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Recent Trends in Public Sector Technological Innovations

Testing the Development and Diffusion of E-Government and E-Democracy: A Global Perspective

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E-government uses information and communication technology to provide citizens with information about public services. Less pervasive, e-democracy offers greater electronic community access to political processes and policy choices. Few studies have examined these twin applications separately, although they are widely discussed in the literature as distinct. The authors, Chung-pin Lee of Tamkang University and Kaiju Chang and Frances Stokes Berry of Florida State University, empirically analyze factors associated with the relative level of development of e-government and e-democracy across 131 countries. Their hypotheses draw on four explanations of policy change—learning, political norms, competition, and citizen pressures. All four explanations are strongly linked to nations where e-government policy is highly advanced, whereas a country's e-democracy development is connected to complex internal factors, such as political norms and citizen pressures.

Information technology (IT) has been adopted and implemented by countries around the world as a means of improving government performance. In addition to a broad range of New Public Management practices, such as decentralization, privatization, and performance management, e-government has rapidly diffused as an important managerial reform over the past 15 years. Recent reports on the development of e-government reveal different patterns of implementation (Ebbers and Van Dijk 2007; Rose 2005; West 2005), including a serious digital divide that exists around the world between developed and developing countries (UN 2006), referred to as a "global digital divide" (Norris 2001). Another issue of interest is the development of e-democracy practices, related to but distinct from e-government. E-government is the "use of information and communication technology (ICT) and its application by the government for the provision of information and public services to the people"

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(UN 2006, 14). E-democracy also uses ICT, but has as its purpose providing citizens access to information and knowledge about the political process and choices (Backus 2001). Backus (2001) describes the underlying goal of e-democracy as moving citizens from passive information access to active citizen participation in the governing process.

Both e-government and e-democracy have become important instruments of modern governance. These two concepts have different purposes. In this paper, we offer explanations for the development of e-government and e-democracy and provide the first empirical tests to see whether the processes have different drivers, although no literature has yet developed to assert that they have distinct developmental processes. More specifically, we apply a public policy adoption and diffusion model developed by Berry and Berry (1999, 2007) to study this global policy issue. Although there is some previous research on policy diffusion and adoption that helps clarify the reasons we find differences in e-government development, many studies focus on the local level (e.g., McNeal et al. 2003; Moon 2002; Reddick 2004), and only a few studies focus on global e-government comparisons at the national level (Moon, Welch, and Wong 2005; Rose 2005). None of these studies tests as comprehensive a model as we test, and they do not distinguish between the factors relating to e-government and e-democracy developmental levels.

A significant literature has developed that explains policy change (e.g., Baumgartner and Jones 1993; Rose 1993), on which this study draws. Using theoretical and empirical studies across multiple disciplines, and multiple levels of government—local, state, and national—Berry and Berry (2007) summarize four theoretical reasons why policy change occurs: competition,

learning, mandates (normative or coercive), and citizen pressure. In this study, we use those four explanations to develop and conduct preliminary hypothesis tests related to why governments rank higher or lower on e-government and e-democracy. The remainder of the paper covers the key literature used to develop our hypotheses, explains the models and methods we use, and assesses the study's findings.

The Development of Web-Based Applications in the Public Sector

The Emergence of E-Government

National governments have recognized web-based IT as an important part of outreach to citizens since the early 1990s. "E-government" has been the most significant innovation. The emergence of e-government can be traced to the 1993 report *Reengineering through Information Technology*, which was part of the early Bill Clinton administration's National Performance Review (Lenk and Traunmüller 2002). Spurred by this report, and the simultaneous revolution in management quality, the governments of the United States, Great Britain, Europe, Taiwan, and Australia emerged as leaders in implementing e-government applications (Lee, Tan, and Trimi 2005). Many institutions such as the United Nations (UN), the World Bank, and researchers at Brown University and Rutgers University (Newark), have begun gathering empirical data to investigate and compare e-government performance in cities and countries. E-government applications include IT applications to transform both internal and external relationships (UN 2003).[1] Internal relationships refer to interagency interactions within government, while external relationships focus on using web-based applications for better service delivery and public consultation on government information.

Concept Realignment: E-Government and E-Democracy

The early literature on the use of ICT in government primarily referred to the development of e-government, which focused on business applications and website development for governmental jurisdictions. More recently, e-democracy has become an increasingly important issue. Although e-democracy has sometimes been defined narrowly as a tool for abandoning the representative system for one with more direct citizen engagement (Mahrer and Krimmer 2005), we agree with the viewpoint of Garson (2006), who argues that e-democracy is an umbrella term that covers many democratic activities carried out through electronic means and broadly defines e-democracy as the use of ICT by government to improve the efficiency, equity, and quality of democratic participation. The major applications of e-democracy include mechanisms to inform, consult, and broadly engage citizens through ICT use in the political process. These mechanisms are usually called "e-participation" or "e-engagement."

