The Political Economy of Electronic Democratic Forums:
The Design of Californian Municipal Web Sites

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The meteoric rise of Internet usage and high-profile uses of the technology by political campaigns and governments have reinvigorated the nascent debate regarding the democratizing effects of new information and communication technologies (ICTs). At this early stage of the application of Internet in politics, a central theoretical and empirical question demanding attention concerns the dynamics of the design and implementation of electronic political forums. While the proliferation of decentralized, high-bandwidth, two-way communications has the potential to affect politics profoundly, the Internet in raw form remains too chaotic to be constructive. Tools must be developed that facilitate the use of information, channel communications, and support meaningful dialogues on relevant topics.

Electronic democratic forums that provide this requisite organization take on many forms. Candidates and political parties establish sites to provide voters, potential contributors, and the press easy access to campaign information (cite to be added). Government departments and agencies create sites that promote service delivery, information access, and input into decision-making processes. Newspapers may create chat rooms to promote debate on on-going issues, and non-governmental organizations provide centralized locations for debate and information dissemination.

We focus on one particular forum targeted at one form of governance: World Wide Web (WWW) sites that provide information and communication channels oriented toward a municipality.[1] We advance our understanding of the potential effects of such electronic forums by developing a theory of the political, economic, and institutional factors that influence the provision and design of such sites. We then apply the theory to explain the provision of web sites within California cities.

Municipal web sites are a relatively recent phenomenon but are proliferating rapidly. In two nation-wide surveys, Kanfer and Kolar (Kanfer & Kofer, 1995) found that the number of communities on-line increased from only six, in 1994, to over 600, in 1995. In a 1996 survey, we identified web sites within 112 out of California's 460 cities. By the following summer, we identified 214 cities with web site addresses.[2] Sixty-one cities had two or more sites, and eleven had three or more different sites describing some aspect of the locality. Interest in local web applications is also evident in the existence of the community networking movement.

Local governments often, but not always, provide these sites. Chambers of Commerce, private firms, non-profits, and individuals also maintain numerous municipal sites, and there are many cities served by multiple sites. Of the 270 sites in our sample 52.1 percent are provided by government, 25.9 percent by private firms, 14.8 percent by chambers of commerce, 2.2 percent

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by non-profits, and 4.8 percent by individuals not affiliated with any organization.[3]

The quality of these early attempts to extend local civic life into the realm of cyberspace varies greatly (Hale, Musso, & Weare, 1999). Some are little more than a typed-written page posted on the Internet. More innovative sites present a rich collection of political, recreational, and business information in an easy-to-use and appealing manner. In addition, many sites support varied forms of communication, between residents and their political representatives, between resident and resident, or within and between local civic organizations. A few cutting-edge sites have even begun to automate on-line certain municipal services, such as building permit applications.

While it remains too early to measure meaningfully the effects of such electronic forums on local decision-making processes, institutional structure, and policy outcomes, the diffusion of municipal web sites offers an important opportunity to develop new theory and to ground on-going debates empirically. Our goal is to glean insights into the characteristics of communities likely to employ these technologies, and the manner in which design choices may shape use in the future. Because the potential effects of these technologies on governance depend on the quality of the services provided, understanding the determinants of innovation is critical to understanding their eventual impacts. Specifically, we seek to investigate what are the proper roles of public and private institutions in the provision of electronic political forums.

The paper proceeds as follows. In the first section, we discuss the relationship between information and communication technologies and democratic governance. We follow this discussion by developing a theory of the adoption and design of municipal web pages. We then describe our database composed of all Californian municipalities and proceed to present the results of the empirical tests of the model. We conclude with a discussion of the implications of our study.

A.   COMMUNICATION TECHNOLOGY AND LOCAL DEMOCRATIC GOVERNANCE

Until recently, the dominant focus of political communications scholars has been campaign communications (Nimmo & Swanson, 1990). A few early theorists developed frameworks in which the central elements of political development (e.g., political socialization, interest articulation and aggregation, rule making, etc.) were defined and analyzed as communication processes (Almond & Coleman, 1960; Deutsch, 1963). Nevertheless, it is only recently that we have witnessed a fusion between politics and communications, leading to more in depth analysis of the systemic role of communication in politics and building a base of theory

for the investigation of the effects of ICTs on politics (Galnoor, 1980).

The growing appreciation of the role of information and communications on political processes is evident on a number of theoretical fronts. Theories of interest group politics have illuminated the importance of communication and organization costs for organizing political interests and rewarding political actors (Becker, ; Stigler, 1971; Ward, 1996). Similarly, in principal-agent models of voting and regulatory oversight, information and communication play a central role in explaining the structure of congressional and regulatory institutions (Noll, 1984; Spiller, 1990). Kingdon (Kingdon, 1995) has shown the key role of social patterns of communication in the agenda setting process, and Putnam (Putnam, 1993) and March and Olsen (March & Olson, 1995) have highlighted the influence of communication in developing civic identity.

In parallel to these developments, though not directly connected to them, communication scholars have steadily advanced the study of ICTs and politics.   The rise of the cable television industry created new hopes for interactive, decentralized communication systems and sparked a number of studies that saw much promise for increased political participation and democratization of information flows but little actual change (Dutton, Blumler, & Kraemer, 1987). Abramson, Arterton, and Orren (Abramson, Arterton, & Orren, 1988) took a wider perspective examining all forms of new communication technologies. They found that television significantly altered the role of political parties in campaigns, but found fewer impacts in terms of governance and citizen participation. Laudon (Laudon, 1977), in contrast, did find evidence that new communications technologies could enhance the effectiveness of political groups. Finally, the rapid growth of the Internet has been matched by a burgeoning literature on its potential effect on governance (Beamish, 1995; Bimber, 1998; Davis, 1999; Grossman, 1995; Tsagarousianou, Tambini, & Bryan, 1998).

Despite this growing interest in political communications and the Internet in particular, we have much to learn about the political effects of new ICTs. As Laudon (Laudon, 1977, p. 26), argued, "[d]iscussions about the usefulness of communications technology for democratic participation generally produce confusion because the nature of the causal connection between technology and political effects is so nebulous."

