Government Accessibility and Stakeholder Mental Models

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ABSTRACT

The promise by the Obama Administration to the American public was to develop quality, transparent government services to all end users. As government seeks to attain these goals and focuses on the needs of every citizen; have government stakeholders been mindful of those users who have accessibility barriers to the same information? It is essential that all citizens have the same equal access to all government resources. In addition, the informational services needs of any government agency must be evaluated to meet the planning and implementation of that agency's digital strategy. A survey was conducted and data collected from two groups of government stakeholders, to learn about government accessibility and their mental models.

KEYWORDS

Assistive technologies, government, disabled persons/special needs, web-based services

INTRODUCTION

Jaeger had referenced in 2008, that 550 million people worldwide had some form of disability. In 2010, the U.S Census Bureau had estimated 56.7 million United States citizens having some form of disability [20,10]. As the general public continues to engage in online experience through web, social, or multimedia; we can only assume the information these services provide should also be accessible by those with disabilities.

The Civil Rights Act of 1964 created federal and state laws that legally protect and prevent discrimination towards groups of people with shared characteristics *(protected class)*. However, persons with any condition or disability *(physical, sensory, or cognitive)* that makes it challenging to perform specific activities have been treated differently than any other protected class in the United States.

Since the inception of the Internet and its emerging technologies, those that helped enact disability rights laws suddenly found the inaccessibility of online services and their enforcement a challenge like no other minority group had experienced. Disability rights laws are built upon a premise that "rights are only available if one is a member of the class. Therefore, people with disabilities are the only group that has an active responsibility under the law to enforce their own rights and petition for equality when it is not already available [32]."

Therefore, two federal civil-rights statutes were initiated to guide federal, state, and local agencies into making information technology available to Americans with disabilities. The Americans with Disability Act (ADA) of 1990 and Section 508 of the Rehabilitation Act of 1973, as amended in 1998, prohibited places of public accommodation to discriminate against people with disabilities [12,14,17].

Section 508 of the Rehabilitation Act outlined that all electronic and information technologies that may be purchased, developed, maintained, or used; be fully accessible by people with disabilities. Section 508 has described fully accessible websites as being flexible enough to allow for various input and output devices [8,9].

The World Wide Web Consortium (W3C) was created in 1994. The newly formed international organization and its members looked to develop "compatibility and agreement among industry members in the adoption of new standards defined by the W3C [35]." Two years later the Web Accessibility Initiative (WAI) established the Web Content Accessibility Guidelines (WCAG). WAI outlined how Internet content, technology, and authoring tools would help increase accessibility to people with disabilities [31]. Tim Berners-Lee, Director and inventor of the World Wide Web, said "the power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect [26,36]."

The W3C's foundations and guidelines are supported by Lazar's comparing a properly accessible website to that of an accessible building. Lazar has stated that just as an "accessible building offers curb cuts, ramps, and elevators to allow a person with disabilities to enter and navigate through the building with ease [11]," so shall a website's navigation and content provide the same fluid movement throughout. If a website has been considered inaccessible, then all the content and information available to the general public would already be considered less informational to those with impairments or disabilities.

PROCUREMENT

Purchasing agents have used competitive bidding to discover, agree to terms, and obtain goods, services, or work. The U.S Federal Access Board stated in June 2001, all federally signed contracts would be required to comply with 508 Standards. Contractors, suppliers, and their entire supply network would be required to certify their products compliance [16].

Compliance studies, based on policies regarding persons with disabilities [2,6,8,9,10,11,13,15,32,36] have uncovered degrees of accessibility over the past decade. However, a

stakeholder's procurement and selection process based on a product's accessibility was unclear and required investigation.

The General Services Administration (GSA) partnered, developed, and addressed contract and procurement issues with vendors trying to fulfill the requirements of Section 508 with their products [22]. The Voluntary Product Accessibility Template® or VPAT® was created to document and assist in the procurement process of identifying the conformance of a vendor's product set forth by Section 508 standards [24,25]. Vendors that do not have VPAT documents may be required to complete a Government Product/Service Accessibility Template (GPAT) attached to the request for proposal (RFP). GPAT templates have helped government agencies identify present and future vendors in their market research for accessible public facing services or applications [34,33].