Backus (2001) uses "e-governance" to represent the overall impact of IT in the public sector, combining both e-government and e-democracy. He defines e-democracy as allowing and encouraging interaction between actors, such as government and citizens or government and businesses, while e-government refers to getting internal government operations on the Internet with interactive forms and payment

processes to simplify and improve government and the business aspects of governance. Chadwick (2003) argues that IT applications in the public sector are becoming a convergence of "e-democracy" and "e-government," which should reshape public governance in the future, while Lenihan (2005) notes that service delivery improvement and information are distinct from e-democracy. In short, because government is not just about the provision of public service, as it also covers citizen interaction with the tools of governance and decision making, more writers argue that e-government should be divided into distinct parts (Perri 6 2004), with e-democracy separate from the business operations and website function. There is a growing recognition that delivering public services via the Internet will alter the nature of democracy (Bishop and Anderson 2004). Using this distinction between e-government and e-democracy, this paper will analyze the antecedents of both concepts.

The Increasing Disparity in National E-Governments

In the past two decades, through e-government and e-democracy, IT has transformed modern governance. According to UN statistics (2003), the numbers of government websites grew from fewer than 50 in 1996 to more than 50,000 in 2001. By 2005, the total number of online governments had increased to 179, or around 94 percent of the UN member states (UN 2006). Although "going online" has become a global trend and an important component of modern governance, there are significant differences in access to IT and the Internet across countries (OECD 2003; UN 2006).

A serious access divide exists around the world between developed and developing countries (Wei 2004), especially in countries located in South and Central Asia, Africa, and the rest of the world (UN 2006). Because IT is essential to increases in productivity, and few doubt the potential impact of digital technologies,[2] the digital divide poses serious challenges to the worldwide regional balance of economies. Many international agencies have expressed concern over these inequalities in the information revolution (Norris 2001). Furthermore, because government efficiency and IT infrastructure are key drivers of global competition,[3] the availability of IT infrastructure and applications suggests that inequalities will remain, although a contrarian view notes that laggard countries can catch up to the more advanced countries because technology has become cheaper and more user friendly, with "best practices" widely written about that can be imitated.

Policy Adoption and E-Government

The limited literature that uses a policy adoption or determinant perspective to examine why governments adopt e-government or other IT applications can be categorized into two groups. One group uses individual-level data to assess what factors influence individuals' IT use. For example, Berry, Berry, and Foster (1998) find that communication, attitudinal, and organizational capability factors are key variables that influence mangers' use of a computerized expert system. Moon and Norris (2005) examine the association between adoption and managerial attitudes of e-government at the city level in the United States, and find that individual managers' innovativeness orientation, government capacity, city size, and government type are all important determinants affecting city e-government adoption.

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In the second category, researchers use aggregated jurisdiction-level data to compare disparities among cities, states, or countries. One example, conducted by McNeal et al. (2003) to examine organizational and institutional variables, found that cities in states with Republican-controlled legislatures, high legislative professionalization, and more active professional networks were more likely to embrace e-government. Similarly, Moon (2002), using U.S. city-level data, found that two institutional characteristics—city size and manager-council governments—were positively associated with e-government adoption.

The foregoing findings summarize key U.S. e-government research. We next review studies that address the global e-government perspective. Authors note that because of the heterogeneity of economic, cultural, and institutional characteristics in the world, it is difficult to compare e-government across countries. West (2005) has developed a broad-based global comparative model that includes organizational, fiscal, and political factors. In his cases, however, the only factor that significantly influences e-government performance is the number of scientists in the country. Srivastava and Teo (2006) assert that technical infrastructure and quality of human capital are necessary conditions for e-government development. Norris (2001, 123–28) finds that technology development measured by the spread of Internet use plays the single most significant predicator of a nation's e-governance development. E-governance may reinforce democratization, but the level of democratization does not appear to be the cause of e-governance.

