

# Understanding the Co-Evolution of Institutions, Technology, and Organizations: The Enactment of the State Government Portal of Puebla

Luis F. Luna-Reyes  
Universidad de las Americas Puebla  
Sta. Catarina Martir, Cholula, Mexico  
+52 (222) 229-2000 ext. 4536  
luisf.luna@udlap.mx

J. Ramon Gil-Garcia  
Centro de Investigacion y Docencia Economicas (CIDE)  
Carretera Mexico-Toluca 3655, DF, Mexico  
+52 (555) 5727-9800, ext. 2311  
joseraimon.gil@cide.edu

## ABSTRACT

Until recently, researchers and practitioners around the world thought that information technologies could by themselves transform government organizations. However, current studies show that there are complex relationships between information technologies, organizations, and institutions. This paper presents a preliminary theory of the co-evolution of organizational networks, institutional frameworks and technology in the development of state government portals. The theory uses the grammars of system dynamics and builds upon institutional approaches to understand interactions among all these factors in the development of information and communication technologies in government. The preliminary theory shows the relevance of networks and relations to successful portal development. Moreover, institutionalization of work practices and methods appears to be also an important success factor, and there are several interactions among the variables identified.

## Categories and Subject Descriptors

H.4.2 [Information Systems Applications]: Type of systems – *e-government applications*.

## General Terms

Management, Performance, Design, Theory.

## Keywords

Digital Government, Portals, Puebla, Portal Evolution and Design, Institutional Theory, System Dynamics.

## 1. INTRODUCTION

Access to government portals via the Internet has contributed to an information revolution around the world, as well as improvements in the services governments offer to their citizens

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from [Permissions@acm.org](mailto:Permissions@acm.org).

*dg.o* 2013, June 17 - 20 2013, Quebec City, QC, Canada  
Copyright 2013 ACM 978-1-4503-2057-3/13/06...\$15.00.

via the web. Currently, all state governments in Mexico have a website with specific characteristics and functionality that turn each site into a single government portal. The levels of functionality of state portals in Mexico has been measured for several years now [30, 31]. While these studies show the dynamics and development of new content and functionality in portals, they tell little of the history and processes that have made the development of such content and functionality possible. Although the technological development of the Internet and the World Wide Web (WWW) play an important role in facilitating the development of new functionality in portals, they are not the only significant component that drives their performance and evolution. Indeed, the development of functionality and content in state government portals, as well as in other digital government applications, happens over time as a result of the complex interactions between organizational practices, inter-organizational networks and institutional frameworks. Despite the fact that such relationships have already been demonstrated in the literature [13, 37], a greater understanding of the specific way they operate and influence each other is still required.

Accordingly, and building on quantitative explorations of Mexican state government portals [30, 31], in this paper we present the case of Puebla, its development since its creation in 2000, and its evolution to its current status in 2012. The Puebla state government portal has been positioned as one of the leaders in functionality and content over the last few years. Using the Technology Enactment Framework [13] as a focus, the case constitutes an interesting illustration of the co-evolution of organizational, institutional, contextual and technological components in order to achieve instances or enactments of specific technologies. The chapter includes a conceptualization of this process of co-evolution using the grammar of systems dynamics. The analysis provides qualitative information that contributes to existing research aimed at understanding success factors in the development of government portals.

The paper is organized into six sections, including the foregoing introduction. The second section includes a review of relevant literature, particularly studies that apply institutional theory and other integrative models. The third section describes the method used to undertake this study. The fourth and fifth sections comprise a description of the portal's evolution and an analysis of several of its most important dynamics, respectively. Finally, the last section provides some final comments and suggests areas for future research about this topic.

## 2. LITERATURE REVIEW

Information technologies have the potential to significantly transform the way in which governments perform their functions [13, 14, 37]. However, the process of ICT-enabled government transformation had not begun 10 or 15 years ago, when researchers and public administrators alike started to refer to the use of ICTs in government as electronic or digital government. The roots of this process lie in the introduction of ICTs to government in the 50s and 60s, when government agencies began to automate repetitive and intensive tasks using large central servers or mainframes [1]. The introduction of personal computers in the 80s significantly reduced the size and cost of processing, and encouraged more widespread use of computers in public agencies. In the 90s, the Internet and computer networks had brought new opportunities and challenges to public servants [25]. Moreover, the evolution of social applications on the Internet continues to promote organizational and institutional transformations in government.

Although it could be argued that the challenges and developments over the last few years are more important than those carried out during the 50s, it would be simplistic to think that these changes are the sole result of technological developments [25]. The current phenomenon of digital government is the result of the development over time of many other movements in administrative, organizational and institutional areas [2, 6, 20, 27, 29]. The reengineering movement was one such movement which saw public administration follow the trends of new public management or joined-up government. On the other hand, new organizational forms, such as networks, are substituting hierarchies and bureaucracies to resolve complex problems [26]. Electronic commerce and other trends in business-related contexts have emboldened citizens to demand that governments provide the same levels of service they receive from private companies, whereas governments around the world are looking to forge stronger ties with citizens and other agencies in the community. Digital government is perceived as a strategy to support these trends and goals, but it has to be understood in a more comprehensive way [37].