Problems of determinism. A continuing source of debate is the causal relationship between technology and society. A narrow technological determinism colors many studies concerning the potential of ICTs to transform democratic governance. These writings imply that the development of more decentralized and ubiquitous communications networks will

necessarily alter patterns of political communication, power relations, and methods of service delivery (Beamish, 1995; Bonchek, 1995; Grossman, 1995; Negroponte, 1995; Toffler & Toffler, 1995; Ward, 1996). Others, in contrast, emphasize the social shaping of technology (Davis, 1999; Dutton et al., 1987; Graham & Aurigi, 1997; Sassen, 1997; Streeter, 1997). In their strongest form, these theories argue that existing elites control the development, design, and proliferation of new technologies and that, consequently, new technologies merely reinforce existing patterns of power.

This study takes the middle ground and incorporates a soft technological determinism perspective (Abramson et al., 1988; Pool, 1983). Technological change cannot be treated as purely exogenous. There are abundant examples of political and regulatory decisions either impeding or advancing technological innovation. Through the 1960s, for example, the Federal Communications Commission hampered the development of cable television, which the National Association of Broadcasters perceived as a competitive threat, through the imposition of onerous restrictions. In contrast, the Internet revolution could have never begun if the National Science Foundation had not decided in 1989 [check] to open up the Internet to commercial uses (Bar & Hart,). In addition, the importance of prevailing political structures cannot be ignore given the evidence that active political groups are typically the first to exploit new technologies (Abramson et al., 1988; Rogers, 1983).

Nor can technological change be treated as purely endogenous. The long-term effects of technologies are often completely unexpected. For example, in the late 1980s neither government officials, industry experts, nor academics fully appreciated the vast potential of the Internet. To the extent that technological developments are unanticipated, they remain beyond the control of decision-makers. In addition, new technologies do affect patterns of communication by creating new communication channels and lowering the costs of existing forms of communication, and these changes in communication patterns influence, though do not fully determine, political behaviors and outcomes.

Outcome or process orientation. A limitation of many studies has been a tendency to adopt an ambitious focus on outcomes, such as changes in political participation or social polarization. While such outcome variables rightly deserve attention, a full understanding of outcomes must be predicated on study of the nuanced processes through which ICTs ultimately affect governance. The deployment of a new ICT involves a complex policy formulation process involving myriad design choices and actors within and outside government. Decisions made in the implementation process will influence the extent to which the ICT alters pre-existing

communication patterns, information acquisition, or political mobilization and ultimately, the effects of the technology.

This paper focuses on the intermediate steps between policy formulation and ultimate use. Because the proliferation of the Internet and other ICTs is a recent phenomenon, we cannot yet rigorously analyze the end result for democratic governance. Given that these effects will be conditioned by the provision, design, and uses of these technologies, we focus on developing and testing theories of provision and design.

Institutional diversity. A third issue arises because the Internet is revolutionizing media systems by providing low cost, easy to use, two-way communications capabilities to new classes of individuals and organizations. Traditionally, the dissemination of political information has been largely controlled by the government and a relatively small number of mass media outlets, raising the possibility that concentration of media stifles democratic debate (Bagdikian, 1997). The Internet, however, allows service provision by diverse players, including new media firms, non-profits, and even individuals. Attention to the comparative capabilities and interests of these actors may illuminate the potential for complementarity or competition between alternative democratic forums and in turn, the implications for democratic participation.

Political Constructs. A fourth complication is that local democratic governance has been the subject of multiple, and often conflicting, positive and normative political theories. For example, the issue of "who governs" continues to engage pluralists, elite theorists, and adherents to the new political economy in the debate about power and influence in the urban setting (Dahl, 1961; Peterson, 1981; Stone, 1989; Yates, 1984). While greater interaction between the fields of local politics and communications is needed, the variety of political theories and the differing constructs on which they focus complicate the study of ICTs. For example, if one adopts Yates (Yates, 1984) "penny arcade" view of local politics involving constantly shifting mixes of institutions, organizations, and actors interacting in multiple forums over many issues, the effects of ICTs on bureaucracy and interest-group conflict would be the proper focus of study. In contrast, if like Peterson (Peterson, 1981), one envisions city politics as quieted by the migrational threats of local businesses and wealthy citizens, then ICTs are more likely to affect service delivery and economic development programs rather than to alter the balance of interest group power.

Thus, theory needs to encompass multiple perspectives to analyze how new ICTs may affect various dimensions of local governance. We address this issue by developing multiple measures of the quality of services provided by municipal web sites, relating each measure to

differing conceptions of urban governance (Musso, Weare, & Hale, 1999).

Methodological emphasis on case study. Finally, our understanding of the relationship between ICTs and democratic governance has been hindered by the methodological constraints of early studies. Many studies have focused on a small number of exemplar applications (Dutton et al., 1987; Guthrie, 1992; Tsagarousianou et al., 1998; Varley, 1994). While these studies have highlighted the early prospects and problems of electronic democracy initiatives, they are unlikely to be accurate indicators of their more general impacts. For example, revisionist historians of the Progressive Era have argued that a focus on exemplars led early analysts of this political movement astray:

> "Reformers in the Progressive Era and liberal historians since then misread the nature of the movement to change municipal government because they concentrated upon dramatic and sensational episodes and ignored the analysis of more fundamental political structure, of the persistent relationships of influence and power which grew out of the community's social, ideological, economic, and cultural activities."(Hays, 1998, p.142)

Statistically this problem is called selection bias, and it can be corrected through proper sampling and application of statistical techniques.

B.   THE MODEL

The phenomenon we are observing is the provision of municipal web sites by a variety of public and private actors in cities with differing political, demographic, and economic characteristics. The city is the unit of analysis, and we wish to investigate the factors that lead various agencies to provide a municipal site for a particular city. Beyond the simple decision to provide a site, we are also interested in its design. Existing municipal web sites vary widely. The simplest do not take advantage of the Internet's capacity to support improved information dissemination and interactive communications. Even more advanced sites do not in general support all the possible functionalities that can potentially influence citizen participation, interest group dynamics, service delivery, or other dimensions of local governance. Consequently, the design and quality of sites is a key factor in the likely future effects of this type of electronic democratic forum, and the provision of a simple site should be considered a qualitatively different choice from the provision of a more sophisticated one (Guthrie & Dutton, 1992).

