

Representative Communication: Website Interactivity & “Distributional Path Dependence” in the U.S. Congress*

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Abstract

We examine the speed and extent to which members of the U.S. House of Representatives adopt emerging web-based communication technologies. Given the growing centrality of communication for governance and the web's growing role in effective public outreach, a rational actor approach would suggest that members of Congress should aggressively exploit online communication technology. And this should especially be true for freshmen members. We test these expectations using two waves of data coded from the official websites of the U.S. House of Representatives, for the years 2006 and 2007. We observe that incumbents show considerable path dependence in their website technology adoptions, while the websites of the freshmen who won election in 2006 are largely independent of the web designs of their corresponding predecessors. This independence does not mean, however, that freshmen are fully exploiting communication technology. Instead, the web design practices of freshmen appear to be governed by the distribution of existing practices among incumbents, a process we label "distributional path dependence." This surprising null finding suggests that members have web-based communication practices that are governed by informal norms socially constructed among congressional offices, and that the institution is slow to adapt to emerging communication technologies.

1 Introduction

Any normative conception of accountability in democratic representation requires that legislators have the capacity to communicate directly with their constituents (Pitkin, 1967). Members in turn have strong incentives to measure up to this normative expectation (Mayhew, 1974). Because they desire reelection, members of Congress engage in ongoing public relations outreach to inform constituents about their issue positions and to claim credit for governmental largess that flows to the district (Lipinski, 2004). Members also communicate to try to build a sense of empathy with constituents, to build trust, and to establish their expertise and credibility, communication that Fenno (1978) refers to as “presentation of self.”

Recent developments in interactive web technology have created new opportunities for enhancing communication between members and constituents when compared to both hard copy and broadcast media (Druckman, Kifer, and Parkin, 2007). Previous studies have shown, however, that the design quality of legislative websites tends to lag behind those found in entertainment and e-commerce (Adler, Gent, and Overmeyer, 1998; Burden and Hysom, 2007; Owen, Davis, and Strickler, 1999). In particular, members’ websites do not typically take advantage of the interactive potential of Internet communication technologies, instead often using their web pages simply as “electronic brochures” similar to hard copies of member newsletters (see Kamarck, 2002).

That long-serving incumbents do not make efficient or even remotely optimal use of emerging interactive technologies is perhaps not surprising. These members are likely to have developed working strategies for communicating with constituents, and a central proposition in the literature on American political development asserts the design of political institutions tends to be path dependent (Page, 2006; Pierson, 2004). Freshmen members, however, typically have lower reelection margins than more senior members (Butler, 2009), and so have stronger incentives to enhance direct communication with constituents (Alvarez, 1997, 165). In addition, since they set up their official web pages from scratch, freshmen presumably are not locked into a suboptimal website design, and so may find it easier to first reflect on how to

make optimal use of information technology to best reach constituents. Like all institutional designs, websites are likely to be path dependent once they have been developed, but the initial design need not be.

New Institutionalism theory suggests, however, that institutional norms can affect how freshmen act on these incentives in practice. The collection of offices within Congress socially construct, via institutional isomorphism (DiMaggio and Powell, 1983), standard routines and practices for communication technology adoption (Sparrow, 2006; Suchman, 1995). Norms that have emerged from existing practices among incumbents may be taken for granted design requirements for legislative websites (Bimber 2003; Chadwick 2006; Fountain 2001, 93; Roscoe 1999; Xenos and Foot 2005, 183). These isomorphic processes often result in suboptimal designs that are homogeneous and persistent. Even among freshmen, it may be this existing institutional normative environment, not technical best practice standards regarding the optimal use of web-based communication technology, that governs website development.

To test for this, we use over time data that codes a wide array of best practice interactive attributes of the official websites of all House members, in 2006 and in 2007, data measured both before and after a midterm election. These overtime data on websites allow us to assess the extent to which the design properties of incumbents' websites change from one year to another. In this election 63 seats changed hands, and this also allows us to assess the extent to which freshmen websites differ from the websites one would expect to observe if the incumbent had stayed in office. We find that, as expected, returning incumbents demonstrate considerable path dependence from year to year in the interactive qualities of their websites. In contrast, the interactive qualities of a typical freshman's website are almost completely unrelated to the qualities of her predecessor's website. This independence is generally true for all freshmen websites taken together, as well as specifically for seats that did not change parties and for seats where the incumbent left office voluntarily. Among freshmen, then, we do not observe the ordinary *sequential* path dependence that is typically conceived of in the

literature on American political development (Page, 2006), where the actions of individuals are “locked in” by their own past institutional circumstances (Pierson, 2004).

But saying that freshmen are not locked into a particular website design does not mean that freshman necessarily exploit anything near the full communication potential the medium offers. Instead, we find that the design qualities of freshmen websites are simply independent draws from the existing distribution of website practices among returning incumbents. The existing distribution of websites among incumbents, rather than website best practice standards, appears to serve as the normative institutional environment for freshmen as they design their websites from scratch. Freshmen appear to be locked into a form of path dependence in which the existing *distribution* of practices serves as the institutional normative environment conditioning website design. We label this process, where the practices of incoming actors are governed by a distribution that preexists within an institution, “distributional path dependence.”¹ This process resembles an information cascade, where individual members are led to neglect this objectively crucial aspect of their communication strategy.

2 Enacting Interactive Technology and “Distributional” Path Dependence

As Schaffner (2006) notes, members benefits from their efforts in representing a district only when constituents actually know what the member claims to have accomplished (see also Lipinski, 2004; Mayhew, 1974). Survey results show that, beginning in the mid-2000s, citizens now consider members’ official websites an important source of political information compared to the traditional media. For example, the 2006 Cooperative Congressional Election Study survey (<http://dvn.iq.harvard.edu/dvn/dv/cces>) asked respondents to indicate all of the media sources they would use to discover where their member of Congress stood on

¹This distinction resembles the one Page (2006) makes between “path-dependent” and “phat-dependent” processes. “Distributional path dependence” expands on the conception of a phat-dependent process but where the argument of the outcome function is a cross-sectional distribution rather than a sequential history.

issues. By far, the modal choice was the member's official website, which was the choice of 72 percent of respondents. In contrast, only 36 percent of respondents indicated they would find this information by calling or writing the office directly; 19 percent from TV news; 7 percent from TV talk shows; 8 percent from radio news; 13 percent from radio talk shows; and 20 percent from newspapers and magazines. In addition, 37 percent of respondents said they received political news and information from the websites of elected officials.

In this context, a rational actor approach would argue that all members have powerful incentives to make optimal use of web-based communication technology, and especially those who desire reelection. As Alvarez (1997) and Bartels (1986) note, voters tend to be risk averse, and hence uncertainty about their member decreases their level of support. Schaffner (2006) finds that incumbents who garner relatively more newspaper coverage are more likely to gain constituents' votes. Since citizens are turning more and more to members' official websites for information, one could expect that an informative and well-designed website could especially further members' reelection prospects, as well as their ability to govern effectively while in office.

In this paper we assess the quality of what Stromer-Galley (2000, 118) labels the "media interactivity" of legislators' official websites, that is, the "interactive nature of the medium itself."² With media interactivity, users are able to *control* the medium to locate information, through hyperlinks, search engines, downloading capacities, audio and video. Media interactivity on official legislative websites enable "one-stop" information portals in what Jane Fountain calls the "virtual state" (Fountain, 2001, 4), where citizens can gain information regarding their legislators that is of most interest and importance to them, at low search costs and with minimal gatekeeping (Garson, 2004, 4).

²We do not evaluate members' adoption of what Stromer-Galley (2000, 117) calls "human interactive" technology, more recently referred to as the Web 2.0. Human interactivity requires the capacity for interaction between two or more people through a computer interface, where each is equally able to share and receive information. Legislators currently do not make extensive use of this form of technology (Owen, Davis, and Strickler, 1999; Stromer-Galley, 2000), mostly out of concerns that this form of interactivity can take the website "off message" (Druckman, Kifer, and Parkin 2007, 433; Kamarck 2002; Stromer-Galley 2000, 125). We evaluate the quality of human interactive designs for legislative websites in separate work [cite omitted].

While all members have incentives to communicate effectively via their official websites with their constituents, freshmen often have the greatest strategic incentive to increase the media interactivity of their websites. Freshmen tend to expect stronger challenges than long-serving incumbents and so have relatively higher incentives to reduce the uncertainty of undecided voters (Adler, Gent, and Overmeyer 1998, 587; Alvarez 1997; Druckman, Kifer, and Parkin 2007, 429-30; see also Herrnson, Stokes-Brown, and Hindman 2007).³ While all incumbents typically have advantages over challengers (Erikson, 1971; Gelman and King, 1990), a number of studies have shown that the incumbent advantage is lower for freshmen running in their first reelection than for more senior members. For example, using a regression discontinuity design and data on House elections between 1946 and 2004, Butler (2009) demonstrates that the margin of victory for freshmen is about 2.3 percentage points lower than for non-freshmen (see also Alford and Hibbing 1981; Canes-Wrone, Brady, and Cogan 2002, 133 and 136; and Dawes and Bacot 1998).⁴

In addition to having this greater strategic incentive to exploit communication technology, freshmen also should find it less costly to adopt technical best practice standards compared to more senior incumbents. Since freshmen do not have sunk costs invested, they are less likely to be locked into a particular website design (Pierson, 2000). Conditional on having to build a website from scratch, the marginal cost of attending to best practices should be quite low. One can make an analogy to developing countries having better wireless networks than developed countries, as the former have the chance to plan as they set up infrastructure from

³Druckman, Kifer, and Parkin (2007, 436) find that candidate websites include more media interactive features and more up-to-date information as races get tighter.

⁴There are several likely reasons for freshmen's diminished advantage. First, freshmen members typically have worse committee assignments and less seniority, making it more difficult for them to engage in constituency service and to direct funding to projects in the district (Cox and Morgenstern, 1993; King, 1991). Second, Goodliffe (2004) finds that the longer a member is in office, the larger is her campaign war chest, and that the larger the war chest, the lower is the quality of the challenger (see also Epstein and Zemsky, 1995; Levitt and Wolfram, 1997). Butler (2009, 127) notes that freshmen incumbents are 25 percentage points more likely to face a quality challenger than more senior incumbents. As a result, freshmen also typically raise more campaign contributions than nonfreshmen (Cox and Magar, 1999; Grier and Munger, 1993). (Butler (2009, 126) finds no difference between freshmen and nonfreshmen in fundraising, but this is likely a reflection of the local effect estimate in his regression discontinuity design; nonfreshmen incumbents who barely won their previous election likely have the same added incentives for fundraising as their freshmen counterparts.)

scratch (Pentland, Fletcher, and Hasson, 2004). Thus, freshmen have greater incentives as well as fewer barriers to consult best practice standards (Burden and Hysom, 2007) as they design their websites from scratch.

Politicians often lack the technical background knowledge to make optimal or efficient use of new technology, however, or even to assess the risk that might be associated with technical innovations (Dawes, Bloniarz, and Kelly 1999, 20; Druckman, Kifer, and Parkin 2007, 429; Ferber, Foltz, and Pugliese 2005, 144; Fountain 2001, 88; Owen, Davis, and Strickler 1999, 27). Working within the framework of New Institutionalism, Sparrow (2006) argues that communication practices are instead socially constructed within interorganizational fields through processes of institutional isomorphism. Institutions create normative environments for what communication practices are considered appropriate, professional or legitimate (Fountain, 2001); it is these within-institution norms, rather than technical best practice standards, that determine how technology is used by the institutions' members (DiMaggio and Powell, 1983; Lieberman, 2002; Xenos and Foot, 2005).⁵ Given the path-dependence of institutional practices, technology typically develops faster than organizations can accommodate. As a result, all members of Congress, even those with relatively unsafe seats, might only use a very limited range of functionality in the communication technologies available to them (Dawes, Bloniarz, and Kelly 1999, 21; Fountain 2001, 88). This New Institutional perspective suggests that all members, even those that are electorally vulnerable, will be slow to adopt emerging communication technology.