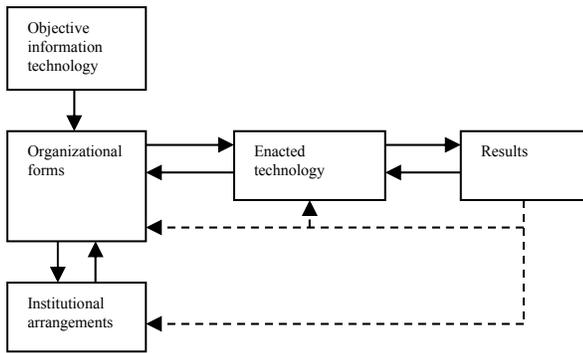
Institutional theory provides a reference framework for understanding the applications of digital government, such as state government portals, as it not only takes into account technology, but also the context, forms of organization and the institutional arrangements in which they are embedded, to constitute a comprehensive theoretical focus [28, 35-36]. According to North [40], "Institutions are the rules of the game in a society or, more formally, are the human devised constraints that shape human interaction" (p. 3). Institutions have also been understood as the collection of integrated rules, mechanisms for their application, and the organizations that support them [50]. Institutions represent constraints created by options available to both groups and individuals, except that these constraints are subject to changes over time [4]. Institutions then are defined as shared and typified rules with identified categories of social actors, as well as their relationships. Institutions may also be understood as guides for action created by society and the individuals that form it [21-22]. Contemporary institutional approaches recognize the interactions between social structures (macro) and the actions and interactions between individual actors (micro). Therefore, the basic principle of institutional theory is that the actions of individuals and organizations are guided by institutions which, at the same time, are replicated or modified

through the collective action of individuals and organizations [7, 52, 22].

Many researchers have used institutional approaches in order to understand a wide variety of phenomena in disciplines like the economy [40, 49], political science [45], sociology [7], and organizational research [3, 46, 52]. Institutional theory has been useful in understanding organizational change, and identifying the relevant aspects of the context in which information technologies are designed, implemented and used [5, 28, 15, 51]. Following the institutional tradition, and in an attempt to explicitly include the role of technology from a comprehensive viewpoint, Fountain [12, 13] developed the theory of technology enactment (see Figure 1). Technology enactment theory explains the effects of the organizational forms and institutional arrangements on the technology used by government agencies and their results [12, 13].

Fountain [14] states that "two of the most important influences on technology enactments are organizations and networks" (p. 6), and gives examples of information technology enactments in comparable organizational contexts, but with very different results. She proposes that interactions between organizational, network and institutional characteristics may explain some of these differences. She also argues that actors' embeddedness in social, cultural, cognitive and institutional structures influence the design, perception, implementation and use of information technologies. Each project is embedded in a certain organizational environment, and is affected by specific institutional arrangements. As a result, each organization uses the technology differently, and obtains different performance, cost and results [10, 13]. Therefore, organizational characteristics and institutional arrangements have a direct impact on technology enactments and their results [13, 23, 36].

Fountain [13] proposes an analytical distinction between objective technology and enacted technology. She describes objective technology in terms of its capacity and functionality; hardware, software, networks and other material characteristics, regardless of how they are used by the people [14]. In contrast, enacted technology refers to the way users perceive and react to objective technology. As such, enacted technology could be conceived as a subset of objective technology [47]. In respect to state government portals, objective technology is the collection of technological possibilities that can be included on a website, which is continually changing over time. Moreover, the functionality that each government decides to include in its portal is construed as a specific enactment of objective technology. However, social actors may also create new uses that were not included as an integral part of the original technological design and functionality [43, 13]. As such, enacted technology is flexible and fluid; and its development over time may be observed through the different interactions between social actors and the characteristics of certain technological artifacts [43, 32, 23, 37]. In fact, enacted technology is affected by social, cultural, cognitive, structural and political factors, but also affects these factors dynamically and recursively [13, 14]. Social actors act on the basis of institutional arrangements and, therefore, enacted technology is affected by institutions, organizational characteristics and the contextual conditions in which they are developed or implemented [14, 33].



**Figure 1. Technology Enactment Framework [31]**

### 3. RESEARCH DESIGN AND METHODS

In this paper we use the case study method to describe the evolution of state portals and some development trends more generally. The case study gives us the opportunity to undertake a detailed exploration of the relationships between the levels of functionality of a state portal, and the relevant organizational, institutional and contextual components to explain its successful development. We decided to select the Puebla State portal for this study because of the consistent improvement it underwent between 2007 and 2010, according to the assessment we made year on year, to go from twenty-third spot to second place. Accordingly, we believe that this portal, together with the organizational practices and institutional arrangements that have evolved along with it, can help explain the successful development of digital government projects, such as state government portals.

Ten people were interviewed for the study, including the person in charge of the portal (1), the development team that worked directly with the person in charge (5), and the web managers of other government ministries who were responsible for the content of each of these agencies (4). This sample enabled us to compile the points of view of the portal administrator, its development team, and the liaisons for the different state government agencies responsible for content. The interviews were conducted during the second semester of 2009 using a questionnaire based on the work of Gil-Garcia [24], which included questions related to organizational and institutional factors associated with portal development processes and their successful development. The questions focused on topics such as job descriptions and main roles, the origin and evolution of the site, mission, and the portal's short- and long-term goals and challenges, characteristics and services offered to citizens, political factors and influence on the generation of information, accessibility, usability and management, main guidelines, security and standardization of information, decision making, benefits to the public and private sector, limitations and organization.

### 4. DEVELOPMENT OF THE PUEBLA STATE GOVERNMENT PORTAL

In this section of the paper we describe the portal's development from 2000 through until 2009. At the end of this description we include a brief update of the portal's current situation, and the

changes it has undergone over the last few years. The description is based partially on a case that was documented previously in the literature [39].

#### 4.1 Portal Origins

The Puebla State Government Portal was first developed in 2000. During that year, the State Government hired GEDAS (Volkswagen), a private company, to develop the portal. HTML Fireworks was the code editor chosen as the tool for the portal's development. This editor only allowed the development of static web pages. Maintaining the portal was complicated since modifications to the content meant changes to multiple HTML files included in the portal. As a result, the Government portal started off as a static portal where information was not easy to change or manipulate.

