ENACTING E -BUDGETING IN MEXICO (1)

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Abstract

There is a common understanding that e -government applica tions have the potential to transform governmental operations and services. Public managers in different countries are working to provide the benefits of information technologies to their agencies and clients. Budgeting is one of the most relevant and comp rehensive government processes and electronic budgeting is a very necessary part of this new wave of reform. However, e -budgeting is not only a matter of how information technology can change the budgeting process, but also a question of how the government setting affects the kind of technology that can be implemented and used. This paper discusses how organizational dynamics and institutional arrangements affect the technology features of e -budgeting projects in Mexico.

Introduction

During the last dec ade, many countries have attempted to transform their governmental structures and improve the quality of the services they provide (OECD, 2003). E -government is seen as a powerful tool for administrative reform (Kraemer and King, 2003).
Mexico has been par t of this Information and Communication Technology (ICT) revolution and has designed and implemented several projects that can be identified as e -government. E -government initiatives fall into four general categories: e -services, e -management, e -democracy, and e -policy (Gil -Garcia and Luna -Reyes, 2003). Each of these applications has both distinctive enablers and

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barriers. However, all of the applications can be shaped by organizational characteristics and institutional arrangements.

In Mexico, most of the se ICT initiatives emphasize the operational efficiency and effectiveness of the government. Using a top -down perspective, the federal government has attempted to integrate ICT solutions into budgeting and many strategic functions. The e -budgeting projects were among the first policies to be approved, designed and implemented by the current federal administration (SHCP Presentación, 2003; OPR Manual de Orientación, 2002).

It is clear that e -government has the potential to transform the way in which govern ment operates and provides services (Heeks, 1999; Holmes, 2001; Moon, 2002). However, the relation between IT and social or organizational structures is bi -directional and complex (DeSanctis and Poole, 1994; Kling, 2000; Orlikowski, 2000). IT has the capab ility to change government organizations, but at the same time, IT is limited by several organizational and institutional constraints (Kraemer et al., 1989; Fountain, 2001; Dawes and Pardo, 2002; Fletcher, 2002; Garson, 2004).

The purpose of this paper i s to explain how organizational characteristics and institutional arrangements shape the functionality of e -budgeting projects in Mexico. The paper examines three e -budgeting initiatives led by the Budgetary Office (*Subsecretaría de Egresos – SSE*), which i s a sub -area of the Ministry of Finance (*Secretaría de Hacienda y Crédito Público – SHCP*) in the Mexican Federal Government.

The paper is divided into six sections, including these introductory comments. The second section presents some definitions and f oundations of budgeting. The third section develops a theoretical framework for understanding the effects of institutions and organizations on the actual characteristics of information technology used in government organizations. The fourth section describ es the research method and design, as well as some of the variables to be measured. The fifth section is a detailed presentation of the three cases. Finally, the sixth section contains final comments and suggestions for future research.

Public Spending a nd the Budgeting Process

One of the most important policy instruments is the public budget, which has been a subject of study by different disciplines, such as economics (Musgrave and Musgrave, 1992; Ayala, 1996), political science (Wildavsky, 1984; 1992), and organization theory (Arellano et al., 2000; Arellano and Gil -Garcia, forthcoming). Public spending can be considered a main frame for social science, from economic welfare, market failures, and public finance to collective action, public choice, eco nomic development, and neo - institutionalism (Ayala, 1996).

Traditionally, the main instrument of governmental control has been the budgeting process (Petrei, 1997). This process can be defined as the focal point of public spending policy application. It is necessary to have a control system regarding what and how government conducts planning, programming, legislating, contracting, executing, and public spending (Musgrave and Musgrave, 1992: p. 39).

Public servants who design public policies, operate pro jects and programs, make decisions, evaluate and communicate the outcomes, know that the budgeting process is not a homogeneous and monolithic mechanism. Budgeting requires several administrative actions, including planning, programming, executing, control ling, supervising, and evaluating. The process also entails the gathering of general budgetary reporting data in addition to very detailed and specific reports and procedures.

There are four phases in this process: 1) Executive budget preparation by the Executive; 2) Executive budget and budgetary normative evaluation by the legislative branch; 3) Legislative legislation and normative execution by the Executive; and 4) Control (OECD, 1997; Musgrave and Musgrave, 1992; Petrei, 1997). These four functions a re central to the decision -making and administrative processes.

All of these activities are predominantly technical. However, authors such as Wildavsky (1984; 1992) have argued that important parts of the budgetary process are the human problems and solu tions that arise during the complex processes of negotiation. This political view should not be different for e -budgeting projects. In fact, IT

projects are not purely technical, but rather political and socially constructed (Orlikowski, 1992; Fountain, 19 95; Robey and Sahay, 1996). The technological features result from people's perceptions of reality and the impact of social structures on those perceptions. Therefore, organizational characteristics and institutional arrangements are expected to shape and be shaped by government information technologies.

The Enactment of E -Budgeting

Most of the initial studies of IT were very deterministic. Fortunately, some theoretical traditions propose a different way of understanding the relations between IT and socia l structures. According to Orlikowski and Iacono (2001), these ensemble -view approaches can refer to technology either as an embedded system or as a structure. Social informatics (Kling and Scacchi, 1982; Kling, 1999; 2000) and the technology enactment the ory (Fountain, 1995; 2001) can be considered as cases based on the embedded system view. Two examples of the structuration perspective are the structurational model of technology (Orlikowski, 1992; Orlikowski, 2000) and the adaptive structuration theory (D eSanctis and Poole, 1994). Using different, but related, theoretical constructions, all these theories argue that there is a dynamic interaction between social structures and information technologies. According to these theories, IT has the potential to ch ange social and organizational structures, but at the same time, the design, implementation, and use of IT affect these structures.

Technology Enactment

Scholars from different disciplines, such as economics (North, 1999; Rutherford, 1999), sociology (B rinton and Nee, 1998), and political science (Peters, 2001; March and Olsen, 1989) have developed institutional frameworks to understand diverse social phenomena. In addition, institutional theory has been useful in understanding organizational settings (S cott, 2000; Powell and DiMaggio, 1991). Based on this institutional tradition, the technology enactment theory explains the effects of organizational forms and institutional arrangements on the information technology used by government agencies. Fountain (2001) mentioned that the technology enactment framework pays attention to the relations between information technology, organizations, embeddedness, and institutions.

According to the enacting technology framework, objective information technologies are in some way modified by organizational and inter-organizational factors (1995). In other words, "…the embeddedness of government actors in cognitive, cultural, social, and institutional structures influences the design, perceptions, and uses of the Internet and related IT" (Fountain, 2001: p. 88). Fountain (2001) established that enacted technology can be understood as the perception, design, and use of objective technologies, such as the Internet and different variable pieces of hardware and software.