3 Data

We assess these expectations using data coded from the official websites of members of the U.S. House of Representatives. The coding occurred in two waves, one wave in 2006 and

⁵An expectation that the underlying, hard-wired programming of developed web technology determines the content or forms of websites within political institutions would require a belief in "technological determinism," where the objective or material properties of the technology itself causes institutional change independent of human agency or the state of current institutional practice; see Fountain (2001, 84) and Chadwick (2006, 18).

one in 2007. A general election intervened between these two time points that resulted in 63 seats changing hands. The two cross sections in this study allow us to test the year-to-year dynamics of incumbent websites, and whether freshmen websites are similar to or different from what we would expect to observe if the corresponding incumbent had remained in office.

Web technology is changing rapidly and so we do not present our analyzes as a journalistic account of current web practices within the Congress. Examining the dynamics of web practices surrounding a recent election is important, however, as the data allow for a case study of how legislators adapt to technology at a time when the objective technology itself is undergoing rapid change (Bimber, 2003, 8). As we note above, surveys show that by 2006, members' own constituents express demands for informative official websites. Our data allow us to test the extent to which members respond to these demands.

For our data, we use the Congressional Management Foundation (CMF) codings of all official House websites, completed for each congressional office in each of the two years. In the summers of 2006 and 2007, teams of trained coders at CMF accessed and coded each official website based on nearly 100 operational criteria (see Johnson, 2004; Owen, Davis, and Strickler, 1999). CMF identified and defined the criteria using a number of sources regarding best practice standards for legislative websites, specifically by asking focus groups of citizens to spend time on a sample of sites, interviews and surveys with office staff and citizens, and by conducting web industry research (Burden and Hysom, 2007).⁶

The coding for the 27 variables we use for this study, and the instructions given to the coders, are listed in appendix table 2. The descriptive statistics for the coded variables are

⁶Because the data come from two different years, we must assess intercoder reliability both within each year as well as across the two years. There were a total of 8 coders involved in each year. Each CMF coder evaluated ten common web sites in each of the two years. Coders received extensive training and then evaluated all web sites in a randomized order, and did not know which ten web sites were the common web sites. The error rates within each year were very low across the items, ranging from as low as 8.2 percent to as high as 15.0 percent, when one would expect about a 50 percent error rate by chance. To assess over time reliability, two of the coders happened to participate in each year's coding effort. In the 2007 coding, we asked these two coders to code an additional ten websites that were archived from 2006. The error rates never exceeded 20 percent across the items. On only one item (out of over 100 items) did there appear to be a drift in the standard for evaluation between the two years, where both coders rated one item (vote rationales) slightly higher in 2006 than in 2007. Overall, the within year and over time reliability of these data appear to be good, reflecting the extensive training each coder received.

listed in table 1. Table 1 partitions the coded variables into three groups, where in each group, the items measure an important latent quality of legislative websites: the quality of the *issue information* (Druckman, Hennessy, Kifer, and Parkin, 2009), the quality of *constituency services* (Adler, Gent, and Overmeyer, 1998), and the quality of the online *technology* of the website (Druckman, Kifer, and Parkin, 2007). These items measure the quality of the media interactivity of the website on these three dimensions. The issue and constituents dimensions assesses the quality of the information citizens typically seek when interacting with legislative websites. The technology dimension measures the presence and overall quality of the media interactive communication technology on the site. For purposes of this paper, we confine our definition of the “quality” of a website’s media interactivity to these three dimensions.

The dataset includes seven items that measure the quality of issue information on each site. These are coder ratings of the quality of information regarding national issues, state and local issues, and issues of special importance to the member; the presence of rationales that help explain the member’s voting decisions; and a discussion of current events. We also include two measures of how up-to-date the information is on the website, an objective measure of whether the issue information covers issues from the current Congress, and a subjective rating of the overall timeliness of the information available on the website.

We use nine items to measure the overall quality of constituency services on the website. These include coders’ rating of the quality of casework FAQ answers, the presence of information on how to initiate casework with the member’s office, whether the website includes an online casework initiation form, and the presence of links to federal agencies and to FirstGov.gov (now www.usa.gov). We also include measures of the presence of information regarding internships in the member’s office, how to be nominated to a military academy, how to acquire a flag that has flown over the Capital building, and about local district resources and services.

For items measuring the technical quality of each website, we include measures of whether

Table 1: Descriptive Statistics

	2006		2007				Difference
			Incumbents		Freshmen		
	Mean	SD	Mean	SD	Mean	SD	
Issue Factor (θ_1 & η_1) Items							
National Issues [†]	0.52	0.50	0.50	0.50	0.24	0.43	0.26*
Member's Issues	0.58	0.49	0.55	0.50	0.33	0.48	0.22*
State/Local Issues	0.41	0.49	0.45	0.50	0.30	0.46	0.15*
Vote Rationales [†]	0.60	0.49	0.73	0.44	0.84	0.37	-0.10 ⁺
Current Events	0.48	0.50	0.34	0.47	0.22	0.42	0.11 ⁺
Content is Current	0.38	0.49	0.32	0.47	0.43	0.50	-0.11 ⁺
Timeliness [†]	0.36	0.48	0.27	0.45	0.46	0.50	-0.19*
Constituent Factor (θ_2 & η_2) Items							
Casework FAQs [†]	0.48	0.50	0.58	0.49	0.35	0.48	0.23*
Casework Initiation	0.51	0.50	0.61	0.49	0.33	0.48	0.28*
Casework Form	0.69	0.46	0.77	0.42	0.54	0.50	0.23*
Agency Links	0.52	0.50	0.66	0.47	0.41	0.50	0.25*
Link to FirstGov	0.45	0.50	0.55	0.50	0.54	0.50	0.01
Internship Info	0.89	0.32	0.89	0.32	0.86	0.35	0.03
Academy Info	0.93	0.25	0.95	0.21	0.90	0.04	0.05 ⁺
Flag Info	0.82	0.38	0.61	0.49	0.44	0.50	0.16*
Grant Info	0.80	0.40	0.85	0.36	0.84	0.37	0.01
Info about District Resources	0.36	0.48	0.29	0.45	0.06	0.03	0.22*
Technology Factor (θ_3 & η_3) Items							
Video	0.39	0.49	0.56	0.50	0.65	0.48	-0.09
Audio	0.26	0.44	0.31	0.46	0.21	0.41	0.10 ⁺
Text Only	0.12	0.32	0.10	0.30	0.02	0.13	0.08*
Blog	0.06	0.24	0.11	0.31	0.05	0.21	0.06
RSS Feed	0.12	0.32	0.26	0.44	0.25	0.44	0.01
Podcast	0.08	0.28	0.13	0.34	0.05	0.21	0.08 ⁺
Look & Feel [†]	0.49	0.50	0.52	0.50	0.48	0.50	0.04
Navigation [†]	0.61	0.49	0.53	0.50	0.62	0.49	-0.09
Readability [†]	0.38	0.48	0.48	0.50	0.49	0.50	-0.01
Organization [†]	0.57	0.50	0.60	0.49	0.63	0.49	-0.03

* $p < 0.05$

[†]These items are subjective coder ratings, originally coded on a 0 to 5 scale. Each of these items has been dichotomized in a manner that maximizes the variance of the dichotomous variable; see table 2 (appendix) and footnote 7 for specifics.

Number of incumbents in 2006 = 538; Number of incumbents in 2007 = 474; Number of freshmen in 2007 = 63

or not the site contains audio, video, has a text only option, a blog, an RSS feed, and podcast capabilities. We also include subjective measures of the overall look and feel of the website, its navigability, its readability, and its organization.

Each item in table 1 is dichotomous,⁷ so the cell entries are the percentages of members' websites that either possessed the item, or were rated on the high end of a subjective scale. The columns labeled 2006 includes all websites from the first wave of coding, the year before the election. The columns for 2007 report the percentages for incumbents and freshmen separately for the second wave of coding. The final column reports the differences in percents for each item between incumbents and freshmen in 2007. With the exception of timeliness, all items where there is a statistically significant difference show incumbents have a higher percentage than freshmen. The result for timeliness is perhaps trivial since any information on freshman's website must be new. These descriptive results suggest that freshmen overall tend not to be especially effective at exploiting web communication technology, a point we test more formally in the statistical model.

4 Statistical Model

Like many concepts in social science, it is difficult if not impossible to reliably capture the "quality" of website media interactivity with any single measure. Any specific measure would not capture the richness of what we mean by website media interactive quality, and any general measure would be too subjective to be reliable in statistical tests.

In this paper we rely on structural equation models that estimate the quality of each website's media interactivity as a set of three latent variables, one each for issue quality, constituent services quality, technology quality, in each of two years. The full model is

⁷Most of the items measure the presence or absence of a feature, and so have a dichotomous measure. The items that require a subjective rating were measured on a 0 to 5 scale. We dichotomize these ratings to reduce the degree of subjective error in their measure. Dichotomizing the variables also reduces the complexity of the model, given the large number of outcome equations in the model and hence the large number of unconstrained threshold parameters required to model ordinal data. In each case, we dichotomized the variable in a way that maximized the dichotomized variable's variance, keeping the same coding for both years.

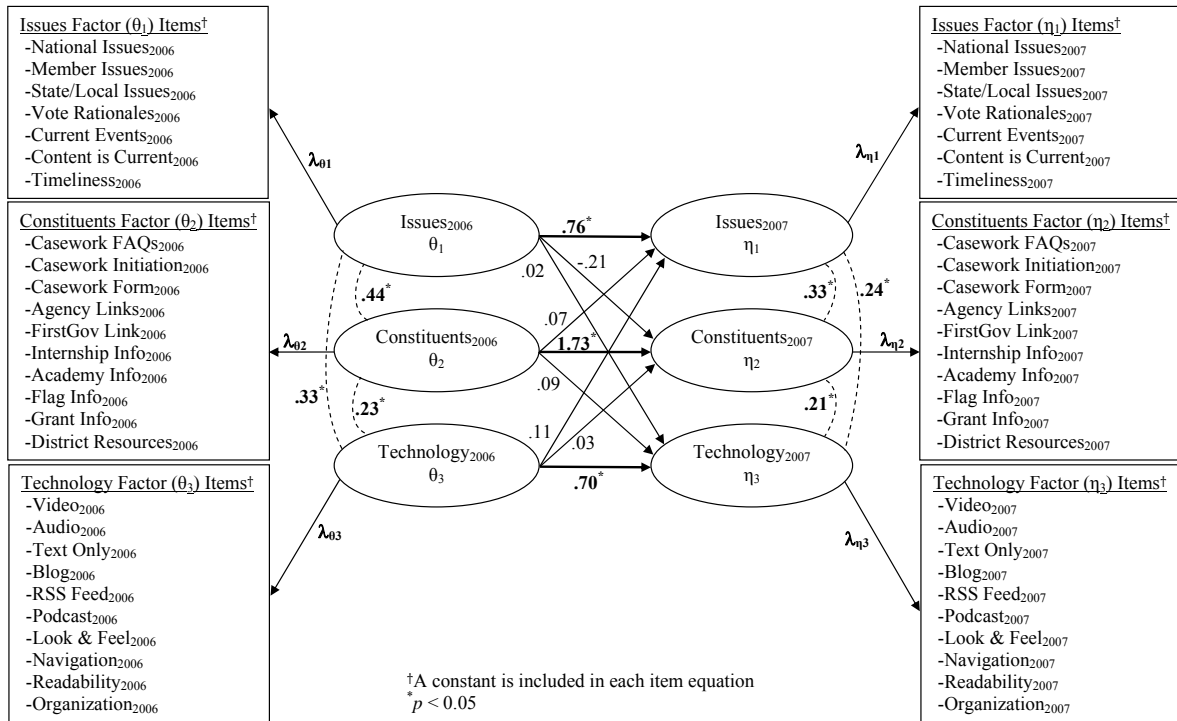


Figure 1: Website Quality Structural Equation Model

diagrammed in figure 1. The full set of equations for this model are set out in the appendix. In the diagram, the ovals indicate latent variables, the boxes contain observed indicator variables, straight arrows assign variables to equations (or equivalently, indicate regression coefficients), and curved arrows indicate estimated correlation parameters. The structural equation model allows some latent variables to be regressed on other latent variables (Bollen, 1989).