In the beginning, the portal only contained information about some government agencies programmed in HTML. The initial design was spectacular as it included a selection of images that represented the state; however, the page was not very functional. That year, the people in charge of the government portal gave more weight to design than functionality. An example of this was that the page was designed using a frame of more than 1200 X 800 pixels, when the most common resolution of [computer] monitors at the time was only 800 X 600. As such, in order to view the page (frame), you had to use the browser's scroll bars, from bottom to top, and from left to right, which made navigation difficult.



**Figure 2. Evolution of the Puebla State Government Portal 2001 – 2009. Source: [39]**

The evolution of the portal saw several changes in its design which became more frequent toward the end of the last decade (see Figure 2). For the most part, these designs included information that the portal working group thought worthwhile. No comparisons were made, nor was there any study that offered a standard to follow. From 2006, the area in charge of the portal began to collaborate with the Social Communication area. The information included and its design had a clearer guideline as a result of this collaboration. On the other hand, the Social Communication area, which came directly under the office of the Governor, did not have the technological know-how to develop

web pages. As a result, communication and collaboration between the two areas gave rise to a number of problems in the portal's operation related to the lack of agreement on technical issues, such as the weight of images (in bytes), cuts and other technical design elements.

In terms of the development platform, the portal also changed after the first few years, moving from Fireworks to a content manager developed by the area in charge of the portal. This content manager turned out to be inadequate over time, mainly due to increases in available information and the complexity of the state government portal.

## 4.2 Technical, organizational and institutional developments associated with the administration of the portal

One of the interviewees commented that during its administration from 2005 to 2011, the area in charge of the portal was given greater liberty to design and configure the web page. During the first few years of development, state government agencies and entities decided on the content and development platform for their own websites, which were linked to the state portal. With the intention of unifying these official sites of agencies and entities under the same structure, changes were made during 2009 to the graphical image, platform and content management systems, discontinuing the use of the content manager designed internally and adopting an open source tool (Joomla). In general, the team adopted a series of open source development tools as the basis for developing the portal. The group developed links with the Joomla community for training and self-learning purposes, as well as to adopt additional modules to develop the portal's different functionality. In fact, [they] searched for solutions that had already been developed by the community to reuse and adapt to the needs of the Puebla portal.

The working group that collaborated on the portal's development until 2011 held the long-term vision of achieving the differentiation and functionality of the state portal compared to other websites. To accomplish this differentiation, the team maintained the following strategic objectives: (1) Remain among the top three in the national rankings of government portals and try to rise to first, (2) increase citizen participation functionality in the portal, as well as in its design, (3) provide support in maintaining the flow of transactions when the web service is in high demand due to payment of taxes, and (4) set up a blog with moderated comments in order to get feedback from users on portal (rather than government) related topics. To achieve this objective, the group adopted a series of routines and organizational practices that proved effective at continuously improving the levels of functionality of the state government portal, causing it to climb the national rankings from twenty-third to second place.

One of the elements that the team recognized as key to the portal's development was the adoption of the Scrum methodology which is an agile software development methodology based on the iterative development of prototypes that gradually improve in terms of functionality. The methodology involved short meetings (15 minutes) each day with the working team to show results and redefine work priorities. These regular meetings held by the working team allowed goals and objectives to be established and reviewed periodically so that they could be shared clearly among all the members of the team. In addition, the team adopted the use

of performance indicators and metrics obtained through Google Analytics as guides for continuous improvement of the portal's different components.

Furthermore, the working team adopted a series of principles for strategic monitoring of the environment like sources of innovation of portal content and functionality. In this way, the team was able to keep a constant eye on site characteristics and innovations which at the time maintained its position of leadership over other state portals in the country (Nuevo León). The working team was also looking closely at the developments in the Chilean government portal which was perceived by the team as one of the leaders in Latin America in terms of accessibility and usability of government web portals. In addition, the team carried out periodical benchmarking against other international government portals. Lastly, as part of this strategic monitoring strategy, the working group held informal meetings with citizens in order to directly gauge the users' opinion of the portal.

As a result of the practices and routines of the working group, as well as of the monitoring of other national and international portals, the group adopted a series of strategic guides for developing the portal's functionality and content. Some of these guides included continuous simplification of processes for users, focus on continuous improvement of usability and accessibility of the page, standardization of graphics and site uniformity, and periodical updating of the content manager via the Joomla system. In fact, according to interviewee perceptions, modifications to portal design and content respond primarily to the continuous monitoring of other government portals and, occasionally, to direct orders from political actors, such as Government Ministries.

According to the point of view of working group members, one of the government portal's success factors is based on the good relationship between the team members themselves. The treatment and collaborative attitude were considered fundamental to the good flow of information between the ministries and the development team. The working team at that time leaned toward self-taught learning and its leader encouraged collaboration giving an outstanding effort.

Apart from the team in charge of developing and maintaining the portal, the content related to the different state government ministries and entities was developed through a network of contacts in each entity and ministry. In this way, each government entity and ministry had an area dedicated to managing information, and had direct and regular contact with the personnel in charge of the state portal. Some of those within this network of contacts were seen as strategic partners who were vital to the portal's success. They worked in the Social Communication area, the Ministries of Public Education, Tourism, Economic Development, the Department of Transparency Policies, and the area responsible for applications and services, otherwise known as `Tramit@pue`.

Given the importance the team attributed to this network, collaboration took place according to a series of principles governing respect and cooperation. For example, the team began to take special care to respect the information and autonomy of the ministries, mediating with those responsible in each area on ideas and initiatives for sharing images and the functionality of each page in the portal. This gave the person responsible for each agency the freedom to manage their own sites. As part of this exchange, the team in charge of the portal sought at all times to offer personalized attention in order to understand the needs of

each government agency, and worked with them regularly in training processes. Complementary to addressing these needs, the team strived to address them as quickly as possible by taking advantage of its agile development methodology, and keeping online records of updates and new functionality for each ministry. The network of collaborators extended outside the government and included a team of external designers who gave their point of view on the portal's progress, tendencies and design.

