E-Government in Chile and the Adoption of XML as Standard

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This paper presents the development of e-Government in Chile from its beginning, until the recent adoption of XML as standard for electronic documentation in Government agencies. The local legislation is the result of technical and legal discussions among the Government, private sector and academia. This work presents the context, the process of adoption, and relevant experiences.

1 Introduction

One of the basis of the modernization process in Chile is the development of an electronic government. This development is viewed as the "incorporation of Information and Communication Technologies in the administrative organizations of the State, in order to improve the information services offered to citizens, the efficiency of public agencies, and to increase substantially the transparency of the public sector and citizens participation" [12].

Recent studies show that e-Government in Chile is between the "Presence" and the "Interaction" maturity phases [3]. This means essentially that the problem of interoperability is becoming one of the main issues. Based on this diagnosis, on international experiences, and available technologies, the Chilean Government took in the year 2004 the bold step of introducing XML as standard for all the electronic documentation exchange among its agencies. From a technical point of view, this decision is easily understandable based on the well-known features of XML and related technologies. The social, administrative and engineering consequences of this decision are less obvious.

This paper presents the origins and evolution of e-Government in Chile, and the process toward the adoption of XML as standard for digital documentation. First, the context is introduced in Section 2 by presenting the geopolitical situation and the process of adoption of Information and Communication Technologies in Chile. Then, Section 3 presents the state of the art of e-Government in Chile, including the origins, legislation and the most relevant and successful experiences previous to the general adoption of XML. Section 4 presents the transition from paper document management to the adoption of XML as standard for digital documentation, and discusses the Chilean Norm about XML documentation in detail. Finally, Section 5 presents the conclusions.

2 The Context

Chile is a long and thin country located on the southwestern coast of South America, and with a population of 16 million people. Considered as one of the countries in the area that has a better consolidated democracy and stability after decades of turbulence and dictatorships, it is also

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shown as "example" in the area of fiscal accounting and macro economic figures. In recent years, Chile has advanced to an important economic opening based on Free Trade Agreements with the European Union, Korea, United States, EFTA, Central America and Mexico. Agreements with China, India, New Zealand and Singapore are currently under study [1]. These agreements bring opportunities of greater investment in the country, and development of new business and companies. They also rise the need of greater and better services provided from the Government to national and international companies, from national to international companies, among Governments agencies, and between citizens and Government.

Chile has a presidential system of Government democratically elected by popular suffrage. Chile is divided in 13 regions, with cities dispersed along more than 4000 km., with an extremely complex geography including deserts, mountains and islands. This geographical diversity makes particularly complex the communication and access to services and Government agencies by citizens. Every region is further divided into provinces and every province into counties (51 and 346 respectively). Despite some regional attributions, Chile's Government is strongly centralized [9].

The nineties marked the introduction of digital interconnection at a massive level in Chile. The Internet connectivity dates from 1991 [3]. Since 1992, there has been a sustained effort to interconnect Chilean schools [14]. The first ATM network started to work in 1994 [2]. By 1999 the Government had a solid Intranet [11], and the law enforced the interconnection and quality standards of the Internet Service Providers. Currently there are 6 million people (more than 40% of the population) that have access to Internet, either from home, their jobs or educational organization [10]. The Internet access of schools is 100% in high schools and 50% in primary schools [14]. The 97.8% of the public sector have e-mail servers and Internet connection, and at least 15 public services declare to implement some type of automated transaction together with another public service [13].

Nevertheless, a coherent policy of technological development in the IT area started recently with the year 2000. The first step in this direction can be considered the program compiled in the Blue Book (2000) reporting the state of IT in Chile and the perspectives for the future. Twelve initiatives were identified that would make IT progress in Chile, in three main areas: massification of the access to digital networks, development of new capabilities using new technology, and the use of new technology to modernize the government.

The next step was given by a common effort of the Government, industry and academia, which together developed a program called *Digital Agenda* [6], released in February 2004 and improved in August 2004. This *Agenda* is a program comprising the guidelines for the development of the IT in Chile. It consists of a list of 34 strategic initiatives grouped in six priority areas that would contribute to the development of Chile by using information and communication technologies. The ultimate goal of the Digital Agenda is to make Chile a digitally developed country by 2010.