1. Quality Measures

As discussed above, the measure of web site quality requires attention to multiple

perspectives on municipal governance. In other work (Musso et al., 1999), we have developed such a framework. We argue that web sites can improve democratic communications through two basic mechanisms: improved access to information and improved communication channels. In addition, we argue that the specific services provided depend on the vision of municipal reform underlying the provision of a web site. Reform may either focus on improving city services to residents and local business or to facilitate great civic dialogue. Civic reform may further be distinguished between pluralistic and communitarian reforms. Pluralistic reforms attempt to facilitate citizen and interest group involvement in the policy making process. In contrast, communitarian reforms that seek to develop the types of citizen and group interactions that communitarian theorists argue is key to building the social capital and civic involvement that promotes strong democracy (Barber, 1984; Etzioni, 1996; Putnam, 1993).

Based on this theory we hypothesize that there are six underlying dimensions to the quality of municipal web pages:

1. The amount of political information.
2. The amount of service related information.
3. The amount of information concerning local organizations.
4. The number of vertical communications channels to elected officials.
5. The number of vertical communications channels to service providers.
6. The number of horizontal communications channels to local organizations and other citizens.

2. Provision and Design.

A theory of the provision and design of municipal web pages must account for a number of consequential characteristics of the phenomenon. First, web sites are provided by a mix of public, private, and non-profit enterprises. Supply decisions, therefore, depend not only on the characteristics of the city (e.g., demand factors) but on the interests, capabilities, and incentives of each provider type.[4] Second, electronic political forums are, for practical purposes, public goods. They are non-rival in that all residents of a city may access the site without infringing on others ability to access it, and they are non-excludable in that everyone on the Internet can access the site.[5] Consequently, the comparative ability of different institutions to discern demand for public goods and to overcome the free rider problem becomes an important consideration (Coase, 1974). Third, the creation of a municipal web site involves the adoption of a new technology. Thus, the factors that promote and hinder innovation must be considered.

To address these issues we develop a multidisciplinary theory that synthesizes insights from the literatures on public goods, diffusion of innovations, local politics, and non-profits.

From the perspectives of the economics of public goods, the probability of provision is related to the net benefits provided by the good. Because the costs of constructing and maintaining a public good do not increase with use, the total benefits will be largest in cities with a greater number of Internet users and a larger total population.[6] In addition, we expect the net benefits to be higher in communities with higher average incomes because demand for the public good will increase with income. We also expect that when multiple sites serve a city, quality will increase either because of competition or because of specialization by sites to serve specific needs.

The literature on the diffusion of technologies provides several insights on the factors that lead to such innovative choices (Rogers, 1983). Four features of the technology are predicted to increase the ratio of benefits to costs thereby increasing the chances of adoption. They are the ease of use, ease of experimentation, ease of observing the results of adoption, and the degree to which the new technology improves on existing possibilities. The technology involved in municipal application is favorable in all of these dimensions. Thus, it is not surprising that the technology has diffused as rapidly as it has. The literature also identifies several characteristics of lead adopters. Most importantly, they tend to come from social elites, suggesting that cities with richer, better-educated citizens concentrated in elite professions will have stronger demands for municipal web sites.[7]

In addition, our review suggests that different provider types will bring varying interests and capabilities to the design and provision of these applications. We focus on three main types: government, private firms, and non-profits. We examine the demand factors to which each institution is likely to be sensitive, the factors that lead it to provide a site, and the factors that influence design decisions. These implications are summarized in Table 1.

PLACE TABLE 1 ABOUT HERE

Government. City officials, and particularly elected officials, are primarily concerned with preserving their existing control over political and bureaucratic decision-making (Mayhew, 1974). Nevertheless, they are sensitive to the demands of their constituents. Consequently, the main factors that increase the demand for public goods should influence city officials. In addition, they should be sensitive to the political environment. Higher rates of political participation indicate greater interest in the services that can be provided by a municipal web site. Guthrie and Dutton (Guthrie & Dutton, 1992) also claim that ideology is a factor, arguing that more liberal cities with inclusive politics will be more likely to develop electronic democratic forums.[8] Alternatively, higher levels of political dissatisfaction, as indicated by third party membership, may lead to stronger demand. Residents who are dissatisfied with the status

quo may have more interest in having a forum to express their concerns, and members of third parties may have few opportunities to see their views expressed in the mainstream media.

The decision to provide a site should be related to the strength of demand and according to the diffusion literature, the concentration of elites in the city. In addition studies of technology adoption in organizations find that organization size promotes innovation (Damanpour, 1992; Mansfield, 1963; Mohr, 1969). This insight suggests that larger cities or those with greater amounts of slack resources are more likely to provide web sites.   The free-rider problem should not constrain city provision because of their general tax powers.   Nevertheless, they remain subject to constraints imposed by city fiscal capacity.

Given the interests of city officials, one would expect them to support web services that strengthen their power bases, facilitate credit claiming, and improve their ability to gauge and respond to constituent demands. Such services would include providing information on the activities and accomplishments of local government and supporting vertical communication links between constituents and local officials. In contrast, broadening access to information and creating new communication channels reduces the costs of interest group formation and collective action, thereby altering the existing balance of political power. City officials would likely have less interest in providing services that facilitate such shifts in power, suggesting that they are less likely to support the provision of politically sensitive information and horizontal links between citizen groups.

Private Firms. The foremost problem faced by private, for-profit providers is the free-rider problem. If all Internet users can access the information they provide without paying for it, how can they generate revenues? Following most media firms, we expect private providers to rely on advertisements, thereby converting a public good (the municipal web site) into a private good, audiences for advertisers (Owens & Wildman, 1992).[9] This business model should lead firms to seek out cities with large potential audiences, making them sensitive to the demand for the public good. In addition, they are more likely to cater to cities with high concentrations of wealthy social elites, populations in which advertisers are more interested.

Because advertising rates depend on hit rates, private providers should design sites that include all types of information and communication services for which the cost of provision is less than the increased advertising revenue generated by added traffic. Thus, we hypothesize that they will focus on services with mass appeal (e.g., entertainment, shopping, and recreation information) and ignore others that are highly valued by a very small population (e.g., city council meeting minutes).   In particular they are likely to provide types of interactive services

that build a community of association, differentiating their site and giving visitors a reason to return (citation to be added).