Organizational forms contain structural characteristics, such as centralization, formalization, and communication channels. According to Fountain (2001) several bureaucratic characteristics of the organizations that design, implement, or use the technology are contained in this construct. Organizational and organizational network factors have a direct effect on the enacted technology. In contrast, institutional arrangements are represented by laws, regulations, and other cognitive, cultural, or socio-structural constraints found in government contexts (Fountain, 1995). According to the technology enactment, institutional arrangements affect organizational forms, and therefore, indirectly affect the enacted technology.

Furthermore, the resulting enacted technology produces certain organizational outcomes. These outcomes (good or bad) modify the technology itself, but also may lead to long-term transformations in the organizational forms or even the institutional arrangements. Thus, the technology enactment framework recognizes the complex relations between information technology and social structures.

E-Budgeting Enactment

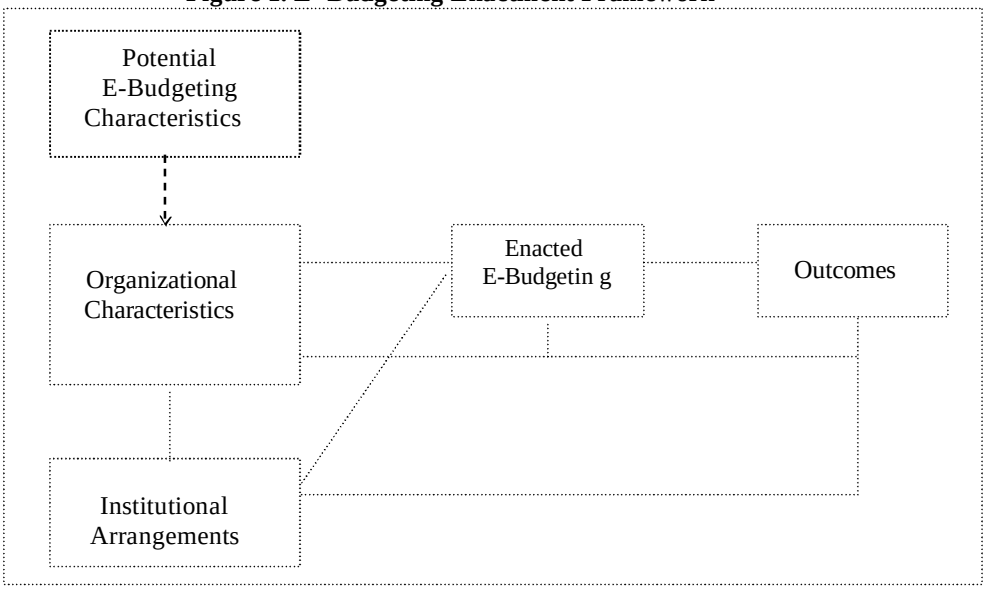
Following the technology enactment view, e-budgeting enactment refers to the perception, design, and use of information technologies at any stage of the budgetary process. Similar to any other use of IT in government, the technological characteristics of e-budgeting projects are affected by the organizational context in which they are developed. According to the enactment framework, this context is mainly represented by two kinds of variables:

organizational forms and institutional arrangements (Fountain, 1995; 2001).

The e-budgeting enactment framework proposed in this paper is similar to the generic conceptual model developed by Fountain (2001). Some important differences, however, merit further discussion. First, in the original framework, the effects of institutions are indirect. Institutions only affect the enacted technology through their direct effects on organizational characteristics. The budgeting process is a highly regulated and standardized government activity. Therefore, it is important to take into consideration the potential direct effects of institutional arrangements on the enacted e-budgeting.

Second, due to the non-longitudinal nature of this study, it is difficult to analyze the feedback effect of both the enacted e-budgeting and the outcomes on organizational characteristics and institutional arrangements. Therefore, in Figure 1 the dotted lines are not discussed in this paper. However, some comments are made about potential bi-directional effects. Similarly, this study assumes that the effect of institutions on organizational characteristics needs a longer period of time in order to be observed accurately. Therefore, a longitudinal analysis is necessary to capture this link.

Figure 1. E-Budgeting Enactment Framework



Source: Adapted from Fountain (2001).

Finally, the arrow moving from potential e -budgeting characteristics to organizational characteri stics is not a causal link, but rather an indication of process. Organizational characteristics act as a filter of potential e -budgeting characteristics. The result of this filtering action is the enacted e -budgeting (with technological features).

Resear ch Method and Design

This paper analyzes three e -budgeting initiatives in Mexico. The initiatives analyzed are: (1) Digital Signature for the Budgetary Transactions and Procedures Project (*Firma Digital para Trámites y Procedimientos Presupuestarios – FDTP*); (2) the Integral Process for Programming and Budgeting Project (*Proceso Integral de Programación y Presupuesto – PIPP*); and (3) the Government Strategic Planning Project (*Sistema de Planeación Estratégica del Gobierno – SPE*).

Case study research met hodologies are used to gather and analyze information about these projects (Yin, 2003). Specifically, analysis of documentation, direct observation, and interviews are the main data collection procedures. The unit of analysis is the e - budgeting project. Da ta is collected at both the individual and the project level, but the analysis is conducted at the project level. Two of the three projects (*FDTP* and *PIPP*) are led by the Subsecretaría de Egresos (SSE), which is a sub -area of the Secretaría de Hacienda y Crédito Público (SHCP). The third project (*SPE*) is managed by both SSE and the President's Office (Oficina de la Presidencia de la República – OPR). Since part of their institutional environment is very similar, more similarities are expected from the two c ases that are led by the same organization – *literal replication* (Yin, 2003: p. 47).

Thus, this paper follows a replication logic similar to that of experiments. First, this paper analyzes one case in a relatively comprehensive manner. Then, two other ca ses are included in the analysis with the purpose of corroborating the initial findings. The rationale for this procedure is to indicate that the first case study helps the understanding of the theoretical framework in use and the manner in which this theo ry applies to the specific situation. The two

subsequent case studies should literally or theoretically replicate the findings of the first (Yin, 2003).

In order to collect the data for this study, several techniques were used. First, official documents, such as manuals, procedures and other normative budgetary policies established by the SSE, were analyzed to identify different characteristics of the initiatives and the characteristics of their institutional environment. The documents were examined to find specific key elements, such as technology features and institutional factors. Second, the use of some components of the first two systems was restricted to specific locations. That situation allowed the researchers to directly observe how the systems work and how users take advantage of their features. Some problems and limitations of the current technology were also identified.

Finally, interviews with project managers and users helped to assess the impact of organizational and institutional arrangements regarding the characteristics of the systems (enacted technology). Eight formal interviews for the first project were conducted with project leaders and users. Semi-structured interviews were used to understand the different processes by which organizational characteristics and institutional arrangements shaped the technological features of the three initiatives. Several informal conversations also took place with project managers and users of the other two systems.