In terms of institutions, perhaps the institutional component of greatest relevance to the portal was the Transparency and Access to Public Information Law for the state of Puebla. Enacted in 2004, this law followed national trends started by some local governments in 2001 and was backed up by the Federal Transparency and Access to Public Information Law published in the Official Federal Gazette of June 11, 2002 (Ley de Transparencia y Acceso a la Información Pública del Estado de Puebla, 2011). From the start, this state law established a basic collection of information that must be made public (such as organic regulations, budgets, expenditure, etc.), as well as the state public agencies and bodies that are obligated to publish this information. The state law has been subject to criticism since it was enacted in 2004. The Law was amended in 2008 as a consequence of changes to article 6 of the constitution, which elevated the right to information to a constitutional right, and more recently in 2011 in response to criticisms and evaluations that placed the Puebla State law at number 27 out of the 32 State Transparency Laws in Mexico [18]. Nevertheless, these latest amendments currently put the law among the top five in the country according to the same evaluation instrument.

The Transparency and Access to Public Information Law for the state of Puebla is relevant to the portal's development since the different ministries and the office of the executive are obligated to abide by this Law. In this way, the existence of this Law and the institutions to oversee its application –in this case the Commission on Access to Public Information and the Protection of Personal Information for the state of Puebla– ensure that the state portal contains additional information. Therefore, the legal framework has helped to shape and increase the portal's content. Nevertheless, there is no evidence to suggest that the evolution of the legal framework has been influenced, albeit partially, by the development of the portal's functionality during this space of time.

On the other hand, certain organizational practices were recognized by some interviewees as institutionalized routines or practices that lend legitimacy to both the portal and the development process. An example of this institutionalization process is the adoption of the SCRUM development method, which became a routine part of the development process. In addition, treating content holders with respect, not just by the personnel in charge of the portal's design, but also by the state government bodies that collaborate with them, have given legitimacy to these development processes.

At the time, the office of the governor held no special interest in using the portal as a tool for increasing citizen participation, access to information, transparency or improving services. The portal did not form part of the state government's strategy in any of these areas. This fact was exploited by the portal's development team as it gave them the freedom to adopt work routines that are uncommon in government organizations, but which are inherent to the Internet, such as publishing unpolished

or unfinished content to get ahead, and returning repeatedly to improve it. The results however, attracted the interest of the governor who began to include more and more information from the portal in his Annual Report. As one interviewee commented: "The number of lines that each agency or topic was allocated in the government report depended directly on its importance. At the beginning, the portal earned a brief mention. Now, in the fifth report, this mention has been widened significantly, which just goes to show the current importance of the portal".

### 4.3 Results of the portal's development

The results of the Puebla State Government Portal are made up by its very content and functionality, as well as by the benefits that this content and functionality achieve. The Puebla State Government Portal, as it was in 2009, contained a range of functionality. The list below describes the portal's main components as they were described by the development team:

- Informative applications.
- Online applications.
- Applications that complete a loop which start and end online.
- Applications that start online and end in the office.
- Transparency.
- Legal System (laws that make up a state).
- Citizen involvement mechanisms.
- Informative.
- Events.

For the purpose of increasing access to the portal's services and functionality by the state's inhabitants, the development group continuously sought improvements in the usability and accessibility of the portal's applications by adding functionality, such as automatic adjustment of image quality, depending on the device used to view the portal, continuous improvements to the language of the content, the capacity to print or send content via e-mail, including content related to services of other levels of government, better search options within the portal, access to content via several routes (through the ministry offering the service or topics, such as family, women or business), interaction of certain ministry pages with citizens via chat, etcetera. In this way, the site could be consulted easily using mobile devices, and there was a special version for the visually impaired.

In terms of the benefits that were obtained from its functionality, the interviewees identified transparency and better communication between government and citizens. One of the interviewees commented that "the portal is a means the citizen trusts to voice their concerns, make complaints and extend their congratulations; in the end, it is an enduring means of communication between the government and citizens". The Alexa ranking, which is an indicator of the number of visitors received by a portal and a proxy for measuring its impact on citizens, has held the Puebla State Portal among the top ten state portals in Mexico for the last four years.

### 4.4 What the development team has learned

Others who have been involved in the portal's development commented that the commitment of the leader in each ministry is directly related to the success of each page in particular. They also believe that quality information generates citizen involvement including taking part in surveys, sending e-mails, entering chats, and sending virtual postcards via the page.

There are several areas and agencies that do not view the government as an integrated body, but as a collection of independent agencies; a situation that complicates the flow of information for developing the portal. Integrating and coordinating the areas is extremely difficult, but not impossible. On many occasions, the information is outdated and ministries have to be encouraged to update the information so that it is suitable and accurate. There are administrators with differing levels of commitment to the portal. The working teams used the freedom they have to release content as a mechanism for promoting greater commitment on the part of leaders and contacts in agencies, such as uploading pages with a title, but no content. Finding their sites “blank” encouraged the different agencies to add content to the site more actively.

The development team’s point of view is that comparing their portal to others throughout the country helps with self-evaluation and opens areas of opportunity for improving the website. Furthermore, the team members consider it important not only to learn from portal functionality, but also the back-office processes needed to develop it. For example, the leading portal in 2010 invited academics and citizens to provide feedback to help develop and improve the portal. Although this process was tried in the state of Puebla, it did not have the desired result. Therefore, feedback on the Puebla website is given regularly by family members and friends of the portal’s development team.