3 Current State of E_Government in Chile

The first step toward the development of e-Government in Chile was a Presidential document delivered in 1998, commanding simplification of procedures, focusing on process redesign and elimination of dependencies. At the same time, the Government was providing basic information online to citizens via an official Web Portal, and building a broadband Intranet to improve communication among its agencies.

The next stage of service availability for citizens was the development of the Web portal called

Trámite Fácil (Easy Errand). It was created the year 2000 to give information about errand procedures of different Government agencies. Some procedures were accessible online, forwarding the user to the corresponding agency portal, which implemented and owned the online service. Examples of available errands are: declare and pay medical and retirement funds, get birth certificates, declare and pay Value Added Tax (VAT) and apply to different help programs. Currently, it has 1550 procedures on public services that permit to execute 220 errands online [8], [13]. Special mention deserves the possibility of online tax payment, a revolutionary initiative that guided future developments.

After the Presidential Instructive 905 released in 2001, the Government started developing initiatives for building the legal and technical framework for a unified e-Government. Among them, we can find: the State Reform Committee of Ministries composed by representatives of the Industry, Presidency and Internal Affairs Ministries; the Committee for Interoperability Norms, under the authority of the Industry Ministry, whose objective is to advise the President in the definition of norms for interoperability; the *Project for the Reform and Modernization of the State* (PRYME by its Spanish acronym), under direct supervision of the President, whose work areas include e-Government, modernization, citizen participation, administrative procedure, regionalization and transparency [3]; the *Digital Agenda*; and new and better services in different government agencies (Central Identification Service, Tax & Revenue Service.).

According to a standard classification of e-Government phases, the United Nations estimates that Chile is in the "Interaction" maturity phase [7]. This estimation is similar to the results obtained in a local study showing that Chile is in between the phase of "Presence" and "Interaction" [3].

As for the near future, the action plan for the 2004-2006 period concentrates on promoting the generalization of the access and the sophistication of IT usage, specially through the use of the Internet by people, companies and institutions. There are six priority areas identified as part of the Digital Agenda that will contribute in reaching these goals. They are: *massive access* (reach 900 thousand homes connected to the Internet), *education and training* (training at least one million people in digital technologies), *on-line Government* (make electronic errands massively available and extend the use of IT in all Government agencies), *national industry* (promote connectivity and sophisticated usage of the Internet for at least 150 thousand companies), *development of the IT industry* (promote the development of a large number of companies in the sector), and *legal infrastructure* (new advances in current legislation incorporating digital issues).

There is a high impact initiative stated in the *Agenda* that is being developed: a back-office for the Government that interconnects the different services offered by each agency. The administrative motivation of this project is the implementation of the "Transparency Act" of 2002 (see section 3.1). Finally, one of the major steps in the whole process is the adoption of a standard for digital documentation that will impact every level of e-Government. The elaboration of the norm started in 2003 and finished in December 2004 with its public release.

3.1 Current Legislation on Topics of E-Government

One of the first legislation related to e-Government in Chile was the privacy and security of digital data, promulgated on 1999, which permits to identify the owner of the data related to a procedure, and the attributions of the Government agencies when interchanging such data.

In year 2002, it was released the *Digital Document, Signature and Certification* law, which defines the electronic signature as a group of data that identifies uniquely the signer of an electronic document. This signature has the same legal value as a signature in paper.

The most important regulation, due to its administrative implications, is the Administrative Procedures Law ("Transparency Act"), which essentially enforces that Government agencies cannot ask a citizen (when doing an errand) for documents which another Government agency already has (e.g. the identity card when asking driving license). This means that Government agencies should be able to at least exchange or validate information among them, which due to the volumes of information generally managed, implies automation of the process.

By the end of the year 2004, it was released the *Efficiency of Digital Communications* decree. This decree rules the communication using electronic media by which Government agencies and citizens can interact, caring that techniques used are appropriate and the information transmitted is correctly managed. In December 2004, it was released the *Interoperability of Digital Documents* decree, which – due to its importance – will be covered in detail in Section 4.