The dependent variable is the enacted technology, that is, the actual characteristics of the system. A comparison between the actual features of each e-budgeting initiative and the potential technology characteristics (objective technology) is presented to understand the impact of the institutions and organizational forms regarding the selection of technological features. The specific technology features that are analyzed are: (1) General System Characteristics that refer to the technology in use, such as functionality, speed, safety, and practicality; (2) Connectivity and Integration that examine the actual and potential systems that could be connected to the system under study; (3) Information Security that analyzes the attributes of information in terms of security policies required to protect the data specifications; and (4) Reporting Accessibility that delves into the actual and potential users, organizational levels, and areas that have access to the reporting system.

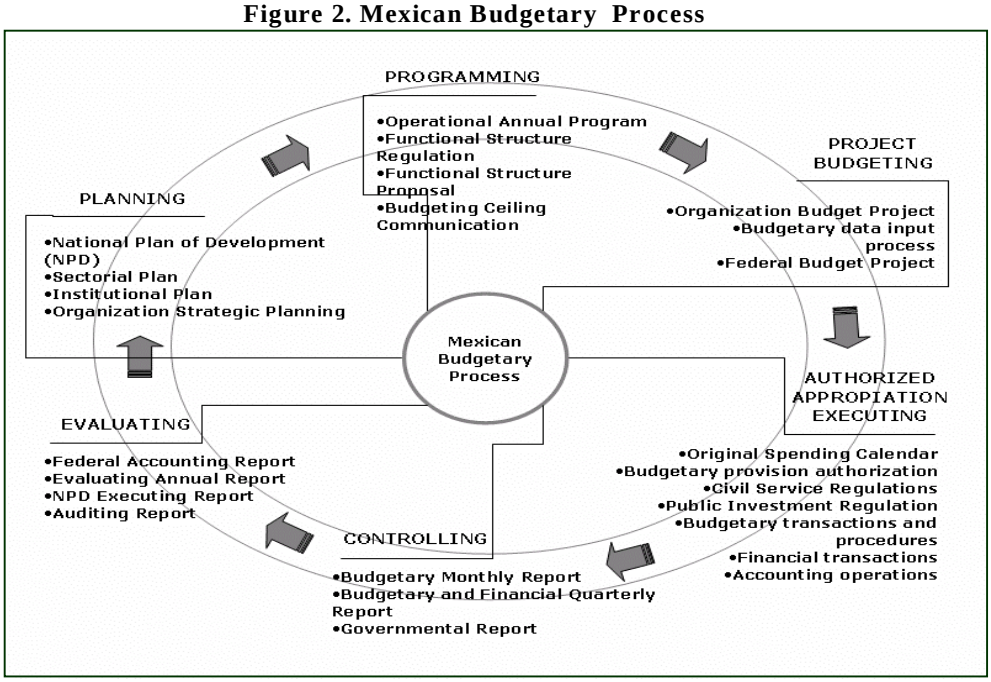
Several independent variables affect the perception, design, and use of information technology. Most of these factors can be divided into two groups: (1) Institutional Arrangements that explore the limits and enablers enacted by law and organizational normative structure, such as internal manuals and policies; and (2) Orga nizational Characteristics that refer to characteristics of the organizations that are leading or participating in the initiatives. This criterion includes not only individual -organization factors, but also characteristics of the interrelations among diffe rent organizations (organizational networks).

Finally, some organizational outputs are analyzed. Observing specific outputs can assist in an understanding of how the enacted technology affects organizational performance. E -budgeting initiatives enact cer tain technological features, and these features directly impact the capabilities of the system and indirectly impact the budgetary process. The outputs intrinsically included in the analysis are: (1) operational efficiency and effectiveness, and (2) organi zational inclusion.

Enacting E -Budgeting in Mexico

This section describes and analyzes the different e -budgeting initiatives, and introduces the budgeting process in Mexico. The cases are organized with the purpose of showing the relations between differ ent characteristics of information technology and the projects' organizational structures. Organizational characteristics and institutional arrangements were found to be closely related to both the functionality of the e -budgeting projects and to their lim its.

Figure 2. Mexican Budgetary Process



Source: Adapted from Secretaría de Hacienda y Crédito Público Documents, SHCP (2003).

The Budgeting Process in Mexico

The budget process in Mexico is similar to that in the United States. In order to understand how the public spending process works, it is necessary to study the complex relations in which it is embedded. There have been some attempts to study the Mexican budgeting process from an organizational perspective (Arellano - Gault et al., 2000). However, the budgetary process has traditionally been conceptualized as a technical process. According to this technical view, the budgetary process in Mexico entails the following steps (SHCP Guía Funcional, 2003): planning, programming, budget project, executing of authorized appropriations, controlling and evaluating. Each administrative step involves several regulations, procedures, and transactions, which are accomplished by official documented reporting -oriented processes (see Figure 2).

The Mexican Budgetary Process (BP) could be conceptualized as a central public administration "macro process" in which budget control agencies and all other public organizations participate. The President through the President's Office (*Oficina de la Presi dencia de la República – OPR*) plays the role of strategic planner and macro public spending policy maker. The *Secretaría de Hacienda y Crédito Público* (SHCP), through its internal structure conformed to the *Subsecretaría de Egresos* (SSE) as a budgetary and accounting manager and the *Tesorería de la Federación* (TESOFE) as a financial manager, is the controller agency that plays a constant instrumental and operational role in the BP. Every public organization has a budgetary or financial area to coordinate ex ternal reporting to the SSE and TESOFE. These budgetary areas enforce internal regulations, procedures, and transactions for all the administrative units that are part of the organization's structure. These units also

manage the budgetary "micro process" o f what they are planning, programming, executing, controlling, evaluating, or reporting as final public spending executors.

It may be evident to the reader that the budgetary process in Mexico requires the participation of all agencies at different stage s in the cycle. The projects analyzed in this paper were initiated with the purpose of improving some sub -processes within this more general framework. In the following subsections, the three case studies are presented and analyzed. Specific attention is p aid to variables that represent the constructs that are key components of the e -budgeting enactment framework.

Introduction to the Cases

This section describes the e -budgeting initiatives that are analyzed in detail later in the article. It also presents the historical background, objectives, and initial conditions.

E-Budgeting and Digital Signature. During 2002, the Budgetary Policy and Control Unit (BPCU) of the Budgetary Office (*Subsecretaría de Egresos* – SSE) created a project team to modernize budg etary transactions and procedures. This team found several problems: (1) slow response to the budgetary procedure, (2) dysfunctional and impractical budgetary systems, (3) rigid budgetary normative regulations, and (4) paper -based, official document - orient ed procedures. All these problems were causing public spending inefficiencies and low public policy performance (SHCP Presentación, 2003).