### 4.5 Transition Process

In 2011, there was a new change in state government, and for personal and professional reasons, the working team that had been in charge of the portal over the last few years disintegrated. In addition, and perhaps partially due to the impact achieved by the portal on a political level, the governor elect sought to further integrate it into his governing strategy. In fact, the 2011-2017 State Development Plan is the first strategic plan that includes the state portal as part of the State’s strategic development lines. Expectations of change in the transition were very high, and qualified consultants were hired to give support to the portal redesign process. Given the time limitations of the transition process and the complexity of the portal itself, those involved in the process acknowledged that the primary change lies in the fundamental design; the structure of the content and functionality was so complex that it was difficult to achieve the change hoped for in such a short period of time. Figure 3 shows a comparison of the portal before and after the transition. The images reveal the design’s parallel nature and the way in which the primary change lies in its “colors”.

Following the transition process, the consulting group entrusted with changing the portal handed over its development to a new team. This new team has had to start from scratch with the building of links to other areas, the re-conceptualization of the portal, and the role it will play within the state development plan. Figure 4 shows the current situation of the portal. After falling from second place to seventeenth in the national rankings during 2011, the portal has returned to seventh position in the rankings for 2012. The current team is committed to continuous improvement and learning, and together with the institutional support of forming part of the state development plan, will likely maintain it as one of the leading portals in the country.



Figure 3. Comparison of the State Portal before and after the transition process.

## 5. DISCUSSION

The history of the state portal that was presented in the previous section allowed us to understand the way in which different institutional, organizational and technological components develop over time and interact between them in recursive and complex ways. In this section, we will use the grammar of systems dynamics to illustrate these relationships. Systems dynamics is a dynamic simulation method that enables us to understand how accumulations, activities and feedback loops explain the behavior of social systems [53, 48]. Furthermore, this method has been used successfully in the area of digital government [35]. While the method is largely quantitative, using

it qualitatively has been recognized as a way of developing theory and improving our understanding of dynamic phenomenon [54].

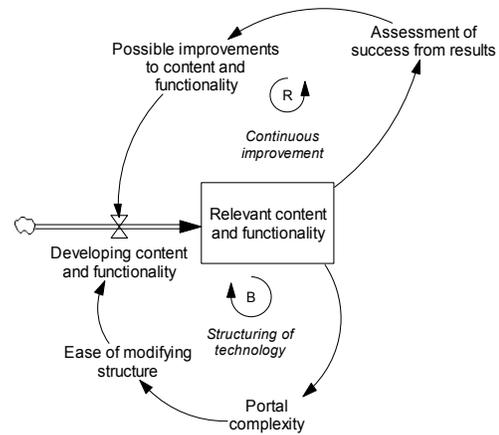


**Figure 4. Current form of the Puebla State Government Portal (2012).**

Figure 5 shows the main components of the grammar of systems dynamics applied to the Puebla State Government Portal. The rectangle in the figure represents an accumulation in the system, in this case, the content and functionality of the portal which constitute technology enactment. The accumulations, in addition to acting as the main indicators of the status of a system, are also capabilities that facilitate or hinder the development of activities in the system. Figure 5, for example, illustrates the activity of developing content or functionality. This activity is linked to the amount of content and functionality through two recursive processes or feedback loops. The top of the figure illustrates the way in which continuous evaluation of the portal leads to identifying improvements that can be included in the portal development process to create a positive feedback loop. These processes, which may become virtuous circles, also constitute potential traps at the start of the process. On the other hand, and as illustrated by the state portal transition process, the structure of the portal may be so complex that modifying its structure can require so much effort that it hinders development activity. This process of technology structuring has already been documented by researchers, such as Orlikowski [43], where the technology itself becomes one more institutional component that facilitates or hinders the development activities of actors in the system. This type of recursive process is known as a balancing loop, and normally anticipates change in systems.

Nevertheless, the components shown in Figure 5 constitute just a small part of the system in which the portal is immersed. Figure 6 shows a more complete representation of this system, and includes four more accumulations. Objective technology is found in the lower part [13], represented by the functionality available in the WWW. Such functionality, as it is described by Fountain, limits the possible functionality that can be added to specific enactments of this technology. The Puebla State Portal is no exception and, at the beginning, when the main form of working was the direct programming of html pages, the content and functionality of the portal was static and relatively simple. The advent of content managers gave rise to new technical possibilities for facilitating development. It is worth mentioning that the case suggests that functionality of the objective technology depends, at least partially, on the demands of the developers of specific enactments. In fact, the first content

