Centralization and Decentralization in State Agency Website Infrastructure:
A Computational Census and Qualitative Inquiry

A.J. Million, Doctoral Candidate

University of Missouri, School of Information Science & Learning Technologies

Introduction

Cloud computing is a computational model and an expression of sociotechnical organization. Organizations adopt cloud computing, and like approaches, to use resources owned by third parties. As such, the term implies the use of technology across organizational boundaries. The difficulties associated with public administration have long challenged civil servants, but using outside resources creates unique opportunities.

Problem Statement

Over the past decade, a topic discussed by online government service (e-government) scholars was user-centered design. Noted in scholarly discussions was how a barrier to e-government is not considering citizen needs. Theoretically, cloud computing, and like approaches, provide more flexible ways to build services citizens desire. Yet, doing so also requires sufficient authority, resources, and knowledge to manage the process.


States Responding

States Interviewed

Literature Review

In public administration, Layne and Lee's (2001) popular model of e-government argues system development occurs in four separate stages: 1) cataloging information, 2) building transactional tools, 3) integrating systems within agencies, and then 4) integrating them across organizational boundaries. User-centered design supports this model, but it says little about implementation. In recent years online tools have become more diffuse, because cloud computing (and like models) trade local control for the use of third-party infrastructure.

State governments have been building websites for two decades, and they have adopted a wide range of development strategies (Greenberg, 2011). Still, while these sites are often evaluated for accessibility, service facilitation, and usability (Yu & Parmanto, 2011; Huang, 2007), systemic characteristics are of scant interest to researchers outside system oriented disciplines.

Location Built

Pooled Resources
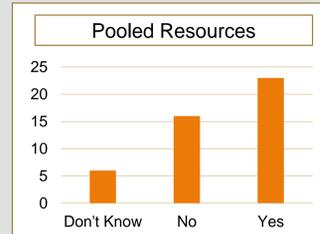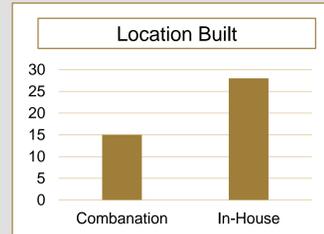
Methodology

To examine state agency Web infrastructure from a management perspective, in the context of cloud computing, I asked three study questions. Next, I selected the two part explanatory mixed method research design (Ivanokova, Creswell & Stick, 2006). State departments of transportation (DOTs) were studied, because they are medium agencies found in all U.S. states. Finally, I defined Web infrastructure to be a subset of the concept of an "innovation" (Rodgers, 2003).

Research Questions

1. What are the characteristics of DOT Web infrastructure?
2. Why do DOTs adopt cloud computing, and like approaches, to create, host, and manage their websites?
3. What are the implications for e-government services given their reasons for adoption?

Quantitative Strand

In June 2015, I created an online survey based on a definition of cloud computing and models of public administration (Mell & Grance, 2011). The survey was sent to members of three groups in the DOT community. Data collection ended in mid-August 2015, and I tabulated descriptive statistics to answer research question one. Chi-squared tests helped me examine variable significance and select a maximum variation sample.

Qualitative Strand

Informed by quantitative results, I selected interview subjects and conducted semi-structured interviews. Statistical testing revealed little, calling for a pragmatic approach. My analysis of interviews was similar to grounded theory, and I created axial codes ($n = 7$) after a first series of interviews. Codes were consolidated, then I carried out another series of interviews ($n = 5$) until saturation. Next, my codes were consolidated again to organize passages and answer the second research question.

Initial Findings

- For the population of DOTs ($N = 50$) 45 states (90%) responded to my survey with 61 employees contributing.
- The statistical margin of error was +/- 5% with a 95% CI.
- Survey respondents tended to be mid-career ($M = 13.9$, $Mdn = 14$, $Mo = 15$, $SD = 9.2$) managers ($n = 34$), staff ($n = 14$), and executives ($n = 13$).
- Sites were replaced every five years, on average.
- Most were built in-house ($n = 28$) and the remainder used some form of outside help ($n = 18$).
- Resource pooling was more common ($n = 23$) than in-house ($n = 16$) operations.
- Only a small number ($n = 2$) of DOTs used cloud computing.
- Web infrastructure tended to be run in-house ($n = 37$) as was true for content creation ($n = 42$).
- It was typical for $5-10$ agencies per question to respond they "didn't know" an answer, which is surprising.

Follow-Up Work

Building on my initial findings, interviews ($n = 12$) were conducted given state characteristics and subject availability. Six codes emerged from interviews explaining Web infrastructure adoption. Interviews suggested cloud computing use is rare, because many states have consolidated IT departments. The five-year average to replace websites may have also been a factor, as "the Cloud" is somewhat new. Finally, the consolidation of resources by state governments allowed in-house management, but by staff with weak ties to DOTs.

State	Main Reason Chosen
Delaware	Built with external help
Iowa	Deploys on private server owned by DOT
Kentucky	Cloud computing used
Missouri	Content administration in-house
New Hampshire	Systems possess broad network access
New Jersey	Infrastructure administered in-house by state
Nevada	Does not measure use
North Dakota	Deploys on community server
Oklahoma	Lacks on-demand service
Utah	Pools all IT resources with state government
Washington	Site not rapidly elastic
Wisconsin	Did not know specifics for site traits

Bibliography

To view a list of material I consulted to make this poster scan the QR code below.

Last revised: November 29, 2015

- **Bureaucracy and Authority:** The main reason DOTs adopted Web infrastructure had to do with their organizational layout. Some managers noted state IT was centralized at the expense of local control.
- **Cultural, Personal, and Social Factors:** The preferences of major officials and organizational cultures influenced adoption, though minimally.
- **Knowledge and Expertise:** E-government services are often complex. In cases where outside expertise and/or resources were leveraged, DOT needs were not prioritized.
- **Missions:** Adoption decisions supported agendas set by high-level authorities. When infrastructure was pooled, this created tensions about priorities.
- **Resources:** Staff, money, and time influenced the adoption of site infrastructure. Economies of scale and prior investments also limited flexibility.
- **Technology:** Networking allowed the linking of systems, but doing so required sufficient resources and expertise to develop them in light of user needs.

Conclusions

This study identified website infrastructure traits and their causes of adoption. Attention was paid to management, in the context of cloud computing, and the use of outside resources, because like models theoretically grant managers added flexibility to better meet public needs.

I found cloud computing is rare due to the centralization of IT and a five-year timetable to replace websites. For example, statewide concerns about network security prevented some agencies from hosting elsewhere, even if sensitive information was not made available. That said, cloud-like (i.e., pooled) approaches were common, and interviews revealed six reasons for adoption. These show managers are often constrained by organizational factors, even when outside resources are leveraged.