Non-profits. Non-profits encompass an eclectic group of organizations, including community organizations, school districts, associations of local governments, and chambers of commerce. Not surprisingly, there are a number of theories that attempt to describe their goals and behaviors (Hansmann, 1987). Two theories are most relevant for the organizations that we observe providing web sites. Weisbrod (Weisbrod, 1974; Weisbrod, 1977) has theorized that non-profits arise to provide public goods when governmental entities have failed to provide or under provide a good demanded by a large group of residents. Others have theorized that non-profits arise to provide their members with greater control over output quality (Hansmann, 1987). The first theory can be applied to understand community groups and the second can help us understand the actions of chambers of commerce.

In public-good providing organizations, the provision decision would be sensitive to both the demand for public goods and to perceived unfulfilled needs. In contrast, membership organizations should be more concerned with their specific constituency, business development in the case of chambers of commerce.

Non-profits are typically thought to focus on the quality of their outputs, but the specific goals of non-profits are sensitive to the specific inclinations of their management (Hansmann, 1987). Consequently, we expect that public good driven organizations will provide a high level of all types of information and communication capabilities, including those such as horizontal communication links that are most likely to upset existing power relations. Nevertheless, the quality of their outputs will be constrained by their ability to overcome the free-rider problem and attract donations or grants for their services. Chambers of commerce serving their members are more likely to focus on business development and municipal service delivery issues.

Individuals. Finally, individuals provide a number of web sites. Because their preferences are highly idiosyncratic, we do not attempt to predict their design choices. Nevertheless, these sites are an indicator of the revolutionary nature of the Internet in that it opens up powerful forms of political activity to new groups.

To sum up, at this early stage of the growth of electronic networks, municipal web sites, potentially forming the basis for new electronic political forums, are diffusing within a population of heterogeneous cities. The provision of sites is a function of the demand for the public good within each community and the various institutions' propensity to innovate.[10] For those municipalities that are served by sites, the quality of the site in terms of information

provision and communications capabilities is a central determinant of the site's potential effects on local governance. This design decision is conditioned not only by demand factors but also by the different incentives and resources of the specific actors who provide the site

C.   DATA

We test this theory on a unique data set that combines socio-demographic data on all California cities with a comprehensive content analysis of California municipal web sites. To identify all municipal web sites an extensive search of the Web was conducted in the summer of 1997, employing several search engines and three Web-based indices of municipal Web sites: City Link, City.Net, and the Association of Bay Area Governments.[11] Addresses for 290 municipal web sites were identified. Twenty sites could not be located during the study, leaving 270 sites from 203 cities.

Three trained coders conducted a structured content analysis, coding 115 specific dimensions of each site. These included information on and communication channels to political officials and providers of eight different types of municipal services (e.g., police, fire, economic development, etc.). In addition, they coded for the provision of information related to political issues (e.g., city council meeting minutes), service delivery (e.g., recreational program schedules), community groups, and other levels of government. Inter-coder reliability was acceptable, given the varied and often complex manner in which information is organized on web sites. Using Krippendorf's alpha (Krippendorff, 1980), questions scored on a nominal scale had an alpha of .69 and questions scored on a ordinal scale had an alpha of .76. These scores indicate that the observed level of agreement was respectively 69% and 76% above what would be achieved by pure chance.[12] Sites were also coded for the organization providing the site. A separate survey was sent out to webmasters when site authorship was ambiguous.

Socio-demographic data on the sample cities was obtained from the 1990 census, except for 1996 population figures which came from the California Department of Finance. Four cities, all which have web sites, incorporated after the 1990 census and had to be eliminated from the final analysis due to the lack of census data. Because city level data on Internet usage is not available, we employed the number of Internet service providers (ISPs) that operate in a community as a proxy measure for Internet use. These data were from a 1996 county level survey of all United States ISPs (Greenstein,). Information on 1996 voter registration and party affiliation was obtained from the California Secretary of State, and data on local government finances were gathered from the California Controller's Financial Transaction Reports of 1993.

D.   RESULTS

Estimation of the model involves two steps. First, confirmatory factor analysis is employed to derive a number of measures of web-site quality based on the content analysis. Second, we employ these quality measures to test the model of design choice. Each stage is discussed in order.

1.   Derivation of Quality Measures

We hypothesize that the information gathered in our content analysis are indicators of a web designer's underlying proclivity to provided certain functionalities. Consequently, confirmatory factor analysis is an appropriate method to estimate these latent factors based on observed indicators (Byrne, 1998; Hayduk, 1987).

Our theory led us to expect six dimensions of quality or underlying factors:

1. Political information
2. Service related information.
3. Information concerning local organizations.
4. Vertical communications to elected officials.
5. Vertical communications to service providers.
6. Horizontal communications to local organizations and other citizens.

Unfortunately, our data does not contain sufficient indicators to estimate factors for both information on and communications to local organizations. Thus, we collapsed these two factors into a single one. In addition, our data are highly skewed to the left, because most sites have low levels of information provision and communication capabilities. Given that estimation in LISREL assumes that the data is distributed multivariate normal, we transformed the data prior to estimation based on the assumption that the observed data come from an underlying normal distribution [LISREL citation]. This transformation, however, requires additional degrees of freedom, necessitating a reduction in the number of indicators employed. We eliminated certain indicators because they loaded weakly on the underlying factors in preliminary analyses. Summary indicators were then created for the remaining indicators. For example, the number of e-mail addresses to the mayor's office, the city council, and the city manager were summed to create an indicator for the number of e-mails to political officials.[13] The nineteen resulting indicators are listed in Appendix A.

This model with five factors and nineteen indicators was estimated employing weighted least squares techniques in LISREL designed to address the problem of skewed data [LISREL

citation]. This model performed well. All of the indicators loaded strongly on the hypothesized factors, and the overall fit was very good with a Comparative Fit Index of .95. Nevertheless, a number of the factors were highly correlated. Political information and vertical communication to elected officials had a correlation of .95, and service related information and vertical communications to service providers had a correlation of .99. Consequently, the decisions to provide information and communication capabilities do not appear qualitatively different, and we reformulated our model to include only three factors: 1) political communication and information (PCI), 2) service related communication and information (SCI), and 3) horizontal communication and information (HCI).

