

Exploring the Success Factors of State Website Functionality: An Empirical Investigation

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ABSTRACT

Analyzing information technology (IT) success factors is not a recent academic and practical interest. The last two decades have been rich in studies exploring the phenomenon of IT success/failure in both private and public organizations. However, many of the previous studies hypothesized only direct effects and did not allow more complex relationships between different categories of factors. Based on Fountain's technology enactment theory, this study develops a model to explore the influence of organizational, institutional, and contextual factors on the functionality of e-government state websites in the US. Data about all 50 states were gathered from available published sources and the theoretical model was evaluated using partial least squares (PLS). Organizational factors such as size of the IT organization, budget structure, IT training, in-house development, outsourcing, and marketing strategy were found to have a significant direct effect on state website functionality. The availability of resources for state government agencies represented by the overall size of the state economy also has a significant direct influence. Institutional arrangements, political orientation, and demographic factors have an indirect effect on state website functionality.

Categories and Subject Descriptors

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

General Terms

Management, Performance, Economics, Human Factors, Theory.

Keywords

E-Government, IT Success Factors, Technology Enactment, Partial Least Squares, PLS.

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1. INTRODUCTION

Recently, attention to information technology (IT) initiatives and specifically to developing e-government websites has increased at all levels of government. A portal is considered as an entry point for the different services that government agencies provide. Gant, Gant, and Johnson state [33] “a web portal serves as the integrated gateway into the state government website and provides visitors with a single point of contact for online service delivery within the state.” (p. 6). According to this broad definition of portal, all states in the US have developed e-government portals to provide information and online services to their constituencies.

The interest in studying this type of information technology at different levels of government has increased considerably in recent years [25, 27, 28, 33, 62]. State portals are e-government initiatives that require moderate operational change and moderate institutional change [32]. Therefore, they are interesting and useful in understanding other types of e-government and their success factors.

There is no consensus within the practitioner or academic communities about which are the most important success factors for IT initiatives. Scholars from different disciplines have developed important research about the impact of organizational, institutional, and contextual factors on the selection, design and use of information technologies [12, 24, 34, 49, 51, 58]. However, our current knowledge is limited and a more comprehensive understanding seems to be necessary.

Based on Fountain's technology enactment theory [32], this study develops and tests a model of the influence of organizational, institutional, and contextual factors on the functionality of state websites. Adopting an ensemble view of technology [57], this research is not only interested in the enacted technology, as embodied in the technical features and outcomes of the state websites; but also in the processes that generate certain organizational characteristics and certain institutional arrangements.

This paper is organized in six sections, including these introductory comments. Section two presents the research model and hypotheses. In section three, the research method and design are described. Section four includes a brief explanation of the data analysis and the main results of this study. In section five, a discussion of the findings is offered and some areas for future research are identified. Finally, section six contains some concluding remarks.

2. RESEARCH MODEL AND HYPOTHESES

Previous studies have found evidence supporting different factors as important determinants of IT success. However, most of this research has hypothesized models in which all factors are at the same level of importance, limiting understanding about the complex relationships among different kinds of factors (e.g., organizational and institutional).

The research model presented in this paper is based on Fountain's technology enactment theory and refined through a review of the IT implementation, IT success, social informatics, and e-government literature. Based on the institutional tradition [60, 64], the technology enactment theory attempts to explain the effects of organizational forms and institutional arrangements on the information technology used by government agencies. According to Fountain [31, 32] the technology enactment framework pays attention to the relations between information technology, organizations, embeddedness, and institutions.

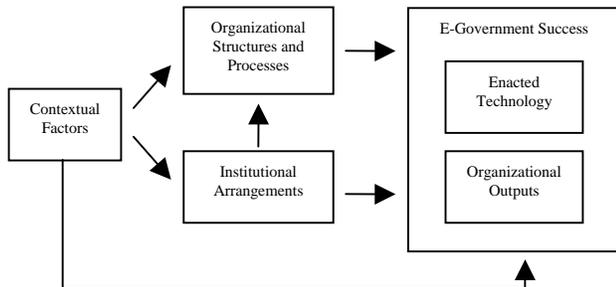


Figure 1. Research Model for Electronic Government Success

E-government as a concept has very different meanings [36]: from internal systems to the Internet, from hardware to organizational technologies, from computers in government offices to highly sophisticated information systems that cross organizational boundaries. As a consequence, there is not a consensus about what IT success is and how to measure it [13]. The technical and experiential aspects of IT within an organization constitute the enacted technology [31] or computing package [46]. Two of its more important elements are its technological sophistication and sociotechnical interface, which are clearly related to specific outcomes [46].