Ndou (2004) further focuses on developing countries to study e-government. His conceptual paper indicates that in addition to ICT infrastructure, legislation, and human capital development, change management, partnerships between the public and private sectors, and leadership are key factors for developing countries to successfully develop e-government initiatives. In general, most global e-government research has focused on limited explanatory dimensions, such as economic status and technological variables. Wei (2004) uses a global e-government survey conducted by the UN and finds that technological, socioeconomic, and human development factors play an important role in global e-government development. Kiiski and Pohjola (2002) compare OECD countries and find that economic status is an important predictor of Internet connectivity and diffusion.

Our study develops a more comprehensive theory to explain the development of e-government and e-democracy than has previously been compiled, allowing us to test a more complete explanation of why countries differ in their e-government and e-democracy development. We next turn to a review of the theories that make up our research framework, and articulate the hypotheses we will test.

Models of E-Government and E-Democracy Development

Kumar et al. (2007) consider citizens as central to the application of e-government services. Their proposed model emphasizes citizen characteristics and factors related to increasing citizen satisfaction through online services, such as providing 24/7, secure, and reliable experiences online. This model suggests that higher levels of citizen satisfaction should lead to higher levels of e-government adoption and use. Research at a national and cross-national level, such as why

one nation more readily adopts e-government or e-democracy than another, has been the subject of recent studies (Liu and San 2006; Moon, Welch, and Wong 2005; Rose 2005; Wei 2004).

This paper uses nations as the unit of analysis, develops the aggregate viewpoint of innovation and diffusion, and applies four models based on arguments summarized by Berry and Berry (1999, 2007) to analyze what factors are likely to lead a country to use e-government or e-democracy policies at a more developed level. Two of the factors—learning and competition—can be viewed as strictly related to diffusion, while the third and fourth factors—national norms and citizen pressures—share some diffusion characteristics but also are internal factors within countries. Rogers defines the phenomenon of diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (2003, 5). In the past five years, an increasing number of authors have conducted cross-national diffusion studies (e.g., Dobbin, Simmons, and Garrett 2007; Lee and Strang 2006; Weyland 2005). Our study considers four theoretical reasons for policy diffusion and innovation—competition, learning, coercion/normative norms, and citizen pressure—as articulated by Berry and Berry (1999, 2007) related to national-level e-government and e-democracy development. This is the first empirical study to assess the determinants of e-government and e-democracy separately, so we have no empirical basis for expecting them to behave differently, and we hypothesize that they will be influenced similarly by the four theoretical models. The four models can be described as follows.

First, in the competition model, governments are assumed to compete with each other, and they may be especially sensitive to competition with nearby or neighboring states or countries. They emulate policies from other states or countries to gain economic advantages or to avoid being disadvantaged.[4] Meseguer (2005) notes that countries with similar cultural and political systems feel pressure to keep up with each other, while they are more likely to learn from each other, too. Therefore, according to the competition model, neighboring countries' e-government and e-democracy performance should play a key role in a country's own e-government and e-democracy development.

> H_1: A nation that is adjacent to one or more neighboring countries with high e-government performance will be more likely to have a higher e-government ranking.

> H_2: A nation that is adjacent to one or more neighboring countries with high e-democracy performance will be more likely to have a higher e-democracy ranking.

Second, organizations that are closely connected to adopters of a technology innovation learn about it and adopt it earlier, whereas organizations at the periphery of innovation networks are slower to adopt (Attewell 1992). The learning model relies on the classic theory of incremental decision making and bounded rationality (Simon 1947). Governments may discover that it is relatively simple and saves time and money to gain new information just by observing particular policies' results in other countries when they face uncertainty or difficult policy decisions (Meseguer 2005). Bala and Goyal (1998) apply the concept of social learning to explain technology diffusion. Learning from neighbor states or other

countries anywhere could be a critical consideration when analyzing the adoption of technology. The more international organizations a country belongs to, the more channels it has to learn from other countries' experiences in e-government and e-democracy. Countries tend to save time and money by gaining new information through the observation of other countries' experience (Meseguer 2005). In short, engaging in more interactive circumstances can decrease the administrative costs of IT planning and increase the IT policy implementation in the public sector. Because the learning process should not be limited by geographic location, we expect that external factors may be more vital when testing the learning model of policy diffusion. Information exchange could be the most important factor that leads to the learning process. Therefore, the third hypothesis is as follows:

H$_3$: The more a nation participates in international organizations, the more highly ranked the nation will be in e-government and e-democracy.

Third, there is pressure on governments to conform to well-accepted management and policy standards. The standards can be coercive or normative (DiMaggio and Powell 1983). At the national level, Meseguer (2005) also mentions that a supranational or international entity will sometimes vertically drive diffusion through coercive mechanisms, such as mandates connected to funding.

