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ABSTRACT

Interoperability standards play an important role in system integration and information sharing in e-Government environment. But the development and establishment of these standards do not depend on technological aspects only. System integration and information sharing do not mean just enable data interchange but, mainly, integrate processes and transactions. In this scenery, other variables from the institutional (organizational and politics), economic and social contexts arise. Therefore, the development and establishment of standard processes present a high complexity, due to the number of agents that participates in the processes, the environment where they occur, the interactions of the agents with the environment, besides the likely conflicts of interests that can arise. The objective of this paper is to analyze these processes, its characteristics and the involved challenges. It is believed that the understanding of these processes will allow addressing future actions for the standards diffusion and evolution.

Keywords

Interoperability, standardization, integration, information sharing, electronic government.

INTRODUCTION

Aiming to improve their stages of electronic government, several countries are concentrating efforts on the establishment of interoperability standards to facilitate the integration of their systems and the information sharing between their federal, state and local agencies. United Kingdom, New Zealand, Germany, France and United States are examples of countries that are already implementing these standards.

But the development and establishment of these standards do not depend on technological aspects only. The integration of systems and information sharing do not just mean exchange of data but, mainly, integration of processes and transactions. In this scenery, other variables of the institutional (organizational and political), economic and social contexts arise. Besides, in electronic government's environment the transactions generally involve multiple agents and they are strongly conditioned by cultural aspects, what makes those processes more complex and interrelated. And more: the establishment of standards implies restructuring of processes and/or changes in the way that these agents interact with several government agencies. As a result, the standardization processes in this environment need a great effort to establish governance and cooperation so that effectiveness is achieved in its implementation.

Interoperability is established through networks and systems able to correctly receive, transfer and use data from different information systems. It is based on technologies that interact with each other, building an information network ready to be used in real time by different agencies. As a result, we get an increase in the quality of the public services and in the citizen's life.

But some agencies acquire and develop technological solutions that are unable of being integrated to the networks and systems from other agencies. This impossibility of integration may result in tasks overload, an excess of records and unnecessary data storage. The consequences are increase of bureaucracy, rise of services costs and emerging of barriers to provide a quicker response to the citizen's demands. A possible way of reducing these problems is the establishment of interoperability standards. The interoperability also brings the possibility of operational costs reductions, a higher level of integrity of the information and an effective financial and administrative integration among the different agencies.

Aiming to present some of the perspectives and challenges of the establishment and implementation of interoperability standards, the e-PING program, an evolving set of interoperability standards for electronic government established by the Executive Branch of the Brazilian Federal Government, is used an illustration case.

STANDARDS, STANDARDIZATION AND INTEROPERABILITY

Interoperability is the ability of a system or process to use information and/or functionality of another system or process through the adherence to common standards. An architecture of interoperability, for its turn, it is constituted by a range of technical specifications, systems, standards, guidelines and policies that are supplementary to each other (EPAN, 2004).

The interoperability standards, therefore, play an important role in the integration of systems and information sharing. In the electronic government's case, The United Nations specifies that the ideal environment must provide a unique access door to the information and services for the users. In this context, it is easy to identify the need of the adoption of standards, based on the requirements of systems integration and the information sharing of the involved agencies. Several authors, for example Akbulut (2003), Dawes (1996), Landsbergen Jr. and Wolken Jr. (2001), have already investigated these processes in the electronic government's environment and identified that the standardization as a form of supporting compatibility is a conditioning factor.

In a broader sense, a standard can be defined as a group of specifications for which all products, processes, formats, or procedures under its jurisdiction have to agree (TASSEY, 2000). For David and Greenstein (1990), a standard can be understood as a group of technical specifications stuck by a group of vendors, tacitly or as a result of a formal agreement.

David and Greenstein (1990) distinguish three types of standards: reference, minimum quality and compatibility. The standards can also be classified based on the processes by means of which they are established. A distinction is frequently made among formal, *de facto* and *de jure*. Formal patterns are created by standardization entities; *de facto* are technologies unified by market mechanisms, and *de jure* are imposed by laws (HANSETH & MONTEIRO, 1998).

Since the standardization process comprehends all the possible routes from the conception and definition to the implementation, it necessarily becomes complex (SLOANE, 2000). According to Moreton *et al.* (1995), the standardization process can go into different paths between the need and the obsolescence phases.

According to Graham *et al.* (1995), the standardization process represents an attempt to align interests, business practices and expectations of a group of people with an interest to develop and to use the system that will be standardized. Then, the standardization is not just to provide an usable solution but, mainly, to articulate and to align expectations and interests (WILLIAMS, 1997).

There are several approaches already applied to the study of the development and implementation of standards: law, strategy, marketing, operations engineering, political theory, political science and sociology (SWANN, 2000).

