

Enacting Collaborative Electronic Government: Empirical Evidence and Lessons for Developing Countries

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Abstract

It now seems clear that achieving the promises of e-government is a difficult task and this is even more challenging when working across organizational boundaries. A growing body of literature argues for the need of integrative frameworks in order to understand the complex socio-technical nature of electronic government initiatives. Based on the technology enactment concept, this paper contributes to the field by testing relationships often cited in the literature, but with little empirical quantitative exploration. In addition to the relationships originally proposed by Fountain, this paper tests additional direct effects and whether an inter-organizational construct is relevant, particularly when the e-government initiatives are collaborative in nature. Empirical evidence supports the original enactment framework and identifies a few additional direct effects, specifically from organizational forms to results and from institutional arrangements to the enacted technology.

1. Introduction

The use of information and communication technologies in government has been considered a powerful tool to transform government structures and processes. Its implementation in organizational structures has the potential to trigger organizational change [13, 29]. ICT's enable a plethora of mechanisms to improve government's performance, which can be observed through specific variables such as quality of service, reduction of transaction costs, and accountability, among many other benefits [23, 25].

An increase in e-government initiatives around the world within the last decade have naturally led to a significant interest in understanding the relationships between the introduction of information technologies and successful government results. There is no consensus among practitioners or academic communities about which are the most important

factors of success for electronic government initiatives. In addition, most of the research about inter-organizational e-government projects has been done in the United States and Europe. The knowledge about potential benefits and challenges in other institutional and social contexts such as Latin America is scarce in the literature. Important challenges faced by developing countries are associated with the lack of the appropriate technological and human infrastructures, as well as the lack of relevant content in the local language to create a significant social impact.

However, there is a growing body of literature that proposes the use of integrative models to understand the complex interplays between information technologies, organizational structures, institutional arrangements, and environmental conditions in government settings. Some of these scholars have developed research about the role of institutions as determinants of electronic government success [8, 12, 21, 31, 32, 41]. Institutional theory argues that formal and informal rules shape and are shaped by how organizations behave and, in this case, how technologies are selected, design, implemented, and used [20, 28].

This study is based on institutional theory, particularly Fountain's Technology Enactment Framework [19, 20]. This framework attempts to explain the effect of organizational forms and institutional arrangements on the technology used by government agencies [19, 20, 25]. Therefore, organizational characteristics and institutional arrangements have an impact on the enacted technology [19, 20, 25, 35]. Fountain's framework recognizes collaboration networks as a relevant organizational form influencing both technology use and success. Moreover, other research in electronic government has identified trust as a key component for a successful collaboration [14, 33-36].

We consider Fountain's framework an integrative approach and a comprehensive starting point for understanding e-government success factors and here

we test it using a survey administered to public managers working in inter-organizational IT projects in the Mexican federal government. In addition, a few researchers have previously tested Fountain's framework finding alternative relevant variables to be considered or additional relationships among the enacted technology, the organizational outcomes, and the different factors impacting these two constructs [28,46,47]. Based on a review of recent studies, it seems that inter-organizational forms could be a relevant variable to be included in the model. Inter-organizational partnerships may become extremely important for complex IT projects, because of certain collaborative and trust-generating mechanisms. So, this paper tests the importance of this new construct in the context of the rest of the model and based on a survey of inter-organizational IT projects from the Mexican federal government.

Therefore, the purpose of this paper is to quantitatively test the technology enactment framework, but also to test whether additional theoretical constructs and more relationships among the existing factors are necessary, particularly in the case of collaborative electronic government initiatives. In addition, in contrast with previous attempts, this study uses a survey designed and implemented *ex profeso* for conducting this type of quantitative empirical testing.