In the global phenomenon of e-government, developed countries that have strong financial and technological resources actually play a leading role (Lee, Tan, and Trimi 2005). Their influences have gradually spread all over the world. However, the successful practices of these nations in e-government or e-democracy are not just based on their advanced technology and stable economy, but are likely to be a result of their political and civic fundamental norms—democracy, transparency, and freedom. For example, an open and free social atmosphere could accelerate the spread of information around the country and a democratic polity could promote the growth of Internet development (Milner 2003). These norms allow developed countries to upgrade their performance in e-government and e-democracy step by step. In order to assess this assumed relationship, the following hypotheses are proposed:

H$_4$: When a nation is ranked highly in the area of transparency, it is more likely to be highly ranked in e-government and e-democracy.

H$_5$: When a country is ranked highly in its level of freedom, it is more likely to be highly ranked in e-government and e-democracy.

H$_6$: When a nation scores highly on its level of democracy, it is more likely to be highly ranked in e-government and e-democracy.

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Finally, public officials can experience citizen pressure from their own constituents to adopt policies. Citizens may receive the information through the news and wish to adopt the same popular policies that have been adopted in other states or countries. Furthermore, as the general education level is raised in society, increasing numbers of citizens become informed and knowledgeable (Mälkiä and Savolainen 2004). These conditions should form strong citizen pressures to push the government to adopt popular policies, such as e-government and e-democracy (Walker, Avellaneda, and Berry, forthcoming).

Many government innovations in the area of technology and computer use also result from the demands of business leaders and citizens, who see successful cases in the private sector and pressure the government to change and develop e-government and e-democracy (Ho and Ni 2004). Moreover, according to the findings from Wozniak (1987), human capital and information about new technologies are significantly affected by early adoption behavior. Education and information enhance the capacity to soften the resistance caused by technology adoption costs and uncertainty. Therefore, these factors can increase the probability of adopting profitable innovations. However, the flow of technical knowledge and the spread of tangible IT tools, such as the personal computer and Internet infrastructure, play an important role in hastening the adoption of e-government and e-democracy (Moon, Welch, and Wong 2005). Therefore, when a country has sufficient information and communication technology infrastructures, well-educated citizens, and a large base of Internet users, it possesses a strong potential for adopting e-government or e-democracy. This leads to the last two hypotheses:

H$_7$: When a country has a high human capital level (combined adult literacy rate and school enrollment level), it is more likely to be highly ranked in e-government and e-democracy.

H$_8$: The larger the numbers of frequent Internet users, the more likely a nation will rank higher in e-government and e-democracy.

Research Methods and Variables
Dependent Variables
The source of our dependent variable is the UN's 2008 global e-government report. This annual report was first published in 2003 and now has five editions to date. It assessed primary sites, such as national portals or an official government home page. This paper uses the Web Measure Index (UWM) from this report as the measurement of e-government performance, and the e-Participation Index (UEP) to represent e-democracy performance.[5] In the 2007 survey (published in 2008), 192 UN member countries were evaluated.

According to the UN's 2008 report, the UWM was "based on a questionnaire, which allocated a binary value to the indicator based on the presence/absence of specific electronic facilities/services

available" (2008, 15). The so-called electronic facilities/services refers to an e-government developmental stage model. This stage model includes (1) an emerging stage, (2) an enhanced stage, (3) an interactive stage, (4) a transactional stage, and (5) a seamless stage, where stage 1 is the most rudimentary stage of e-government development and stage 5 is the most highly developed stage.

Because there is no explicit worldwide e-democracy survey, this paper uses the e-Participation Index as a proxy measurement for the second dependent variable. According to Coleman and Norris (2005), e-democracy is "anything that governments do to facilitate greater participation in government using digital or electronic means" and "a means for disseminating more political information and for enhancing communication and participation, as well as hopefully in the long run for the transformation of the political debate and the political culture." Because the UEP examines "the quality and usefulness of information and services provided by a country for the purpose of engaging its citizens in public policy through information and communication technologies" (UN 2008, 17), e-participation could represent a core of e-democracy. UEP poses questions in three categories: e-information refers to the governmental information provision for budget, policy, law, and contact information; e-consultation covers the interfaces for citizen engagement; and e-decision making is the government's involvement of citizens in its decision-making processes.

Independent Variables and Research Framework
To construct a theory-based research design, all independent variables are derived from the theory behind the four policy innovation and diffusion models discussed earlier and the e-government literature. (See the appendix for details on the operationalization of all variables.) In the *competition model*, we hypothesize that a country with neighboring countries that have better e-government and e-democracy performance will have a greater incentive to develop its own e-government and e-democracy performance. To test this model, we use two independent variables: neighboring countries' average web measure (NAW), and neighboring countries' average e-participation scores (NAP).