This revised model also performed well and the path diagram for the completely standardized solution is presented in Figure 1. All of the factor loadings are highly significant, and the overall fit of the model remains excellent with a CFI =.95.
Two of the factors, PCI and SCI, are still highly correlated. Nevertheless, on a theoretical basis, there are strong reasons to believe that the provision of political information differs fundamentally from the provision of service related information (Musso et al., 1999). Not only do these two classes differ qualitatively, actors have distinct incentives in providing political versus service related information. Consequently, we retain these two factors as separate theoretical constructs.

Finally, to generate the dependent variables for the next stage of the model we generated factor scores. We normalized all of the indicator variables. The factor scores then calculated as weighted sums of the indicators that load onto each factor where the weight is the factor loading of the indicator (Comrey, 1973).[14]

In sum, the results of this confirmatory factor analysis strongly support the notion that there are small number of underlying factors that explain the diverse information and functionalities provided on web sites. Moreover municipal web sites are not unidimensional. Political, service-related, and community orientated information and communications are distinct services, and sites that excel in one quality dimension may lag in others. This distinction is important because of each of these services has very different implications for the impacts of electronic democratic forums.

2.   Estimation of the Provision and Quality Choices

Based on our theory we are interested in estimating a model of the provision of a web site for a municipality and a model of quality choice. In the first model, Equation 1, the dependent

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variable is one for cities served by web sites and zero otherwise. Demand and propensity to innovate are modeled as a function of population, Internet penetration (e.g., number of ISPs in county), political participation (e.g., percent of adults registered), ideology, per capita city revenues, and the concentration of elites (percent of whites in population, and a socioeconomic index[15]).   In the second model, Equation 2, a quality dimension, Q_i , is modeled as a function of the demand factors and the characteristics of different providers. In particular, per capita city revenues are interacted with a dummy variable for public provision (D_1) to reflect that only these providers are constrained by city revenues. In addition, the social index is interacted with a dummy for private provision (D_2) to test the notion that private providers are especially eager to provide information to elite audiences and with a dummy for non-profit provision (D_3) to test the notion that non-profit providers are more likely to seek out more disadvantaged communities.

$$
\begin{aligned}
\text{Provision} = \ & \text{ß}_0 + \text{ß}_1 \cdot \text{log\_of\_population} + \text{ß}_2 \cdot \text{ISPs} + \text{ß}_3 \cdot \text{percent\_registered} + \\
& \text{ß}_4 \cdot \text{percent\_Democrat} + \text{ß}_5 \cdot \text{percent\_third\_party} + \text{ß}_6 \cdot \text{per\_capita\_revenues} + \\
& \text{ß}_7 \cdot \text{percent\_white} + \text{ß}_8 \cdot \text{socioeconomic\_index} + \text{ε}_1 \qquad\qquad \textbf{[1]}
\end{aligned}
$$

$$
\begin{aligned}
Q_i \quad = \ & \text{ß}_0 + \text{ß}_1 \cdot \text{log\_of\_population} + \text{ß}_2 \cdot \text{ISPs} + \text{ß}_3 \cdot \text{percent\_registered} + \\
& \text{ß}_4 \cdot \text{percent\_Democrat} + \text{ß}_5 \cdot \text{percent\_third\_party} + \text{ß}_6 \cdot D_1 \cdot \text{per\_capita\_revenues} + \\
& \text{ß}_7 \cdot \text{percent\_white} + \quad \text{ß}_8 \cdot \text{socioeconomic\_index} + \text{ß}_9 \cdot D_2 \cdot \text{socioeconomic\_index} + \\
& \text{ß}_9 \cdot D_3 \cdot \text{socioeconomic\_index} + \text{ß}_{10} \cdot \text{private\_provider} + \text{ß}_{11} \cdot \text{chamber\_of\_commerce} + \\
& \text{ß}_{12} \cdot \text{non-profit\_provider} + \text{ß}_{13} \cdot \text{individual\_provider} + \text{ß}_{14} \cdot \text{multiple\_providers} + \\
& \text{ß}_{15} \cdot \text{Mills\_ratio} + \text{ε}_2 \quad \textbf{[2]}
\end{aligned}
$$

Unbiased estimation of Equation 2 requires attention to the selection bias issues discussed above. We may suppose that city residents have varying underlying desires for the information dissemination and communication capabilities afforded by web sites. If those cities that lack sites arguably have sufficiently weak resident demand that no agent was willing to undertake the expense of establishing a site, our data set is censored in that we only have information on the quality choices for those cities with municipal web sites. Consequently, when estimating a model based only on the available data, the expectation of the error terms conditioned on observing a web site is no longer zero, and straightforward application of least square regression techniques is inappropriate (Tobin, 1958).

Heckman (Heckman, 1976) has proposed a solution to this source of bias employing a simple two stage procedure that neatly represents the two stages – provision and design – of our model. He advocates first estimating a probit model for the provision of municipal web sites. The coefficients of this model can then be used to calculate a consistent estimate of the expected

mean of the error term in Equation 2, often referred to as the hazard rate or Mills ratio. Including the Mills ratio in the quality estimation model corrects for the bias. In addition, the coefficient of the Mills ratio provides us with information on the existence and severity of bias if the issues with the censored sample were ignored.

The results of this two-stage analysis are presented in Tables 2 and 3. The probit analysis examines the 454 cities that were incorporated in California prior to 1990 of which 199 had web sites. The model performs well, explaining over 28% of the variance, a respectable level for this type of cross-sectional analysis. Nevertheless, the fact that over 70% of the variance remains unexplained does suggest that the decision to adopt web technology is still influenced by many idiosyncratic personal, organizational, or city specific factors that are difficult to account for in a systematic analysis.