Using partial least squares (PLS) as the statistical technique, the study assesses the influence of organizational, institutional, and inter-organizational factors on the success of IT projects. This paper is organized in six sections, including the foregoing introduction. The following section presents a review of recent studies related to electronic government, institutional theory, and the technology enactment framework. Section three describes the research model and the hypotheses to be tested in this study. Section four includes the data analysis and results. It first describes the measurement model and the way its validity was assessed and then the results of the structural model. The fifth section discusses the main results and provides some implications for research and practice. Finally, we present the overall conclusions of the study and some suggestions for future research within this topic.

2. Collaborative Electronic Government and the Technology Enactment Framework

Institutional theory has been used in different areas of knowledge, such as economics, sociology, organizational theory, political science and others to

study diverse social phenomena [38, 42, 7]. In the context of ICT, institutional theory have addressed one of the main weaknesses present in other models when explaining organizational change due to IT interventions by identifying relevant aspects of the context in which information technologies are designed and implemented [20, 40, 4].

Institutions represent obligations created by the options that individuals and groups have, but these obligations are subject to change overtime [3]. Institutions can also be seen as guidelines or rules created by individuals living in society, which are permanently in construction, whether maintained or reformulated, through the micro-activity and interplay between social actors [22, 38]. Summarizing, this theory argues that organizations and individuals are constrained by a set of rules, values, norms, and assumptions created by their own interaction that greatly influence how things should be done, but do not totally determine human interaction [22, 3].

As an attempt to explicitly include the role of technology in organizational change, Jane Fountain used the Institutional theory principles to explain IT initiatives in governments, conceived as favorable institutional and organizational changes, as well as better outcomes. Fountain's approach is named Technology Enactment Framework (TEF). The TEF explains how users perceive and act upon objective technologies, given a set of institutional, organizational, and contextual determinants that influence the use and functionality of a given objective technology. According to Fountain, individuals enact technologies in order to adapt them to existing organizational rules, routines, and relationships [20]. The enactment process is not necessarily unique, and depends on determinants previously mentioned. For instance, actors tend to enact technology in favor of maintaining or even reinforcing current social order, networks, and structures [20, 30].

The TEF pays attention to the bi-directional and dynamic relationships among information technology, organizations, embeddedness, and institutions. According to Fountain's model, enacted technologies work as mediators between different types of determinants and organizational outcomes, considering no direct relationship between determinants and outputs (see Figure 1). For instance, institutional arrangements have an impact on organizational forms; then organizational forms influence the characteristics of the enacted technology, and finally, these features of the technology affect organizational results. In addition, the enacted technology and the results also can potentially change some organizational forms and some institutional arrangements.

Fountain's TEF has important advantages in comparison to previous theoretical efforts. Nevertheless, some weaknesses of the framework have been previously suggested and discussed. For example, the framework has been considered too abstract and general to be used for prediction and hypothesis testing [6, 11]. Also, some scholars think that the original framework works better for explaining organizational politics rather than information technology and institutional change [28]. Finally, other researchers argue that the TEF is not flexible to different government contexts such as regional or local; therefore, some important variables could be missing [45]. However, several applications to state and local government have been presented in recent papers.

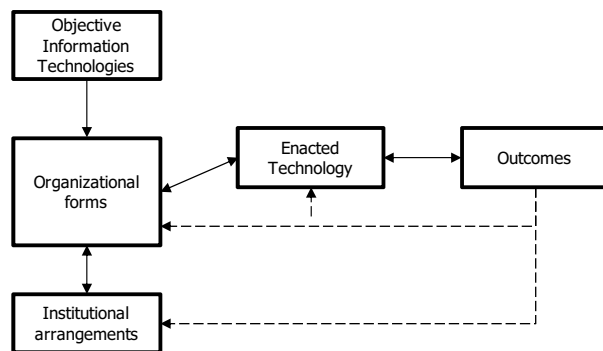


Figure 1. Technology Enactment Framework

In summary, TEF argues technology implemented in government organizations may be seen as enacted technology that could change processes, communication patterns, hierarchical structures, etc. Upon this understanding, potential success of IT projects relies, not only on the enactment of technology, but also in a series of determinants. Critics to TEF point out that it is perfectible and important variables and relationship may be incorporated to better understand e-government as a complex socio-technical phenomenon.