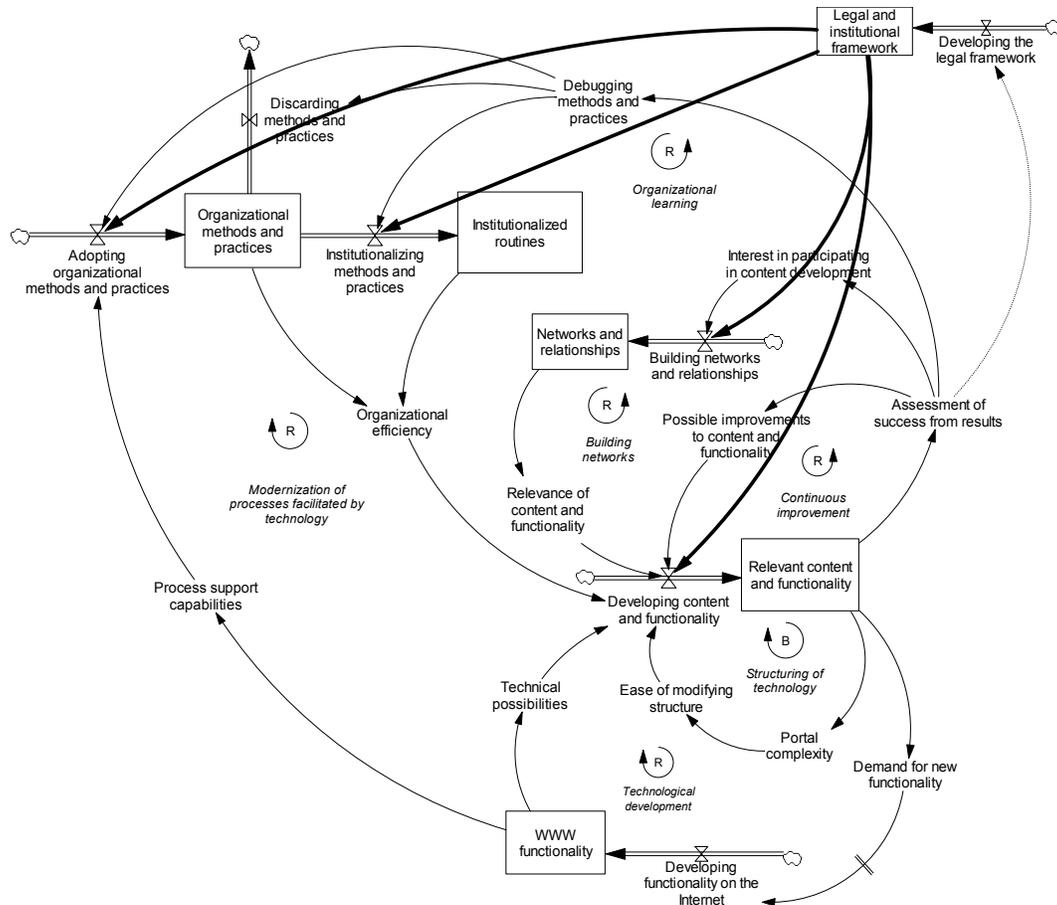
manager produced internally for the state government responds to the demand of users and developers to facilitate their work. Nevertheless, the capacity of this content manager was overtaken once more as the portal grew in terms of content and functionality, putting pressure on the development of new functionality in the World Wide Web (WWW), and encouraging development of new functionality in the WWW.



**Figure 5. Main components of a conceptual model of the systems dynamics applied to the case of the Puebla State portal.**

The specific case of the content managers, which came about in response to the implicit complexity of website management, is especially interesting since it is a technology that promotes the adoption of new organizational methods and practices that facilitate the creation of collaboration networks, such as the one surrounding the Puebla State portal. In such networks, there is a division of work facilitated by technology in which the development group takes charge of the design and functionality while the representatives of the different agencies take direct responsibility for the content in their care. In this way, as shown in the figure, the new characteristic of objective technology has an impact on both the technical possibilities of development and the adoption of organizational processes and practices.

In the specific case of the Puebla State Government Portal, in addition to this method of managing content, the adoption of the SCRUM methodology plays an important role in the development efforts of the portal. In fact, these methodologies facilitate the development of content and functionality by making the efforts of working teams more efficient. As shown in the figure, some of these practices become institutionalized, encouraging, for example, the working team to routinely meet each day to review progress on projects and set priorities. Others on the other hand, are discarded or are difficult to continue. For example, the working team tried to implement a process of receiving feedback from citizens which had to be discarded as it was not accepted by those invited to participate, and continued to take place informally through friends and acquaintances of the development team. This process of adoption and selection of new methods and practices is involved in an organizational learning loop in which those in charge of development learn which are the best methods for increasing their productivity and efficiency in the development of content and functionality.



**Figure 6. Main accumulations and recursive processes in the Puebla State Government Portal.**

Finally, Figure 6 includes one more accumulation or important capability in the development of the portal which, as many of those who participated in its development recognize, is the network of relationships both inside and outside the state government, a key resource in the development of the content and functionality of the portal. The effort required to build these networks and relationships, as shown in the figure, is no doubt affected by the results obtained from the development of the portal.

Figure 6 also shows the last key accumulation that was identified in the case of the Puebla State Government Portal; the legal and institutional framework. This legal framework impacts all the activities within the system by facilitating or limiting them. While it is true that the literature suggests that different components of the system, such as results or success, may encourage institutional change, at least in the case of the Puebla State Government during the years reported in this chapter, there is insufficient evidence to include the feedback on legal framework activity. As those involved comment, while the portal captured greater attention in the governor's report, it failed to change regulatory frameworks or the strategic plans of the state government. Although the portal now plays a larger role in the state development plan, there is insufficient evidence to support whether this is due to the results achieved and the portal's leadership on national rankings.

## 6. FINAL COMMENTS

In this paper, we described and analyzed the evolution of the Puebla state government portal as an example that illustrates the co-evolution of technological, organizational, and institutional components, as well as collaboration networks and the way that the development of each and every one of these factors impact the others, and the functionality or quality of the portal. The purpose of a government portal is to satisfy the needs of citizens, and this philosophy was adopted by the IT staff that made it possible for the portal to function today. A website is a space for interaction between the user (citizens, businesses, etc.) and government. According to national rankings, the portal went from twenty-third to third place in less than three years, and the study revealed that several qualitative factors, such as the adoption of methodologies, human integration, systematic evaluation (comparisons with other portals) and the setting of clear goals, were behind this progress. The transition process offered evidence of the way in which technology can in itself, constitute a structure that is difficult to modify, at least in a limited amount of time.

One of the most important aspects of this case study is the relevance of networks and relations, both internal and external. The portal aims to meet the requirements of external clients and customers, but it is clear that beforehand it must fulfill the needs of internal users. The human interaction and integration of the working team is outstanding, and transmits to the personalized treatment given to each ministry administrator; a clear success

factor. In addition, this gave greater flexibility to use the required tools for identifying the particular needs of users, ease of access to information and the capacity to modify content quickly. All these aspects point to generating benefits like: lower costs, personalization, efficiency in processes, year-round service, promotion of e-democracy, less corruption and the offering of better quality services, all of which are key to e-government.