All of the hypothesized factors are statistically significant and in the expected direction with the exception of political participation and ideology. Neither the percentage of voters registered, democrats or third party members influences the likelihood of provision. The insignificance of the these coefficients may be attributed to the close relationship between participation, party membership and education. Thus, the socioeconomic index variable may be picking up this variance and further study will be required to disaggregate their separate effects. The increased audience size as measured by population strongly increases the probability of provision, but the number of ISPs does not. It is possible that this measure is not an appropriate proxy for local Internet usage. Alternatively, providers may not be influenced by usage either because the information is not easily available or that they expect usage to continue its geometric growth. Finally, as predicted, higher per-capita city revenues and higher concentrations socio-economic elites increases the likelihood of provision.

The second stage of the estimation presented in Table 2 employs ordinary least squares techniques to predict the three measures of quality. The data encompasses the 266 web sites available in the 199 cities that have at least one. The default provider is the public sector; thus, coefficients of the institutional dummies represent the change in quality relative to public providers. We discuss the findings in order.

Political Information and Communications. The model for the provision of political information and communications predicts almost 38% of the variance of this measure of quality. Several demand factors appear important determinants of the quality of political functionalities. Audience size leads to higher quality levels, though the number of ISPs has no effect. In addition cities with higher concentrations of socio-economic elites tend to have higher quality

sites. Ideology in terms of Democratic party membership does appear to influence quality, though the coefficient does not quite reach standard measures of statistical significance. The hypotheses that private firms would be more anxious to serve elite audiences and that non-profits would be more interested in serving disadvantaged audiences are not born out by the data. Also contrary to expectations, provision by multiple providers does not tend to increase quality.

The institutional provider of the web site is influential. Private firms, chambers of commerce, and individuals all provide lower quality sites than public providers in terms of political information and communications. Chambers of commerce provide the lowest quality sites, and even individuals outperform private firms. The coefficient for non-profits is also negative, though it is smaller in absolute terms than the other institutional coefficients and is not statistically significant. This result supports our expectation that non-profits are interested in providing high quality public goods. Nevertheless, this conclusion must be made with caution because of the small number of non-profits in our data.

Service Related Information and Communication. The results of the model examining the quality of service-related information and communication explain almost 34% of the variance. There are three notable differences between the provision of political versus service-related functionalities. First, none of the demand factors are significant. Thus, differences in quality levels are almost completely explained by institutional factors. Second, private firms, chambers of commerce, and individuals still provide lower levels of quality than do public agencies, but the gap is narrower than in the political case.[16] Third, the provision of multiple sites for city does appear to influence quality, but counter to expectations it lowers the quality of service-related information and communications.

Community Information and Horizontal Communications. The third model predicting the quality of community information and horizontal communications contrasts starkly with those for the first two. Most importantly, the predictive power of the model is negligible. Only 8.8% of the variance of the dependent variable is explained by the model, and not a single coefficient is statistically significant.   It appears that the decision to provide information on neighborhood organizations and other community groups and to permit residents to converse directly with one another remains highly idiosyncratic for all types of web site providers. The one notable result is that this is the only quality dimension in which public providers do not outperform others. In fact, there is some weak evidence that private firms are the most likely to provide horizontal communication capabilities. A small number of sites, 27 out of 270, contained either a bulletin board or a chat room through which residents could converse.[17]   Only 7.8% of the publicly

provided sites provided this facility, while 20% of the private sites did.

E.   DISCUSSION AND CONCLUSIONS

We have argued that research on the effects of ICTs on democratic governance can fruitfully focus on technological development rather than solely focusing on end results. To that end we have proposed and tested a theory of the provision and design of municipal web sites. This study has produced a number of insights. The notion that electronic democratic forums have multiple dimensions is strongly supported by our content analysis. This distinction has two important implications. First, because the political, service-related, and community building functions of ICTs should affect distinct dimensions of democratic governance, theories need to distinguish between these dimensions of the technology. Second, differing institutional and demand factors appear to influence the provision and design of these capabilities. Thus, policies to promote electronic democratic forums will have to address distinct sets of policy variables.

Demand for this type of public good influences the probability of it being provided and the quality of political functions offered. The importance of audience size suggests that economies of scale and/or network externalities appear to be important factors in promoting electronic democratic forums. Such economies may mean that democratic forums may easier to establish at higher levels of government, even though citizens interact most with their local government. Alternatively, they may suggest that the success of democratic forums will depend on the creation of portal sites that will be able to attract and manage a larger amount of traffic.

The positive influence of higher concentrations of socio-economic elites on the adoption of web sites and on improved design suggests that, at least at this stage of development, the Internet does have the tendency of serving elites, thereby increasing the gaps between information haves and have nots. An important qualification is that the quality of service-related information and communications does not seem to be influenced by the concentration of elites. Consequently, the gap appears to be much more related to political representation rather than service delivery.

Most importantly, on the supply side we observe that the institutional form of providers plays an important role. The low cost and decentralized nature of the Internet has enabled many players to create municipal sites, but the incentives and constraints faced by the various actors lead to markedly different outcomes. Public provision clearly leads to higher quality political and service-related web site content. It appears that the public good nature of municipal web sites predominates. As economic theory would suggest, the private sector tends to under-

produce public goods, and chambers of commerce, attentive to their members' interests, provide even lower levels of quality. The results concerning non-profits are more ambiguous. As expected, they provide higher levels of quality than private firms or chambers of commerce, but data limitations leave it uncertain whether they match the quality provided by public sites.

The exception to these results concern the provision of community information and horizontal communication. These services are thinly provided by all provider types. This observation is consistent with the notion that public providers may be reluctant to encourage the formation of potentially competitive coalitions. Nevertheless, it is also possible that all providers fear creating forums that risk decline into "telecommunications road rage," shouting matches over contentious local issues (Docter & Dutton, 1998). Upon closer examination of individual web sites, there is some weak evidence that horizontal communication capabilities are more frequently provided by private firms, supporting the hypothesis that firms have incentives to deploy community building technologies in an effort to increase site traffic. If this result is confirmed in future studies, it has important implications for electronic political forums in that non-governments may be the preferred provider for some types of services.

Finally, this study provides some evidence that focusing research on lead adopters does not risk skewing conclusions concerning the effects of ICTs on democratic governance. The coefficients for the Mills ratio included in each model is not statistically significant, indicating that there was not any bias due to sample selection. This result allows researchers to generalize the results from the large body of case studies currently being published with greater confidence. Nevertheless, researchers should remain somewhat cautious given that the coefficient nears statistical significance in the model for political services.