According to the technology enactment framework, there are objective information technologies that are in some way modified by organizational and inter-organizational factors and produce the enacted technology. This is consistent with findings from other studies of public sector information systems [46, 52]. Fountain [32] argues that several bureaucratic characteristics of organizations that design, implement, or use the technology are contained in what she calls organizational forms.

In general terms, organizational structures and processes relate to the organization as a whole and some characteristics of the specific IT initiatives. These factors can include the length of the project, understanding strategic goals, extent of change in business processes, project management approach, and lack of implementation guidelines [14, 20, 65, 66].

The size of the project and the diversity of the users or organizations involved are also important factors in IT initiatives [3, 21, 24, 54]. In addition, lack of alignment between organizational goals and the IT project plays an important role [23]. Information technology is best thought of as part of the strategy of the organization [2].

Finally, individual interests and associated behaviors can lead to resistance to change, internal conflicts, and turf issues [3, 4, 5, 8, 43, 61]. Organizational politics can become a very difficult challenge to overcome. Different social actors have different perspectives about the impact of information technology on their situation within the organization [45].

H1: Organizational structures and processes have a direct influence on the success of electronic government.

Institutions can be seen as guidelines for action, but also constraints to those actions [64]. Information technology initiatives involve a complex set of decisions and interactions. These interactions are constrained by different institutional arrangements, but at the same time institutions "frame how those constraints operate." [32]. Previous theoretical frameworks have used institutional theory to explain different aspects of information technologies such as adoption, implementation, and management [6, 11, 51, 53].

Government organizations are usually created and operate by virtue of a specific formal rule or group of rules. In making any kind of decision, including decisions about IT projects, public managers must take into consideration a large number of laws and regulations [23, 28, 40, 49, 56].

Other institutional factors refer to the political complexities of every governmental system. Some examples of these factors are given by Dawes [22]: (1) external influences over the decision-making process, such as legislative committees, interest groups, civil servants, and other governmental jurisdictions like local governments; (2) the power of agency discretion, which refers to the capacity of expert bureaucrats to influence programs and policies; and (3) the primacy of programs that reinforce vertical connections and disincentives to horizontal collaboration among agencies. For instance, this lack of collaboration can constrain IT projects that attempt to integrate or share information across multiple agencies [12, 24, 32].

In summary, institutional arrangements are represented by laws, regulations, and other cognitive, cultural, or socio-structural constraints found in government contexts [32]. According to the technology enactment theory, institutional arrangements affect organizational forms, and therefore, indirectly impact the enacted technology. Previous studies hypothesized also direct effects.

H2: Institutional arrangements have a direct influence on the success of electronic government.

H3: Institutional arrangements have an indirect influence on the success of electronic government, through their direct impact on organizational structures and processes.

The context of organizations includes very important environmental factors. Some of the environment dimensions identified in the literature are [18, 38, 41]: (1) technological conditions, (2) legal conditions, (3) cultural conditions, (4) political conditions, (5) economic conditions, (6) demographic conditions, and (7) ecological conditions. Scholars interested in

organizational theory have developed different ways to understand the impact of the environment on organizations as well as how organizations attempt to modify their environments [1, 39, 59, 63].

In information systems, researchers have recognized the important role of environmental variables in shaping the way information technology is designed and used in organizations [47, 51]. Some contextual variables or external pressures such as personnel markets, competition, or political factors may affect the results of IT initiatives [5, 10, 15, 52].

Contextual factors have an impact on the enacted technology and subsequently on its outcomes, which are always indeterminate [32]. However, this relationship is not always direct, but mediated by managerial and organizational factors. Therefore, “the environmental factors first encounter and become altered by computing management.” [46]. An organization context is not simple and homogenous. Therefore, this study explores how different contextual factors influence the success of e-government.

H4: Contextual factors have a direct influence on the success of electronic government.

H5: Contextual factors have an indirect influence on the success of electronic government through their direct impact on organization structures and processes.

H6: Contextual factors have an indirect influence on the success of electronic government through their direct impact on institutional arrangements.

3. RESEARCH METHOD AND DESIGN

This section includes sources of the data, some descriptive statistics, and the operationalization of the constructs. Information from all 50 states was gathered from available published sources. The dependent variable is the functionality/quality of the state website as the enacted technology. The overall state e-government ranking is from State and Federal E-government in the United States, 2001 [67]. The e-commerce score is from The Digital State 2001 [50]. The number of online services was obtained from The Book of the States, 2002 Edition [19]. Finally, the number of e-commerce systems is from the NASCIO 2002 Compendium of Digital Government in the States [55].