A latent variable is an unobserved variable, and hence the value for each latent variable for each website is a parameter to be estimated. The point estimate for each website’s latent variable value serves as the point estimate of the (latent) quality score for the website along the corresponding dimension.⁸ Because this point estimate is a parameter to be estimated, we are able to make inferences about the latent quality of each members’ website under different assumptions. For example, in addition to the scores a freshmen actually received

⁸This quality score point estimate is directly analogous to traditional factor scores.

given her observed website in 2007, we can estimate what the website would have scored on each of the three latent distributions in 2007 under the assumption that the previous incumbent had instead retained her seat. In addition, the set of these point estimates, taken as a whole, define a distribution for each latent variable, similar to how ordinary observed variables are governed by a distribution. As a result, we can compare the distribution of each latent variable across subgroups of the sample, such as between freshmen in 2007 and incumbents in 2007.

In the structural equation model, we regress each of the 2007 latent variables on each of the 2006 latent variables. The straight arrows connecting the latent variables in figure 1 represent the structural parameters of these regressions. These parameters may be interpreted as ordinary regression coefficients. If we set the data for freshmen in 2007 to missing, these structural parameters test for the degree to which the technical quality of a member's website in one year can be predicted from the technical quality of the same member's website in the previous year.⁹

We estimate the distribution for each latent variable using an item response theory model (Trier and Jackman, 2008), where each latent variable is measured with the set of coded items listed in each corresponding box of figure 1, and each λ is a vector of parameters.¹⁰ In all, three latent variable distributions are estimated using a total of 27 items, in each of two years. We estimate the correlations among the latent variables within a given year, indicated by the dashed curved arrows, by assuming the three latent variables themselves are multivariate normally distributed, each with a mean of zero vectors and a variance matrix to be estimated. Since the covariances among the latent variables are estimated in the model, we are able to assess how the latent variables relate to each other. In particular, positive

⁹The values of missing data are imputed in the model as missing at random when conditioned on the previous year's data (Tanner and Wong, 1987); the units with missing data are not dropped as in ordinary regression analysis.

¹⁰In an item response theory model, each latent variable is estimated using a set of equations. In each equation, the item serves as an outcome variable, and is regressed on a constant and the unobserved latent variable multiplied by an unconstrained factor coefficient via a probit link function. For identification, the factor coefficient for one of the items must be set to one, and this in turn scales the corresponding latent variable to the empirical variance of the item.

correlations among the latent variables imply that the interactive quality of a website itself is a latent property, in that members who tend to do well on one dimension tend to do well on all.¹¹

In the analysis we use the model depicted in figure 1 as well as several restricted versions of the model. We first estimate the full model, but setting each 2007 freshman's website coded scores to missing data to test for the consistency of incumbents' websites from 2006 to 2007. In this regression we estimate the structural coefficients where latent variables are regressed on other latent variables; we also use this model to impute the missing values on the latent variables for the 2007 freshmen as a way to infer what we would have observed on the incumbent's website if she had instead retained her seat. Second, we re-estimate the same model but this time also setting a random sample of 43 of the 2007 incumbent website codings to missing. This second model allows us to observe how well the model predicts returning incumbents' observed 2007 sites compared to the first model's attempts to predict freshmen's observed 2007 sites. Third, we estimate the model using all data from 2007 (without conditioning on data from 2006) in order to place incumbents and freshmen in 2007 on the same latent variable scales. This model allows us to compare the distribution of scores between incumbents in 2007 and freshmen in 2007 for each of the three dimensions.

5 Results

We first present the results showing our success in predicting non-freshmen incumbents' 2007 media interactive website scores using their 2006 scores. These results strongly suggest that returning incumbents are locked into this crucial and increasingly important component of their communication strategy, in the normal sense of path dependence as envisioned in the institutions literature (Pierson, 2000). Next, we show that the media interactive qualities of

¹¹We use Bayesian MCMC estimation via WinBUGS (Spiegelhalter, Thomas, Best, and Gilks, 1996). We assign flat priors for all effect parameters, a Wishart prior for each variance matrix, and positive uniform priors for the item factor coefficients to constrain each to be positive. We estimated three chains for the posterior distributions, which after a burn in period, were stationary by the Brooks, Gelman, Rubin (1992) diagnostic.

freshmen websites are essentially independent of the qualities of their predecessors, indicating that freshmen website designs are not locked in by the qualities of their predecessors' websites. We then show that the distribution of the qualities of freshmen websites is nearly identical to the distribution of incumbent websites, showing that freshmen are locked into a distributional path dependence, where their website designs are governed by the existing distribution of practices within the institution. Finally, we examine whether there are some specific website items where incumbents and freshmen tend to differ, as a way to identify the sources of any discrepancies between incumbent and freshman quality distributions.

5.1 Ordinary Path Dependence among Returning Incumbents

We begin by considering the extent to which the websites of returning incumbents changed between 2006 and 2007. The extent to which websites remain static indicates that incumbents are locked into a website design, or display the ordinary path dependence that typically is envisioned in the institutions literature. Figure 1 presents the results of the regressions of the latent variables from 2007 on those from 2006, displayed on the straight arrows connecting the latent variables in the figure.

These regressions among the latent variables help to test two separate sets of hypotheses. First, they test whether a latent variable from 2007 can be predicted from the same latent variable measured from the 2006 data. If one were to array all of the regression coefficients in a matrix, where the rows and columns have identical labels, these on-diagonal coefficients would fall on the diagonal. If these coefficients are of the magnitude that high scores in one year often result in high scores in the second year, this would be evidence that some incumbents serve as standard setters for the institution. If these coefficients are positive but of low magnitude, this would suggest that both high and low scoring websites tend to regress toward the mean. Second, these regressions test whether the other latent variables have an independent effect on web quality in 2007. Label these coefficients the off-diagonal elements. The off-diagonal elements would be large and significant if website quality had a dynamic

feedback effect, for example, if a member's website having especially good technical features in one year caused the member's office to revamp the issue information the following year.

The results summarized in figure 1 show the websites of most of the returning incumbents changed very little in this period. For each latent variable in 2007, the off-diagonal elements are not significant, suggesting that the website quality dimensions themselves do not have any dynamic feedback properties. For each of the three latent variables for 2007, only the coefficients for the same latent variable from 2006 is predictive, that is, the on-diagonal coefficients. But these coefficients are not of the magnitude that the previous year's website wholly determines the current year's website. Instead, assuming a member is one standard deviation above the mean for any of the latent variables in 2006,¹² given each of the on-diagonal estimated regression coefficients, one would expect the same member to be about a half of a standard deviation above the mean in the same dimension in 2007. This suggests that members are regressing to the mean on all three dimensions, and are not typically improving their sites from year to year.¹³ In addition, we note modest but statistically significant correlations between the latent variables for both years, ranging from 0.21 to 0.44 (all with $p < 0.05$). This suggests that to a modest extent, websites that score high on one dimension tend to score higher on the other two, but the relationship is rather weak.

In summary, among incumbents we observe modest dependence between the latent variables, a lack of dynamic feedback among the qualities of the websites, and the tendency for incumbents to regress to the mean on each of the three quality dimensions.

¹²The standard deviations are as follows: Issues 2006 (0.855), Issues 2007 (1.161), Constituents 2006 (0.487), Constituents 2007 (1.536), Technology 2006 (0.285), Technology 2007 (0.320).

¹³For identification, the model constrains the means of each latent variable to be the same, zero, for both years, which assumes the mean of the distribution between the two years for each pair of latent variables to be equal. This assumption would be problematic if all websites improved from year to year. To test for this year to year shift, we were able to conduct an overtime analysis since a coder in 2007 recoded an archived version of the highest rated site in 2006, for Javier Becerra (D-CA), and we reran the analysis including this extra "bridge" observation. We found only eight websites in 2007 scored higher than the 2006 Becerra website, or only 1.8 percent of the sample. CMF also coded all Senate websites (although we do not use the Senate data in this study), and we conducted an identical overtime test for Senate websites. In the Senate, the highest rated website from 2006 would also have been the highest rated site in 2007. Thus, we find very little evidence of noticeable year to year improvement in the quality of these legislative websites, and hence the common mean assumption is reasonable.

Imputed and Actual Quality Scores for Incumbents (Posterior Means)

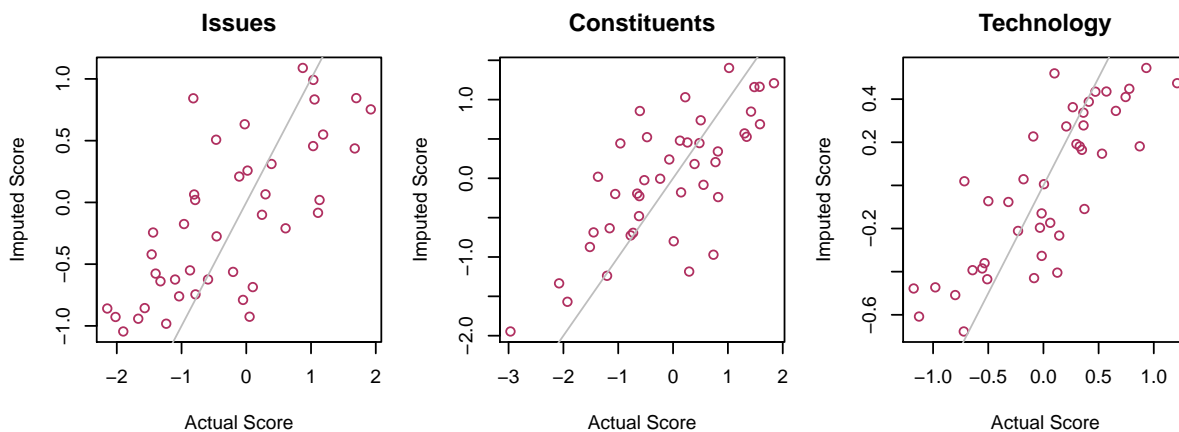


Figure 2: Imputed and Actual Expected Quality Scores for Incumbent

These results suggest that the distribution of website design practices among incumbents is not dynamic and apparently not prone to change. This can be seen graphically in figure 2. To generate the results in this figure, we first set the coding of a random sample of 43 incumbents in 2007 to missing data, and used the 2006 data and the model of figure 1 to impute the coding for each of the 27 items as well as the latent variable values for each of these missing incumbents. In figure 2, we plot the imputed latent variable scores for each of these missing incumbents with their actual score estimated in the model where their observed data are included. For each dimension, we find a strong correlation between the imputed and the actual values. The correlations between the imputed and the actual score for each of the frames in figure 2 is $\rho \geq 0.72$, with each $p < 0.001$.

