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# Towards a Conceptual Framework for E-Government Accessibility for Persons with Disabilities in Developing Countries

Millicent Agangiba
*University of Cape Town*, agnmil001@myuct.ac.za

Salah Kabanda
*University of Cape Town*, salah.kabanda@uct.ac.za

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Millicent Agangiba
University of Cape Town,
agnmil001@myuct.ac.za

Salah Kabanda
University of Cape Town,
salah.kabanda@uct.ac.za

## *Abstract*

Most governments around the world are fast advancing in the provision of services to their citizens through the web. However, developing countries still lag behind in the adoption and use of ICTs in government for inclusive purposes, specifically for persons with disabilities (PWDs) who tend to be side-lined from the population mainstream. Studies focusing on E-government accessibility for PWDs have been minimal from the developing countries context; and this is despite the fact that over eighty percent of the over one billion populations living with disabilities worldwide reside in the developing countries. For E-government to achieve its purpose of providing fast and efficient services to citizens, there is the need to adopt a context-oriented approach. Against this background, this paper proposes a conceptual framework for improving E-government accessibility for PWDs in the developing countries context. Through a systematic synthesis of the literature on E-government accessibility especially in developing countries, a conceptual framework, termed the E-government Accessibility Development Model (EADM) is proposed. EADM describes accessibility challenges of PWDs by identifying contextual barriers of E-government accessibility from multiple stakeholder perspective in developing countries.

## *Keywords*

E-government Accessibility, Persons with Disabilities, Assistive Technologies, Developing Countries and Web Accessibility

## 1.    Introduction

E-government (electronic or digital government) is the use of information and communication technologies particularly the Internet by government to deliver its services to the different stakeholders: citizens (G2C), business (G2B) and other governmental agencies (G2G). The effective applications of ICTs by government can make them more responsive (Adesola, 2012), and is perceived to be the most effective way for government to serve its stakeholders whilst simultaneously running an open and participatory administration (Posada et al., 2014). However, developing countries still lag behind in the adoption and use of ICTs in government for inclusive purposes, specifically in addressing challenges facing persons with disabilities (PWDs) who tend to be side-lined from the population mainstream. Few

studies have documented how E-government fails to address social inclusion and accessibility for all. For example, Abanumy et al, (2005) show how most government websites in Saudi Arabia and Oman were not accessible to PWDs. In another study, accessibility evaluation by Baguma et al, 2007; indicated that all (100%) government websites in Uganda were inaccessible to PWDs. Similar findings are reported in several African countries (Boussarhan & Daoudi, 2014; Rorissa & Demissie, 2010; Makoza & Chigona, 2013). The limited number of studies focusing on PWDs and their access to E-government services in developing countries (Rorissa, & Demissie, 2010; Rodríguez Bolívar et al., 2014), is a concern because access to E-government services, can give PWDs equal access to vast potential job market, information and services and promote their social inclusion in the digital society (Carter & Markel, 2001; Bonacin et al., 2010). The few studies that do address E-government in developing countries, their findings fail to address the context specificity which shape the E-government phenomenon towards PWDs. Paying attention to the context in which E-government services will be accessed from and by whom is important not only because accessibility prerequisites of the developed countries are very different from those of developing countries (Abanumy et al., 2005; West 2005); but also because the tools required to achieve and measure accessibility are either not easily available or these tools fail to integrate PWDs in them (Rubaii-Barrett & Wise, 2008). As governments advance in providing more sophisticated services online, the cost of excluding PWDs could become higher (Dugdale et al., 2005). Against this background, this paper focuses on G2C and proposes a conceptual framework for improving E-government accessibility for PWDs in the developing countries context. The study follows a systematic literature review analysis approach. The rest of the paper is structured as follows: Section 2 will provide related studies on E-government accessibility. Section 3 covers research methodology. The findings and the discussion are documented in Section 4. Finally, Section 5 presents conclusion, recommendations and future research.