The goal of the Digital Signature for Budgetary Transactions and Procedures Project (*Firma Digital para Trámites y Procedimientos Presupuestarios* – FDTP) is to facilitate budgeting management at the programming and authorized appropriations executing steps of the budgetary process (SHCP Presentación, 2003). Specifically, FDTP attempts to improve communications and tran sactions between the BPCU of SSE and all other public organizations. This project seeks delegation and flexibility of budgetary transactions and procedures, without losing data control, transaction security, and process transparency. Digital signature provides the security standards that electronic budgetary transactions and procedures need to maintain transaction transmission, auditing, and supervising protocol.

As a pilot test, BPCU started with the Budgetary Internal Adjustment (BIA) event which implies a budgetary transaction and involves an official document titled *Budgetary Adjustment Document* (SHCP Manual de Normas, 2002). This official document declares there is an explicit authorization from public organizations to make a budgetary adjustment in their original appropriations approved by the Congress. In addition, the BIA includes a request for BPCU to place the budgetary adjustment registration in the database of the Integral System for Budgetary Control (*Sistema Integral de Control Presupuestario* — SICP), the main BPCU instrument that can maintain budgetary control of the adjusted budget (SHCP Manual de Normas, 2003).

The BIA transaction procedure was traditionally a semi-automated process. Budgeting or Financial General Direction in public organizations often sent a BIA document on paper and the BIA file on a diskette to Programming and Budgeting General Directions (PBGD) in the SSE. Eventually, PBGD would analyze and register it into the system (SHCP Manual de Normas, 2003). In 2002, the BPCU project team made a diagnostic study of the BIA transaction situation. After several findings, the BPCU project team found that BIA transactions comprise more than 70 percent of the total operations. However, the BIA event is not a priority for SSE because it does not require Secretaría de Hacienda y Crédito Público (SHCP) - SSE authorization according to the budgetary normative (just the event's registration in the SSE systems) (SHCP, 2002).

E-Budgeting and Budget Integration. BPCU annually analyzes programming and budgeting project procedures (SHCP Manual de Programación, 2003). The main problems identified during the 2004 budget project process were: (1) the lack of coordination and collaboration among SHCP sub-units, and (2) the large number and diversity of public organizations that had to establish their programming structures and budget projects. This problem provoked: (1) useless planning exercises to programming procedures, (2) disarticulated programming procedures to budget project integration data input, and (3) an unrealistic budget projected to real public financial needs (SHCP Guía Funcional, 2003).

The Integral Process for Programming and Budgeting Project (*Proceso Integral de Programación y Presupuesto – PIPP*) attempts to improve the budgetary management process in a sequential and

integral scheme divided among SHCP and different levels of public organizations, with ICT solutions provided by the BPCU. The PIPP project consists of three modules: (1) programming module, (2) integration and authorization of the budget project, and (3) authorized appropriation, control and closing executing accountability (SHCP Guía Funcional, 2003).

This project involves almost all the steps of budgetary process. For the complex analysis that involves the PIPP, the present section focuses only on the programming stage of the budgetary process or the Programmatic Structures Module (*Módulo de Estructuras Programáticas* – MEP). This programmatic structure represents the drawers of a particular budgetary closet in which public organizations assign resources into previously defined concepts of the MEP (SHCP Lineamientos Operativos, 2003).

In sum, the Integration Budget Project (IBP) procedure consists of an arrangement location of the budget project according to the real planning and programming needs. The MEP consists of an interactive web auto-service system available to public organization administrators and PBGD and BPCU executives with specific profiles and accesses. Every official IBP document must be registered with the MEP to comply with the procedure described for the Integration Budget Project event in the MPP.

E-Budgeting and Strategic Planning. According to the first budget process experience, the President's Office (*Oficina de la Presidencia de la República* – OPR) and the Budgetary Office (*Subsecretaría de Egresos* – SSE) perceived that OPR public policies presented poor results (OPR Manual de Orientación, 2002). The general perception was that the President's instructions were dispersed and disarticulated throughout the federal governmental structure. Therefore, the budgetary process became the strategic factor to the success of OPR strategies, policies, and plans (OPR Guía de Referencia, 2002).

The objective of the Government Strategic Planning System (*Sistema de Planeación Estratégica del Gobierno* – *SPE*) is to facilitate the strategic planning process among the executive and operative levels of government, thus connecting governmental plans and strategies with the budgetary process (OPR Manual de Orientación ,

2002). SPE is empowered by an external provider who collaborates directly with the OPR and the SSE.

Planning is the previous reference for programming and the budgetary process. The SPE provides ICT tools for planning methodology and best practices to define all public organizations' strategic planning document and establishes the group of projects in which organizations will prepare their follow up and later programmatic structures and budget projects. The SPE procedures are not considered budgetary, treasury, or accountability events. However, the procedures require an important official document: *Public Organization Strategic Planning Document* (SP) (OPR Manual de Orientación, 2002).

OPR is responsible for defining planning methodology, formats, and norms. SSE is responsible for integrating these elements into the programming structure information that eventually appears in the public organizations' Budget Project chapter. Additionally, SPE contributes project management tools and exercises for public executives regarding their strategic planning, projects, and budget projects.

General System Characteristics

This section describes and compares the general system characteristics of the three e-budgeting initiatives. These features are described in terms of: (1) functionality, whether they are functional to the budgetary activity; (2) speed, measured as the transaction response time; (3) safety, in terms of data quality, at the input, transmission and use levels; and (4) practicality, whether the system is consistent with the practical purpose of the organization using it.

E-Budgeting and Digital Signature. At the beginning, these features for FDTP project were potentially defined as functional, fast, safe, and practical. However, the final perceptions of the FDTP users of the actual technology features were quite different. This comparison led us to understand the differences between an ideal and the extant result.

The BPCU project team suggested an "on line BIA transaction" by a functional, fast, safe and practical auto-service system available

for the Budgeting or Financial General Direction in public organizations (SHCP Presentación, 2003). During the FDTP project's design and development phases in 2002 -2003, the BPCU project team asked for the Tec hnology Coordination (TC) backup to support the decisions that it had already made.

Table 1. General System Characteristics

Initiative	Actual	Potential
Digital Signature:	* Safe * Practical	* *Functional* * *Fast*
Budget Integration:	* Safe * Practical	* *Functional* * *Fast*
Strategic Planning:	* Fast * Safe * Practical	* *Functional*

For example, the BPCU project team considered improper the model of electronic signature of the existing budgetary management system called Sistema Integral de Control de la Gestión Presupuestaria (SICGP): the personal identification number, because the BIA transactions require a high level of security (SHCP Presentación, 2003). TC saw this opinion as another system requirement without any filtering or discussion. Therefore, t he BPCU project team analyzed several electronic signature options, selecting one digital signature scheme without TC's technology expertise. The higher hierarchical position of BPCU allows it to impose technology characteristics.