3.2 Successful and Paradigmatic Experiences

Internet Revenue Collection. The automation of Revenue Collection has been one of the great success stories of e-Government in Chile and it is the first large XML-based system developed for the Government. Every year, Chilean citizens must declare their annual income to the Government through the Chilean Government's Tax and Revenue Service called *Servicio de Impuestos Internos (SII)*, and pay or be credited back with the so called "Global Tax". This used to be an error-prone process, also difficult to process by the *SII*, and therefore, a low and faulty experience and the flaws of the process allowed many people to cheat on tax declarations. As a way to make the process more efficient and reliable, the *SII* implemented in 1998 a Web based system to declare the annual taxes. Since the new automated system presented options from an almost ready to use pre-filled declaration form to more complicated formats, an ever-growing number of people began to use it. The adoption of this system by tax-payers has grown to 66,9% in 2004, over a universe of 2 million of declarations [5]. This is the first massive experience of citizens interfacing the Government via Web.

Electronic Invoicing in Chile. This project represents a pioneer experience and the first large-scale adoption of XML-based digital documents and digital signature in Chile. Since 2002 the SII has been promoting the adoption of Electronic Invoicing for managing and interchanging information about commercial transactions. In 2002, it began an experimental phase, with a few providers and customers (mainly large corporations). The goals were to obtain improvements in the citizens' business processes, decrease significantly the associated costs of the invoicing process and to ease the development of e-commerce in the country. The estimation was to reach US$ 300 million in direct savings for this concept. The first stage of this project (2002) helped to define the technical issues of the new system (XML for encoding the invoices, XML Schema for metadata specification, Xmldsig for digital signature), and some definitions to manage rights to emit invoices. For the interchange of these documents, an e-mail based asynchronous model was adopted, mainly due to the already wide adoption of this method of communication. Nevertheless, its complexity, specially related to ensure the success of a transaction, is still a challenge for the providers of electronic invoice software solutions. In April 2003, it began the official operation of the electronic invoices. Currently there are more than 500 organizations authorized to interchange electronic invoices, 15 providers of electronic invoicing software solutions, and several millions of documents interchanged every month.

National Identification Service. Today a citizen can obtain official documents (e.g. birth certificate) by directly printing them from the Web with encoded validations. The National Identification Service (*SRCeI*) is the agency intended to register citizens' information and facts that are relevant to protect the family rights and personal identification. Additionally, the SRCeI es-

tablishes and registers the identity of the citizens, and delivers the associated official documents and certificates. The SRCeI interacts with many private and public organizations, providing information and services according to Chilean legislation on privacy protection. Since 2003, the SRCeI began the operation of its new system that allows online errands, and permitted to implement automatic interoperability between the SRCeI and many other Government agencies. Additionally, the system offers the innovative service of digital identity validation for the citizens in association with Certification Authorities.

4 XML as Standard for e-Documentation

Adopting a standard for digital documentation appears as a major step within the Government modernization efforts, and several of the initiatives in the Digital Agenda are based on it. This section presents the challenges that are introduced by the new approach for digital document management in order to adhere to the e-documentation norm.

4.1 Document Management

Despite the current high level of automation, the bulk of documentation being processed in Chilean Government agencies in 2005 is still in paper. Currently, public agencies use proprietary formats for electronic documents, and most of them do not have legal value, jeopardizing the possibility to integrate and interchange information among public organizations. Typically, the legal value resides in a hard copy document, which is used as information source to feed the systems of an organization, and which in a few cases contains a code to check authenticity. Administratively, each autonomous organization has a division that interfaces the external environment with the internal workflow. It receives requirements, transported in paper-based forms, and performs the workflow collecting in a folder the corresponding signatures, stamps and related documents.

The tools for processing information are usually ad-hoc systems, office applications and e-mail. Basic services for managing electronic documents are available for several public agencies. These basic services include capture of information, store and search of digital and physical information, and the delivery of proprietary services based on that information (through Web systems or virtual Kiosk). Most of these services are outsourced to local software companies. There are few critical public agencies having advanced services for electronic document management (e.g. National Identification Service, Treasure, and Tax and Revenue Service). These advanced services include: standardization of the documents format, definition of data and services interchange protocols, use of workflow to support the internal process, definition and adoption of security policies, and use of business intelligence and shared knowledge management tools.