## 2.    Related work on E-government Accessibility

One of the cited benefits of G2C has been its ability to promote transparency, effective governance and encourage active citizen participation in government (Fang, 2002). However, whilst meeting these objectives, G2C can also act as a tool for exclusion, particularly for PWDs. In the quest to address equal access to online services; several practical guidelines have been proposed: the use of a model that can guide researchers to identify gaps in their understanding of the phenomenon (Bloch & Richins, 1983); the use of automatic tools so as to address the barriers perceived to be inherent with regards to accessibility; and understanding website implementer's perspective of the website, since perception can shape attitude and ultimately the implementation of an accessible website.

### 2.1    Automatic tools

Accessibility of websites can be evaluated using international standards such as the Web Content Accessibility Guidelines (WCAG) or the legal requirements of Section 508 of the Rehabilitation defined by the US Congress. Section 508 of the Rehabilitation Act of 1973, as amended in 1998 require Federal agencies to make their electronic and information technology accessible to PWDs (Olalere and Lazar 2011). The WCAG documents explain how to make information in a web page or web application more

accessible to PWDs (http://www.w3.org/WAI/intro/wcag). Scholars that have used this approach include Paris Al-Faries et al (2013), Goette et al. (2006), and Hong et al. (2008). Each of them has reported a lack of conformance of the websites to the WCAG guidelines. Although these guidelines provide stakeholders with a means of addressing accessibility; the implementation of these tools and guidelines presents unique challenges. For example, 'it is readily possible for an individual to find a particular web resource accessible on one platform, say a smart phone, but presenting them with accessibility challenges or barriers on different platforms, say a PC or web-enabled TV' (Cooper et al., 2012). Other challenges have been highlighted by Alonso et al (2010) to include accessibility supported technologies; testability of success criteria; openness of techniques and failures; and the aggregation of partial results. Power et al (2012) found that although some of the problems encountered by users were covered by the WCAG; the techniques recommended in WCAG did not solve all the problems of other users. The implication is that even if these best practice tools and guidelines are implemented on websites, 'there is little indication that PWDs will encounter fewer problems' (Power et al 2012, 433).

## 2.2    Web masters and web developers as key stakeholders

Given that accessibility tools are directed at those who design, develop websites; it is therefore important to include them as participants so as to assess their views on accessibility, and not merely as vehicles that facilitate accessibility of websites. Webmasters and web developers' perception and awareness of the need for accessibility can influence design (Baguma et al., 2007; Freire et al., 2008). For example, Evans-Cowley (2005) surveyed webmasters about the accessibility of 100 large municipal websites in USA. The results show that 87% of webmasters are familiar with section 508, but only 18% of the municipal websites follow these standards. Power et al (2012, 433) notes that 'despite awareness of accessibility increasing over the last decade at the level of government and legislation, the level of knowledge in the community of web commissioners and web masters remains quite low'. The implication is that the role of accessibility tools and related guidelines remained unclear to these stakeholders and this could have a negative consequence on how they design, develop, and maintain a website. Jaeger's (2008) study on webmasters perceptions of the accessibility of their websites, revealed that webmasters perceptions often did not match the findings of the user testing and the expert testing. He found that problems of communication existed between the providers of E-government websites and the users of E-government websites. These findings, according to Jaeger (2008) were problematic, both in terms of accessibility and in terms of larger issues of the overall responsiveness and transparency of E-government.

## 2.3    The use of models

For the purpose of structure and a framework of reference, researchers have proposed four main models to address accessibility for PWDs: Composite Practice Model (CPM), Holistic Model (HM), Contextualized Model (CM) and the Web Accessibility Integration Model (WAIM). The Composite Practice Model is an approach that lays emphasis on Assistive Technologies (AT) to address accessibility and service delivery for PWDs.  Leung et al. (1999) used CPM to describe and explain current practice in regard to AT service delivery in post-secondary educational settings across Australia.

The model's strength is in how effectively it highlights the contribution of a range of stakeholders. The Holistic Model approach places PWDs at the core of accessibility development which helps to provide accessibility for diverse disabilities (Kelly et al., 2005). The model focuses on the individual needs of the disabled to provide solutions either via electronic or alternative means taking into consideration the resources available to the individual. Kelly et al (2005) used the holistic model to understand accessibility in e-learning.