The NASCIO 2002 Compendium of Digital Government in the States also provided the number of people working for the IT organization, the percentage of the IT budget revenue sources from federal funds, whether the state provides accessibility training for IT professionals, the percentage of the IT office budget for maintenance, the number of marketing media and intensity of marketing, whether the website services are only outsourced or only directly provided, whether the IT organization directly manages portal development for agencies, the existence of mandatory accessibility standards for state web sites, whether state IT professionals are members of the civil service only, whether the state has executive orders/directives as the only way to establish authority for CIO offices, and whether the state has an IT specific legislative committee in the senate.

Percentage of votes for the democrat and republican parties in the previous gubernatorial election (1997 – 2000), the political affiliation (democrat, republican, other) of the governor in 2000, personal income per capita for 1999, total state revenue, and total

state debt were obtained from The Book of the States, 2002 Edition. Several measures of income, education, computer ownership, and Internet access come from the Census 2000 prepared by the U.S. Census Bureau, and the State and Local Sourcebook 2003 published by Governing. Finally, government gross state product and the number of jobs and private earnings in several industries such as state government, local government, education, communication, electronic and other electric equipment, and engineering and management services were obtained from the U.S. Bureau of Economic Analysis.

3.1 Description of the Data

Some state figures are remarkably different while others are relatively similar among the 50 states. Overall e-government ranking ranges from 31.5 points for Wyoming to 52.0 for Indiana, with a mean of 41.0 points. The digital state e-commerce score has a mean of 59.6 and ranges from 16.7 for Oklahoma to 100 for Maryland. The number of e-commerce systems reported to NASCIO has a range from 1 for Nevada to 10 for Michigan and Texas, with a mean of 6.9. The variable “online services” has a mean of 5.8, with 4 states reporting 9 services (Louisiana, Massachusetts, New York, and Virginia) and 3 states reporting 2 services (Alabama, Colorado, and Vermont).

The size of the IT organization, represented by number of employees, varies from 2 in Vermont to 1058 in New Jersey, with an average of 212 employees. Twenty four states (51% of the respondents) reported to have accessibility training for IT employees. In thirty one states (66%) the IT organization directly manages portal development for agencies. Thirteen states do not use any medium to market their state websites. Some states with a strong marketing strategy are Arizona, Texas, Utah, and West Virginia. In twenty seven states (59%), only the IT organization directly provide website services. In contrast, only in five states (11%), website services are totally outsourced. The percentage of IT budget for maintenance ranges from 0.1% in South Carolina to 38% in Alabama, with a mean of 7.7%. Similarly, the percentage of the IT budget revenue sources from federal funds has a mean of 3.13 and varies from 0% in thirty states to 38% in Michigan. Twenty five states (53%) have an IT specific legislative committee in the senate. In twenty nine states (62%) all state IT professionals are members of the civil service. Only seven states (15%) have executive orders or directives as the only way to establish authority for CIO offices. In thirty four states (72%) there are mandatory accessibility standards for state web sites.

The percentage of votes for the democrat party in the previous gubernatorial election varies from 12% in Maine to 66.1% in New Hampshire, with a mean of 44.8%. In contrast, the percentage of votes for the republican party in the previous gubernatorial election has a mean of 49.2% and ranges from 18% in Alaska to 73.4% in Kansas. In 2000, eighteen states (18) had a governor from the democrat party and thirty (30) states had a governor from the republican party.

Median income per household varies from 29,696 dollars in West Virginia to 55,146 dollars in New Jersey, with a mean of 41,371 dollars. Similarly, median income per family ranges from 36,484 dollars in West Virginia to 65,521 dollars in Connecticut, with a mean of 49,242 dollars. Income per capita has a mean of 27,139 dollars, with a minimum of 20,688 dollars in Mississippi and a maximum of 39,300 dollars in Connecticut. Gross state product

per capita has a mean of 31,596 dollars, with a minimum of 22,498 dollars in West Virginia and a maximum of 44,568 dollars in Connecticut. The percentage of population for whom poverty status is determined varies from 6.5% in New Hampshire to 19.9% in Mississippi, with a mean of 11.94%. Similarly, the percentage of families below poverty level ranges from 4.3% in New Hampshire to 16% in Mississippi and 15.8% in Louisiana (mean = 8.74%).