Inter-organizational partnerships are widely recognized as a powerful strategy to improve public sector initiatives, but the design of such programs requires intense collaboration and an appropriate institutional environment [14, 15, 16]. Collaborative digital government projects have several commonalities [14]. Many of these initiatives originate from problems within a single government agency that generate a need to collaborate. They require the integration of diverse sources of information, an element that presents both technical and organizational challenges. In addition, participating agencies face the technical challenge of promoting communication among different information systems, created in different architectures and formats.

The processes of negotiation and collaboration among multiple organizations are becoming common to many information technology projects. Negotiation here does not have the connotation that it does in the literature on positional bargaining, but is the “conversational interactions among collaborating parties as they try to define the problem, agree on recommendations, or design action steps” [17]. This collaboration process is complicated, especially in public sector projects, given the diversity of perspectives, objectives, values, and cultures among project participants [12, 14], and given that IT projects in the public sector have an important political component [1].

A model explaining collaborative relationships involves a virtuous cycle of trust, willingness to collaborate, and work done [44]. This virtuous cycle, however, has the potential to become a trap early in any project, where there is no progress or work done, and when there is little trust among participants. If we understand collaboration as a process in which several agencies create a shared understanding about a problem and its potential solutions [17], trust becomes a key factor in bringing people to the project table, and also in facilitating the knowledge sharing process that is involved in building a shared vision of the project [33, 43].

3. Research Model and Hypotheses

As mentioned before, the model used in this research is based on Fountain's technology enactment framework, but includes and assesses an additional theoretical construct -inter-organizational relationships. It also tests some direct effects that were not part of the original model, but have been shown to be potentially relevant. According to the original framework, institutional arrangements and organizational forms have an impact on the selection, implementation, and use of information technologies in government. Gil-Garcia [24] proposes that some of those factors may have a direct effect on government outcomes. In fact, some researchers have found direct influences from institutional arrangements to specific technology enactments, and also direct effects from organizational factors on outcomes or results [46, 47].

As previously stated and as shown in Figure 2, we have introduced an additional construct to test the effect of inter-organizational relationships on the enacted technology and outcomes and we have reformulated the relationships between some of the constructs, the enacted technology, and the outcomes. Inter-Organizational relationships are associated with the collaboration between government agencies [36].

Previous research has found that trust and collaboration are success factors in government IT projects involving multiple organizations [5, 34]. Proper collaborative mechanisms could lead to perform more efficiently and could improve the availability and quality of technological resources. Collaboration among social actors relies upon the incentives that government's institutional arrangements have [28]. Hence, the first hypotheses link institutional arrangement with Inter-Organizational relationships and the latter with the rest of the constructs.

As mentioned before, we have introduced additional hypotheses to the Fountain's original model. Here we start with the ones related to the new construct that we are assessing (inter-organizational relationships):

H1: Institutional arrangements have a direct effect on inter-organizational relationships.

H2: Inter-organizational relationships have a direct effect on Organizational Forms.

H3: Inter-Organizational relationships have a direct effect on enacted technology.

H4: Inter-Organizational relationships have a direct effect on e-government success.

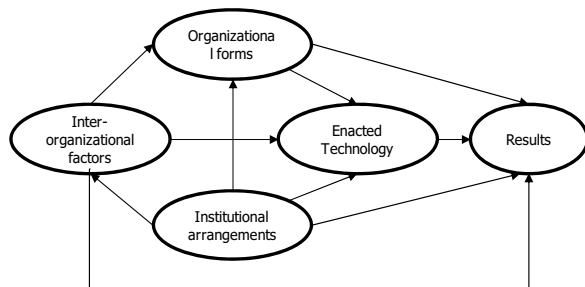


Figure 2. Research Model for Collaborative Electronic Government Success (results)

Institutional theory argues that the context where organizations take action has a direct influence on later performance [2]. Institutional arrangements are represented by procedures, habits, patterns, and regulations that serve as guidelines or constraints for action [20, 25]. These arrangements guide decisions about IT projects, such as size, goals, objectives, and resources, which are relevant organizational features. In this way, the following hypotheses of this research relate to the impact of institutional arrangements (laws, regulations, institutional support, etc.) on organizational forms, and directly on the enacted technology and e-government success.