One might argue that this persistence in year-to-year website designs among incumbents is due to electoral or strategic decisions about optimal communication practices, not to path dependence. Members might take care to tailor their website designs to district interests and voter demands. To test this, we correlated the 2006 quality scores for each member with a

wide array of district characteristics and the electoral circumstances the member finds herself in,¹⁴ and found that only one of the 16 district variables were correlated with the point estimates for any of the three quality score variables (members from safer seats had lower quality constituent service factor scores); this overall pattern is one that could be observed by chance.¹⁵ Using data taken from the from the Congressional Management Foundation (CMF) 2004 House Staff Employment Study (CMF, 2004) we do find that all three factor scores are jointly correlated with management practices within the members' office. For example, the total number of staff employed in the office is positively correlated with all three factors and the decision to contract systems administration to outside vendors is negatively correlated.¹⁶ These correlations suggest that website quality is largely idiosyncratic to the member's office management practices.

The picture that emerges from these results is not one of existing incumbents who serve as the vanguard of technology adoption. While there are certainly some members who make great efforts to improve their websites, these members statistically are very much the exception to the rule. Instead, most incumbents that make efforts one year to develop a high quality website typically regress toward the mean on the following year. Remarkably, members' efforts to manage online information bears no systematic relation to factors that

¹⁴These district variables are the percent white, median household income, the percent holding white collar jobs, the percent holding blue collar jobs, the percent over 64, the percent under 18, the percent college educated, and the percent rural (all taken from the Census); the percent voting for Bush in 2004, the member's age, the member's margin of election in 2006, and the member's age (taken from public records); the percent registered to vote in 2006, the member's summer 2006 approval rating, the percent of voters intending to turn out in the fall 2006 election, the average level of political interest, and the frequency of Internet use among residents in the district (taken from the 2006 CSES, <http://dvn.iq.harvard.edu/dvn/dv/cces>).

¹⁵Neither member nor district characteristics should have much of an effect on adoption, since all members, whether representing urban or rural, high or low SES, etc. district, desire to communicate well with constituents. As a result, we do not expect observed covariates to explain much of the variation, and indeed, the literature finds that district characteristics have little effect (Adler, Gent, and Overmeyer 1998, 591; Cooper 2004, 352; Druckman, Kifer, and Parkin 2007; Druckman et al. 2009, 17; Ferber, Foltz, and Pugliese 2005, 147). We also demonstrate this below when we show that freshmen websites are nearly independent of their predecessors' websites. If website design were heavily conditioned on district characteristics, then we would observe a dependence between freshmen and their predecessors' websites driven by unobserved districted level variables. Web adoption is instead more idiosyncratic and personal, and likely reflects the heterogeneity in members' management practices and interest in web technologies.

¹⁶Interestingly, the salary paid to the press secretary is negatively related to all three factors, which suggests that websites might serve as a substitute for other forms of press contacts.

should drive their strategic incentives to do so. This is quite a striking null finding.

5.2 Freshmen Web Design Practices are Independent of their Predecessors

The results presented in figures 1 and 2 are strongly consistent with the proposition that returning incumbents are locked into a website design. There is little evidence to suggest that incumbents are quick to adopt new best practices for website design. Freshmen, however, may be a different story. Since freshmen set up their websites from scratch, it is possible, indeed sensible, that freshmen would consult best practices standards as they design their new sites.

There are two possible reasons, however, to expect that freshmen may be locked into a website design even before they begin their new job. First, it is possible that freshmen will base the design of their new website on the existing design of the outgoing incumbent's website. Given the costs and effort required to design a site from scratch, it might be sensible for freshmen to emulate the former incumbent's site, a site which presumably would be already well tailored to the stylistic and substantive communication demands of the district. Second, it is possible that unobserved variables that vary across congressional districts explain much of the actual variation in website quality. If district variables are driving website design, even if a freshman did not consider the incumbent's site in her own design, the two sites still would appear similar.

Figure 3 helps to assess whether freshmen websites resemble the websites that one would expect to observe if the corresponding incumbents had remained in office. Recall from figures 1 and 2 that returning incumbent websites in 2007 are well predicted by the design of their websites in 2006. As a result, we are reasonably able to predict what would have been the 2007 design of the websites of the incumbents who did not retain their seats with a high degree of confidence simply by estimating the full model in figure 1 and setting all of the 2007 coded data for freshmen to missing. We also estimate the actual values for each of the three latent variables in 2007 using a model that includes the observed data for freshmen in 2007,

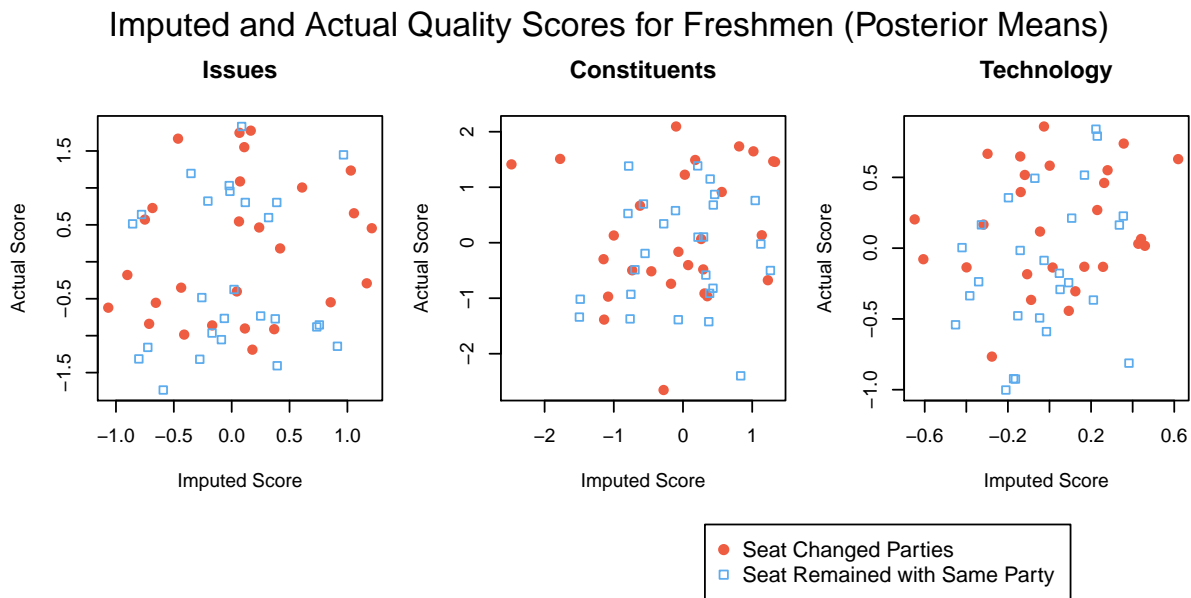


Figure 3: Imputed and Actual Expected Quality Scores, by Party Change

without conditioning on the data and latent variables from 2006 (or identically, constrains all structural coefficients among the latent variables to zero). Using these two models, we generate both imputed and actual web quality scores for each freshman in 2007.

Figure 3 graphs the relationship between these imputed and actual scores for each of the three latent variables. It is apparent from each panel in this figure that there is little if any relationship between the design of freshmen websites and the design of the predecessors' websites. First consider this relationship among all freshmen taken as a group, that is, ignoring the differentiation among symbols in the graph. None of these unconditional correlations are statistically significant. The unconditional correlation for the technology latent variable approaches conventional levels for significance, $\rho = 0.24$, $p = 0.08$, but substantively this correlation is small. The absence of correlations here is in stark contrast to those for incumbents, shown in figure 2.

Next, consider conditioning on whether or not the seat changed parties, shown by the

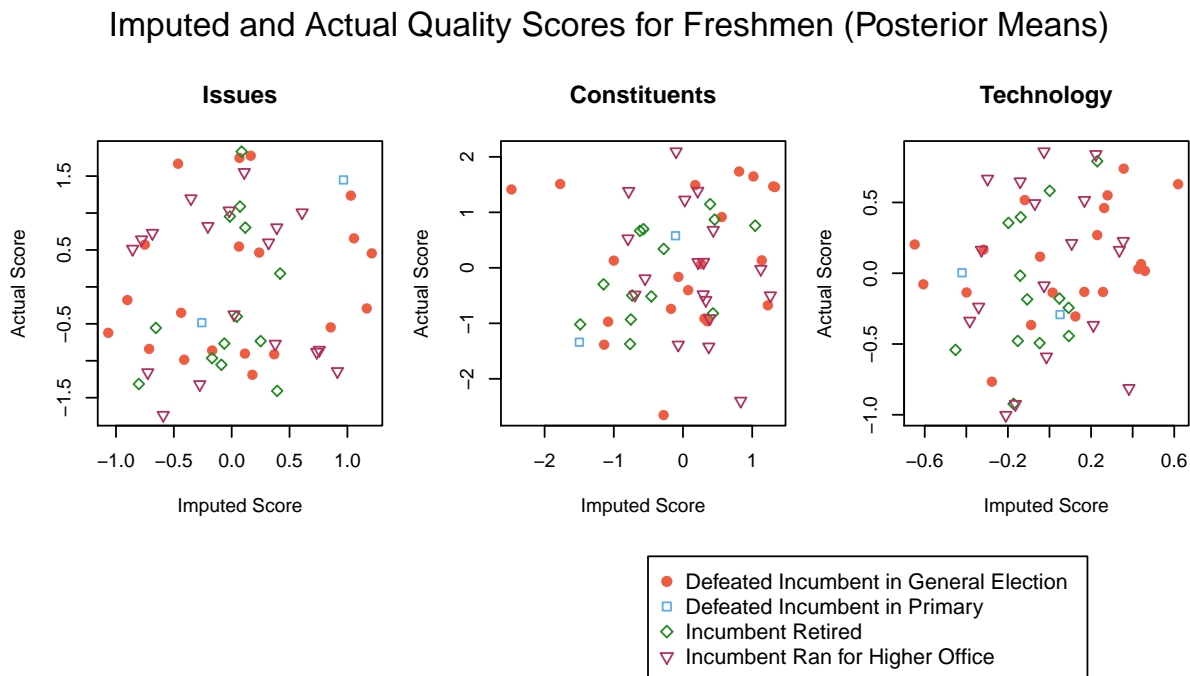


Figure 4: Imputed and Actual Expected Quality Scores, by Incumbent's Outcome

different symbols in each panel of the figure. Here, one might assume that when a seat remains in the same party, a freshman might have special incentives to base her website on that of her predecessor. But the conditional correlations among those seats which do not change parties, as well as among those that do change parties, are not statistically significant. Again, the correlation for the technology latent variable comes the closest, $\rho = 0.30$, $p = 0.13$, when conditioned on the seat remaining in same party.

Figure 4 considers this same question, but now using a finer grain to distinguish why the incumbent did not retain her seat. On the one hand, independent of party, one might expect a freshman purposefully to choose to ignore the website of a member who lost the election, reasoning that it might be time for renewal. On the other hand, a website might still retain value to a freshman if the incumbent had been successful in office, but chose to step down anyway, either through retirement, or perhaps even more so, if the ambitious incumbent chose to run for higher office.

Figure 4 shows that freshmen websites are largely independent of their predecessors' websites, irrespective of the reason the incumbent left office. The unconditional correlations in each panel are identical to the ones in figure 3. Among the conditional correlations, there is a significant correlation only for the constituent service quality score for the condition where incumbents retired, $\rho = 0.57$, $p = 0.04$. In addition, none of the pairwise t-tests for the difference of means between each condition (within each frame) is statistically significant.