Another example that cl arifies this situation was the SICGP and the digital signature module that were designed to work using a web interface. Technically, SICP maintains an hourly connection with the TESOFE system called SIAFF. This hourly connection does not allow users to get the benefits of the "on line transaction". In practice, some transactions cannot be completed in a real -time basis. This circumstance is a result of TC playing the role of a fire department for BPCU, instead of performing a more analytical role in the des ign and implementation of the system.

As a result of a canvass, according to this on -line transaction viewpoint project managers and users described the service as safe and practical, because the FDTP project: (1) assures a certain security policy for da ta input transmission; (2) maintains a user

identification profile and access by a sophisticated crypto -system; and (3) serves as a dynamic procedure for BIA transaction purposes.

However, in terms of budgetary functionality, FDTP users report some commo n problems: (1) administrative units from public organizations that actually initiate the BIA procedure do not have access to SICP and SICGP information; and (2) PBGD at the SSE does not have access to SICP either, and therefore, they cannot supervise any budgetary transaction as a unique budgetary box office. Neither performs the analyst role function according to the SSE organizational and budgetary norms.

In terms of the speed criterion or transaction response, FDTP users present the following problema tic: (1) transmissions delays due to overload Internet sessions and traffic saturation operations in BPCU and public organizations servers because the hourly connection with TESOFE; (2) transaction procedure transmission interruptions; (3) lack of a progra mming response system for these contingencies; and (4) nonexistent user service center response to these situations. Furthermore, the increasing electronic traffic and diversity of web server capabilities between BPCU and other public organizations were no t considered to be key elements in the original project model.

Another important situation that BPCU failed to take into account in the design and development phases of the project was the potential incompatibility between existing technology and the har dware selected for the project. These incompatibility problems caused installation delays and technical patches. The low hierarchical position of TC in the FDTP team and the struggles between technical and non -technical people can partially explain some of these problems.

E-Budgeting and Budget Integration **.** Every fiscal year, BPCU establishes new regulations, programmatic structure changes, or budgetary framework PIPP and MEP modifications (SHCP Guía Funcional, 2003; SHCP Lineamientos Operativos, 2003; S HCP Manual de Programación y Presupuesto, 2003). Therefore, the BPCU project team communicates to the TC team the resultant modifications to the actual PIPP system, software, hardware, and Internet service infrastructure, according to any new requirements. As a result, these requirements imply temporary activities with an

avalanche of work for the TC area, which at the project development phase will bequeath the final responsibility of PIPP project and the MEP module results.

The necessary technology for the PIPP project were established by the BPCU project team as functional, fast, safe, and practical (SHCP Guía Funcional, 2003). In the design phase of the project, there were poor collaboration or coordination relations among the BPCU, PBGD, and TC teams. The TC team just waited for specific technology requirements from BPCU personnel who were budgetary, not technology experts. In this case, the BPCU team was responsible for defining Internet, hardware and software technological requirements, with little intervention from the TC team.

Despite these coordination problems, there were some positive technology features: (1) PIPP and MEP tools are secure from data input transmission damage or user identification profiles and access problems; (2) and the PIPP and MEP modules are practical because they serve the current yearly need for IBP procedure purposes.

However, in some way, PIPP and MEP are budgetarily dysfunctional in terms of performance and improper programming and budgetary activities according to the PBGD specific role. For example, PIPP and MEP users now present the following common problems: (1) administrative units from public organizations that actually initiate the IBP procedure do not have access to PIPP and MEP information; and (2) PBGD personnel at the SSE do not have access to PIPP and MEP either, and therefore, they cannot supervise any budgetary transaction, in order to perform the analyst role function according to the SSE organizational and budgetary norms.

In terms of speed criterion, meaning transaction response, PIPP also presents transmissions delays, overloaded Internet sessions, traffic saturation operations in BPCU and public organizations servers, transaction procedure transmission cuts, lack of a programming response system for these contingencies and lack of proper user service center response.

E-Budgeting and Strategic Planning. Internet, hardware, and software features were defined by the OPR team (OPR Manual de

Orientación, 2002). Among several external software providers, the OPR team established functional, fast, safe and practical software criteria selection according to specific strategic and programming functions and activities needs. This software is supposed to be available to all the public organizations and SSE (OP R Manual de Orientación, 2002). However, the purchase scheme is that public organizations must acquire this software under their own budget provisions. There are not resources assigned from OPR to acquire any public organization software package.

Therefo re, an external software provider was responsible for the technology assistance (OPR Guía de Referencia, 2002). The contract establishes that the SPE system, Internet service, software and training specifications are part of the software license and total service. The SSE team acts as the budgetary assistant for the OPR team. Today, SPE users describe the system as fast, safe and practical because SPE includes swift transaction response, maintains security from data input transmission damage or user identif ication problems, and serves strategic and programming OPR purposes. But SPE is profoundly dysfunctional to the budgetary process activity or budget project integration functions of public organizations and a SSE specific role. For example, today many publ ic organizations face budgetary constraints. So the SPE software is not affordable for many public organizations, which prefer to invest in other ICT project priorities.

Also, SPE demands strategic planning and project management information in terms of OPR perception and use. But the output reports from SPE are not serving the budget project integration functions of public organizations and SSE's specific role. This situation precludes public organizations' investment in SPE software. The organizational outputs consist of an incomplete SPE system that only partially serves OPR interests which are to construct an integral strategic planning system among public organizations.

Connectivity and Integration

This section analyzes the degree of connectivity o r integration achieved by each of the three e-budgeting initiatives. Therefore, it describes systems that can be potentially connected to each of the initiatives and the actual systems connected in the ICT project.

E-Budgeting and Digital Signature. The original design for this project configured two pairs of systems connectivity (SHCP Presentación, 2003). First, connectivity occurred between the SICGP and the Digital Signature Module empowered by the external provider. The objective of this connection w as to establish an administrative path for every transaction and electronic notary and the crypto -system management of digital signatures by user profile and access. Second was the connectivity between the SICP and the Integral System for Federal Treasury Management (SIAFF). The objective was to coordinate the authorized budget and adjusted budget databases between the SSE and TESOFE systems, in particular for the SICP, which is the responsibility of BPCU and technically managed by TC.

In the BIA transact ion operation, administrative units and the Budgeting or Financial General Direction must consider the executed budget and available budget data as the budgetary and treasury background information to make their own analysis and make decisions over the BIA procedure (SHCP Manual de Normas, 2002; SHCP Manual de Procedimientos, 2003). The project design was adequate to manage both the authorized budget and adjusted budget databases, which are BPCU priorities. However, this design does not improve access to BI A information for internal and external users. Nor does it does allow for financial assessment or accountability in data operations.