H5: Institutional arrangements have a direct effect on organizational forms.

H6: Institutional arrangements have a direct effect on enacted technology.

H7: Institutional arrangements have a direct effect on e-government success.

Organizational forms directly influence the use that different individuals decide to give to some objective technologies [20]. In this way, organizational forms (system of goals, objectives, resources, etc.) have a direct impact on enacted technologies.

H8: Organizational forms have a direct effect on enacted technology.

H9: Organizational Forms have a direct effect on e-government success.

It is expected that specific technology enactments are designed, implemented and used to enhance organizational performance according to each organization's specific goals. Therefore, enacted technologies should lead to improve productivity, service quality or efficiency, among other benefits and measures of success [20]. Following this, specific technology enactments have a direct effect on the expected results (success or failure).

H10: Enacted technologies have a direct effect on results.

4. Research Method and Data Sources

The present study used Partial Least Squares (PLS) to empirically test the theoretical model. In general terms, there are certain conditions when PLS is more appropriate than its covariance-based counterpart. Falk and Miller [18] classify these conditions in four groups: theoretical conditions, measurement conditions, distributional conditions, and practical conditions. According to these authors, PLS should be used when no strong theory already exists, some of the manifest variables are categorical and they may have some degree of unreliability, distributions of the data may not be normal, and sample size is small. In this case, although the structural model has been well defined in previous studies [10, 28], the modifications and specific operationalization make it also exploratory in nature.

Similar to other structural equation model (SEM) techniques, PLS is useful to analyze both relationships between indicators and their corresponding construct and complex and multivariate relationships among theoretical constructs [28]. This method produces loadings between reflective constructs and their

indicators, weights between formative constructs and their indicators, standardized regression coefficients between constructs, and coefficients of multiple determination (R-squared) for endogenous constructs (dependent variables). PLS allows for small samples and makes less strict assumptions about distribution of the data.

Structural equations modeling is a quantitative technique of multivariate analysis based on linear regression and factorial analysis. Additionally, this technique can simultaneously test the measurement model (or outer model), which assesses the relationship between indicators and their respective construct and the structural model (or inner model) which assesses the relationships among constructs. In PLS the relationship between indicators and their constructs can be formative or reflective. Formative indicators are considered "the cause" of constructs and the reflective indicators "the effect" of a construct [9, 26]. Reflective indicators are widely used in social sciences. They are expected to measure the same underlying phenomenon and to be unidimensional and correlated with each other. In contrast, formative indicators are conceived as causes of the underlying construct and they represent different dimensions of the construct [26]. This research model considers five constructs, being all reflective, but Inter-Organizational relationships. As shown in Table 1, the construct Organizational Forms have the higher number of indicators, while Inter-Organizational relationships have the lowest.

Table 1. Constructs and Number of Indicators

Construct	Number of indicators	Cronbach Alpha	Type
Institutional arrangements	5	0.66	Reflective
Organizational forms	7	0.61	Reflective
Inter-Organizational forms	3	N/A	Formative
Enacted technology	8	0.93	Reflective
Results	9	0.91	Reflective

Data was based on surveying public managers 13 government agencies identified as involved in inter-organizational projects at the federal level (National Bank for Savings and Financial Services, Ministry of Public Administration, Ministry of Transportation, Ministry of Health, Federal Institute for Access to Information, etc.). The survey sample was 1,216 project participants from the agencies. Although the population is unknown, which may limit the generalizability of the results, this approach allows establishing a robust sampling framework for this research. The survey was implemented via Internet

sending e-mails directly to the sample selected, with a total of three reminders. The first reminder was sent a week after the first e-mail. The second reminder was sent one week later, and the last reminder was sent a day before the survey was closed. Finally, the usable response rate was 23.3% (n=282).