The contextualized model argues that accessibility is a practice or activity that can and will be mediated (Seale 2006). As a practice, it consists of three components of accessibility: stakeholders of accessibility, context in which these stakeholders have to operate and how the relationship between the stakeholders and the context influences the responses they make and the accessible practices that develop. Stakeholder's responses or practice to accessibility are mediated by the context in which they operate. Lazar et al (2004) propose the Web Accessibility Integration Model which is based on technological determinism and a methodological approach grounded on conformance to guidelines. WAIM describes various components that influence web accessibility such as societal values, stakeholders and web development process (Lazar et al., 2004). The model describes various ways accessibility flaw enter design and how to make the web a more accessible place. Although these models have adequately addressed issues of accessibility, they have done so in the context of E-learning and not specifically in the context of E-government services – focusing on PWDs in the developing country context.

## 2.4    Discussion
The assessment of the literature reveals three distinct categories of how accessibility of websites for PWDs is being addressed. Researchers who use automatic tools as evaluation criteria for accessibility of websites for PWDs conclude that techniques recommended by WCAG or the legal requirements of Section 508 of the Rehabilitation did not solve all the problems of PWDs users. To address this challenge; some researchers opt to include designers, web masters and web developers when addressing accessibility of websites because these stakeholder's perception about accessibility can determine the success of it. Researchers who focus on the use of models want to better understand the accessibility phenomenon. Each of the proposed models has its benefits and yet these models provide a limited explanation of, and may sometimes contradict, observed continuance behaviors – especially in the developing country context. This is because empirical evidence from the use of these models has generally been conducted in the context of the developed countries. In order to address the accessibility challenge in developing countries for PWDs, this study seeks to analyze scholarly articles that have looked at the accessibility phenomenon towards PWDs especially in developing countries.

## 3.    Methodology
This study adopted Harden and Thomas', (2005) guidelines on systematic literature review analysis. The following databases were systematically searched: Government Information Quarterly, Electronic Journal of e-Government, IT for Development, Electronic Journal of IS in Developing Countries,

African Journal of Information Systems, and the Journal of Disability Policy Studies. The Government Information Quarterly and the Electronic Journal of e-Government are top journals that address governance issues. The other four journals are high ranking Information Systems journals that focus on developing countries and disabilities studies. Searches included publications in English from the year 2000 – 2015. Within this period, issues of accessibility with regards to online services gained much attention after the formulation of Web Content Accessibility Guidelines version one (WCAG 1.0) in 1998. Google Scholar was also used in addition to assist with a broader search of literature which possibly were omitted using the databases.

Search key terms used were specific to the main goal of the study: E-government accessibility for PWDs in developing countries. As such, the key terms used include: E-government, E-government accessibility, Web Accessibility, Assistive Technology, Developing countries and Persons with Disabilities. The initial search resulted in a total of 616 papers from the six journals. A complement search from Google Scholar resulted in additional 16 articles bringing the total articles to 632. Each of these journal articles became the data corpus for the study. The analysis commenced by reading each of the articles to understand the article's goal and relevance to this study. Whilst doing this analysis, it was found that some articles were repeating and therefore were discarded. For example, in the Journal of IT for Development, the article "A Study of Local Government Website Inclusiveness: The Gap between E-government Concept and Practice" repeated three times. This exercise reduced the total articles in the data corpus to 500. At the next stage of analysis 46 articles were removed because they were administratively focused (i.e special journal issues, commentary). For example, Electronic Journal of e-Government had special journal issues encompassing papers presented at the European Conference on E-government for the past years. After this stage, 454 remained for further analysis.

| Data source | Initial search | After Removing repeating articles | After Removing Special journal issues | Articles on E-government Accessibility | Final search (Focus on Disability) |
|---|---|---|---|---|---|
| Disability Policy Studies | 132 | 116 | 116 | 10 | 3 |
| Journal of IT for Development | 97 | 80 | 60 | 14 | 1 |
| Electronic Journal of e-Government | 229 | 167 | 141 | 15 | 3 |
| Electronic Journal of IS in Developing Countries | 44 | 40 | 40 | 0 | 0 |
| African Journal of IS | 14 | 14 | 14 | 1 | 0 |
| Government Information Quarterly | 100 | 67 | 67 | 11 | 7 |
| Google Scholar | 16 | 16 | 16 | 11 | 11 |
| | 632 | 500 | 454 | 62 | 25 |