As a result of this lack of functional connectivity, the BPCU project team has encountered many BIA transactions that are already signed by digital signature but are not accepted by SIAFF, because it also performs a previous validation process of the financial sufficiency for these transactions. As a result, some BIA procedures that cross the SICGP, Digital Signature Module and SICP validation processes may be rejected by the SIAFF validation process at the end of the BIA procedure. This situation causes high costs in terms of the use of digital signature and unexpected organizational delays in many BIA transactions. On the o ther hand, the effect of the BIA transaction must be updated in the following database systems: Programmatic Structure Model (MEP), Integral Programming and Budgetary Process (PIPP), Governmental Accountability System, and Integral System for Governmental Information (SII). In theory, all

this information must be identical within all five systems. In reality, there are many differences in balance or conciliation.

Table 2. Connectivity and Integration

Initiative	Actual	Potential
Digital Signature:	Systems connectivity: *Integral System for Budgetary Control (SICP) *Integral System for Federal Treasury Management (SIAFF) Database integration: *Original or authorized budget data *Adjusted budget data	Systems connectivity: *Programmatic Structure Mod el (MEP) *Integral Programming and Budgetary Process (PIPP) *Governmental Accountability System *Integral System for Governmental Information (SII) Database integration: *E xecuted budget data *Available budget data
Budget Integration:	Systems connectiv ity: *Programmatic Structure Model (MEP) *Integral System for Budgetary Control (SICP) Database integration: *Estimated budget project data *Estimated budget project calendar	Systems connectivity: * Strategic Planning System (SPE) *Integral Syste m for Federal Treasury Management (SIAFF) *Governmental Accountability System * Integral System for Governmental Information (SII) Database integration: *Actual Executed budget data *Previous year executed budget data
Strategic Planning:	Systems connec tivity: *Strategic Planning System (SPE) *Programmatic Structure Model (MEP) Database integration: *Project Management data *Programming structure budget data	Systems connectivity: *Other Planning and Programming Government System Database integrati on: *Other related planing and budget data

E-Budgeting and Budget Integration. The PIPP and MEP project also has some connectivity implications. First, connection relates the MEP system to the budget project database. The goal of this connection is to establish the programming drawers of the following budget project closet. Second, connection associates the budget project database with SICP. The objective of this connection is to register the original authorized budget database at the SICP,

according t o the appropriations authorized by Congress (SHCP Guía Funcional, 2003).

In the real IBP procedure operation, administrative units and the Budgeting or Financial General Direction personnel must consider actual executed budget details and the previous ye ar's executed budget data to estimate the following budget project. This estimation analysis serves to make decisions over and above the IBP procedure. Likewise, the effect of the IBP procedure must be actualized in the following database systems: Strategi c Planning System (SPE), Integral System for Federal Treasury Management (SIAFF), Governmental Accountability System, and Integral System for Governmental Information (SII).

E-Budgeting and Strategic Planning . Because SPE is empowered by an external sof tware provider according to OPR specifications, it is in practice isolated from any governmental system (OPR Manual de Orientación, 2002). Therefore, OPR information needs are satisfied by that SSE team, which in fact does not conceive of the SPE system as functional to the programming functions and activities requirements of OPR.

Public organizations that already acquired this SPE software still operates the SSE systems because they must fulfill the existing SSE information requirements according to the planning and budgetary norms. The organizational outputs consist of incomplete SPE system connectivity to other governmental systems and virtually no database integration. These implications are derived from the partial usefulness to OPR interests of an in tegral strategic planning system among public organizations.

Information Security

This section presents the level of information security designed and implemented in each of the e -budgeting initiatives. Therefore, it describes security policies that are required according to the data specifications and the actual requirements made in the organization or in the process subject to the ICT benefits.

Table 3. Information Security

Initiative	Actual	Potential
Digital Signature:	Security policy:	Security policy:

	*User syste m profile and access *Smart card and card reader passwords *Digital signature procedure by user	**Internal BPCU security policy and regulations* **Internal Budgeting or Financial General Direction security policy and regulations in public organizations*
Budget Integration:	Security policy: *User system profile and access	Security policy: **Internal BPCU security policy and regulations* **Internal Budgeting or Financial General Direction security policy and regulations in public organizatio ns*
Strategic Planning:	Security policy: *User system profile and access	Security policy: **Public organizations security policy and regulations*

E-Budgeting and Digital Signature . Actually, budgetary norms point to Budgeting or Financial General Di rection areas as responsible for BIA transactions (SHCP Manual de Normas, 2002); however, administrative units that operate BIA transactions and the PBGD personnel at the SSE that analyzes the BIA transaction are also responsible for other kinds of BIA tra nsaction results (SHCP, Lineamientos Normativos, 2002; SHCP Oficio Circular, 2003; SHCP Manual de Procedimientos, 2003). For example: (1) For initial BIA transaction, the Budgeting or Financial General Direction assigned user does not have information elem ents to realize this function; (2) for adjusted budget conciliation and analysis, BPCU personnel do not have knowledge and expertise over certain public organization's budgetary statistics.

On the other hand, the lack of training for the new Budgeting or Financial General Direction personnel resulted in internal security problems and holes in the internal regulation process (SHCP, Lineamientos Normativos, 2002; SHCP Oficio Circular, 2003; SHCP Manual de Procedimientos, 2003). For example, when a user tran sfers to another position and/or is no longer responsible for BIA transactions, the user is replaced by other person who usually continues using the previous user's smartcard, passwords, profile, and access. These circumstances must be regulated by Budgeti ng or a Financial General Direction internal security policy.

E-Budgeting and Budget Integration . PIPP and MEP projects were designed to ensure a proper security level of online IBP

procedure and also to make available an auto -service system for Budge ting or Financial General Direction user purposes (SHCP Guía de Acceso, 2003). This situation comes from a budgetary norm that points to Budgeting or Financial General Direction areas as responsible for IBP procedure (SHCP Manual de Normas, 2003). Therefor e, security policy focuses on a user system's profile and access procedure that is oriented to Budgeting or Financial General Direction assigned users.

Although administrative units in public administration that operate under IBP procedure are also responsible for their results, for example, for an initial IBP procedure, Budgeting or Financial General Direction, the assigned user does not have enough information to estimate the budget. BPCU personnel do not have the knowledge and expertise in certain publ ic organization budgetary statistics to define a particular administrative unit programmatic structure. On the other hand, lack of training has resulted faults and holes in internal security procedure, when there are changes in users' access and profiles.

E-Budgeting and Strategic Planning. SPE project was designed to ensure a proper security level of online SP procedure and to provide an auto -service system to public organizations that contract the external software provider services (OPR Manual de Orie tación, 2002). Therefore, security policy focuses on the user system's profile and access procedure, which is oriented to the assigned users of public organizations.