Note that figures 2 through 4 compare point estimates for each quality dimension. The Bayesian model estimates a full posterior distribution for each quality score for each member, reflecting our uncertainty in the location of these point estimates. Because of this, we can test whether the distributions of the predicted and actual quality scores are distinct, separately for the freshmen sample, and for the random sample of returning incumbents who were set to missing. In this test, for each of these samples, we take the predicted score (the vertical axis in each figure) as fixed at the point estimate, and the imputed score (the horizontal axis) as an estimate, and calculate the percent of websites where the imputed point estimates are more than one standard deviation away from the predicted value. For the freshmen sample, by this measure we find that 53 percent of the distributions are distinct for the issues dimension, 43 percent for the constituents dimension, and 36 percent for the technology dimension. The corresponding statistics for the incumbents' sample are 24 percent, 19 percent, and 10 percent. That is, the freshmen websites are far more independent than incumbents', with each of the differences in percents statistically distinct at $p < 0.01$.

Taken together, figures 3 and 4 show that there is very little dependence between the design of freshmen websites and that of their predecessors, in strong contrast to the dependence we observe among returning incumbents. These results rule out two possibilities. First, freshmen do not appear to cut and paste from their predecessors' site to reduce their start up costs. Freshmen do begin effectively from scratch. Second, this also confirms that district-level variables are not important drivers of website quality.

5.3 Distributional Path Dependence among Freshmen

The results of the previous section show very clearly that freshmen indeed begin their terms with a clean slate, an HTML *tabula rasa*. Knowing this, one might expect that freshmen would typically consult with best practice standards (Burden and Hysom, 2007). To the extent this is true, we would observe freshmen as a group having higher scores on the latent variable measures compared to the distribution of scores among returning incumbents. Freshmen websites would be above average in the quality scales.

However, to say that freshmen are not locked into the website designs of their predecessors is not necessarily to say that freshmen use website communication technology optimally. Those elected to public office typically do not possess extensive technical skills, and hence they may not know how to direct their staff to make optimal use of web communication technology, or even consider the need to on their own accord. Instead of consulting best practice standards, it is possible that freshmen simply look to the existing practice standards that have developed within the institution, or equivalently, hire the same web design vendors used by their peers. Current design practices create a normative context that defines what website designs are appropriate, strategically useful, less risky, and legitimate (DiMaggio and Powell, 1983; Suchman, 1995). We have already demonstrated, though, that current incumbents do not typically engage in dynamic, transformative practices in website design. If freshmen look to the existing distribution of design practices, then the distribution of freshmen quality scores on the three dimensions should be similar to the distributions among incumbents. This information cascade process can lead individual members to overlook the potential for this crucial mode of communication.

We can test for the equality of the three quality score distributions between freshmen and incumbents in 2007 using the estimates from the model that does not condition 2007 estimates on 2006 data, and that includes the observed 2007 codings for all members, including freshmen. Recall that the model estimates a quality score for each latent variable for each

legislator in the dataset.¹⁷ Including freshmen and incumbents in the same model places all members' scores in the same scale for each quality dimension. In this analysis, we simply compare the distributions of these scores, along each dimension, between the freshmen and incumbent subgroups.

Figure 5 presents the results graphically, where each panel provides a quantile-quantile (QQ) plot comparing the freshmen and incumbent empirical distributions for the three quality score dimensions. The two distributions are empirically identical if the dots tend to lie on the grey line. If the dots tend to lie below the grey line, then the freshmen distribution has a higher mode than incumbents, and if they lie above then incumbents have a higher mode. The graphs also report a formal statistical test, the Komolgorov-Smirnov test for the equality of the two distributions. Notice that two of these distributions are nearly identical, the quality of issue information and the technical qualities of the website. In the middle panel, the distributions for the constituent service quality scores are statistically different, but it is the incumbents who tend to have a higher average score, not freshmen.

These results strongly suggest that freshmen do not make effective use of communication technology. If anything, freshmen in 2007 tended to have *worse* quality websites compared to incumbents. One might wonder then if this is typically true. Recall that there are only 63 freshmen in the sample, a size small enough to have distinct distributions through sampling error, or more accurately, through the idiosyncrasies of this particular freshmen class. To test for this, we re-ran the model using only the 2006 data, comparing those who were freshmen (in their second year of their first term) to those who had served at least one term before the 2004 election.

Figure 6 presents the results of this analysis. This figure shows that these freshmen (elected first in 2004) also tend to have very similar website quality scores as returning incumbents (in 2004) for the issues dimension and, this time, the constituents dimension.

¹⁷The model is fully Bayesian, so technically, the model estimates a distribution for each legislator's value for each of the three latent variables. In this analysis, we take the mean of each of the three distributions as the point estimates for each legislator.

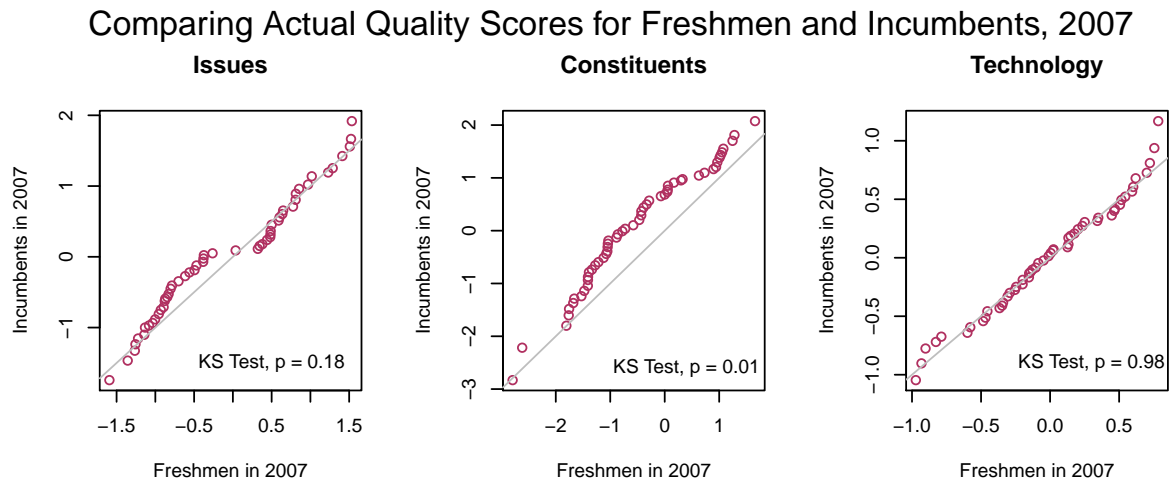


Figure 5: QQ Plots Comparing Expected Quality Score Distributions between Freshmen and Incumbents, 2007

The final panel shows that the class of 2004 freshmen tend to have a higher mode for the technology dimension. When compared to the results in figure 5, several interesting findings emerge. First, in four out of six distributional tests, the distribution of freshmen scores are nearly identical to that of incumbents. Second, there are some freshmen classes who tend to have better designs than incumbents, and some that do worse. But this difference appears to be driven by the idiosyncrasies of the members who compose the freshmen class, and the results as a whole rule out any notion that freshmen, by virtue of their freshman status, are efficiently exploiting communication technology, even though they have strong incentives and low marginal costs to do so. Third, the results show the importance of evaluating data from multiple years. Indeed, if researchers were to conduct this distributional analysis using only the 2006 data, one might be tempted to conclude erroneously that freshmen are especially effective at adopting new communication technologies.

5.4 Item Analysis

In the above analyzes, we compared the distributions of website quality scores between freshmen and incumbents, both to show that freshmen website designs in 2007 are independent of

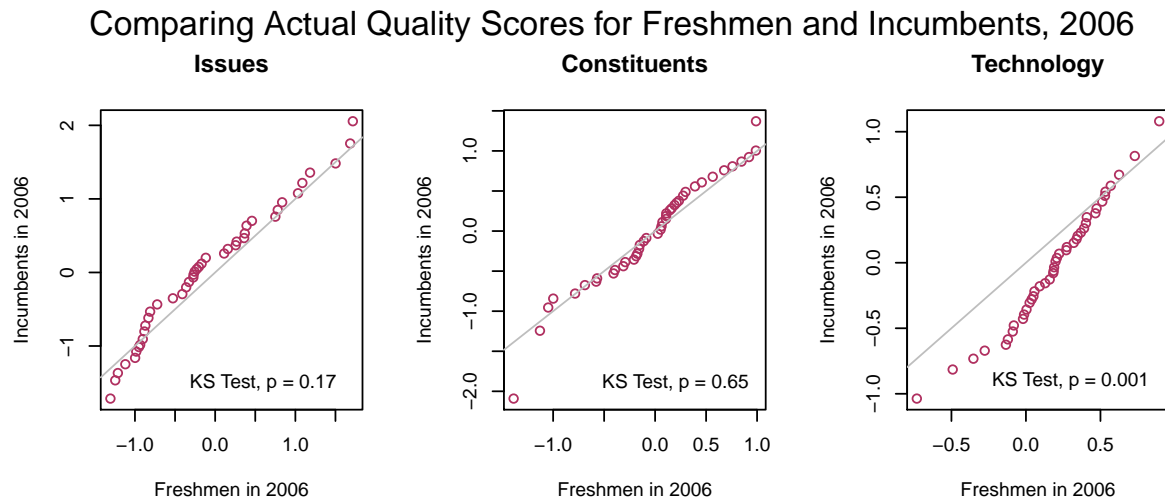


Figure 6: QQ Plots Comparing Expected Quality Score Distributions between Freshmen and Incumbents, 2006

their predecessors' designs and that freshmen in 2007 have similar quality scores on the three dimensions as incumbents in 2007. But these quality scores themselves are estimated from a set of items, and it is possible that freshmen and incumbents tend to emphasize different sets of items, which taken together yield similar overall scores. The analogy would be if we had used a linear index to construct the scores. In such an index, if an incumbent used half of the items, and a freshmen used the other half, then the linear index would give them each a similar score even though the designs are dramatically different. In this section, we report several analyzes that focus on the individual items rather than on the latent variable distributions.

We first consider the independence of freshmen website designs from their predecessors using the 27 individual items. We conducted 27 cross tabulations, testing whether the presence of each code on the incumbent's 2006 website predicts its presence on freshmen's 2007 website. The answer is a very clear "No." Only one out of the 27 tables had a statistically significant prediction beyond chance, or just the number of significant differences one would expect to observe if the process were truly independent. Descriptively, 14 out of

the 27 tables showed that there was a positive relationship between the items, and 13 showed negative relationships.

We next consider whether freshmen in 2007 are statistically more likely to use any of the features or codes compared to incumbents in 2007. The final two columns of table 1 show that, with the exception of timeliness (which freshmen should score higher on by default) and vote rationales, incumbents tend to have higher probabilities of having each item on their website. That incumbents tend to have a high rate of including items on the constituency service scale is reflected in the higher mode in their constituents quality score distribution in figure 5.

6 Alternative Explanations

These results demonstrate that Congressional website designs, for both freshmen and incumbents, are governed by a common distribution. We argue that it is the distribution of current websites within the chamber that creates this normative environment, and that the normative environment itself conditions the designs of legislative websites. One could imagine countering that the common distribution of website designs we observe is not causal but instead is merely a by-product that similar types of people are elected to congressional offices, and the distribution of website designs is merely driven by the type of people who are elected or by district-level variables.