According to the *learning model*, countries can efficiently gain new information and eliminate the possibility of e-policy failure by learning from the experience of other countries. We use the amount of international organization participation (IOP) as an independent variable for this model.

The *normative model* asserts that IT adoption results from pressures on governments to confirm to accepted standards. We use democracy level (DEMO), transparency index (TRAN), and freedom status (FREE) as the proposed drivers of this model.

The *citizen pressure model* argues that governments will improve e-government and e-democracy when they experience public pressure from citizens. We test this model using two independent variables—numbers of Internet users (IUSE) (per 1,000 population), and human capital index (HCI). The human capital measure is a composite concept comprising the adult literacy rate and the combined primary, secondary, and tertiary gross enrollment ratio of the country (UN 2006).

In addition to the theoretically driven independent variables in the four policy models, we also use gross domestic product per capita (GDP) and population (POP) as control variables and domestic characteristics. According to the findings from Weare, Musso, and Hale (1999), population size is a determinant of Internet technology adoption because the larger the number of users, the lower will be the average cost per user. Norris and Moon (2005) find that the adoption of local government websites is highly related to the size of the local government (measured in terms of population). These findings from previous studies lead us to include population as a control variable in our analysis.

GDP is a factor related to national financial resources. Previous literature has found that the lack of financial resources was one of the most significant barriers for local governments to adopt e-government (Norris and Moon 2005); thus, to control for the possible effect of financial resources on a country's performance in e-government and e-democracy, we include GDP as a control variable in our models.

Data Analysis
We used multivariate linear regression to estimate both models, as the dependent variables are measured as continuous data. In running the regression diagnostics, we found some multicollinearity problems among the independent variables and a non-normality distribution in the e-democracy model. In order to handle the multicollinearity, we recoded the numeric variable *Freedom Index* to a three-category multinomial variable: FREE, PARTLY FREE, and NOT FREE. This method mitigated its collinearity with democracy level and transparency level. Second, we used the UEP square root as the dependent variable of e-democracy to remedy a seriously right-skewed distribution.[6]

Table 1 displays the final results for our e-government and e-democracy regression models. In the e-government model, all of the independent variables and control variables show a very strong relationship with the UN scores ($R^2 = .739$, adjusted $R^2 = .717$), and explain 72 percent of the variance in the e-government development scores. More specifically, the e-government model demonstrates that the UN's web measure score (UWM) is associated with human capital, international organization participation, transparency index, and Internet users, and it is more weakly related to neighboring countries' web measure scores. In the e-democracy model (UEP), the independent variables explain just under half of the variation in the e-participation index ($R^2 = .469$, adjusted $R^2 = .425$). The data show that countries with larger numbers of Internet users, higher transparency scores, and larger populations are more likely to improve their e-democracy initiatives.

Discussion
The results for the e-government model show strong support for variables from all four of our models, while the results for the e-democracy model provide support for only two of the models—the normative and citizen pressure models. The adjusted R^2 for both models are strong, although the e-government model's strength, with an adjusted R^2 of 72 percent, is stronger than the e-democracy model, with an adjusted R^2 of 43 percent.

The competition model expects that countries' e-government and e-democracy investments will be driven by a leader's aspirations to

Table 1 Regression Analysis of E-Government and E-Democracy Models

Models/Dependent Variables Independent Variables		E-Government Model			E-Democracy Model[a]		
		B	S.E.	VIF	B	S.E.	VIF
Competition							
Neighboring countries' web measure scores average (NAW)	Neighboring countries' e-participation scores average (NAP)	.152+	.081	2.64	.006	.131	2.18
Learning							
International organization participation (IOP)		.004**	.001	2.25	.002	.002	2.25
Normative							
Freedom Status (Reference group: Free): Not Free		−.001	.056	5.60	.051	.082	5.47
Freedom Status: Partly Free		.019	.038	2.59	−.003	.056	2.54
Transparency Index		.029*	.012	5.49	.035*	.018	5.35
Democracy Index		.006	.014	8.04	.019	.020	7.98
Citizen Pressure							
Human capital Index		.196*	.077	2.07	.029	.109	1.92
Internet users (IUSE)		.000**	.000	5.04	.000*	.000	5.04
Control Variables							
Population (POP)		.000	.000	1.17	.000*	.000	1.17
GDP (per capita)		−.001	.001	3.95	−.002	.002	4.07
Constant		−.244	.108		−.051	.159	
Model Summary		• R^2 = .739 • Adj. R^2 = .717 • n = 131			• R^2 = .469 • Adj. R^2 = .425 • n = 131		

$+ p < .1$; $* p < .05$; $** p < .01$.