CURRENT TECHNOLOGIES
Accessibility tools are made available in both commercial and open source varieties. Searching the web, one will find tools like AChecker, aXe, HTML Code Sniffer (AATT), WebAIM (Color Contrast Checker), and WebAIM (Wave) for websites. As for PDFs (portable document format), Adobe Acrobat XI and higher have built-in tools for testing accessibility. Many others are listed on the World Wide Web Consortium (W3C) list of accessibility tools [29] and the General Services Administration (GSA) Section 508 site for creating accessible electronic documents [17].

Accessibility tools can be useful to designers and programmers whether or not their sites follow the Web Content Accessibility Guidelines (WCAG) [27,28]. These guidelines have encouraged the use of tools "during the design, implementation, and maintenance phases of Web development. If these tools are used carefully, it can help the targeted users in preventing accessibility barriers, repairing encountered barriers, and improving the overall quality of Web sites [2]."

BEST PRACTICES
Government involvement and collective technologies have made public generating and information gathering simpler. Through emerging technologies, governmental agencies have delivered services and information to citizens using the Internet. Paper records, once locked away in vaults and document warehouses, have been digitized and distributed through online government resources. Since web interface services have become commonplace in recent years; [5] one might ask whether accessible websites are designed to meet the user's needs, preferences, skills, and situations. If so, does the flexibility benefit people in certain circumstances, "such as people using a slow Internet connection, people with temporary disabilities such as a broken arm, and people with changing abilities due to aging [31]."

Jaeger's findings have discovered "government agencies do not, as a rule, engage citizens in the development of their e-government services and resources. Rather, many applications are internally driven to meet cost savings and other government mandates regarding efficiency [4]." If government agencies are not engaging users for feedback on desired services and resources; then how are they testing and deploying accessible resources to users within their communities?

For users to have engaged in government services and resources without barriers, agencies must take an in-depth look into the strategies needed for integrating and designing the information and services required by their end users.

Many laws that have been enacted, empower a retrofitting culture of mandates that are designed or implemented after the delivery of information rather than building it into the early planning stages or long-range planning [6,13]. If today's Internet were to fulfill a promise of providing levels of inclusion for individuals with disabilities; then equal access without barriers must be addressed and eradicated. Mechanisms built into the development, iteration, and deployment of these services would be better for all users had they been integrated from the onset of creation [10,4,1].

SURVEY METHODS
A survey was developed to ask management and creative stakeholders about their mental models of various aspects of website accessibility. Web accessibility has been researched [2,6,8,9,10,11,13,15,32,36], defined (26,27,28,30), and tested [2,15,32] for over a decade. Accessibilities research and testing have been primarily based on guidelines applied to post-development websites. The goal of this study was to identify how stakeholders mental models differ based on their organizational, procurement, and accessibility knowledge. After development, the survey was pre-tested and then distributed.

The survey was distributed using two government professional organizations, and a University graduate program: the National Association of Government Webmasters (NAGW), the Government Management Information Sciences (GMIS), and Northern Illinois University Masters in Public Administration (MPA) program. The survey was distributed using the organization's email systems and made available to participants for three weeks.

DATA COLLECTION
The data was collected using the DePaul Qualtrics system. Survey questions were categorized into five sections:

Screener
Screener questions were asked of each participant. These questions had looked to identify: (1) the participant must be at least 18 years old, (2) the participant be a current state and or local government employee, (3) the participant have a current job title that closely matches a set of benchmark positions, and (4) the participant be involved in the creation or direction of website content (e.g., conceptual ideas,

production, development, or manager).

Organizational Demographics

The organization based questions were asked of each participant to identify: (1) type of government, (2) population size, (3) Home Rule (Dillion's Rule) status, (4) equalized assessed value, and (5) the percent of disabled persons living within their community.

Procurement Demographics

The procurement questions were asked of each participant. This section had defined Voluntary and Government Product/Service Accessibility Templates. Participants were asked their prior knowledge and level of agreement to using these types of templates in the future.

Accessibility Knowledge

The accessibility questions were asked of each participant. The questions were based on general accessibility (content management systems, duration since the last website redesign, knowledge of regulations) and the four areas of the POUR framework: perceivability, operability, understandability, and robust.

General Demographics

These questions were asked of each participant. Participants were asked the length of employment, years at the organization, age, and gender.