Questions were designed based on the research model shown previously. Given that no insights on previous measurements or scales were available, the instrument design followed a careful selection of questions to understand the effects of institutional arrangements, individual, organizational and inter-organizational variables in IT projects. Different scales were used and the majority of factors included one question only. The final instrument had 35 questions; five questions were associated with institutional arrangements, six with organizational forms, eight with enacted technology, and 10 with results (e-government success).

The questions related with institutional arrangements include perceptions about government's culture, favorable legislation, support from congress for collaborative IT projects, and institutional support for the use of IT. The questions in this category showed a Cronbach-Alpha value of 0.66 (see Table 1). Organizational questions include aspects related to the definition of goals and performance indicators, and adequacy of: financial and human indicators, financial and human resources, and recognition from managers. The alpha value for this scale was 0.61. Inter-organizational questions include questions about formal channels of communication, frequency and easiness of collaboration with other organizations.

Enacted technology was operationalized with questions related to the quality of particular technology characteristics such as ease of use, usefulness, information quality, functionality, personalization, security, and privacy. The alpha coefficient for this scale was 0.93. Finally, results were measured as the level of project success in terms of productivity, cost reduction, transparency, effectiveness of government policies and programs, etc. The alpha value for this scale was 0.91.

5. Data analysis and results

PLS results are organized in two sections. The first section presents the measurement model and assesses its validity (convergent and discriminant); satisfactory assessment suggest a reliable construct. The second section shows the results from the structural model and evaluates the relative importance of each independent variable.

5.1 Measurement Model

Table 2 shows the loadings correspondent to each construct. In the cases of enacted technology, results and institutional arrangements, almost all loadings score above 0.7, which suggest good indicator reliability [30]. All loadings are statistically significant at the 1 percent level. Similarly, relevant composite reliabilities (CR) were all greater than 0.7 (see Table 3).

Table 2. Loadings of Measurement Model

Construct	Indicator	Loadings
Institutional arrangements CR: 0.78	Standardized processes	0.0939
	Favorable change in Government's culture	0.6444
	Congress support of governmental IT initiatives	0.7594
	Institutional Appreciation for ICT	0.7875
	Favorable legal framework for governmental collaboration	0.8282
Organizational forms CR: 0.73	Number and comprise of Briefings	0.2177
	Definition of Performance Indicators	0.4534
	Clarity of goals setting	0.5215
	Perceived ability of achieving goals	0.6146
	Availability of Human Resources	0.6608
	Availability of Financial Resources	0.69
	Organizational support of ICT intervention	0.7578
Inter-Organizational forms	Inter-Organizational collaborative easiness compared with intra-organizational collaboration	0.7147
	Frequency of collaboration with internal auditing entities	-0.0254
	Level of complexity of IT project	0.3606
Enacted technology CR: 0.95	Customizability of IT	0.9382
	Privacy of IT	0.7427
	Easiness of use of IT	0.7916
	Usefulness of IT	0.8143
	Security of IT	0.8161
	Access to information of IT	0.8264
	Functionality of IT	0.8718
	Overall Assessment of IT	0.88
	Promotion of citizenship	0.8925
	More transparent government	0.657
Outcomes CR: 0.93	Creating favorable infrastructure for leveraging IT benefits	0.7014
	Creating favorable legal change for leveraging IT benefits	0.7685
	Overall perception of IT project success	0.7714
	Reduction of costs	0.7789
	Increased productivity	0.7855
	Increased Effectiveness	0.7945
	Enhanced quality of service	0.7958