We suggest that popular predictions that the Internet will bring about the end of government as we know it are naïve (Toffler & Toffler, 1995). This study demonstrates that governments at all levels provide order to the Internet that conditions the way in which citizens attain information and participate in governance. While non-governmental organizations and private firms can provide electronic democratic forums, they are still constrained by the free-rider problem and dependence on ad revenues. Nevertheless, the early evidence from California suggests that the development of civic life in cyberspace will involve a rich mix of players, to some extent contradicting those who claim that existing centers of power will continue to dominate this new media.

Table 1
Institutional Perspectives and Their Application to Web Site Provision and Design

|	Local Politics	Firm Economics	Non-profits
Institutional Focus	City Government	For-profit Firms	Non-profits
Demand Factors	Population Income Internet Users Political Participation Ideology Political Dissatisfaction	Population Income Internet Users	Population Income Internet Users Constituency
Provision Factors	High Demand Elites Organization Size and Slack Social Networks	High Demand Advertisers Elites	Constituency Unfulfilled Need Organization Size and Slack Social Networks
Design Factors	Political Advertising Control Over Power Service Delivery Professional Norms	Site Traffic Product Differentiation	Quality Maximization Fiscal Constraint Constituency

Figure 1
Confirmatory Factor Analysis Results
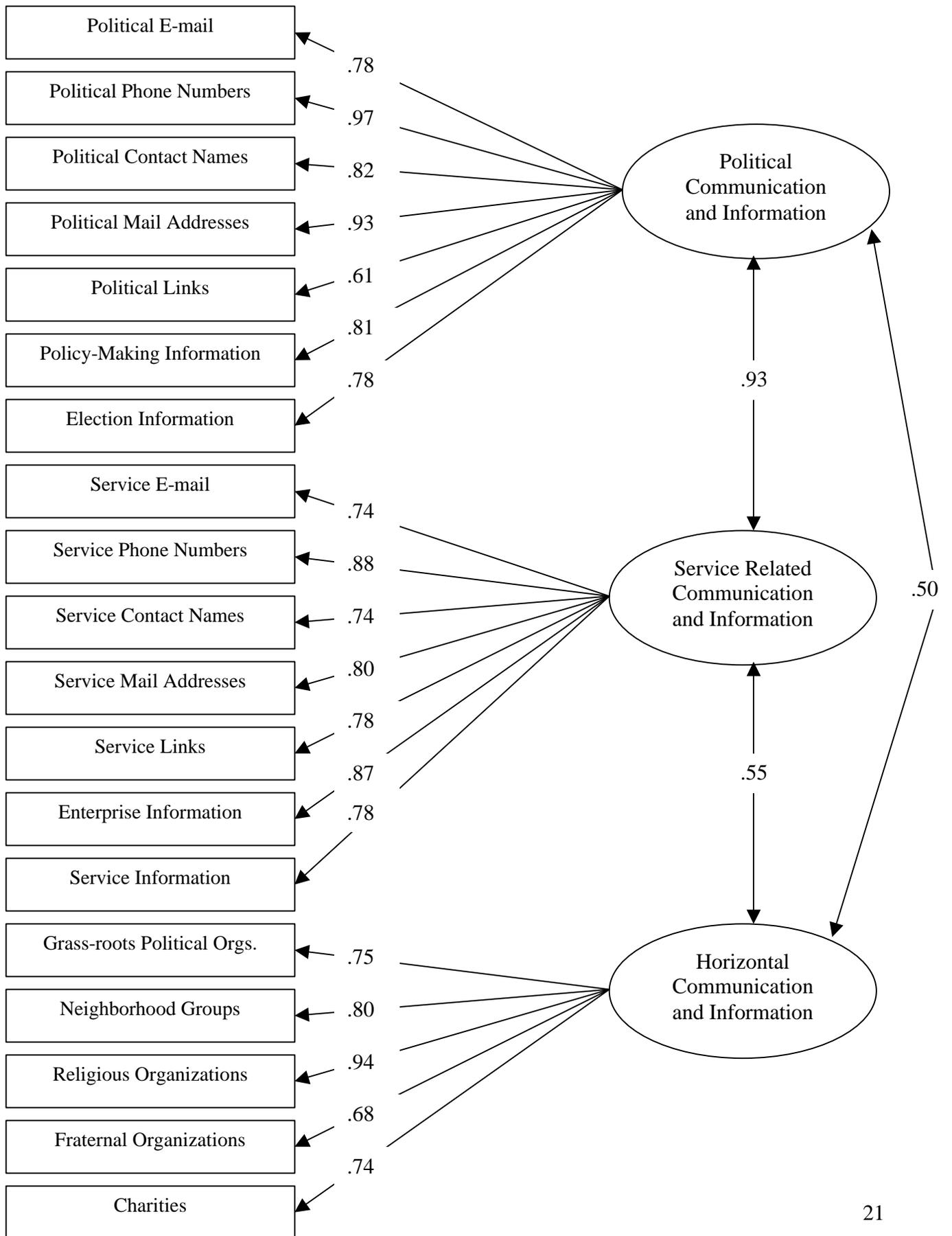
Table 2
Estimate of First Level of Heckman Model
Provision of a Web Site

Number of observations	= 454	R-squared	= .283
Number of positive obs.	= 199.000	Log likelihood	= -235.88
		Fraction of Correct Predictions	= 0.73

Parameter	Estimate
C	-7.85 [.00]
Log of population	.523 [.00]
Number of ISPs in county	.000483 [.95]
Percent registered to vote	.188 [.85]
Percent registered democrats	.819 [.31]
Percent third party registration	-2.02 [.74]
Per capita revenue (1000s)	.239 [.02]
Percent White	.024 [.00]
Index of socioeconomic status	.353 [.00]

Numbers in brackets are p-values.