Most of the literature about standardization is in the economy area. But, relatively disconnected from the economic and the innovation centered literatures, in the last two decades a new social technical based view literature came up (WILLIAMS and EDGE, 1996; HANSETH, MONTEIRO and HALTING, 1996), frequently called of social construction of the technology. These authors analyze standardization as a form of social interaction inside of a network of agents by which the technology is introduced and it is stabilized in the social system. The main points considered are (FOMIN, KEIL and LYYTINEN, 2003): why and how a standard of specific ICT is created and what social and technical factors do influence its creation? How do the involved agents understand the meaning of the project and what reasons they take into consideration for their involvement in the standardization processes? How specific agents are connected by commitments during the process and why? According to Mangematin and Callon (1995), the researchers analyze why the standardization process follows a trajectory and it excludes other.

The development and establishment of standard processes, therefore, present a high complexity, due to the number of agents that participates in the processes, the environment where they occur, the interactions of the agents with the environment, besides the likely conflicts of interests that can arise.

E-PING INTEROPERABILITY STANDARD

The e-PING standard reflects the Brazilian directives for e-government based on the experience of the United States, Canada, United Kingdom, Australia and New Zealand. All these countries have been investing heavily in policies and processes, and in the establishment of Information and Communication Technologies (ICT) standards and structures dedicated to attaining interoperability and to provide better quality government services at lower costs. The UK e-GIF (Government Interoperability Framework) program is recognized as the base on which the Brazilian e-PING was elaborated.

The e-PING is considered as a basic structure for Brazil's electronic government strategy, to be applied initially to the Executive Branch of the Federal Government. But the architecture envisaged covers the exchange of information between the Federal Executive Branch and citizens, state and municipal governments, the Legislative and Judicial Branches of the Federal

Government and the Federal Public Prosecutor's Office (*Ministério Público*), international organizations, governments of other countries, Brazilian and international businesses, and the Third Sector (NGOs, Civil Society Organizations, etc.). The e-PING standards are mandatory in the Federal Executive Branch (including federal public agencies and other federal entities) for all new information systems, for legacy systems involving the provision of e-government services or interaction between systems, and other systems involved in the provision of e-government services.

RESEARCH METHODOLOGY

The research consists in a case study based on documents analysis and data collection using questionnaires and interviews. The research object is the e-Ping program, an evolving set of interoperability standards (version 1.5 as of December, 2005) established by the Executive Branch of the Brazilian Federal Government covering five broad segments: interconnectivity, security, means of access, organization and exchange of information and areas and issues for eGov integration.

The research was divided into two parts. The first one was an analysis of the documents that specify the guidelines that must be followed and the actions taken by government to implement the standard. Some interviews also were made with the e-PING project managers to investigate how the standard has been adopted by the agencies.

The second part of the research (yet in progress) is the analysis of the level of adoption of the e-PING by government agencies and ICT service providers. In this part it data will be collected by questionnaires and interviews, objecting identify which aspects are being enablers and inhibitors of the standard adoption.

CASE ANALYIS AND PRELINARY FINDINGS

The first version of the e-PING was published in May 31st, 2004. From June 1st to August 31st the document was submitted to public analysis in a website. More than 90 suggestions were submitted. Six public audiences also were realized in six different capitals to discuss it during this period, with an attendance of more than 600 people. These consults brought the contributions from public agencies, researchers, and ICT suppliers to the project. After these discussions the document was updated and another version was published in July 13th, 2005. The third version was released in December 16th, 2005.

In this document, the guidelines to implement the interoperability between the several technological solutions used by the Brazilian Government were established. These guidelines address questions as system and network security, computational infrastructure, technological requirements, software development standards and accesses to data and information.

To manage the complexity of the implementation of the e-PING, five committees were created, one for each area covered by the standard. Each group is responsible for promote meetings and discussions about their related area and present the results to the other groups.

Three preliminary findings about the implementation of the e-PING can be considered relevant in the first phase of the research: (1) the guidelines were specified through public consults by internet and public audiences in major capitals over the country, bringing to a common forum the expectations of all interested agents, what can diminish likely interest conflicts; (2) the technological standards adopted by government are *de facto* standards (such as XML and webservices, for example), what makes the decision makers be more willing to adopt the standard; (3) the creation of five committees (one for each addressed area), formed not only by technical coordinators but also by business managers, facilitate the addressing of other aspects other than technological in the standard specifications.

Another finding is that the rate of adoption of the e-PING is not completely known. Since the document is public and is available for download freely, agencies can get the document without any register. And how the adoption is compulsory only for the Federal Executive Branch, adopting agencies from others branches are not easily identified. But several requests have been made for the e-PING coordinators to help agencies implementations, what can mean an increasing adoption intention.

EXPECTED CONTRIBUTIONS OF THE STUDY

The present study is expected to contribute to understand how interoperability standards for e-government are developed and established. These are complex processes and require special attention to the variables and factors beyond technological dimension that can affect the standard adoption such as availability of resources, financial costs, knowledge barriers, external influences, governmental incentives, market forces, environment instability, for example.

Even though the development and establishment of interoperability standards are complex processes, the preliminary findings of the e-PING implementation present some good perspectives. The participation from the several segments of the society in the document formulation and the increasing interest in its implementation by the agencies may be considered as a strong signal of successful adoption of the standard.

As a final product of this research it is expected to be formulated a reference model of the interoperability standard development and implementation in electronic government environment, which will be based on socio-technical perspective.

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