computer-processable meaning (semantics) on the World Wide Web. Currently under the direction of the Web's creator, Tim Berners-Lee of the World Wide Web Consortium, the Semantic Web extends the Web through the use of standards, markup languages and related processing tools.
SERVICE COMPONENT	Business components are software modules that follow the semantics of business-functions, as distinct from technical components that are typically implement a single technical function. For instance, "update customer address" is a service component since it has a meaning relevant in a business context, while "update database" is a technical component since it implements a technical function that has no direct business relevance. The process of developing applications as a collection of service components that exchange information via request/reply or events is referred to as Service Component Architecture (SCA). SCA applications can be modified, managed and changed with little or no programmer intervention, making the SCA approach significantly more attractive for the deployment of business systems in comparison with traditional monolithic application design.
SERVICE COMPONENT ARCHITECTURE (SCA)	SCA is an architectural approach in which application developers decompose problems into smaller modules, each of which executes a well-defined business function and is implemented as an encapsulated component. The interactions between Service Components may be either request/reply (SOA) or via events (EDA). Service Component Architecture thus moves the focus of application design from the concept of distributed computing towards the intelligent design of modular Service Components
SERVICE ORIENTED ARCHITECTURE (SOA)	Service-oriented architecture expresses a perspective of software architecture that defines the use of loosely coupled software services to support the requirements of the business processes and software users. Resources on a network in an SOA environment are made available as independent services that can be accessed without knowledge of their underlying platform implementation.

	A service-oriented architecture is not tied to a specific technology. It may be implemented using a wide range of technologies, including CORBA or Web Services.
SHARED SERVICES	Services shares by different organizations
SOAP	SOAP (originally Simple Object Access Protocol) is a protocol for exchanging XML-based messages over computer network, normally using HTTP. SOAP forms the foundation layer of the Web services stack, providing a basic messaging framework that more abstract layers can build on. The original acronym was dropped with Version 1.2 of the standard, which became a W3C Recommendation
SMART CARD	Transactional electronic technology capable of storing and updating authentication or account information about the user.
SOFTWARE LICENSE	In computing, software that is copyrighted must be licensed to be used. These licenses are primarily written to deal with issues of copyright law and product liability law. They can also concern issues related to patent law, trademarks, trade secret law, and laws pertaining to access to services. Software licenses are generally classified into two categories: proprietary software licenses and free software licenses, depending on their content.
SPECIFICATION	Description of the desired behavior of a system, as derived from its requirements. A specification is used to develop and test an implementation of a system. SPOOFING – illicitly masquerading as a legitimate company, party or individual
SYSTEM	An inter-dependent collection of components that can be considered as a unified whole; for example, a networked collection of computer systems, a distributed system, an editor, a memory unit and so on.
TECHNICAL REQUIREMENTS	Description of hardware, software, and communications requirements associated with the initiative.
THIRD-PARTY ACCESS	Eavesdropping on or entry to data communications, telephony or stored computer data by an unauthorized party.
TRUST	The concept that a system will provide its intended functionality with a stated level of confidence. The term is also used for other entities; e.g. trusted software, trusted network, trusted individual. Sometimes the confidence – also called assurance – can be measured but sometimes it is inferred on the basis of testing and other information
UDDI	UDDI is an acronym for Universal Description, Discovery, and Integration, a platform-independent, XML-based registry for businesses worldwide to list themselves on the Internet. UDDI is an open industry initiative, sponsored by OASIS, enabling businesses to publish service listings and discover each other and define how the services or software applications interact over the Internet. A UDDI business registration consists of three components: White Pages — address, contact, and known identifiers; Yellow Pages — industrial categorizations based on standard taxonomies; and Green Pages — technical information about services exposed by the business. UDDI is one of the core Web Services standards. It is designed to be interrogated by SOAP messages and to provide access to Web Services Description Language documents describing the protocol bindings and message formats required to interact with the web services listed in its directory.
UNIF	United Nations Interoperability Framework
UNSPC	United Nations Standard Products and Services Code. Hierarchical convention that is used to classify all products and services. The UNSPSC is 10 digits code : "SSFFCCPPBB" SS : Segment - Logical aggregation of families for analytical purposes FF : Family - Commonly recognized group of inter-related commodity categories CC : Class - Group of commodities sharing common characteristics PP : Commodity - Group of substitutable products or services BB : Business Function - Function performed by an organization in support of the commodity
URL	Uniform (or Universal) Resource Locator. A unique identifier of a page which is the standard address of files on the Web. The components of an URL are: protocol // domain : port / path / filename.
VoIP	Voice over Internet Protocol
WAN	Wide Area Network
WEB 2.0	Web 2.0, a phrase coined by O'Reilly Media in 2004, refers to a perceived or proposed second generation of Internet-based services—such as social networking sites, wikis, communication tools, and folksonomies—that emphasize online collaboration and sharing among users. Its exact meaning remains open to debate, and some experts, notably Tim Berners Lee, have questioned whether the term has meaning.
WEB-ENABLING	The adaptation of existing ICTs so that at some stage Web-based technologies are

	employed – for example, creating a channel of communication with users or accessing information held on legacy systems using a browser.
WEB SERVICES	Software service designed to support interoperable machine-to-machine interaction over a internet network. Web services are frequently just application programming interfaces (API) that can be accessed over a network, such as the Internet, and executed on a remote system hosting the requested services.
WEBSPHERE	WebSphere refers to a brand of proprietary IBM software products, although the term also popularly refers to one specific product: WebSphere Application Server (WAS). WebSphere helped define the middleware software category and is designed to set up, operate and integrate e-business applications across multiple computing platforms using Web technologies. It includes both the run-time components (like WAS) and the tools to develop applications that will run on WAS
WiFi	Radio internet access technology that can be open to anybody or restricted to a group in a cell of #100 meters.
WIKI	Website that allows the visitors themselves to easily add, remove, and otherwise edit and change available content, and typically without the need for registration. This ease of interaction and operation makes a wiki an effective tool for mass collaborative authoring. The term wiki also can refer to the collaborative software itself (wiki engine) that facilitates the operation of such a Web site, or to certain specific wiki sites, including the computer science site (the original wiki) WikiWikiWeb and on-line encyclopedias such as Wikipedia.
WiMax	Radio Internet Access activate by a Service Provider for users in a cell of #1 to 10 km. Some WiMax technologies are Point-to-Point and are available on #30 km distances.
WSDL	WSDL: the Web Services Description Language, which effectively provides the contract for Web services, setting out what inputs are expected and what outputs will be supplied
WWW	World Wide Web. The complete ensemble of graphics and text documents published on the Web sites and inter-connected via the Internet trough clickable 'hypertext' links.
W3C	World Wide Web Consortium.
XML Extensible Markup Language	A schema which defines the data and data format that can appear in a web-based form. Enabling definition, transmission, validation and interpretation of data between The standard agreed as the e-Government protocol for the exchange of data between different IT systems.
.NET	Microsoft's framework for Web services and component software introduced in 2000 and pronounced "dot-net." .NET is Microsoft's approach to a comprehensive development and runtime environment similar to J2EE. .NET supports all the Web-based features and functions, including XML and the Web services protocols such as SOAP and UDDI (see Web services). .NET applications run on intranets as well as public Internet sites, thus .NET is an all-inclusive Web-oriented software architecture for internal and external use. Subsequent versions of Microsoft products (browsers, applications, Windows) were enhanced with support for .NET in some manner.