The percentage of population 25 years old and over with less than 9th grade education has a mean of 6.7%, with a minimum of 3.2% in Utah and a maximum of 11.7% in Kentucky. The percentage of population 25 years old and over with high school or higher education varies from 72.9% in Mississippi to 88.3% in Alaska, with a mean of 81.96%. The percentage of population 25 years old and over with Bachelor's degree or higher education has a mean of 23.8%, with a minimum of 15% in West Virginia and a maximum of 33% in Massachusetts. Similarly, the percentage of population between 25 to 34 years old with Bachelor's degree or higher varies from 17.3% in Nevada to 41.4% in Massachusetts, with a mean of 26.6%.

The percentage of households with computers has a mean of 42.7% in 1998 and 51.5% in 2000. In 1998, it varies from 25.7% in Mississippi to 62.4% in Alaska. For 2000, this percentage has a minimum of 37.2% in Mississippi and a maximum of 66.1% in Vermont. The percentage of households with Internet access has a mean of 26% in 1998 and 41.4% in 2000. The minimum value for 1998 was 13.6% in Mississippi and the maximum was 44.1% in Alaska. In 2000, this percentage varies from 26.3% in Mississippi to 56% in New Hampshire.

Government gross state product for 2000 varies from 2,327 millions in Vermont to 141,087 millions in California, with a mean of 22,683 millions of dollars. State total revenue in 2000 has a mean of 25,199 millions of dollars, with a minimum of 2,873 millions of dollars in South Dakota and a maximum of 172,481 millions of dollars in California. Total state debt (2000) ranges from 1,249,515 dollars in Wyoming to 78,615,990 dollars in New York, with a mean of 10,958,494 dollars (more descriptive statistics for all variables available from author).

3.2 Operationalization of Constructs

Website functionality has been used as a measure of e-government success in local government studies [42]. At the state level, several studies assess e-government success by examining different aspects of functionality [33, 67]. Following this well-established convention, this study operationalizes this construct as the state website functionality measured with four different scales: Overall state e-government ranking, digital state e-commerce score, e-commerce systems, and online services. The first two are composite scales and they include important elements such as number of online services, electronic payments, types of online information, specific government forms, usability assessment, e-mail responsiveness, privacy and security, foreign language access, and democratic outreach.

Organizational structures and processes are divided in two categories. There are some organizational structures and processes that are more general and enduring such as organizational size, formal structures, and budgeting schemes. In contrast, there are organizational characteristics that are more flexible and particular

to the specific initiative such as overall management strategies, division of labor, and marketing. For purposes of this study, and consistent with Kraemer, et al. [46] this last category is treated as web management practices. General organizational factors include the number of people working for the IT organization as a measure of size, percentage of the IT budget revenue sources from federal funds, whether the state provides accessibility training for IT professionals, and percentage of the IT office budget devoted to maintenance. Web management practices are represented by the number of marketing media and intensity of marketing, whether the website services are only outsourced or only directly provided, and whether the IT organization directly manages portal development for agencies.

As mentioned early in this paper, institutional arrangements are laws, regulations, policies, and other factors (cognitive, socio-cultural, etc.) that shape organizational forms [32]. In this study, institutional arrangements are represented by the existence of mandatory accessibility standards for state web sites, whether state IT professionals are members of the civil service only, whether the state has executive orders/directives as the only way to establish authority for CIO offices, and whether the state has an IT specific legislative committee in the senate as a measure of legislative involvement.

The context of organizations includes multiple factors and it is practically impossible to include all of them in one research project. This study selected three of the most important factors to represent this context in which organizations are embedded: Political orientation, demographic factors as a proxy for potential e-government demand [42, 48], and overall size of the state economy as a proxy of availability of resources for state government agencies. Political orientation is represented by the percentage of votes for the democrat and republican parties in the previous gubernatorial election (1997 – 2000) and whether governor was democrat or republican in 2000. Demographic factors include several measures of income, education, computer ownership, and Internet access (see table 2). Overall size of the economy was operationalized using government gross state product, total state revenue, total state debt, and the number of jobs and private earnings in several industries such as state government, local government, education, communication, electronic and other electric equipment, and engineering and management services (see table 2).

4. DATA ANALYSIS AND RESULTS

Partial least squares (PLS) was used to empirically evaluate the theoretical model. PLS is a structural equation modeling (SEM) technique similar to covariance based SEM as implemented in LISREL [44], EQS [7], or AMOS. Therefore, PLS can simultaneously test the measurement model (relationships between indicators and their corresponding constructs) and the structural model (relationships between constructs). It produces loadings between reflective constructs and their indicators, weights between formative constructs (see below) and their indicators, standardized regression coefficients between constructs, and coefficients of multiple determination (R-squared) for endogenous constructs (dependent variables).