The dynamism, integration, cooperation, updating of information, redesign, learning and keeping in touch with new trends will continue to be essential factors that provide legitimacy to a government portal. The main objective, and one that gives meaning to a government portal, is to satisfy the citizen by providing quality information and improving services. Competition and the comparison of the portal with other states allow continuous improvement but one must never lose sight of the citizen's perception of the design and functionality of the page they visit, which is not necessary the same in different states and countries. The aspect that requires the most is citizen participation. Government portals, over the last decade or so, are and have been a direct permanent connection with the citizen, and represent a perfect link for exchanging experiences and improving relations between government and the citizen. We hope to see more participation channels and opportunities in the near future. Following the logic of open government and open data, government portals could become central in promoting transparency, participation and collaboration.

## 7. REFERENCES

- [1] Andersen, D., & Dawes, S. 1991. *Government Information Management. A Primer and Casebook*. Englewood Cliffs, NJ: Prentice Hall.
- [2] Arellano, D. 2004. *Mas allá de la Reinención del Gobierno: Fundamentos de la Nueva Gestión Pública y Presupuestos por Resultados en América Latina*. Mexico: Centro de Investigación y Docencia Económicas y Miguel Angel Porrúa.
- [3] Bansal, P. 2005. Evolving sustainably: a longitudinal study of corporate sustainable development. *Strategic Management Journal*, 26(3), 197-218.
- [4] Barley, S. R., & Tolbert, P. S. 1997. Institutionalization and structuration: studying the links between action and institution. *Organization Studies*, 18(1), 93-117.
- [5] Bennett, M., Bouma, J. J., & Ciccozzi, E. 2004. An institutional perspective on the transfer of accounting knowledge: a case study. *Accounting Education*, 13(3), 329-346.
- [6] Bogdanor, V. (Ed.). 2005. *Joined-Up Government*. New York: Oxford University Press.
- [7] Brinton, M. C., & Nee, V. 1998. *The New Institutionalism in Sociology*. Stanford, CA: Stanford University Press.
- [8] Checkland, P., & Holwell, S. 1998. *Information, Systems and Information Systems -- Making Sense of the Field*. Chichester: John Wiley & Sons.
- [9] Cherns, A. B. 1977. Can behavioral science help design organizations? *Organizational Dynamics*, 5(4), 44-64.
- [10] Dawes, S. 2002. Government and Technology: User, Not Regulator. *Journal of Public Administration Research and Theory*, 12(4), 627-631.
- [11] e-México. 2003. Resumen ejecutivo del sistema nacional e-México Retrieved January, 2006, 2006, DOI=[http://www.emexico.gob.mx/wb2/eMex/eMex\\_Resumen\\_ejecutivo\\_del\\_Sistema\\_Nacional\\_eMexic](http://www.emexico.gob.mx/wb2/eMex/eMex_Resumen_ejecutivo_del_Sistema_Nacional_eMexic)
- [12] Fountain, J. E. 1995. *Enacting Technology: An Institutional Perspective*. Cambridge, MA: John F. Kennedy School of Government, Harvard University.
- [13] Fountain, J. E. 2001. *Building the Virtual State. Information Technology and Institutional Change*. Washington, D.C.: Brookings Institution Press.
- [14] Fountain, J. E. 2004. Prospects for the Virtual State. *Working papers* Retrieved May, 2006, DOI=<http://www.j.u-tokyo.ac.jp/coeps/pdf/040710.pdf>
- [15] Fountain, J. E. 2008. Bureaucratic Reform and E-Government in the United States: An Institutional Perspective. In A. Chadwick & P. N. Howard (Eds.), *The Handbook of Internet Politics*. New York: Routledge.
- [16] Fountain, J. E., & Gil-Garcia, J. R. 2006. Comparing Integrative Models of Technology and Structure in Government. Paper presented at the 2006 APPAM Fall Conference "Tax and Spend: Designing, Implementing, Managing and Evaluating Effective Redistributive Policies", Madison, WI.
- [17] Fountain, J. E., McKinnon, R., & Park, E. 2003. E-Government Cross-Agency and Intergovernmental Initiatives Research Project: Web Survey Results. Boston, MA: *Working Papers Series, Natinal Center for Digital Government, John F. Kennedy School of Government, Harvard University*.
- [18] FUNDAR .2012. Análisis de la reforma a la Ley de Transparencia y Acceso a la Información del Estado de Puebla. FUNDAR Centro de Análisis e Investigación. [Accessed:20-jul-2012].DOI=<http://fundar.org.mx/mexico/?p=6065>.
- [19] Gascó, M. 2004. E-Gobierno en Bolivia y Paraguay. In R. Araya Dujisin & M. A. Porrúa Vigon (Eds.), *América Latina Puntogob: Casos y tendencias en gobierno electrónico* (pp. 125-150). Santiago: FLACSO-Chile/ AICD-OEA.
- [20] Gascó, M. 2004. *¿Luces? y sombras de la reforma del Estado en América Latina*. Institut Internacional de Governabilitat de Catalunya, Barcelona, Spain,
- [21] Giddens, A. 1979. *Central Problems in Social Theory. Action, Structure and Contradiction in Social Analysis*. Berkeley and Los Angeles, CA: University of California Press.
- [22] Giddens, A. 1984. *The Constitution of Society*. Berkeley and Los Angeles, CA: University of California Press.
- [23] Gil-Garcia, J. R. 2006. Enacting State Websites: A Mixed Method Study Exploring E-Government Success in Multi-Organizational Settings. January 4-7, 2006. Paper presented at the 39th Hawaii International Conference on System Sciences (HICSS).
- [24] Gil-García, J. Ramón. (2012). *Enacting Electronic Government Success: An Integrative Study of Government-wide Websites, Organizational Capabilities, and Institutions*. New York, NY: Springer. [Estados Unidos] [ISBN: 978-1-4614-2014-9]