The move towards electronic documentation is an international trend (see e.g. the well-documented case of dissemination of U.S. Government electronic documentation [15]). Among its advantages are: (a) reduction of storing, maintaining and disseminating costs; (b) greater functionality, like searching, linking to related information, manipulation, and other available features like images, audio and video; (c) increase of document accessibility.

E-documents are more accessible to citizens, including those with physical impairment; once posted, they are accessible to thousands of users from multiple locations around the nation, which in the Chilean case is extremely relevant because it eliminates geographic discrimination. However, the migration to electronic documentation has several challenges. Among the most important are authentication, persistency, equally accessible rights to all individuals, and in general, legal issues.

4.2 The Chilean Norm

The Chilean Government has identified the electronic document management as a key issue in order to implement an effective e-Government platform. In December 2004 was published the Decree 81 [12] which enforces the adoption of electronic documents by public agencies, and defines XML as the standard technology to be used for it. The motivations from a political and administrative point of view were: to ease the access to Government information, to increase productivity and reduce operational costs of Government agencies, to ease the communication between citizens and Government agencies, and to ease the interaction among Government agencies. From a technical point of view, among the most important motivations were: easy classification, storage and search of documents, interoperability among documents of different agencies at hardware, operating system and software levels, and easy development of generic applications for document processing in Government agencies.

The Committee for Standards of interoperability, a group of technical people from the Government, private sector, and academia, was called in 2003 to elaborate a standard for electronic documentation meeting the above requirements. This Committee worked for almost a year and a half, and presented a proposal to the Government. Although XML emerged as the main candidate to meet the desired requirements, there were other proposals also considered, e.g. PDF. Finally, XML and its family of technologies were chosen because of XML's flexibility to specify formats, its modularity (mainly compositionality and reuse), scalability, the fact that it is an open *de facto* standard, its independence of platforms and applications, its good industrial and commercial support, and its architecture compatible with future extensions of the global information system.

Decree 81 establishes three levels of implementation, and implicitly states the time-frame for its adoption. In *Level 1* (for whose adoption the decree gives 30 days after its release) the agencies should be able to receive, store and redirect electronic documents already generated by a third part. The rationale behind this decision was the existence of browsers that currently read XML, like *Mozilla*. Communication can be done via e-mail. The *Level 2* (for whose adoption 2 years were given) states that each agency should be able to generate XML documents by itself plus the functionality stated in Level 1. The *Level 3* and final, states that each agency should be able to process XML documents without restrictions. The Government thinks that this third stage should be completed by year 2009.

On the more technical perspective, the XML technologies enforced are XML v.1, XML Schema for schemas, XForms, XML Signature, UTF-8 (current digital documentation in Chile use mainly UTF-8) and a translation service for UNICODE, XSL and XHTML for visualization, and Web Services as a recommendation. The standard also states that each document must contain the following metadata: schemas used, metadata documenting use and meaning of the schemas used, semantic metadata to ease localization, metadata to permit follow the life of the document, and references to a dictionary of metadata.

Other important issues that are included in the standard refer to the fact that the document should permit signature, should have a unique identifier (associated to its localization), should allow alternative visual presentations for different media, and mechanisms to verify integrity and authenticity of the visualizations of the signed versions.

5 Conclusions

The e-Government initiative in Chile intends to improve the availability and interoperability of Government information and services, to reduce operational costs of public agencies and to

increase public administration visibility.

Adopting the XML standard was a bold initiative. Several factors motivated this decision, among the most important are the priority given to macro objectives over short term goals; the adoption by the Government of a *de facto* standard of the industry; the advantages of a centralized and stable Government; the widespread IT infrastructure as compared with similar countries in the region; and the fact that there are almost no e-Government legacy applications. These issues conform an advantageous situation to adopt a global solution for digital document management.

Nevertheless, the decision is not free of risks. The initiative will have to deal with technical, operational and economical problems. The assimilation of XML by the Chilean software companies and Government local developers is the main technical problem to be faced. Training programs will play a key role during the next years. In addition, an adoption plan of XML-based solutions should be designed and implemented by public agencies that lead this initiative. This issue and the available time represent the main operational challenges. The economic cost of adopting XML will be important, but it is a comparatively smaller challenge.

Finally, let us say that with any degree of success, this process will bring experience not only to Chile but also to the region as a whole.

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