We reject this argument, and we do so in two ways. First, as we note above, we observe no local-level dependence between a freshman's website and the previous incumbent's website. But if the website designs were driven by the types of candidates who are elected, or by district-level variables, we should observe a good deal of dependence at the local level, since district level variables are constant, and since members elected from the same district are typically more similar to each other compared to members from other districts.

Second, using a model of spatial dependence (Congdon, 2003, chapter 7), we also find no spatial dependence among adjacent congressional districts (results not reported). Again,

since members from adjacent districts are similar to each other, and since district level variables are strongly correlated at this level, if website designs were driven by the types of members or local level variables, we should observe dependence at this level. We argue instead that website designs are governed by the normative environment of the chamber, whether the design is driven by staff or by the vendors that members hire to design their sites¹⁸

7 Conclusion

We show that freshmen are not locked into an suboptimal website design. Freshmen must attend to building a website, and so they have a low marginal cost to build a good one. Given that they tend to be electorally vulnerable, their incentives to do so should be strong. But in practice freshmen website designs are governed by the distribution of websites defined by existing institutional practices. That is, among freshmen we do not observe “process” path dependence that is typically conceived of in the literature on American political development, where an individual is locked in by her own past actions or the actions of her immediate predecessors (Pierson, 2000). Instead we observe a “distributional” path dependence where freshmen website designs are simply draws from the status quo distribution of existing practices. The distribution of existing website communication practices appears to define what legislative website designs are acceptable or legitimate.

Typically, through the logic of path dependence among incumbent members, the normative environment governing institutional practices is slow to change. To say that norms change slowly is not to say that they cannot change (see Lieberman, 2002), or that institutions cannot adapt to technological developments (Fountain, 2001, 12). When legislators do adopt new technologies, for whatever reasons, the practices of the new adopters can disrupt existing normative standards and enable new communication practice standards to emerge

¹⁸A third possibility includes a normative environment outside of the chamber, although no other research has suggested that members look to external websites for their standards, and it is not clear even what external websites those would be.

(Bimber 2003, 13; Chadwick 2006, 3). For example, Xenos and Foot (2005, 183) note legislative campaign website designs have emerged as a well-defined genre, where omitting basic issue or biographical information stands out as a noticeable omission. Websites in the House of Representatives overall have improved since the mid-1990s. There does not seem to be any institutional drive, however, that leads individual members to make the most out of web based communication technology. Indeed, institutional norms might be functioning as a kind of misleading information cascade that obscures the individual incentives that freshmen members have to attend to building a high quality web-based communication platform. One might hope that freshmen would reflect on and incorporate best practices, since in the long run, these websites could serve to transform and update institutional norms (Bohman 2004, 51; Shane 2004, 73); we do not find evidence of this.¹⁹

The overall picture of website technology adoption that emerges from these analyzes is of an institution that is in a suboptimal equilibrium with respect to an effective or efficient use of web communication technology. Incumbents are locked into website designs based on their own prior years' designs. Those incumbent members who tend to score well in one year tend to regress to the mean the next. Freshmen are not locked into a specific design based on their predecessor, but they tend to be inward looking toward existing institutional practices when establishing a website from scratch, rather than outward looking to technical best practice standards. Our results suggest a type of governmental failure, or a suboptimal institutional design that does not effectively serve constituents of the twenty first century. Given the enormous and growing importance of communication and communication technology in politics, it is perhaps even more curious that these results suggest a failure of individual rationality on the part of freshmen, and of members more generally.

¹⁹There has been several efforts at the federal level at revamping governmental technical standards, including Newt Gingrich's efforts to modernize the House web presence through the Cyber Congress Project and an expanded role for the House Information Resources Office (Adler, Gent, and Overmeyer, 1998, 586), as well as the Clinton Administration 1993 National Performance Review directed by Al Gore (Fountain, 2001, 18).

References

- Adler, E. Scott, Chariti E. Gent, and Cary B. Overmeyer. 1998. "The Home Style Homepage: Legislator Use of the World Wide Web for Constituency Contact." *Legislative Studies Quarterly* XXIII(Nov.): 585–595.
- Alford, John R., and John R. Hibbing. 1981. "Increasing Incumbency Advantage in the House." *The Journal of Politics* 43(Nov.): 1042–1061.
- Alvarez, R. Michael. 1997. *Information and Elections*. Ann Arbor, Mich.: University of Michigan Press.
- Bartels, Larry M. 1986. "Issue Voting Under Uncertainty: An Empirical Test." *American Journal of Political Science* 30(Nov.): 709–728.
- Bimber, Bruce. 2003. *Information and American Democracy: Technology in the Evolution of Political Power*. New York, N.Y.: Cambridge University Press.
- Bohman, James. 2004. *Democracy Online: The Prospects for Political Renewal Through the Internet*. New York, N.Y.: Routledge chapter Expanding Dialogue: The Internet, Public Sphere, and Transnational Democracy, pp. 47–61.
- Bollen, Kenneth A. 1989. *Structural Equations with Latent Variables*. New York, N.Y.: John Wiley & Sons, Ltd.
- Burden, Collin, and Tim Hysom. 2007. *2007 Gold Mouse Report: Lessons from the Best Web Sites on Capitol Hill*. Washington, D.C.: Congressional Management Foundation.
- Butler, Daniel Mark. 2009. "A Regression Discontinuity Design Analysis of the Incumbency Advantage and Tenure in the U.S. House." *Electoral Studies* 28: 123–128.
- Canes-Wrone, Brandice, David W. Brady, and John F. Cogan. 2002. "Out of Step, Out of Office: Electoral Accountability and House Members' Voting." *American Political Science Review* 96(March): 127–140.
- Chadwick, Andrew. 2006. *Internet Politics: State, Citizens, and New Communications Technologies*. New York, N.Y.: Oxford University Press.
- CMF, Congressional Management Foundation. 2004. *2004 House Staff Employment Study*. Washington, DC: Chief Administrative Officer, U.S. House of Representatives.
- Congdon, Peter. 2003. *Applied Bayesian Modelling*. Hoboken, N.J.: John Wiley & Sons, Ltd.
- Cooper, Christopher A. 2004. "Internet Use in the State Legislature: A Research Note." *Social Science Computer Review* 22(Fall): 347–354.
- Cox, Gary W., and Eric Magar. 1999. "How Much is Majority Status in the U.S. Congress Worth?" *American Political Science Review* 93(June): 299–309.

- Cox, Gary W., and Scott Morgenstern. 1993. "The Increasing Advantage of Incumbency in the U.S. States." *Legislative Studies Quarterly* 18(Nov.): 495–514.
- Dawes, Roy A., and A. Hunter Bacot. 1998. "Electoral Career Patterns and Incumbency Advantage in the U.S. House of Representatives." *Legislative Studies Quarterly* 23(Nov.): 575–583.
- Dawes, Sharon S., Peter A. Bloniarz, and Kristine L. Kelly. 1999. *Some Assembly Required: Building a Digital Government for the 21st Century*. Albany, N.Y.: Center for Technology in Government.
- DiMaggio, Paul J., and Woody W. Powell. 1983. "The Iron Cage Revisited – Institutional Isomorphism and Collective Rationality in Organizational Fields." *American Sociological Review* 48(2): 147–160.
- Druckman, James N., Cari Lynn Hennessy, Martin J. Kifer, and Michael Parkin. 2009. "Issue Engagement on Congressional Web Sites, 2002-2006." *Social Science Computer Review* 27(June): 1–21.
- Druckman, James N., Martin K. Kifer, and Michael Parkin. 2007. "The Technological Development of Congressional Candidate Websites: How and Why Candidates use Web Innovations." *Social Science Computer Review* 25: 425–442.
- Epstein, David, and Peter Zemsky. 1995. "Money Talks: Detering Quality Challengers in Congressional Elections." *American Political Science Review* 89(June): 295–308.
- Erikson, Robert S. 1971. "The Advantage of Incumbency in Congressional Elections." *Polity* 3: 395–405.
- Fenno, Richard F. 1978. *Homestyle: House Members in Their Districts*. Boston, Mass.: Little, Brown and Co.
- Ferber, Paul, Franz Foltz, and Rudy Pugliese. 2005. "Computer-Mediated Communication in the Arizona Legislature: Applying Media Richness Theory to Member and Staff Communication." *State and Local Government Review* 37(2): 142–150.
- Fountain, Jane E. 2001. *Building the Virtual State: Information Technology and Institutional Change*. Washington, D.C.: Brookings Institution Press.
- Garson, G. David. 2004. *Digital Government: Principles and Best Practices*. Alexi pavlichev and g. david garson ed. Idea Group Publishing chapter The Promise of Digital Government, pp. 2–15.
- Gelman, Andrew, and Donald B. Rubin. 1992. "Inference from iterative simulation using multiple sequences." *Statistical Science* 7(Nov.): 434–455.
- Gelman, Andrew, and Gary King. 1990. "Estimating Incumbency Advantage without Bias." *American Journal of Political Science* 34(Nov.): 1142–1164.

- Goodliffe, Jay. 2004. "War Chests as Precautionary Savings." *Political Behavior* 26(Dec.): 289–315.
- Grier, Kevin B., and Michael C. Munger. 1993. "Comparing Interest Group PAC Contributions to House and Senate Incumbents, 1980-1986." *The Journal of Politics* 55(Aug.): 615–643.
- Herrnson, Paul S., Atiya Kai Stokes-Brown, and Matthew Hindman. 2007. "Campaign Politics and the Digital Divide: Constituency Characteristics, Strategic Considerations, and Candidate Internet Use in State Legislative Elections." *Political Research Quarterly* 60(March): 31–42.
- Johnson, Dennis W. 2004. *Congress Online: Bridging the Gap Between Citizens and Their Representatives*. New York, N.Y.: Routledge.
- Kamarck, Elaine Ciulla. 2002. *governance.com*. Elaine ciulla kamarck and joseph s. nye, jr. ed. Washington, D.C.: Brookings Institution Press chapter Political Campaigning on the Internet: Business as Usual?, pp. 81–103.
- King, Gary. 1991. "Constituency Service and Incumbency Advantage." *British Journal of Political Science* 21(1): 119–128.
- Levitt, Steven D., and Catherine D. Wolfram. 1997. "Decomposing the Sources of Incumbency Advantage in the U.S. House." *Legislative Studies Quarterly* 22(Feb.): 45–60.
- Lieberman, Robert C. 2002. "Ideas, Institutions, and Political Order: Explaining Political Change." *American Political Science Review* 96(Dec.): 697–712.
- Lipinski, Daniel. 2004. *Congressional Communication: Content and Consequences*. Ann Arbor, Mich.: University of Michigan Press.
- Mayhew, David R. 1974. *Congress: The Electoral Connection*. New Haven, Conn.: Yale University Press.
- Owen, Diana, Richard Davis, and Vincent James Strickler. 1999. "Congress and the Internet." *The Harvard International Journal of Press/Politics* 4(2): 10–29.
- Page, Scott E. 2006. "Path Dependence." *Quarterly Journal of Political Science* 1: 87–115.
- Pentland, Alex (Sandy), Richard Fletcher, and Amir Hasson. 2004. "DakNet: Rethinking Connectivity in Developing Nations." *Computer* 37(Jan.): 78–83.
- Pierson, Paul. 2000. "Increasing Returns, Path Dependence, and the Study of Politics." *American Political Science Review* 94(June): 251–267.
- Pierson, Paul. 2004. *Politics in Time: History, Institutions, and Social Analysis*. Princeton, N.J.: Princeton University Press.
- Pitkin, Hanna Fenichel. 1967. *The Concept of Representation*. Berkeley, Calif.: University of California Press.