PLS allows for small sample sizes and makes less strict assumptions about the distribution of the data [37]. Small samples

not always meet normality and homogeneity assumptions. Similarly, categorical variables could also not satisfy the distributional assumptions of covariance-based SEM. According to Chin [16], sample size should be 10 times which ever is greater: (1) the larger number of indicators in a formative construct, or (2) the larger number of structural paths going to an endogenous construct. However, this may vary depending on the actual effect sizes. For instance, after a Monte Carlo simulation Chin and Newsted [17] affirm “overall, the results show that the PLS approach can provide information about the appropriateness of indicators at sample size as low as 20.” (p. 335).

Table 1. Constructs and Number of Indicators

Construct	Number of Indicators	Type
E-Government Functionality	4	Reflective
Web Management Practices	4	Formative
General Organizational Factors	4	Formative
Institutional Arrangements	4	Formative
Political Orientation	4	Reflective
Demographic Factors (Demand)	14	Reflective
Overall Size of the Economy	17	Reflective

In general terms, there are certain conditions when PLS is more appropriate than its covariance-based counterpart. Falk and Miller [26] 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. After a systematic review of all these conditions, it was decided that PLS was the most appropriate technique for this study.

In PLS, the relationship between a construct and its indicators can be modeled as either formative or reflective. Formative indicators are also known as cause or induced indicators and reflective indicators are also known as effect indicators [9]. 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 [16, 35]. In contrast, formative indicators are conceived as causes of the underlying construct and they represent different dimensions of the construct [35]. In this study, state website functionality, political orientation, potential e-government demand, and overall size of the state economy are reflective constructs with four, four, fourteen, and seventeen indicators respectively. Web management practices, general organizational factors, and institutional arrangements are formative constructs with four indicators each. Table 1 presents a summary of the constructs used in this study.

PLS does not directly provide significant tests. Significance levels for loadings, weights, and paths were calculated through bootstrapping. Two hundred bootstrap samples (200) were used to empirically calculate standard errors and evaluate statistical significance. PLS results are organized in two main sections. The first section presents the measurement model and assesses its validity (convergent and discriminant). The second section shows the results from the structural model and evaluates the relative importance of each independent variable.

4.1 Measurement Model

Reflective and formative indicators must be treated differently. For reflective indicators, there are two important aspects of the measurement model that should be evaluated: convergent and discriminant validity [35]. Convergent validity can be assessed by the examination of indicator reliability, composite reliability, and average variance extracted [29]. Table 2 shows that all loadings, but one were above the 0.7 threshold, suggesting good indicator reliability [30]. They are all statistically significant at the 1 percent level. Similarly, composite reliabilities (CR) were all greater than 0.7 (see table 2).

Table 2. Loadings of Reflective Constructs

Construct	Indicator	Loading
E-Government Functionality CR: 0.853	Overall Quality of E-Government	0.8315
	Number of Online Services	0.8267
	Number of E-commerce Systems	0.7108
	Quality of E-Commerce	0.7048
Political Orientation CR: 0.911	Governor was democrat in 2000	0.9069
	Governor was republican in 2000	-0.8545
	Percentage of votes democrat party	0.8461
	Percentage of votes republican party	-0.7794
Demographic Factors (Demand) CR: 0.968	Median income per Family (1999)	0.9332
	Median income per household (1999)	0.9217
	Percent of population in poverty (1999)	-0.8844
	Households with Internet access (2000)	0.8838
	Percent of families in poverty (1999)	-0.8673
	Percentage population with bachelors	0.8609
	Households with computers (2000)	0.8393
	Personal income per capita (1999)	0.8253
	Households with Internet access (1998)	0.8206
	Gross state product per capita (2000)	0.7994
	Households with computers (1998)	0.7784
	Population 25 to 34 with bachelors	0.7734
	Population with complete high school	0.7275
	Population - < 9th grade education	-0.6457
Overall Size of the Economy CR: 0.994	Local gov. private earnings (2000)	0.9910
	Gov. and GE private earnings (2000)	0.9903
	State gov. private earnings (2000)	0.9895
	Government gross state product (2000)	0.9877
	Number of local gov. jobs (2000)	0.9864
	Eng. and management jobs (2000)	0.9839
	State total revenue (2000)	0.9838
	Gov. and gov. enterprises jobs (2000)	0.9828
	Eng. and mangnt. Priv. earnings (2000)	0.9778
	Number of state gov. jobs (2000)	0.9643
	Jobs in communications (2000)	0.9554
	Comm. industry priv. earnings (2000)	0.9366
	Number of educ. Services jobs (2000)	0.9341
	Electronic and elect. equip. jobs (2000)	0.9201
	Electronic and EE priv. earnings (2000)	0.8888
	Educational serv. priv. earnings (2000)	0.8790
	Total state debt (2000)	0.8586