Although BPCU and PBGD personnel in SSE that supervise SP document do not have access to information that may help to make budget projections, they can regard certain public organizations' budgetary statistics as defining a particular administrative unit programmatic structure.

Reporting Accessibility

This criterion refers to the potential access to information, through reports in each of the e -budgeting initiatives. Therefore, it describes potential users, levels and areas that should have access to the reporting system, as well as existing organizational users, levels and areas that reall y do have access in the organization or in the process subject of the ICT benefits.

Table 4. Reporting Accessibility

Initiative	Actual	Potential
Digital Signature:	Organizational levels: *Budgeting or Financial General Direction personnel in public orga nizations *BPCU personnel as certification authority agents	Organizational levels: **Administrative units that operate BIA transaction* **Programming and Budgeting General Directions (PBGD) personnel as a budgetary BIA transaction analysts and normative supe rvisors*
Budget Integration:	Organizational levels: *Budgeting or Financial General Direction personnel in public organizations *Budgetary and Policy Control Unit (BPCU) personnel *Programming and Budgeting General Directions (PBGD) personnel	Organizati onal levels: **Programming and Budgeting General Directions (PBGD) personnel* **Administrative units that operate IBP procedure*
Strategic Planning:	Organizational levels: *Budgeting or Financial General Direction personnel in public organizations	Organiz ational levels: **Budgetary and Policy Control Unit (BPCU) personnel* **Programming and Budgeting General Directions (PBGD) personnel*

E-Budgeting and Digital Signature. In practice, there are other organizational levels and areas within public organiz ations and SSE that participate directly or indirectly for BIA procedures, for example, administrative units that originate a BIA transaction and request written authorization from Budgeting or Financial General Direction. Moreover, SSE is responsible for performing budgetary analysis ensuring that the BIA event follows all the applicable budgetary norms and regulations (SHCP Manual de Normas, 2002). However, Budgeting or Financial General Direction personnel does not have access to meaningful reports.

Th is organizational exclusion was an unexpected result of the BPCU's single -organization view. Today, in order to develop the analyst role and related functions, each month PBGD requests from BPCU an external, adjusted budget database SICP system view, becau se it no longer participates in the BIA procedure. Administrative units do the same to the Budgeting or Financial General Direction areas in the public organizations.

E-Budgeting and Budget Integration. Other organizational levels and areas of public organizations participate directly or indirectly in IBP procedure, for example, administrative units that initiate IBP procedures and written authorization from Budgeting or Financial General Direction (SHCP Guía Funcional, 2003).

This organizational exclusion was an unexpected consequence of the BPCU team-oriented requirement. In order to develop the analyst role and functions, administrative units request from the Budgeting or Financial General Direction areas the actual executed budget database, because they no longer participate in IBP procedure.

E-Budgeting and Strategic Planning. In praxis, SSE areas like BPCU and PBGD participate directly or indirectly in the SPE procedure. For example, BPCU serves as the programmatic structure regulator, and PB GD acts as the budgetary analyst according to the existing norms. This organizational exclusion was an unexpected result of the OPR team-oriented requirement (OPR Manual de Orientación, 2002). Today, BPCU and PBGD are excluded from the planning phase and require parallel programming and budgeting information to accomplish their regulatory functions or analyst roles. A close organizational relationship between OPR and SSE was a determinant in the disqualification of BPCU and PBGD information needs from the planning step of the budgetary process. This situation directly affected the budgetary process performance.

Organizational and Institutional Factors

In the previous sections of this paper, several organizational and institutional factors clearly shape the technology features of the three e-budgeting initiatives. This section summarizes and discusses different organizational dynamics and institutional arrangements that had an impact on each of the initiatives.

E-Budgeting and Digital Signature. Some relevant institutional arrangements that affected the FDTP project were the following:(1) a BIA transaction does not need SHCP authorization, but it requires its registration on SSE systems; (2) every Budgeting General Direction in public organizations is responsible for BIA authorization; (3) BPCU is the SSE area responsible for BIA registration at SICP; (4) by contract, the BPCU area is responsible for

internal hardware installation, software training, connectivity, and integration of the system; and (5) acc ording to internal organizational regulations, the TC area is only responsible for technological assistance and backup to the SSE areas and sub -areas.

These formal rules marked several preconditions for the BPCU project team at the designing phase. First , according to the budgetary norms, an automated BIA transaction might be considered an unfair transfer of duties from public organizations to BPCU operations. Second, the main organizational characteristic that had a direct impact over the FDTP project wa s the inter -organizational relation between BPCU and TC teams at the design and developing phases. In terms of budgetary process performance, SHCP cannot be seen as a whole organization. In order to understand their ICT projects, BPCU, PBGD, TC, and TESOFE should be treated as different and separate organizations with different and sometimes conflicting priorities.

Any SSE area can request technology assistance, and the TC area usually responds to the requirements of that particular area. TC does not eval uate or take into account potential problems arising from the lack of a more comprehensive view. In addition, due to the lack of TC leadership and coordination at the design and development phases, some TC technical responsibilities have to be assumed by t he substantive SSE area. In this case, the BPCU team has made many technological decisions without having adequate expertise. In sum, when two systems from different SHCP areas have to be connected or integrated, the key issue does not only involve technic al elements, but also clarity of responsibility, shared accountability, political hierarchy, and power.

BPCU asked for some specific requirements that allowed it to preserve authorized budget and adjusted budget databases control. Connection incompatibil ity and differences in data structures between the SICP and SIAFF databases affected the level of database integration. Reporting accessibility and information security policies confirmed that the FDTP project is a BPCU -needs -oriented project that does not meet the requirements of other administrative units and Budgeting or Financial General Direction users. Even internal SSE sub -areas such as PBGD, were not taken into account in the design of FDTP.

Some results of these organizational and institutional factors are: (1) administrative units from several public organizations that actually initiate the BIA procedure do not have access to SICP and SICGP information; (2) PBGD at the SSE does have access to SICP, and therefore, it cannot supervise every budgetary transaction, or perform the analyst role (as mentioned in the SHCP organizational and budgetary norms); (3) poor systems connectivity; (4) absence of personnel training; (5) transmissions delays; (6) overload of Internet sessions; (7) traffic saturation in BPCU and other public organization servers; (8) transaction transmission interruptions; (9) lack of a programmed response system for these contingencies; and (10) absence of an IT service center to handle these situations. Certain organizational and institutional factors clearly affected the way that systems were developed and implemented, as well as on their final outputs.