ANALYSIS METHODS

A total of 49 participants were recorded for the survey. 24 participants had completed the survey. 24 participants had uncompleted surveys. One participant had screened out of the survey. The low participation rate (N) had caused the results to be divided into two groups: completed and uncompleted. The final analysis was focused on the completed group.

The survey results for Question 1.3, *Job Title,* were converted into two quantitative groups. The position titles that had been identified as *management* were given a binary value of 0. Position titles that had been identified as *creative* were given a binary value of 1. After further analysis, 11 survey questions and their responses were removed from the results. These questions had been identified as having measurement errors based on wording or exceeding respondents potential.

Statistical inference was used to construct multiple two-sided t-tests using RStudio. These tests were conducted on the final survey questions to examine how mental models of accessibility differ between the two groups of government stakeholders.

SURVEY RESULTS

Demographics

The survey was completed by 24 participants (Table 1). Participants had responded with a position title of 2 - Village/City Manager/ Executive Director, 6 - department directors, 7 - department managers, 2 - content creator/specialists, 2 - designers, and 5 - developers. 13

were male, and 10 were female, and one chose not to answer.

Respondents were aged: 25-35: 3; 36-45: 8; 46-60: 6; 60 and over: 6; and one preferred not to answer. Stakeholder distribution resulted in 15 (62.5%) participants identifying themselves as managers or department heads, while 9 (37.5%) identified as content creators.

Characteristics	# of Participants
Stakeholder type	
Manager/Department Director	15
Content Creator	9
Position type	
Village/City Manager/ Executive Director	2
Department Directors	6
Department Managers	7
Content Creator/Specialist	2
Designers	2
Developers	5
Age	
25–35	3
36-45	8
46-60	6
60+	6
No answer	1
Gender	
Female	10
Male	13

Table 1. Participant Demographics

Procurement

The definitions of Voluntary Product Accessibility Templates (VPAT) and Government Product/Service Accessibility Templates (GPAT) were given to all participants. Questions were asked about their knowledge and whether future template usage might be used in vendor selection. 80% of the participants responded as not having prior knowledge of a VPAT document (Table 2); while 90% of participants had no prior knowledge of the GPAT document (Table 3).

When participants were asked if they would use VPAT or GPAT templates in future vendor selection: 8 (33.3%) responded as neither agree or disagree, and 16 (66.7%) agreed or strongly agreed.

Stakeholders	# of Participants
Prior Template Knowledge	
Manager/Department Director	
Yes	3
No	12
Content Creator	
Yes	1
No	8
Future Template Usage	
Manager/Department Director	
Neither Agree or Disagree	5
Agree	7
Strongly Agree	3
Content Creator	
Neither Agree or Disagree	3
Agree	4
Strongly Agree	2

Table 2. Prior and Future VPAT Usage

Stakeholders	# of Participants
Prior Template Knowledge	
Manager/Department Director	
Yes	2
No	13
Content Creator	
Yes	0
No	9
Future Template Usage	
Manager/Department Director	
Neither Agree or Disagree	6
Agree	7
Strongly Agree	2
Content Creator	
Neither Agree or Disagree	2
Agree	6
Strongly Agree	1

Table 3. Prior and Future GPAT Usage

Website Knowledge

Seven questions were asked of stakeholders to measure and identify website knowledge regarding their content management systems. Questions 5.5, 5.6, and 5.7 were modeled after questions in Lazar's survey [11] to observe changes in stakeholder mindsets.

Question 5.1 had asked, *"How would you categorize your website's content management system: in-house (Wordpress, Drupal, custom) or vendor purchased (CivicPlus, Invision, etc.)?"* 11 (45.8%) participants had responded as having in-house, and 13 (54.2%) had purchased through a vendor.

Question 5.2 had asked, *"When was the last redesign of your website?"* The question sought to identify how current the participant's website was since last redesigned. Participants had responded with 4 - were less than six months, 3 - one year, 8 - two years, 1 - three years, 3 - four years, and 5 with greater than five years.

Question 5.3 had asked, *"How would you categorize your website's content management?"* The question sought to categorize the website management by one or many persons in the organization. 12 participants (50%) had responded centralized with the other 12 (50%) decentralized.

Question 5.5 had asked, *"Have you ever been involved with the creation of a website that is accessible for users with disabilities?"* The question sought to identify participants involvement with accessible website creation. 12 participants (50%) responded yes, and the other 12 (50%) participants answered no.