Notes: All models in this table correspond with normality and homoskedasiticity assumptions, and there is no serious multicollinearity problem. All VIF values are less than 10. The details of the regression diagnosis and remedy are described in note 6.

[a] In the e-democracy model, the dependent variable is the square root of e-participation index. This is for normality assumption of ordinary least squares.

lead in the global competition to have the best e-governance system, and that leaders are influenced by their neighboring countries, who are their immediate rivals. A leading position in IT infrastructure and administrative efficiency could attract international investment and bring a positive political reputation to the country's governors. This view of world competition is represented in the language of some national e-government strategic plans. For example, Singapore's first e-Government Action Plan envisions the country "to be a leading e-Government to better serve the nation in the digital economy,"[7] while Denmark's e-government Strategy 2007–2010 mentions that "Denmark occupies a leading position in this field. The goal is to keep and improve this position."[8] In our analysis, as table 1 shows, neighboring countries' average web measure scores (NAW)—the competitive pressure from neighboring countries—is a weakly significant driver of national e-government rankings, but this explanation has no impact on a country's e-democracy rankings.

Likewise, the results give fairly strong support to the learning model's impact on e-government rankings, but they do not influence the e-democracy rankings. In the world of e-government, apparently countries that are more involved in the networks of UN meetings in which they can gain more IT knowledge and advanced applications from international interactions are more likely to have stronger e-government scores. However, this transference of information and learning is not found to be very strong in the e-democracy model. Perhaps this is because countries have different political systems and therefore do not depend as much on learning across diverse political countries. E-democracy is much more recently developed than e-government. Perhaps international interaction and "expected standards" for countries to meet are not yet well established, so international interaction and learning are not so important yet.

The normative model asserts that countries pay attention to political norms in their own country and to international norms that match their values. Countries' normative beliefs come from successful experiences or from the principle spirit of a country's constitution. For example, countries that emphasize freedom, democracy, and the transparency of government may tend to focus on the development of e-government and e-democracy because these policies' values—civic engagement, political openness, and incorruptible government—are related to their national core values. E-government and e-democracy are helpful for the development of these core values. Of the three indicators that we used to construct the normative model[9]—transparency index, democracy level, and freedom status—only transparency (see table 1) is highly significant, while the other two factors are not strongly related to the performance of e-democracy and e-government.

These results are consistent with those from previous studies. Rose, in his 2005 paper, argues that the integrity of bureaucracy, or what he calls transparency, is an element of the modern governmental resource. Differences in the capacity of countries to supply standard e-government services are a result of the degree of their modern resources. Our test shows that the transparency level of government is associated with both the performance of e-government and also that of e-democracy. West (2005) finds that democratic nations are no better than nondemocratic countries at e-government performance. We also found a similar result in our models. Rose (2005) proposes that political openness, which he defines as a composite of civil liberties and media freedom, should be a critical factor influencing the supply of e-participation facilities in a country. We utilize the freedom level to represent the concept of political openness; however, it does not reach significance in either the e-government and e-democracy model.

The last model we tested is the power of the citizen pressure model. The findings here show that the human capital index, (composed of the adult literacy rate and educational levels), is strongly associated with e-government development, and the extent of Internet users is strongly associated with both e-government and e-democracy development. Countries with a high rate of educated human capital tend to develop advanced e-government applications. Countries with large numbers of Internet users have better IT policy development. This finding echoes the results of two previous studies. Moon, Welch, and Wong (2005) call Internet users the "pushing factor" for e-governance, while Rose (2005) categorizes the literacy rate as a demand-side influence of e-government. Our results are consistent with both descriptions of e-government, and also demonstrate that demand-side or citizen pressure also operates for more advanced e-democracy development.

Differences between the E-Government and E-Democracy Models

We summarize the analytical results of e-democracy and e-democracy in table 2. All four of our models have positive impacts on e-government development, while e-democracy development is only associated with the normative and citizen pressure models.

The strength of the e-government model may be a result of e-government's unique developmental history. E-government has followed the path of e-commerce, which focuses on quickly adapting to change, rapidly reacting to customers' requests, and immediately correcting mistakes (Chadwick 2003). E-commerce means applying digital technology to efficiently provide qualified service and rapid response to the demands of customers with lower cost. This trend explains why the citizen pressure model (Internet users and human capital index) is significant.