- Roscoe, Timothy. 1999. "The Construction of the World Wide Web Audience." *Media, Culture & Society* 21: 673–684.
- Schaffner, Brian F. 2006. "Local News Coverage and the Incumbency Advantage in the U.S. House." *Legislative Studies Quarterly* XXXI(Nov.): 491–511.
- Shane, Peter M. 2004. *Democracy Online: The Prospects for Political Renewal Through the Internet*. New York, N.Y.: Routledge chapter The Electronic Federalist: The Internet and Eclectic Institutionalization of Democratic Legitimacy, pp. 65–82.
- Sparrow, Bartholomew H. 2006. "A Research Agenda for an Institutional Media." *Political Communication* 23: 145–157.
- Spiegelhalter, David, Andrew Thomas, Nicky Best, and Wally Gilks. 1996. BUGS 0.5: Bayesian Inference Using Gibbs Sampling Manual (version ii). Technical report MRC Biostatistics Unit.
- Stromer-Galley, Jennifer. 2000. "On-Line Interaction and Why Candidates Avoid It." *Journal of Communication* 50(Autumn): 111–132.
- Suchman, Mark C. 1995. "Managing Legitimacy: Strategic and Institutional Approaches." *The Academy of Management Review* 20(July): 571–610.
- Tanner, Martin A., and Wing Hung Wong. 1987. "The Calculation of Posterior Distributions by Data Augmentation." *Journal of the American Statistical Association* 82(398): 528–540.
- Trier, Shawn, and Simon Jackman. 2008. "Democracy as a Latent Variable." *American Journal of Political Science* 52(Jan.): 201–217.
- Xenos, Michael A., and Kirsten A. Foot. 2005. "Politics as Usual, or Politics Unusual? Position Taking and Dialogue on Campaign Websites in the 2002 U.S. Elections." *Journal of Communication* 55(March): 169–185.

Appendices

This appendix contains a table with the detailed coding rules of each of our items, and the statistical model written as a set of equations.

Table 2: Item Coding Rules

Item	Scale	Coding Rule
Issue Factor Items		
National Issues	1-5	To what extent does the site provide information about major national issues (e.g. education, budget, taxes, defense/foreign affairs, healthcare, workforce, economy, energy, agriculture, transportation, trade, social security, medicare, etc.)? 1=National issues are only addressed through press releases in the press release section (if a site has a press release section, it will score at least a 1); 2=National issues are addressed through a sparse issues section (less than 5 national (versus Member or district/state) issues); 3=The issue section contains at least 5 national issues that are addressed through a paragraph or two of narrative OR through links to further information (i.e. press releases); 4=The issue section contains more than 5 national issues that are addressed through a paragraph or two of narrative or links to further information within the site (i.e. press releases); 5=The issues section contains at least 10 national issues addressed through informative narratives AND links to further information on and/or off the site. (Recoded: 1 – 3 = 0; 4 – 5 = 1)
Member's Issues	0-1	The site provides issue information or features (not links to features off the site, but information on the site) related to issues the Member is active on. To count as member issues, the issues must be highlighted in the biography and more information on the highlighted issues must be available in the issues/legislation section. If there is no issues section, there can not be Member's issues on the site.
State/Local Issues	0-1	The site provides issue information or features (not general interest, but issue-related) related to issues of specific interest to the district or state. If national issues are addressed at the local level, it does not count here. This is more for genuinely local issues like highways or location-specific issues (Yucca mountain, national parks in district/state, road projects, etc.).

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Table 2 – continued from previous page

Item	Ratio-	Scale	Coding Rule
Vote nales		0-5	To what extent does the site provide information about why a Member voted a certain way on certain legislation? This information might be included in the issues section or as a separate section (or not at all). Press releases and e-newsletters do not count, unless they're featured on the home page, since we're looking for information that's easy to find and access online. It ONLY counts where there is reference to specific legislation (H.R. 1234 or a specific bill title), how the Member voted, AND the Members reasons for voting that way. Discussing bills the Member introduced does not count as vote rationale. 1=Vote rationales are addressed only through press releases or features on the home page; 2=Some of the issue sections/writeups contain vote rationales; 3=Most of the issues sections contain vote rationales; 4=All of the issues sections contain vote rationales; 5=All of the issues sections contain highlights of key votes and the Member's vote rationales. (Recoded: 0 = 0; 1 - 5 = 1)
Current Events		0-1	Home page includes a feature(s) or highlight(s) on an event or issue that is currently in the national news. Exclude press releases and only count if there is a special feature (or link to a special feature) on Iraq, immigration, Katrina/hurricanes, gas prices, etc. Local issues count only if they are important enough to have become national news.
Content Current	is	0-1	MOST of the issue information addresses legislation/issues from the 109th Congress (evaluators will have to look up bill references on Thomas). Most means more than half of the issues.
Timeliness		1-5	How up to date is the site? 1=everything on the site is clearly old, even press releases; 2=press releases are up to date (within the last month) and everything else is old; 3=press releases are up to date and everything else is too generic to tell the age; 4=press releases and issues are up to date (press within the last month and issues obviously from the 109th Congress); 5=everything is clearly up to date and it is clear that the office makes an effort to include timely information on the site (Recoded: 1 - 3 = 0; 4 - 5 = 1)

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Item	Scale	Coding Rule
Answers to Casework FAQs	0-5	To what extent does the site help constituents understand what the office can do for them and how to get answers to their questions? (this does not have to be in the form of question and answer) 1=The only has a contact my office for assistance message; 2=In the services section, the site has a contact my office for assistance message and links to agency home pages or very basic information (a couple of sentences); 3=In the services section, the site provides limited guidance (e.g. a paragraph on types of cases the office handles); 4=In the services section, the site provides sections on more than four types of casework services (e.g. passports, social security, veterans benefits, business assistance, student loans, etc.) with extensive information and/or links to specific information on agency Web sites; 5=In the services section, the site provides sections on more than four types of casework services and incorporates links to specific agency pages and/or contact information INCLUDING information about local resources for assistance. (Recoded: 0 – 2 = 0; 3 – 5 = 1)
Guidance on Casework Initiation	0-1	The site clearly explains how and why a constituent can initiate a casework request. Needs to give constituents at least a bit of context about how the office can help, what casework is, and/or how to open a case. Just providing a form doesn't count.
Casework Form	0-1	The site provides a form (can be pdf) for constituents to fill out to initiate a casework request. The privacy release form is the same thing as a casework form. It will usually be provided in PDF because it requires a physical signature so the Member can get personal information about the case from the relevant agency.
Agency Links	0-1	The site provides links to agency Web sites in a section other than the constituent services section (e.g. a links or resources page). This is for links included in another section. If they are included in the casework section, it does not count for this.

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Item	Scale	Coding Rule
Link to First-Gov	0-1	The site includes a link to FirstGov (the federal government portal). A link to FirstGov for kids does count.
Internship Info	0-1	The site provides information on how to apply for an internship (just a form, a sole reference to the office having interns, or a contact my office to learn more message does not count)
Academy Info	0-1	The site provides information on how to apply for an academy nomination (just a form or reference or a contact my office to learn more message does not count. Links to academy Web sites with some context do count).
Flag Info	0-1	The site provides information on how to order a flag from the office (a contact my office message or flag request form without context does not count). Must include information about what the flags are and/or why a constituent may want one.
Grant Info	0-1	The site provides information on how to get government grants. Student Loan info does not count.
Information about District Resources	0-1	In the services section, the site includes information about local resources for assistance (links in the the district/state section or a links page count only if they are to services, not towns, sports venues, educational institutions, etc.). Links must be to services – places where the constituent can get help. Best place is for this to be included in the casework section, but OK if it's included in district section, as long as it's to SERVICES. Links to state and local government only counts if it's to specific agencies, versus the governor's office, the state government portal, or municipal pages.
Technology Factor Items		
Video	0-1	The site provides video clips (welcome messages do not count – think substance (floor speeches, committee hearings, etc.)

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Table 2 – continued from previous page

Item	Scale	Coding Rule
Audio	0-1	The site provides audio clips (welcome messages do not count – think substance (floor speeches, committee hearings, etc.)
Text Only	0-1	The site allows option for a text-only screen for faster downloading
Blog	0-1	The site includes a blog (counts even if it's not a real blog that accepts comments)
RSS Feed	0-1	The site includes an RSS feed (sometimes hard to tell – when in doubt, don't include it)
Podcast	0-1	The site includes a podcast (audio updates automatically sent to subscribers)
Look & Feel	1-5	What impression does the look and feel/design leave? 1=The look and feel looks like circa 1996 with lots of scrolling, ugly colors, and clunky navigation; 2=The look and feel is too cluttered, too sparse, and generally uninviting; 3=The look and feel is OK, not too uninviting, but not exactly inviting, either; 4=The look and feel is inviting and professional; 5=The look and feel is in keeping with what you expect from the better commercial Web sites (Recorded: 1 – 3 = 0; 4 – 5 = 1)

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Table 2 – continued from previous page

Item	Scale	Coding Rule
Navigation	1-5	How easy is it to move about the site? Navigation is about movement through the site, and it includes link text but not information location. This is about the menus and links. Organization is about whether or not information is where you would expect it to be. 1=navigation is dependent on back button and home page (no navigation bar); 2=navigation links are confusing (language doesn't make it clear what you'll find), navigation options are so abundant that it's hard to find what you're looking for, navigation changes on every page and/or some of the main navigation links go off site or to pdf files; 3=navigation may be cluttered, but it's clear what you'll be getting at the other end; 4=it is easy to navigate through site and easy to understand what you'll get when you click on a link; 5=navigation is clear and easy, and the site provides additional navigation features on most pages (such as links within text (e.g. links to bill text are included on issue pages) or section or page-specific navigation tools that make navigation easier (e.g. breadcrumbs or links to additional related information)). (Recorded: 1 – 3 = 0; 4 – 5 = 1)
Readability	1-5	How easy is it to read the content of the site? This is not about content, but about whether it's easy to scan pages, whether there are bullets, headers, and clear links; whether the contrast between the foreground and background makes the text legible; and whether there are short pages and paragraphs. A site where you have to read or scroll down ten screens on most pages is not that readable. 1=on most pages, the contrast between the text and the background or changing fonts and font sizes make the pages difficult to read; 2=on many pages, the sheer volume of information (e.g. really long text or really long lists of links) makes the pages difficult to read; 3=generally, the information on the site is easy to read; 4=generally, the information on the site is written for the Web, with short paragraphs, bullets, headings, internal links, etc. that makes it easy to read and scan through; 5=the information throughout the site is written for the Web (Recorded: 1 – 3 = 0; 4 – 5 = 1)

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Item	Scale	Coding Rule
Organization	1-5	<p>Organization is about whether or not information is where you would expect it to be or whether you have to hunt around for it. Movement through the site is navigation. How well is the site organized? 1=the site appears thrown together with no thought, rhyme, or reason; 2=some thought seemed to go into how the site was organized, but it is difficult to figure out the organization scheme and difficult to find the information you're looking for; 3=the site is organized well enough that you can usually find what you're looking for with only one or two false starts; 4=the site is organized well enough that you can usually find what you're looking for within three clicks (no false starts); 5=the site is organized well enough that you can usually find what you're looking for within three clicks AND you usually have access to additional information from other sections of the site (the site is cross-referenced)</p> <p>(Recoded: 1 – 3 = 0; 4 – 5 = 1)</p>