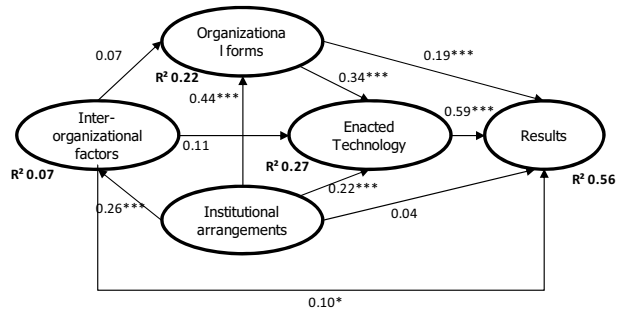
Table 3. Correlations and Square root of AVE

	Institutional arrangements	Organizational forms	Enacted Technology	Results
Institutional arrangements	0.67			
Organizational Forms	0.47	0.54		
Enacted Technology	0.41	0.46	0.83	
Results	0.39	0.50	0.72	0.77

In Table 3 we compare the square root of the average variance extracted (AVE) with the correlations among reflective constructs. All constructs were more correlated with their own outer model than with any other of the constructs, which suggests good convergent and discriminant validity.

5.2 Structural model

The structural model represents the relationships among constructs. Yet, there are not well-established fit measures in PLS method. However, the performance of the model can be assessed analyzing paths (statistical and practical significance) and coefficients of determination (R-squares) together. R-squares are measures of the variance in endogenous constructs accounted by other constructs that were hypothesized to have an effect on them (see Figure 3).



Significant tests were conducted using bootstrapping (200 samples) and paths with *** are significant at the 1 percent level, those with ** are significant at the 5 percent level, and those with * are significant at the 10 percent level

Figure 3. Structural Model Results

Table 4 shows the path coefficients and R-squares. Hypotheses 1, 5, 6, 8, 9 y 10 (at the 0.01 level) and 4 (at the 0.10 level) appear to be significant; the hypotheses 2, 3 and 7 are not supported. This study could not find a direct effect of institutional arrangements on results, which is consistent with previous empirical studies [28, 46] and with the TEF. Inter-Organizational relationships do not have an effect in any of the relationships hypothesized. However, organizational forms have a direct effect on results. Institutional arrangements have a high effect on Organizational Forms; Organizational Forms on Enacted Technologies and Enacted Technologies have an effect on results, which are consistent with Institutional theory and TEF. Furthermore, Organizational Forms have an indirect Effect of 0.20 on Results through Enacted Technologies. Fifty six percent of the variance in Results is explained by the model as a whole. Organizational Forms are explained mainly by Institutional Arrangements. The variance of

Enacted Technology is explained in about 27% by its determinants. Inter-Organizational Forms appear to be barely explained and not influential to other constructs.

Table 4. Structural Model Results for the Full Model

	Path Coefficient	t value	Significance level
Effect on Results	R Squared: 0.56		
Institutional arrangements	0.037	0.67	0.5030
Organizational forms	0.194	3.31	0.0011
Inter-Organizational forms	0.106	1.70	0.0896
Enacted technology	0.589	10.46	0.0000
Effect on enacted technology	R Squared: 0.27		
Institutional arrangements	0.22	3.65	0.0003
Organizational forms	0.337	5.49	0.0000
Inter-Organizational forms	0.111	1.52	0.1301
Effect on organizational forms	R Squared: 0.22		
Institutional arrangements	0.447	6.97	0.0000
Inter-Organizational forms	0.07	1.08	0.2775
Effect on Inter-Organizational forms	R Squared: 0.07		
Institutional arrangements	0.26	4.34	0.0000

6. Discussion and Implications

This section discusses some of the main results of this study, both in terms of the descriptive statistics and the PLS model. It also attempts to highlight some of the theoretical and practical implications of the results. Overall, respondents believe e-government projects (where they got involved as participants or users) were successful. Specifically, 88% of the respondents believe their projects have well-defined goals, 84% believe it is feasible that their project will reach these defined goals, and 75% believe there are clear indicators for success.