Compared to the e-government model, e-democracy emerged later and developed after elementary or advanced e-government infrastructure was in place. The UN started the first global e-participation evaluation in 2004. In all, 82 percent of countries still remain in the bracket of low e-participation

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(UN 2008). Our study findings show that two models—the citizen pressure and normative models—capture important impacts on e-democracy development. External forces, especially the competitive factor, do not demonstrate a strong impact on e-democracy. We believe this is partly because e-participation is not yet a widely used channel of public opinion inputs, but it is a developing phenomenon related to institution design, policy development, and the policy decision-making process. Countries need strong normative beliefs to mobilize the application of e-democracy, and they need a large enough Internet-using population to drive an online public participation channel.

Conclusion

With the advent of new information and communication technologies, e-government and e-democracy have been important innovations that have greatly reshaped public administration in the last decade, and have the potential to reshape governance in the future. Owing to the belief that IT can improve the efficiency and effectiveness of public services, e-government and e-democracy bring many new issues, models, and theories into public administration research. Among these emerging areas, one relatively unexplored topic is the determinants of e-government and e-democracy development. What factors drive countries to develop e-government and e-democracy policy? Are both e-government and e-democracy driven by the same factors? As our literature review demonstrated, most prior studies on e-government and e-democracy developmental models are based on intellectual speculation rather than data from empirical observation, do not connect e-government development to a well-established public policy theory, and focus only on e-government, without considering e-democracy separately. This study contributes to filling these missing areas of global e-government and e-democracy development research.

Moreover, this paper also offers an empirical test and support of policy innovation and diffusion theory from a global and cross-national perspective. Although more and more current studies are discussing the phenomenon of global diffusion in public policy and management, they are often written without empirical support for their arguments. Our research fills

Table 2 Summary of the Results of Hypotheses/Policy Models Tests

Policy Models	Hypotheses	E-Government Model	E-Democracy Model
Competitive model	H₁: A nation that is adjacent to one or more neighboring countries with high e-government performance is more likely to have a higher e-government ranking.	Partially accept	—
	H₂: A nation that is adjacent to one or more neighboring countries with high e-democracy performance is more likely to have a higher e-democracy ranking.	—	Reject
Learning model	H₃: The more a nation participates in international organizations, the more highly ranked the nation will be in e-government and e-democracy.	Accept	Reject
Normative model	H₄: When a country is ranked highly in its level of transparency, it is more likely to be highly ranked in e-government and e-democracy.	Accept	Accept
	H₅: When a country is ranked highly in its level of freedom, it is more likely to be highly ranked in e-government and e-democracy.	Reject	Reject
	H₆: When a country is ranked highly in its level of democracy, it is more likely to be highly ranked in e-government and e-democracy.	Reject	Reject
Citizen pressure	H₇: When a country has a high rate of human capital, it is more likely to be highly ranked in e-government and e-democracy.	Accept	Reject
	H₈: The larger the numbers of frequent internet users, the more likely a nation will rank highly in e-government and e-democracy.	Accept	Accept

this gap by utilizing cross-national data to test several hypotheses developed from policy innovation and diffusion theory. Taking the theoretical explanations from prior innovation and diffusion research across many policy areas, we have integrated four primary explanations—competition, learning, norms, and citizen pressure—into our research and tested them in a multivariate model that yields some striking results. In a nutshell, we do find differential impacts on e-government and e-democracy development, and the developmental process is consistent with theory.

Our findings show that all four explanations have significant and positive impacts on the developmental levels of e-government across 131 countries of the world. One of the strongest factors is the human capital index, which demonstrates that domestic development is critical and that citizen pressures account for much of a government's actions in e-government. However, we also found support for the other three models of e-government development—the competitive model (where there is a weak impact of neighboring countries' development), the learning model (in which the extent of participation in international organizations is associated with higher e-government development), and finally, the normative model (where a country's government transparency is associated with e-government rankings). These findings suggest that in a policy area such as e-government that has come to maturity over the past 20 years, government policy is influenced by both internal pressures and external diffusion pressures—whether those pressures be concern over competition from neighboring countries for citizen and business approval, or participation in international agencies and meetings in which learning takes place about best practices and good standards of e-government delivery.