Table 3 compares the square root of the average variance extracted (AVE) with the correlations among reflective constructs. All constructs were more strongly correlated with their own measures than with any other of the constructs, suggesting good convergent and discriminant validity. Finally, as suggested by Chin [16] cross-loadings were calculated and all indicators showed higher loadings with their respective construct than with

any other reflective construct (cross-loadings available from author).

Table 3. Correlations and Square Root of AVE

	E-Gov Funct.	Political Orient.	Demo. Factors (Demand)	Overall Size of the Economy
E-Gov Functionality	0.771			
Political Orientation	-0.152	0.848		
Demographic Factors (Demand)	0.034	0.081	0.829	
Overall Size of the Economy	0.473	-0.024	0.124	0.954

Formative indicators are not expected to be correlated with each other. Therefore, traditional measures of validity are not appropriate [16]. However, Bollen [9] mentions that validity is “the strength of the direct structural relation between a measure and a latent variable” (p. 222) and therefore, validity of formative constructs can be evaluated by looking at the size and significance of their weights. Table 4 shows the weights of formative indicators in their respective constructs. These results can be examined to identify the relevance of these indicators for the research model in general and for each formative construct, in particular.

4.2 Structural Model

The structural model represents the relationships between constructs that were hypothesized in the research model. In PLS there are not well-established overall fit measures. Paths (statistical and practical significance) and coefficients of determination (R-squares) together indicate how well the model performed. R-squares are measures of the variance in endogenous constructs accounted by other constructs that were hypothesized to have an effect on them. Therefore, they can be interpreted as R-squares in regression analysis. Table 5 shows the path coefficients and R-squares.

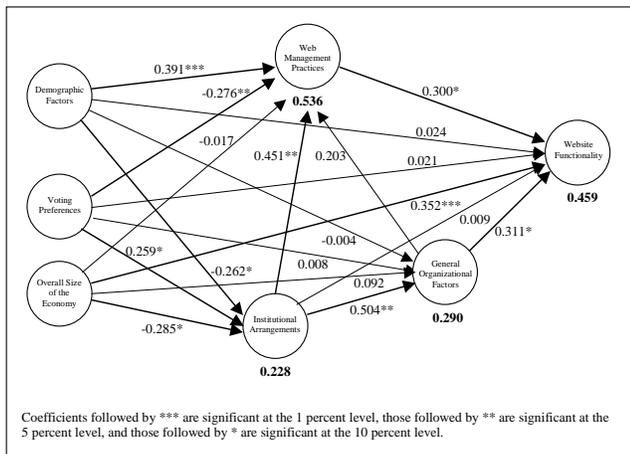


Figure 2. Structural Model Results

Hypotheses 1, 3, 4, 5, and 6 were supported. Hypothesis 2 was not supported. This study could not find a significant direct relationship between institutional arrangements and e-government success represented by state website functionality. However, institutional arrangements indirectly influence the functionality of the state websites through their direct impact on general organizational factors and web management practices. The existence of a direct link was tested and found to be neither statistically nor practically significant (at least 0.2). This finding is consistent with the technology enactment theory. Despite the lack of a direct effect, institutional arrangements seem to be very important in explaining other constructs in this model (general organizational factors and web management practices).

Table 4. Weights of Formative Indicators for the Full Model

Construct	Indicator	Weight
Web Management Practices	Website services are entirely outsourced	-0.7843 (***)
	Marketing media and intensity of marketing	0.7203 (***)
	Only the IT organization directly provide website services	-0.4836 (**)
	IT organization directly manages portal development for agencies	0.2701
General Organizational Factors	Number of people working for the IT organization (Size)	0.7087 (***)
	Percentage of the IT budget revenue sources from federal funds	0.5387 (**)
	State provides accessibility training for IT professionals	0.4406 (*)
	Percentage of the IT office budget devoted to maintenance	-0.2919
Institutional Arrangements	State IT professionals are members of the civil service only	0.7185 (***)
	State has executive orders/directives as the only way to establish authority for CIO offices	-0.5883 (***)
	State has an IT Specific Legislative Committee - Senate	-0.3712 (*)
	State has mandatory accessibility standards for state web sites	-0.2904

Significant tests were conducted using bootstrapping (200 samples) and weights 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.