Table 3
Choice of Quality Among Adopting Cities
(N=266 for all equations)

	Political Information & Communication		Service-Related Information & Communication		Community Information & Communication	
	Beta	P-value	Beta	P-value	Beta	P-value
C	-29.8	.038	14.3	.249	-11.6	.291
Log of population	1.90	.019	1.22	.130	.573	.351
Number of ISPs in county	-.0143	.271	-.00862	.508	.0132	.184
Percent registered to vote	1.26	.736	.961	.130	1.36	.635
Percent registered democrats	5.02	.067	2.93	.286	1.18	.573
Percent third party registration	-13.9	.570	-14.8	.546	-19.2	.305
Per cap. revenue (1000s) X Public provider dummy	.521	.254	.609	.185	.470	.179
Percent White	.070	.105	.040	.355	.047	.215
Index of socioeconomic status	1.80	.009	.577	.405	.452	.392
Index of socioeconomic status X private provider dummy	-.394	.447	-.479	.359	.194	.626
Index of socioeconomic status X non-profit provider dummy	-1.36	.341	-1.96	.174	1.67	.129
Private firm	-3.71	.000	-2.79	.000	.570	.184
Chamber of commerce	-4.63	.000	-3.68	.000	-.685	.231
Non-profit	-2.33	.170	-1.54	.368	.779	.549
Individual	-2.71	.012	-4.22	.000	.493	.549
Competition	-.352	.459	-.913	.057	-.262	.472
Mills Ratio	4.35	.108	.916	.736	1.82	.381
R-SQUARED	.379		.338		.088	

Appendix A

Indicator Name	Description
Political E-mail	Number of e-mail addresses to the city council, mayor's office, and city manager's office.[1]
Political Phone Numbers	Number of telephone numbers to the city council, mayor's office, and city manager's office.
Political Contact Names	Number of contact names for the city council, mayor's office, and city manager's office.
Political Mail Addresses	Number of mail addresses for offices of elected officials
Political Links	Number of links to personal web pages of elected officials
Service E-mail	Number of e-mail addresses to the police department, fire department, and economic development office.
Service Phone Numbers	Number of telephone numbers to the police department, fire department, and economic development office.
Service Contact Names	Number of contact names to the police department, fire department, and economic development office.
Service Mail Addresses	Number of mail addresses for city departments
Service Links	Number of links to departmental web pages
Policy-Making Information	Number of categories of information concerning public meetings, the budget, and the municipal code.
Election Information	Number of categories of information concerning elected officials and elections.
Enterprise Information	Number of categories of information of interest to local businesses (e.g., the city's business climate, local businesses, local regulations, and job opportunities)
Service Information	Number of categories of information concerning service delivery (e.g., mission statements of city departments and information on recreational programs, transportation, service fees, and local events)
Grass-roots Political Organizations	Information and/or communication links to this type of organization.[2]
Neighborhood Groups	Information and/or communication links to this type of organization.
Religious Organizations	Information and/or communication links to this type of organization.
Fraternal Organizations	Information and/or communication links to this type of organization.
Charities	Information and/or communication links to this type of organization.

[1] E-mail addresses, phone numbers, and contact names were measured using ordinal scales. Thus these summary measures do not exactly equal the total number of contacts found on a web site.

[2] These variables were coded 1 if either information or a link was found for this type of organization, and they were coded 2 if both were found.

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ENDNOTES

[1] In California, there is one form of municipality, the incorporated city. California law does not, for example, provide for townships.

[2] Not all of these sites are included in our analysis because 20 of them were not found during data collection.

[3] The government category includes sites managed by public/private partnerships and by non-city governmental agencies such as school districts or regional government associations. The chamber of commerce category includes tourism bureaus.

[4] For a spirited debate concerning the comparative incentives and capabilities of private versus public providers, see the exchange between Ira Magaziner and Ben Barber at a 1998 MIT conference (http://media-in-transition.mit.edu/conferences/democracy/session4.html).

[5] Electronic political forums are not pure public goods. They can become rival if traffic to the site overloads the server's capacity. In addition, they can be made excludable, by requiring a password and charging a subscription. For example, the Wall Street Journal runs discussion groups on political topics, but access is limited to subscribers. In practice, however, municipal web sites are made freely available to all comers.

[6] The population of potential users may also be a function of the average age of city residents given that younger people tend to be heavier Internet users. Nevertheless, we tested models that included average age as an explanatory variable and found that it was insignificant.

[7] Technological adoption has been also been shown to be sensitive to the information actors receive concerning the potential benefits of the technology. Consequently, the social networks through which agents gather information play an important role. This observation suggests that cities that interact more closely with others through bilateral negotiations or regional associations are more likely to adopt. Because of data limitations, we do not pursue this hypothesis, but it remains an important area for further study.

[8] It is not clear that liberal political ideologies are more closely linked to technological use. The political science literature lacks any formal theory or empirical evidence linking political ideology to choice of information services.

[9] Many of the private sites are provided by web site design and Internet consulting firms. In these cases, the entire site is in essence an advertisement for the firm's services, and the revenues from the site are the stream of benefits from the additional work generated by the advertisement.

[10] All provider types are theorized to be sensitive to the same general factors influencing demand and innovativeness, but the influence of these factors are likely to differ between institutions. Nevertheless, we are unable to model these institutional differences for the provision choice because we lack information on the provider types that would be used by non-adopters.

[11] Given our sampling method, a municipal web site may be defined as any site that an Internet user would find if they performed a search on a city name.

[12] The coding instrument is available from the authors upon request.

[13] The confirmatory factor analysis program was also run using all disaggregated indicator variables and the subset of disaggregated indicators that performed better. These models produce qualitatively similar results to those reported here, although the measures of fit must be interpreted with caution given that the data are not multinomial normal.

[14] We also created factor scores employing different methods including a simple sum of all the indicators loading onto a factor, the sum of all normalized indicators, and factor scores regression. All of these factors scores are highly correlated and lead to qualitatively similar results.

[15] The measures are median household income, median housing value, percent of population with a college degree, and percent employed in a profession. These four measures are too highly correlated to include as separate explanatory variables. Thus, a single factor was extracted using maximum likelihood techniques, and factor scores were calculated employing multiple regression.

[16] The scales of the indicators from which these two indices are constructed are the same and the means and standard deviations of the two indices are virtually identical. Both have mean of 0 and one has a

standard deviation of 4.0 while the other's standard deviation is 4.1. Thus, it is possible to roughly compare the coefficients from the two estimations.

[17] This indicator for horizontal communications was not included in the confirmatory factor analysis because it scored very low on reliability tests with the other indicators.