In contrast, our findings on the determinants of e-democracy development reflect a more limited set of factors that are important in explaining country-level e-democracy development. Interestingly, e-democracy seems to be highly influenced by internal factors to a country and not by the external factors of standard innovation and diffusion theory. Both the normative and citizen pressure models are strongly supported in our tests, but the competition and learning explanations do not receive support. Competition may be important for e-government as countries compete for businesses that are looking globally at where to site company infrastructure or establish markets. E-democracy does not yet seem to be part of the calculus for businesses about where to locate resources. Thus strategic government leaders are not paying attention to their neighbors or best practices globally as they develop e-democracy. They are reacting more to demands from internal users and to the values of their political culture. Our work clearly shows that it is useful to understanding these practices to separate e-government and e-democracy policies, and is likely to be even more useful in the future as e-democracy practices develop and become more common across countries.

Future Research Issues
The results of this study contribute to resolving the theoretical ambiguity regarding the development of e-government and e-democracy. Although this paper has attempted to measure the time change of web-based IT policy, its generalizations have been constrained by the features of cross-sectional variables. Further research can gather more valid and reliable indicators to represent the four policy models.

An additional area that should be tested is the political and economic impacts on the development of e-government and e-democracy policies. More specifically, what are the impacts of regional economics, types of government institutions, and the location of governments in regions or in business trade relationships that may pressure governments to do more in the virtual world?

This paper's findings also contribute to the broader literature on innovation and diffusion, especially in the case of e-government, which is a more mature policy area than is e-democracy. By confirming the Berry and Berry model's explanations, which are derived from many studies of innovation and diffusion across diverse policy areas, our study finds that e-government adoption and development can be explained by the four broad theories of innovation and diffusion: competition, learning, normative, and citizen pressures that have been found to be major influences, to a greater or lesser degree, in so many other studies. E-democracy, a younger policy area that is not yet competitive across the world, seems to be determined by pressures and strategies within a country's border. Future research should continue developing better models of the influence of regional economics, political development, and new applications of e-democracy to see how they diffuse, and whether there is a process of maturation in the e-democracy policy area that seems to be occurring in the e-government policy area.

Notes
1. While there are several models of e-government development, perhaps the most frequently noted model is that proposed by Layne and Lee (2001), which describes four stages of growth for fully functional e-government. The first stage is the cataloguing of information, such as online presence or document download, while the second stage is a transaction mode—using online mechanisms for service delivery. The third and fourth stages correspond to increasingly complete integration between governments.
2. See the *Global Competitiveness Report* of the World Economic Forum (http://www.gcr.weforum.org/). IT infrastructure is an important indicator in their assessment.
3. Refer to the evaluating indices of global competitiveness reports from IMD (http://www.imd.ch/index.cfm) and the World Economic Forum (http://www.weforum.org/en/index.htm).
4. State governments in the United States have also been shown to compete. A state may adopt a lottery policy to decrease the number of citizens who cross the border to play other states' lottery games (Berry and Baybeck 2005; Berry and Berry 1990).
5. We tested our models using the e-government rankings from Brown University (GES), as there is a lack of consensus regarding the best comprehensive index of e-government. Overall, we found a poorer model fit using the GES rankings than using the UWM scores, with an R^2 of .32 using the GES data and an R^2 of .74 on the model using the UWM data. Studies on the rankings themselves showed that a discrepancy in indicators led to varied conclusions on the global state of e-government, and that the existing e-government indices are not highly correlated with each other (Moon, Welch, and Wong 2005; Ojo, Janowski, and Estevez 2007). We also found that the UN (UWM) and Brown University rankings (GES) were not highly correlated with each other. This is almost certainly attributable to their different measurement scale and targets. Overall, their correlations are .533, .503, .621, and .664. Among e-democracy scores and e-government scores, the UN's e-participation scores (UEP) have high associations with the UWM (.723, .749, .782, and .869), while the UEP has a more modest association with the GES (.503, .559, .567, and .643). Regarding the internal stability across years, the UWM has the highest correlation between

2005 and 2007. We have chosen to use the UN measures because they include both e-government and e-democracy, so they more adequately measure our theoretical concepts, and the UN measures are more highly correlated over time than are the GES index scores.

6. The final analysis result (table 1) of this paper has gone through several models. We ran models that kept and also deleted five outlier countries. However, we decided to keep the outliers in our sample, as we found only small differences between the results of the model with and without the outlier countries.

7. See Singapore's iGov website at http://www.igov.gov.sg/.

8. See http://www.e.gov.dk/.

9. We think that freedom status is not as appropriate for e-government models as it is for e-democracy models. We need other explanatory variables to validly test the normative power in e-government models, such as national e-government blueprints, but we could not find data to use for this concept.

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