- [25] Gil-García, J. R., & Luna-Reyes, L. F. 2008. A Brief Introduction to Electronic Government: Definition, Applications and Stages. *Revista de Administración Pública RAP* 116, 43(2), 221-241.
- [26] Goldsmith, S., & Eggers, W. D. 2004. *Governing by Network: The New Shape of the Public Sector*. Washington, D. C.: Brookings Institution Press.
- [27] Grönlund, Å., & Horan, T. A. 2004. Introducing e-gov: History, definitions and issues. *Communications of the AIS*, 15(39), 713-729.
- [28] Hassan, S., & Gil-García, J. R. 2008. Institutional Theory and e-Government Research. In G. D. Garson & M. Khosrow-Pour (Eds.), *Handbook of Research on Public Information Technology* (pp. 349-360). Hershey, PA: IGI Global.
- [29] Homburg, V. 2008. *Understanding E-Government: Information Systems in Public Administration*. Abingdon: Routledge.
- [30] Luna, D. E., Gil-García, J. R., Luna-Reyes, L. & Sandoval, R. 2011. Índice de Gobierno Electrónico Estatal La Medición 2010., *Documento de Trabajo 264. Centro de Investigación y Docencia Económicas, DAP*. México.
- [31] Luna, D. E., Duarte, A., Gil-García, J. R., Luna-Reyes, L. & Sandoval, R. Índice de Gobierno Electrónico Estatal: Comparativo de las mediciones 2011 y 2012. *Documento de Trabajo 273. Centro de Investigación y Docencia Económicas, DAP*. México.
- [32] Luna-Reyes, L., Zhang, J., Gil-García, J. R., and Cresswell, A. M. (2005). Information Systems Development as Emergent Socio-Technical Change: A Practice Approach. *European Journal of Information Systems*, 14 (1): 93-105. [Reino Unido] [Social Science Citation Index]
- [33] Luna-Reyes, L. F., Gil-García, J. R., & Cruz, C. B. 2006. Collaborative Digital Government in Mexico: Some Lessons from Federal Web-Based Inter-Organizational Information Integration Initiatives. August 4-6. *Paper presented at the 12th Americas Conference on Information Systems, Acapulco, Mexico*.
- [34] Luna-Reyes, L. F., Gil-García, J. R., & Cruz, C. B. 2007. E-Mexico: Collaborative Structures in Mexican Public Administration. *International Journal of Cases on E-commerce*, 3(2), 57-74.
- [35] Luna-Reyes, L. F., Gil-García, J. R., & Estrada-Marroquín, M. 2008. The Impact of Institutions on Interorganizational IT Projects in the Mexican Federal Government. *International Journal for Electronic Government Research*, 4(2), 27-42.
- [36] Luna-Reyes, L. F., Hernández-García, J. M., & Gil-García, J. R. 2009. Hacia un Modelo de los Determinantes de Éxito de los Portales de Gobierno Estatal en México. *Gestión y Política Pública*, XVIII(2), 307-340.
- [37] Luna-Reyes, L. F. & Gil-García, J. R. 2011. Using institutional theory and dynamic simulation to understand complex e-Government phenomena. *Government Information Quarterly*, vol. 28, n.º 3, pp. 329-345.
- [38] March, J. G. 1981. Footnotes to Organizational Change. *Administrative Science Quarterly*, 26(4), 563-577.
- [39] Méndez, R., and Cindy R., Pérez D. and Luna-Reyes, L. F. 2010. Portales de gobierno estatal en México: el caso del portal del gobierno del Estado de Puebla. *DG.O'10*. 183-192
- [40] North, D. C. 1999. *Institutions, Institutional Change, and Economic Performance*. New York: Cambridge University Press.
- [41] Orlikowski, W. J. 1992. The duality of technology: Rethinking the concept of technology in organizations. *Organization Science*, 3(3), 398-427.
- [42] Orlikowski, W. J. 1996. Improvising organizational transformation over time: a situated change perspective. *Information Systems Research*, 7(1), 63-92.
- [43] Orlikowski, W. J. 2000. Using Technology and Constituting Structures: A practice lens for studying technology in organizations. *Organization Science*, 11(4), 404-428.
- [44] Orlikowski, W. J., & Iacono, C. S. 2001. Research Commentary: Desperately Seeking the "IT" in IT Research--A Call to Theorizing the IT Artifact. *Information Systems Research*, 12(2), 121-134.
- [45] Peters, B. G. 2001. *Institutional theory in political science. The 'new' institutionalism*. London: Continuum.
- [46] Powell, W. W., & DiMaggio, P. J. 1991. *The New Institutionalism in organizational analysis*. Chicago, IL: University of Chicago Press.
- [47] Puro Cid, G., & Gil-García, J. R. 2004. Enacting E-Budgeting in Mexico. *Public Finance and Management*, 4(2), 182-217.
- [48] Richardson, G.P. and A.L. Pugh III. 1981. *Introduction to System Dynamics Modeling with DYNAMO*. Cambridge: MIT Press; reprinted by Productivity Press, Portland, Oregon.
- [49] Rutherford, M. 1999. *Institutions in economics. The old and the new institutionalism*. New York: Cambridge University Press.
- [50] Scheela, W., & Van Dinh, N. 2004. Venture capital in a transition economy: the case of Vietnam. *Venture Capital - An international journal of entrepreneurial finance*, 6(4), 333 - 350.
- [51] Schellong, A. 2007. Extending the Technology Enactment Framework. Boston, MA: Harvard University, *Kennedy School of Government, Program on Networked Governance, Working Paper No. PNG07-003*.
- [52] Scott, W. R. 2001. *Institutions and organizations* (2nd ed.). Thousand Oaks, CA: Sage.
- [53] Sterman, J. 2000. *Business dynamics: systems thinking & modeling for a complex world*. New York: Irwin-McGraw-Hill.
- [54] Wolstenholme EF. 1990. *System Enquiry—a System Dynamics Approach*. Wiley: Chichester.