Question 5.6 had asked, *"Are you familiar with the Section 508 laws by the U. S. Federal government?"* The question sought to identify participant's knowledge of current accessibility laws. 17 participants (73.9%) responded they were familiar with the Section 508 laws, 3 (13%) responded as uncertain, and 3 (13%) responded with no knowledge.

Question 5.7 had asked, *"Is the website that you are currently overseeing accessible to users with disabilities?"* 14 participants (58.3%) had responded as currently overseeing an accessible website, 6 (25%) had responded as uncertain, and 4 (16.7%) had indicated their website was not accessible to users with disabilities.

POUR Methodology

The next four sections, participants were asked their level of agreement or disagreement to statements based on the four areas (perceivability, operability, understandability, and robust) of the POUR framework.

Perceivability has been defined as a website with information and user interface components that people with different perceptive preferences and needs can decipher. Therefore one must give alternatives to these elements if users cannot use particular senses.

Question 6.2 had stated, *"Our website provides text alternatives for any non-textual content."* The statement had sought to measure and identify the usability standard of the website based on WCAG's principle of text-alternatives. 4 participants (16.7%) had responded disagreed, 6 (25%) responded as neither agree or disagree, 12 (50%) responded with agree, and 2 (8.3%) responded with strongly agree.

Question 6.4 stated, *"Our website makes content adaptable and available to assistive technologies."* The statement sought to measure and identify the usability standard of the website based on WCAG's principle of adaptability. 3 participants (12.5%) had responded disagreed, 8 (33.3%) responded as neither agree or disagree, 10 (41.7%) responded with agree, and 3 (12.5%) responded with strongly agree.

Question 6.6 stated, *"Our website allows users to view content without loss of functionality through scaling text."* The statement had sought to measure and identify the usability standard of the website based on WCAG's principle of distinguishability. 1 participant (4.2%) had responded with disagree, 9 (37.5%) responded as neither agree or disagree, 9 (37.5%) responded with agree, and 5 (20.8%) responded with strongly agree.

Operability has been defined as allowing everyone the ability to manage their website's user interface components and navigation using various devices.

Question 7.2 stated, *"Our website makes functionality available through keyboard accessibility."* The statement had sought to measure and identify the user's knowledge of a feature based on WCAG's principle of keyboard accessibility. 13 participants (54.2%) had responded yes, 10 (41.7%) responded as uncertain, and 1 (4.2%) responded no.

Question 7.5 stated, *"Our website provides breadcrumbs on all internal pages."* The statement had sought to measure and identify the usability standard of the website based on WCAG's principle of operability. 16 participants (66.7%) had responded yes, 4 (16.7%) responded as uncertain, and 4 (16.7%) responded no.

Question 7.6 stated, *"Our website's textual link colors change after previously viewing resulting pages."* The statement had sought to measure and identify the usability standard of the website based on WCAG's principle of navigation in addition to judging participant's knowledge. 12 participants (50%) had responded yes, 8 (33.3%) responded as uncertain, and 4 (16.7%) responded no.

Question 7.7 stated, *"Our logo creates a link to our homepage on all internal pages."* The statement had sought to measure and identify the usability standard of the website based on WCAG's principle of navigation in addition to judging participant's knowledge. 21 participants (87.5%) had responded yes, 2 (8.3%) responded as uncertain, and

one did not answer.

Question 7.8 stated, *"Our website's textual links display in a shade of blue."* The statement had sought to measure and identify the usability standard of the website based on WCAG's principle of navigation. 17 participants (70.8%) had responded yes, 4 (16.7%) responded as uncertain, 2 (8.3%) responded no, and one did not answer.

Question 7.9 stated, *"Our website's textual links are underlined."* The statement had sought to measure and identify the usability standard of the website based on WCAG's principle of navigation. 15 participants (62.5%) had responded yes, 5 (20.8%) responded as uncertain, and 4 (16.7%) responded no.

Question 7.10 stated, *"Our website's site search is prominently displayed on the homepage."* The statement had sought to measure and identify the usability standard of the website based on WCAG's principle of navigation. 22 participants (91.7%) had responded yes, and 2 (8.3%) responded as uncertain.

Understandability has been defined as website information and operations of the user interface to allow users to understand content and structure in a friendly way.