Although respondents consider their projects to be successful and to offer high quality results, they also mention some problems. Problems are associated with the lack of human and financial resources and mismatches between project goals and agencies regulations. Half of the respondents believe the current laws support inter-organizational digital government initiatives, and one-third (35%) believe legislators support these kinds of projects.

Regarding descriptive statistics from the constructs, the lowest relative mean correspond to organizational forms, and the highest to enacted technology.

Standardizing the mean value to a 10-point scale, respondents assigned an 8.0 to the adequacy of laws, government, culture, congress support, and institutional support, a 7.6 to the definition of goals and performance indicators, combined with the adequacy of human and financial resources and systems of recognition (organizational forms). They assigned 8.6 to the current design of the information technologies in terms of ease of use, utility, quality, functionality, customization, security, and privacy.

On the model's relationships, a great body of knowledge about information technology in government already exists. Nevertheless, explorations of the complex relationships between information technology and social structures in government are not abundant. This study contributes to a better understanding of e-government success by including multiple factors and theorizing about their interrelationships. Following this, some theoretical and practical implications are provided and areas for future research are highlighted.

Overall, results show that the technology enactment framework is a good model to explain government information technology initiatives, including their results. Organizational forms and Institutional arrangements have a direct effect on the enacted technology. In addition, as Fountain's original model proposes, enacted technologies have a significant effect on organizational results.

Consistent with previous literature on institutional theory and the role of IT in government agencies, the main - link goes from institutional arrangements to organizational forms, and then, from organizational forms to enacted technology, and finally, from the enacted technology to results. Among all the direct effects from institutional arrangements, the most important one is to organizational forms, which is consistent with previous studies.

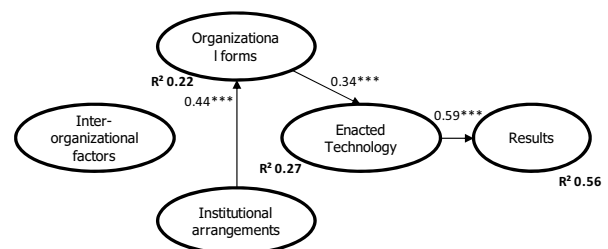


Figure 4. Main Enactment Impact Path

As mentioned before, we consider that, although there are multiple relationships among the constructs on examination, there is a clear direct effects backbone from institutional arrangement, which is the exogenous variable, to organizational results, which is the ultimate dependent variable. This backbone is consistent with

Fountain's original model (compare Figures 1 and 4). Empirical results show that the four highest effects are those that connect the suggested main chain between determinants and outcomes (see Figure 4). The highest effect on the model is from Institutional arrangements to organizational forms, followed by the effect from Enacted Technologies on Results, and finally Organizational Forms influencing Enacted Technologies.

Not surprisingly, a potential conclusion derived from these results is that successful IT initiatives require a previous work on shaping organizational and institutional arrangements before or jointly with the IT intervention. Reframing institutions should lead, through re-alignment of incentives, constraints and processes, to an organization to be prepared to better perform with the introduction of certain technologies.

Regarding inter-organizational relationships, results show that they are influenced by institutional arrangements (see Figure 3), but they have no indirect influence on results. However, they have a direct influence in results. This result suggests that organizations involved in these projects were cooperating, but not necessarily collaborating. In other words, they may be sharing some resources or contributing content to a web portal, but without changing any local practice or without a more close collective action. Adding resources has a weak impact on results, but not in making the technology or the local processes better.

Nevertheless, since this is an exploratory study which used a first-hand dataset to test the TEF model, a reason to explain the relationships of Inter-Organizational Forms may be attributed to a misconception of the outer model. It is possible that indicators do not capture sufficiently inter-organizational activity. For this specific set of initiatives, this result may suggest that the strength of institutional arrangements (in the form of a presidential mandate) may compensate for the lack of an optimal inter-organizational design. Regarding the indicators from other constructs, which were more confirmatory than exploratory, they show better measurements due mainly to the availability of more empirical studies.