E-Budgeting and Budget Integration. The main factors that had an effect on BPCU organizational characteristics and on PIPP and MEP projects were the following budgetary normative conditions: (1) IBP procedure requires SHCP authorization and SSE systems registration; (2) every Budgeting or Financial General Direction in public organizations is responsible for IBP authorization; (3) BPCU is the SSE area responsible for IBP registration at MEP; and (4) according to internal regulations, TC area is responsible for technological assistance and backup to SSE areas and sub-areas.

The diversity of goals and priorities of BPCU, PBGD, and TC teams in the design and development phases were instrumental in the final outputs of the system. The BPCU area is embedded in its own budget project integration priorities by preserving PIPP and MEP database updating and the IBP procedure control ideal. In the change, the PBGD area maintains a supervisory or intermediary role. The TC area is the technology assistant that must perform its functions without overlapping BPCU, and PBGD responsibilities. In addition, the TC team does not feel responsible for the technology particular use from SSE areas. Again, the critical issue is not only technical, but also clarity of responsibility, organizational politics, and regulatory complexity.

PIPP and MEP projects are BPCU needs-oriented, which does not help other administrative units to respond appropriately to IBP procedure. Even internal SSE sub-areas, like PBGD as a budgetary

analyst were not taken into account for PIPP and MEP projects' requirements. Power conflicts, regulatory inconsistencies and other factor s produced unanticipated system results: (1) administrative units from public organizations that actually initiate the IBP procedure do not account for PIPP and MEP information; (2) transmission delays, overloaded Internet sessions; (3) traffic saturation operations in BPCU and public organizations servers; (4) transaction procedure transmission cuts; (5) lack of a programming response system for these contingencies, and (6) improper user service center response to these situations.

As we observed in the FDTP project, some organizational characteristics and institutional arrangements had specific weight in this case. Organizational politics, hierarchical structures, complex regulatory frameworks, and lack of incentives for inter - organizational collaboratio n were important factors that had an impact on the system characteristics and final outputs.

E-Budgeting and Strategic Planning. As mentioned earlier, the objective of the SPE is to enable the strategic planning process among executive and operative lev els of government, in other words, to connect the plans and strategies of the President's Office to the budgetary process. Under the law, OPR must participate in the budgetary process and SSE must regulate and integrate budgetary operations. These overlapp ing functions imply a coordination and communication effort between OPR and SSE, with OPR as supervisor and SSE as the operative responsible. This situation affected the SPE design and implementation phases. In the beginning, OPR and SSE teams with differe nt perceptions of what a budgetary process is, proceeded to participate by pursuing different objectives and using their own expertise.

OPR sought to connect national planning priorities to the strategic plans of public organizations. On the other hand, SSE sought to maintain its budgetary authority, responding to OPR requirements as a budgetary area. Every time OPR claimed budgetary assistance, SSE reacted to these new SPE project requirements. The SSE team was the budgetary fire department for the OPR t eam. The main organizational challenge was again managing the relationships between OPR and SSE teams.

Public organizations that are the operative users of the SPE were confused by this parallel official workflow. First, there was an official relationshi p between OPR and public organizations around the new system SPE. Second, there was other workflow operated by the traditional SSE procedures established among public organizations. In terms of efficiency, this lack of coordination and collaboration betwee n the OPR and SSE teams interfered with the budgetary process. As a consequence, the administrative parallelism finally inhibited the planning -programming -budgeting connections that SPE sought to maintain.

On the other hand, the acquisition software sche me selected by the OPR team was not suited to the existing public finance conditions. Every public organization must consider extra technology investment resources to purchase the OPR system; the actual public finance restrictions precluded any investment. In other cases the investment priorities were different to the original OPR plans. The embedded nature of these public finance regulations seems to be the main cause of organizational exclusion in the SPE case.

Conclusion

There is an emerging need for e-government tools for the budgetary process. Information technology has the potential to transform budgetary, treasury, and accounting transactions and operations. However, as shown in this paper, government agencies are inserted into complex environment s that have an impact on the kinds of technology features that are selected, implemented, and used. These organizational and institutional factors can diminish or even offset the potential benefits of e -budgeting initiatives.

Many budgetary systems and a pplications have been designed and implemented by the Mexican Federal Government. Many of these projects have been relatively successful. In some ways, they achieved their goals and solved some of the original problems. However, the projects could not atta in the highest standards of efficiency or technical sophistication because they were entrenched in certain institutional arrangements. Government organizations are normally constrained by many complex legal frameworks and by organizational politics, among other contextual factors. This paper presents evidence of the impact of organizational and institutional

characteristics on the enacted technology for e -budgeting projects. There are several practical lessons to be learned from these innovative initiatives .

First, almost every area claimed that the development of technology based on its own requirements was the ideal situation. However, in terms of a wider organizational or inter -organizational performance, the lack of certain other requirements was causi ng unintended consequences and related problems. In addition, the lack of expertise and experience in dealing with laws and regulations was also a challenge. Some organizational characteristics affected the teams' interactions and impeded the development o f the IT projects.

Second, these factors undermined other potential technology characteristics from developing, resulting in inefficiency and organizational exclusion from the budgetary process. In general, the systems became dysfunctional according to t he budgetary activity or specific role, and for some transactions, the systems became slow in the transaction response. In most of the cases, these problems derived from the initial selection, implementation or use of the information systems. Therefore, it is not only a matter of how information technology can change the organization, but also about how the organization affects the kind of technology that can be implemented and used.

Third, e -budgeting, like other public management policy tools, is not a cure -all solution for performance or accountability problems. E-budgeting is shaped by organizational characteristics and institutions, and many of the technology features perpetuate the current status of government agencies. Agencies with power in the cur rent stage are going to select technology that helps them to preserve that level of inter -organizational power. In the case of e -budgeting, central control agencies can exert political and financial pressure to influence the way that the e -budgeting system is constructed. E -budgeting, at least in some cases, can be seen as another way of imposing reasonable control and maintaining the inter -organizational status quo. This is not always desirable in terms of constructive organizational change.

It is also i mportant to emphasize the limits of this study. Being based on case studies, this paper does not claim to generalize its findings, but rather to discern the processes behind e -budgeting

initiatives. Nor is it the purpose of this paper to argue that specifi c organizational characteristics or institutional arrangements lead inevitably to specific technology features (enacted technology). The way that organizational forms and institutions shape the enacted technology is complex in nature, and other methods in addition to those discussed in this paper could be used to test different hypotheses about the more specific impacts of a single institution on the resulting e-budgeting system. However, by looking at the evidence in these three cases, the reader should be aware of the effect of the institutional context in the development of any e-budgeting projects. Information technology is a powerful instrument of administrative reform, but public managers should be aware of the institutional limits of this type of proj ect.

Notes

1. A shorter version of this paper was presented at the International Conference on Public Participation and Information Technologies 2003 (ICPPIT03), organized by the Massachusetts Institute of Technology and the Research Center on Informati on Technologies and Participatory Democracy, November 10-12, 2003.

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