Question 8.5 stated, *"My organization includes community members with disabilities to test our website and online services."* The statement had sought to measure and identify the usability standard of the website based on WCAG's principle of input assistance. 3 participants (12.5%) had responded yes, 2 (8.3%) responded as uncertain, and 19 (79.2%) responded no.

General Demographics
The survey had concluded by asking participants their level of agreement or disagreement with their organization's measure of accessibility and policy. Questions 10.3 and 10.5 were modeled after questions in Lazar's survey [11] to observe changes in stakeholder mindsets.

Question 10.2 stated, *"We have or look to establish/implement an accessible content and services policy in the next 12 months."* The statement had sought to measure and identify public organization creation of accessibility policies. 1 (4.2%) participant had responded strongly disagreed, 4 (16.7%) responded as disagreed, 6 (25%) responded as neither agree or disagree, 7 (29.2%) responded with agree, and 6 (25%) responded with strongly agree.

Question 10.3 asked, *"When you make updates to your website, do you consider the factor of making the site accessible to all users?"* The question had sought to measure and identify inclusive content creation. 1 (4.2%) participant strongly disagreed, 2 (8.3%) disagreed, 14 (58.3%) responded with agree, and 7 (29.2%) responded with strongly agree.

Question 10.4 stated, *"All new public facing information and services are evaluated for accessibility."* The statement had sought to measure and identify inclusive public services. 1 (4.2%) participant had responded with strongly disagreed, 7 (29.2%) responded disagreed, 5 (20.8%) responded as neither agree or disagree, 7 (29.2%) responded with agree, and 4 (16.7%) responded with strongly agree.

Question 10.5 asked, *"Who do you think should be responsible for ensuring a website is accessible for users with disabilities?"* The question had sought to measure and identify responsibility for inclusive government websites. 9 (4.2%) participants had responded with Village/City Manager/Exec Director, 14 responded with Department Director, 10 responded with Department Manager, 14 responded with Content Specialist, 13 responded with Designer (Graphic, Web, UI), 10 responded with Programmer, and 15 responded with Developer (web, application, front/back end, mobile).

DISCUSSION/CONCLUSION

Accessible websites may be challenging to maintain by stakeholders. However, a creator's and stakeholder's mindsets and responsibilities are difficult to determine through accessibility studies.

The survey results had indicated few participants used or had knowledge of VPAT and GPAT templates. However, participants had agreed that future government solicitation would benefit from using procurement templates. The participants were familiar with Section 508 laws and their website's accessibility to users with disabilities. However, few organizations had included community members with disabilities in testing their website's level of accessibility.

The survey results from questions (5.5, 5.6, 5.7, 10.3, and 10.5) were compared with the modeled questions from Lazar's findings [11]. The participants who had been involved with the creation of accessible websites had declined. The knowledge of Federal laws concerning Section 508 had shown a slight decline. Managed websites that were considered accessible to users with disabilities have shown a slight increase. Updates and factors of making websites accessible had increased. The participants are not specific as to what position should be responsible for making a website accessible. However, participants have responded with a general response from department director to developer.

Overall, the survey results had found no significant differences that could establish or confirm that mental models of accessibility differ between government stakeholders.

LIMITATIONS AND FUTURE WORK

The length of the survey and measurement errors based on wording or exceeding respondents potential may have limited the size of the sample. Future research would include shortening the length of the survey and limiting the respondent's knowledge potential.

In past surveys [11] as well as this survey, the majority of stakeholders' organizations do not include community members with disabilities to test their websites and online services.

Future surveys which continue to explore accessibility might look into: (1) how government agencies assess and understand their end users' needs, (2) how web accessibility policies have encouraged accessibility by considering it a core feature rather than an afterthought [30], or (3) how to find a way to measure the cost of web accessibility [19,32].

The openness to comply with regulatory laws has taken a slow start. Jaeger has stated, "Governments need to incorporate ongoing evaluation practices regarding their E-Government services to continually improve and enhance their services [4]." When government websites are created from the beginning to use Section 508 standards, it would take minimal effort to maintain and improve one's existing services.

As federal regulatory laws regarding accessibility are added; a broadened knowledge of accessibility and inclusive design will increase the ability for people to obtain information and conduct electronic transactions, increase civic engagement and independence for individuals with disabilities, and allow government agencies to gain access to a larger pool of developers and content creators with accessibility knowledge [23].

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