Direct effects from determinants to results were also tested. Results show that Organizational forms have a direct influence over results, while Institutional arrangements have not. This is consistent with previous empirical work in different contexts, and in this same context but using different statistical methods [28, 46]. In Gils-Garcia's work, organizational features are significant at the 0.10 level, while Institutional arrangements are not. Luna-Reyes et al [47] also examined this framework with PLS method (being all construct significant), where they found the same

pattern: organizational forms have a higher effect on e-government success, and institutional arrangements have a lower effect. Those two studies, summed with this article, test TEF over different concepts of e-government success, and the results behave coherent.

Variance in results explained by the whole model is considerably high and is consistent with other empirical results. Gil-Garcia [28] reports a composed effect of 46% on e-government websites functionality and a composed effect of 29% on organizational forms. Luna-Reyes et al [47] show an aggregated effect of 45% over Mexican state websites, and an R-squared of 77% on organizational processes and structures. This study, as shown in Table 4, finds a combined effect of 56% on governmental IT intervention success, and 22% on organizational forms.

Different from those previous studies, this research uses a database constructed explicitly to observe and measure each construct; the others, gather secondary information to approximate the measurement needed to test the TEF. Other previous studies that suggest similar results using the same data set use less sophisticated statistical analysis [46]. Because of this, we consider that these results are more precise on estimating the model and the effect of each relationship.

From a more practical perspective, it is possible to say that working in the development of better legal frameworks is a high impact activity to the success of digital government projects by promoting better organizational practices and high quality applications. Additionally, being able to build a network to promote some very basic forms of cooperation, such as sharing some resources or contents has also an effect on project results, although they may not get reflected in better organizational practices or applications. Although project leaders may have a small impact on the development of laws and regulations, they may have more control on the creation of collaboration or cooperation networks. Moreover, project managers have much more control on creating effective organizational practices, which could lead to better systems and better results.

7. Final Comments

Collaborative electronic government initiatives are becoming more pervasive and countries around the world are attempting to obtain the benefits of cross-boundary information sharing and integration. Inter-organizational initiatives promise additional positive results, but also face new challenges. This paper provides evidence of the importance of combining

technology interventions with relevant organizational and institutional changes. The impact that these three variables have on government results is quite high and future studies should explore how different combinations of them produce distinct types of outputs and outcomes. An interesting finding from this study is that among these three important factors, the characteristics of the enacted technology seem to be essential, with the greater impact.

As mentioned from the beginning, this research assesses whether a new construct is necessary when studying e-government initiatives that involved cross-boundary collaboration and information sharing. More research about this specific difference is necessary, but preliminary results from this study identify an influence path from institutional arrangements, to inter-organizational forms, and then to government results; without any significant effect through organizational forms or the enacted technology. In addition to the inter-organizational construct, this paper tests some direct affects that were not included in the original framework proposed by Fountain in 2001. We found that institutional arrangements have a direct effect on the enacted technology and organizational forms have a direct effect on government results. This is consistent with previous studies in e-government, public managements, and organizational theory. No direct effects were found from institutional arrangements to results or from inter-organizational factors to organizational forms or to the enacted technology.

Overall, it seems clear that integrative models such as the technology enactment framework help to better understand complex e-government phenomena, including inter-organizational collaboration, information sharing, and information integration. These initiatives are clearly embedded in organizational and institutional contexts and the relationships among the different constructs should not be studied in isolation since they are clearly intertwined and their interplays affect the enacted technology and the final results. More research is needed to continue testing integrative models with sophisticated quantitative and qualitative techniques in order to disentangle some of the inherent complexity and improve our current knowledge about single relationships among the factors as well as the importance of direct and indirect effects.

Collaborative electronic government has the potential to realize many of the benefits that societies around the world are demanding from their government in the 21st century. Sharing and integrating relevant information and data could greatly help to provide better services by creating networks of governments, citizens, businesses, and not for profits that could jointly solve the most urgent problems in

modern societies. Information technologies are not the solutions, but could be, without a doubt, part of them.

8. References

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