General organizational factors have a significant direct influence on the functionality of the state website. Factors related to web management practices (represented by outsourcing, direct provision, marketing, and portal development) have a significant direct influence on the functionality of state websites. The overall size of the state economy is a significant direct factor in shaping the functionality of a state website. Some demographics representing the potential demand for e-government (such as education, income, computer ownership, and Internet access) were found to have an indirect effect on the functionality of the state website, through their significant direct effect on institutional arrangements and web management practices. Similarly, political orientation (conservative vs. liberal) has an indirect impact on the functionality of state websites through its

significant direct impact on web management practices and institutional arrangements.

About 46% of the variance in state website functionality was accounted for by its explanatory constructs. Similarly, the model explained about 54% of the variance in web management practices, 29% of the variance in general organizational factors, and 23% of the variance in institutional arrangements. The average explanatory power of endogenous constructs in the model was about 38% (R-square = 0.3783).

5. DISCUSSION AND IMPLICATIONS

A great deal of knowledge about information technology in government has been gained. Nevertheless, current knowledge about the complex relationships between information technology and social structures in government is quite limited. This study contributes to a better understanding of e-government success by including multiple factors and theorizing about their interrelationships. Following, some theoretical and practical implications are provided and areas for future research are highlighted.

Table 5. Structural Results for the Full Model

	Path Coeff.	t value	Signif. Level
Effect on E-Government Functionality (R-sq = 0.4591)			
Web Management Practices	0.300	1.656	*
General Organizational Factors	0.311	1.931	*
Institutional Arrangements	0.009	0.045	
Political Orientation	0.021	0.163	
Demographic Factors (Demand)	0.024	0.178	
Overall Size of the Economy	0.352	3.019	***
Effect on Web Management Practices (R-sq = 0.5365)			
General Organizational Factors	0.203	1.284	
Institutional Arrangements	-0.451	2.474	**
Political Orientation	-0.276	2.164	**
Demographic Factors (Demand)	-0.391	2.710	***
Overall Size of the Economy	-0.017	0.123	
Effect on General Organizational Factors (R-sq = 0.2895)			
Institutional Arrangements	-0.504	2.200	**
Political Orientation	0.008	0.043	
Demographic Factors (Demand)	-0.004	0.021	
Overall Size of the Economy	0.092	0.598	
Effect on Institutional Arrangements (R-sq = 0.2281)			
Political Orientation	0.259	1.896	*
Demographic Factors (Demand)	-0.262	1.710	*
Overall Size of the Economy	-0.285	1.959	*

Significant tests were conducted using bootstrapping (200 samples) and path coefficients 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.

An important portion of e-government initiatives is based on Internet technologies. As mentioned early in this paper,

functionality is a widely used measure of e-government success. Electronic services (transactions) are very important aspects taken into consideration in all state website functionality assessments. Two of the measures in this study included other relevant elements such as types of online information, usability assessment, e-mail responsiveness, privacy, and security, among others. However, the fact that all four indicators clearly loaded in the same factor and presented a good composite reliability score shows that elements other than the number of online transactions are less heavily weighted in the more complex measures. Future studies should develop more comprehensive and balanced measures of e-government functionality.

Kraemer et al. [46] propose a model based on a socio-technical perspective. They recognize that both environmental determinism and managerial voluntarism offer partial explanations of the use of IT in organizations. With respect to managerial voluntarism, they state “after extensive empirical study, we were forced to conclude that the role of managers in computing change in organizations was much less clear than expected. Something other than management policy was playing a major role.” [46]. Our study shows that management practices are important, but they are interrelated and partially explained by other factors such as political orientation and institutional arrangements. Therefore, this study suggests that both contextual factors and managerial strategies are important in understanding e-government. In addition, this study identifies two different influences from organizational-level characteristics. First, managerial strategies and practices are clearly important factors of e-government success. Strategies such as outsourcing, marketing, or centralized web development have a direct influence on the success of e-government initiatives. With similar importance, the capability of IT organizations in government (general organizational factors) also has a direct effect on e-government success. Although not statistically significant in this study, there is a relationship between these two factors. Future studies should focus on the nature (recursive or non-recursive) and strength of this relationship.