Issues 2007 Factor (η_1) Equations

$$\begin{array}{l}
 \text{National Issues}_{2007,i} \sim \text{Bernoulli}(p_{1,i}) \\
 p_{1,i} = \Phi(\beta_1 + 1 \cdot \eta_{1,i}) \\
 \text{Member Issues}_{2007,i} \sim \text{Bernoulli}(p_{2,i}) \\
 p_{2,i} = \Phi(\beta_2 + \lambda_{\eta_{1,1}} \cdot \eta_{1,i}) \\
 \text{State/Local Issues}_{2007,i} \sim \text{Bernoulli}(p_{3,i}) \\
 p_{3,i} = \Phi(\beta_3 + \lambda_{\eta_{1,2}} \cdot \eta_{1,i}) \\
 \text{Vote Rationales}_{2007,i} \sim \text{Bernoulli}(p_{4,i}) \\
 p_{4,i} = \Phi(\beta_4 + \lambda_{\eta_{1,3}} \cdot \eta_{1,i}) \\
 \text{Current Events}_{2007,i} \sim \text{Bernoulli}(p_{5,i}) \\
 p_{5,i} = \Phi(\beta_5 + \lambda_{\eta_{1,4}} \cdot \eta_{1,i}) \\
 \text{Issue Content Current}_{2007,i} \sim \text{Bernoulli}(p_{6,i}) \\
 p_{6,i} = \Phi(\beta_6 + \lambda_{\eta_{1,5}} \cdot \eta_{1,i}) \\
 \text{Timeliness}_{2007,i} \sim \text{Bernoulli}(p_{7,i}) \\
 p_{7,i} = \Phi(\beta_7 + \lambda_{\eta_{1,6}} \cdot \eta_{1,i})
 \end{array}
 \left. \vphantom{\begin{array}{l} \dots \\ \dots \\ \dots \\ \dots \\ \dots \\ \dots \\ \dots \\ \dots \\ \dots \\ \dots \end{array}} \right\} 1 \leq i \leq N$$

Constituents 2007 Factor (η_2) Equations

$$\begin{array}{l}
 \text{Casework FAQs}_{2007,i} \sim \text{Bernoulli}(p_{8,i}) \\
 p_{8,i} = \Phi(\beta_8 + 1 \cdot \eta_{2,i}) \\
 \text{Casework Initiation}_{2007,i} \sim \text{Bernoulli}(p_{9,i}) \\
 p_{9,i} = \Phi(\beta_9 + \lambda_{\eta_{2,1}} \cdot \eta_{2,i}) \\
 \text{Casework Form}_{2007,i} \sim \text{Bernoulli}(p_{10,i}) \\
 p_{10,i} = \Phi(\beta_{10} + \lambda_{\eta_{2,2}} \cdot \eta_{2,i}) \\
 \text{Agency Links}_{2007,i} \sim \text{Bernoulli}(p_{11,i}) \\
 p_{11,i} = \Phi(\beta_{11} + \lambda_{\eta_{2,3}} \cdot \eta_{2,i}) \\
 \text{FirstGov Link}_{2007,i} \sim \text{Bernoulli}(p_{12,i}) \\
 p_{12,i} = \Phi(\beta_{12} + \lambda_{\eta_{2,4}} \cdot \eta_{2,i}) \\
 \text{Internship Info}_{2007,i} \sim \text{Bernoulli}(p_{13,i}) \\
 p_{13,i} = \Phi(\beta_{13} + \lambda_{\eta_{2,5}} \cdot \eta_{2,i}) \\
 \text{Academy Info}_{2007,i} \sim \text{Bernoulli}(p_{14,i}) \\
 p_{14,i} = \Phi(\beta_{14} + \lambda_{\eta_{2,6}} \cdot \eta_{2,i}) \\
 \text{Flag Info}_{2007,i} \sim \text{Bernoulli}(p_{15,i}) \\
 p_{15,i} = \Phi(\beta_{15} + \lambda_{\eta_{2,7}} \cdot \eta_{2,i}) \\
 \text{Grant Info}_{2007,i} \sim \text{Bernoulli}(p_{16,i}) \\
 p_{16,i} = \Phi(\beta_{16} + \lambda_{\eta_{2,8}} \cdot \eta_{2,i}) \\
 \text{District Resources}_{2007,i} \sim \text{Bernoulli}(p_{17,i}) \\
 p_{17,i} = \Phi(\beta_{17} + \lambda_{\eta_{2,9}} \cdot \eta_{2,i})
 \end{array}
 \left. \vphantom{\begin{array}{l} \dots \\ \dots \\ \dots \\ \dots \\ \dots \\ \dots \\ \dots \\ \dots \\ \dots \\ \dots \end{array}} \right\} 1 \leq i \leq N$$

Technology 2007 Factor (η_3) Equations

$$\begin{array}{l}
 \text{Video}_{2007,i} \sim \text{Bernoulli}(p_{18,i}) \\
 p_{18,i} = \Phi(\beta_18 + 1 \cdot \eta_{3,i}) \\
 \text{Audio}_{2007,i} \sim \text{Bernoulli}(p_{19,i}) \\
 p_{19,i} = \Phi(\beta_19 + \lambda_{\eta_{3,1}} \cdot \eta_{3,i}) \\
 \text{Text Only}_{2007,i} \sim \text{Bernoulli}(p_{20,i}) \\
 p_{20,i} = \Phi(\beta_20 + \lambda_{\eta_{3,2}} \cdot \eta_{3,i}) \\
 \text{Blog}_{2007,i} \sim \text{Bernoulli}(p_{21,i}) \\
 p_{21,i} = \Phi(\beta_21 + \lambda_{\eta_{3,3}} \cdot \eta_{3,i}) \\
 \text{RSS Feed}_{2007,i} \sim \text{Bernoulli}(p_{22,i}) \\
 p_{22,i} = \Phi(\beta_22 + \lambda_{\eta_{3,4}} \cdot \eta_{3,i}) \\
 \text{Podcast}_{2007,i} \sim \text{Bernoulli}(p_{23,i}) \\
 p_{23,i} = \Phi(\beta_23 + \lambda_{\eta_{3,5}} \cdot \eta_{3,i}) \\
 \text{Look \& Feel}_{2007,i} \sim \text{Bernoulli}(p_{24,i}) \\
 p_{24,i} = \Phi(\beta_24 + \lambda_{\eta_{3,6}} \cdot \eta_{3,i}) \\
 \text{Navigation}_{2007,i} \sim \text{Bernoulli}(p_{25,i}) \\
 p_{25,i} = \Phi(\beta_25 + \lambda_{\eta_{3,7}} \cdot \eta_{3,i}) \\
 \text{Readability}_{2007,i} \sim \text{Bernoulli}(p_{26,i}) \\
 p_{26,i} = \Phi(\beta_26 + \lambda_{\eta_{3,8}} \cdot \eta_{3,i}) \\
 \text{Organization}_{2007,i} \sim \text{Bernoulli}(p_{27,i}) \\
 p_{27,i} = \Phi(\beta_27 + \lambda_{\eta_{3,9}} \cdot \eta_{3,i})
 \end{array} \left. \vphantom{\begin{array}{l} \dots \end{array}} \right\} 1 \leq i \leq N$$

Issues 2006 Factor (θ_1) Equations

$$\begin{array}{l}
 \text{National Issues}_{2006,i} \sim \text{Bernoulli}(p_{28,i}) \\
 p_{28,i} = \Phi(\beta_28 + 1 \cdot \theta_{1,i}) \\
 \text{Member Issues}_{2006,i} \sim \text{Bernoulli}(p_{29,i}) \\
 p_{29,i} = \Phi(\beta_29 + \lambda_{\theta_{1,1}} \cdot \theta_{1,i}) \\
 \text{State/Local Issues}_{2006,i} \sim \text{Bernoulli}(p_{30,i}) \\
 p_{30,i} = \Phi(\beta_30 + \lambda_{\theta_{1,2}} \cdot \theta_{1,i}) \\
 \text{Vote Rationales}_{2006,i} \sim \text{Bernoulli}(p_{31,i}) \\
 p_{31,i} = \Phi(\beta_31 + \lambda_{\theta_{1,3}} \cdot \theta_{1,i}) \\
 \text{Current Events}_{2006,i} \sim \text{Bernoulli}(p_{32,i}) \\
 p_{32,i} = \Phi(\beta_32 + \lambda_{\theta_{1,4}} \cdot \theta_{1,i}) \\
 \text{Issue Content Current}_{2006,i} \sim \text{Bernoulli}(p_{33,i}) \\
 p_{33,i} = \Phi(\beta_33 + \lambda_{\theta_{1,5}} \cdot \theta_{1,i}) \\
 \text{Timeliness}_{2006,i} \sim \text{Bernoulli}(p_{34,i}) \\
 p_{34,i} = \Phi(\beta_34 + \lambda_{\theta_{1,6}} \cdot \theta_{1,i})
 \end{array} \left. \vphantom{\begin{array}{l} \dots \end{array}} \right\} 1 \leq i \leq N$$

Prior Distributions

$$\left. \begin{aligned}
 \boldsymbol{\theta}_i &\sim \text{MVN}([0, 0, 0]', \boldsymbol{\Sigma}_\theta^{-1}) \\
 \boldsymbol{\eta}_i &\sim \text{MVN}([\mu_{\eta_{1,i}}, \mu_{\eta_{2,i}}, \mu_{\eta_{3,i}}]', \boldsymbol{\Sigma}_\eta^{-1}) \\
 \mu_{\eta_{1,i}} &= \gamma_{\theta_{1,1}} \cdot \theta_{1,i} + \gamma_{\theta_{2,1}} \cdot \theta_{2,i} + \gamma_{\theta_{3,1}} \cdot \theta_{3,i} \\
 \mu_{\eta_{2,i}} &= \gamma_{\theta_{1,2}} \cdot \theta_{1,i} + \gamma_{\theta_{2,2}} \cdot \theta_{2,i} + \gamma_{\theta_{3,2}} \cdot \theta_{3,i} \\
 \mu_{\eta_{3,i}} &= \gamma_{\theta_{1,3}} \cdot \theta_{1,i} + \gamma_{\theta_{2,3}} \cdot \theta_{2,i} + \gamma_{\theta_{3,3}} \cdot \theta_{3,i}
 \end{aligned} \right\} 1 \leq i \leq N$$

$$\boldsymbol{\Sigma}_\eta \sim \text{Wishart}_3(\mathbf{I}_3, 4)$$

$$\boldsymbol{\Sigma}_\theta \sim \text{Wishart}_3(\mathbf{I}_3, 4)$$

$$\left. \begin{aligned}
 \lambda_{\eta_{1,m}} &\sim \text{Uniform}(0, 2) \\
 \lambda_{\theta_{1,m}} &\sim \text{Uniform}(0, 2)
 \end{aligned} \right\} 1 \leq m \leq 6$$

$$\left. \begin{aligned}
 \lambda_{\eta_{2,m}} &\sim \text{Uniform}(0, 2) \\
 \lambda_{\theta_{2,m}} &\sim \text{Uniform}(0, 2) \\
 \lambda_{\eta_{3,m}} &\sim \text{Uniform}(0, 2) \\
 \lambda_{\theta_{3,m}} &\sim \text{Uniform}(0, 2)
 \end{aligned} \right\} 1 \leq m \leq 9$$

$$\beta_m \sim \phi(0, 1000) \quad \left. \right\} 1 \leq m \leq 54$$

$$\left. \begin{aligned}
 \gamma_{\theta_{1,m}} &\sim \phi(0, 1000) \\
 \gamma_{\theta_{2,m}} &\sim \phi(0, 1000) \\
 \gamma_{\theta_{3,m}} &\sim \phi(0, 1000)
 \end{aligned} \right\} 1 \leq m \leq 3$$