Institutional arrangements seem to be affected by all three contextual factors in this model, but this construct is not well explained (R-square = 0.22). This may be an indication that there are many other environmental conditions that affect institutions and, therefore, institutional arrangements are difficult to understand or predict. Nevertheless, institutional arrangements are significant predictors of both general organizational factors and web management practices. These two factors are very important in understanding e-government success. Consistent with this situation, the current literature recognizes the importance of understanding and, in some cases, changing the institutional framework as a way to improve the conditions for e-government initiatives. This study provides evidence about the potential effects of institutional change on certain organizational characteristics and, subsequently, on e-government success. However, this study also provides evidence of how complex it is to understand government institutional frameworks. Thus, future e-government research should take into consideration a larger set of contextual factors and develop a better explanation of this institutional construct.

One of the theoretical contributions of this research is the testing of a technology enactment model and the provision of quantitative

empirical evidence of the complex mechanisms of technology enactment in government settings. This study shows that there is not a direct effect of institutional arrangements on the enacted technology. However, government agencies are embedded in institutional arrangements and other contextual factors that shape organizational forms and management practices, having an indirect influence on the enacted technology [32]. In addition, this paper presents a theoretical model that explains the technology enactment process at the state level. From the analysis it seems that state government settings are similar to other levels of government, but they have some differences with respect to information technologies from federal agencies [32] and local governments [46]. Fountain's original model describes how, at the federal level, all the effects of the environment are filtered by or represented in the institutional arrangements. In contrast, the process model of computing change establishes that contextual factors directly influence management action [46]. This study found that at the state level some contextual influences go directly to management practices and others have an indirect effect on both management practices and general organizational factors, through their direct influence on institutional arrangements. This finding may be a reflection of different degrees of flexibility and responsiveness to environmental pressures at different levels of government; specifically in the way they deal with IT initiatives.

According to the ensemble view, in order to study the information technology and organization phenomenon, researchers should explore not only the technological artifacts, but also the social structures around those artifacts. In fact, the IT phenomenon in government should not be defined only in terms of hardware and software. For digital government researchers, the object of study can be better characterized as a complex socio-technical network that includes not only technological artifacts, but also people, physical spaces, social relationships, and environmental constraints, among other important elements. Taking this more comprehensive view, this study identified and analyzed the impact of three important contextual factors: Political orientation, potential e-government demand, and availability of resources for other state agencies. This integrative approach allowed us to understand the impact of these contextual factors not only on the enacted technology and its outputs, but also on some organizational characteristics and institutions in which the technological artifacts were embedded.

Some lessons for public managers can also be derived from this study. For instance, it seems clear from the results that outsourcing alone is not the best solution to improve the success of e-government in general and the functionality of state websites in particular. A thoughtful combination of in-house development and outsourcing appears likely to be the best strategy to follow. In addition, financial resources are important, but organizational capabilities and management strategies are also important determinants of e-government success. Having enough human resources and available training options are two important factors. In addition, marketing strategies seem to be positively related to the success of e-government. Finally, certain degree of web development centralization seems to have a positive effect on the functionality of state websites. Therefore, obtaining adequate resources continues to be important, but developing organizational capabilities and carefully designing web management strategies should be a focus of IT managers in government settings.

Government institutional frameworks are very important in shaping organizational characteristics and web management practices. For instance, having all the IT employees as members of the state civil service seems to be negatively related to e-government success. This may be an indication of the degree of managerial flexibility and may show that more flexibility could lead to better results. Similarly, having executive support and legislative involvement appears to be positively related to e-government success. Statewide standards for accessibility, usability and other relevant issues can also lead to more functional e-government. Finally, political, demographic, and economic factors can shape both organizational characteristics and institutional arrangements. Public managers should be aware of these indirect effects on e-government success and take them into consideration when making IT investment and implementation decisions.

6. CONCLUSION

There is a preliminary consensus around the idea that e-government problems are not only about the complexity of technology. Success factors are more related to organizational, behavioral, institutional, socio-structural, and cultural aspects. This study provides evidence of the influence of different organizational, institutional, and contextual factors on the success of e-government. It is necessary to acknowledge that the relative impact of these factors may be different according to specific initiatives and contexts. However, it seems to be clear that their interrelations are very important and studying any one of them in isolation may lead to limited understanding of the overall situation. Digital government research should be both theoretically sound and practically useful. In order to clearly establish this link, researchers should develop theoretical frameworks with a more integrative and comprehensive view to social phenomena.

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