**Table 1**: Summary of literature synthesis

Each of the remaining articles in the data corpus was reviewed in the following manner to assess the articles relevance to the study. The article's title, abstract, keywords, introduction and conclusion were read; and articles whose focus was only on E-government accessibility were included for the next phase

of analysis. This exercise once again substantially narrowed down the number of articles to 62 (see Column 4). The next phase of analysis focused on determining whether the articles were specific to PWDs and online services. That is, only articles that focused on PWDs were included - those that were on E-government accessibility but whose unit of analysis was not PWDs were excluded. For example, Reddick et al (2012) examines how factors of the digital divide explain channel choice made by citizens in the context of E-government. Thus although the study addresses E-government and accessibility, the focus was not on the disabled, but rather on the digital divide. A total of 37 papers were removed, making the data corpus to have 25 articles. The remaining articles were categorized into research goals, approach, and technique as shown in Table 2.

| | Focus point | Framework | Articles |
|---|---|---|---|
| Goal | Investigate how disability policy and law impact E-government accessibility | WAIM | 4 |
| | Investigate how assistive technologies impact on E-government accessibility | CPM | 1 |
| | Evaluate E-government websites accessibility for persons with disabilities | WAIM | 15 |
| | Understand perception of government and web developers/ webmasters on E-government accessibility | WAIM | 3 |
| | Examine factors hindering web accessibility for PWD | CM | 2 |
| Methodology | Quantitative: Website analysis, Questionnaires/ Survey, Document analysis | | 21 |
| | Qualitative: Observation + document analysis | | 1 |
| | Mixed Approach: Interviews + Document analysis + Website analysis | | 3 |

**Table 2***: Summary of goals and methodologies for articles

## 4. Findings and Discussion

### 4.1 Focal points on accessibility of E-government in developing countries for PWDs

The findings shown in Table 2, show that the majority of papers were focused on one common theme – that of evaluating E-government websites accessibility for PWDs using automatic tools. The next theme that received significant attention was how disability policy and law impact E-government accessibility. The next set of articles advocated for the need to understand perception of government and web developers/ webmasters on E-government accessibility issues. Finally, the themes that received low count were those related to awareness of government towards accessibility problems, and how AT impact E-government accessibility. In context of the literature surveyed, only one paper used the CPM to address accessibility for PWDs. This article's focal point was on examining how availability of AT impact E-government accessibility for PWDs. Two of the papers addressed accessibility based on the CM and argue that stakeholders' responses to accessibility is greatly influenced by the resources allocated to them. The most used model in addressing the E-

government phenomenon was the WAIM model; accessibility with conformance to accessibility guidelines.

Further findings show that the majority of studies followed a positivistic stance and used quantitative methods and techniques such as Website analysis, Questionnaires, Survey and Document analysis. Although through this approach, researchers can "predict or explain the status quo" (Orlikowski and Baroudi 1991, p. 19); their findings fail to recognise that data cannot be 'value-free data, since the enquirer uses his or her preconceptions in order to guide the process of enquiry, and furthermore the researcher interacts with the human subjects of the enquiry, changing the perceptions of both parties' (Walsham, 1995, 376). Ontologically, the researcher is seen to play a passive, neutral role, and does not intervene in the phenomenon of interest. Studies that acknowledged the role of the researcher and that understood that one cannot separate themselves from the phenomena and people they study, because personal values do influence the investigation, were minimal. For example, only one study was purely interpretive in nature whilst one followed a mixed method approach that acknowledged both ontological stances.

## 4.2 Discussion of Findings

In summary, the findings show a consistent positivistic approach and the use of the WAIM model towards the address of E-government accessibility for the PWDs in developing countries. The low rate of studies following an interpretivist or a mixed method approach is problematic for the developing countries not only because these two approach endorse the subject matter of inquiry by acknowledging the world of consciousness and humanly created meanings (Ngwenyama & Lee, 1997), and, in so doing, give an understanding why people behave as they do within their specific cultural and contextual settings (Alvarez, 2002); but also because 'the positivist reliance on a human notion of causality and the location of generalizable scientific laws at the level of the empirical conjunction of events is inconsistent with both the experience of information systems research and the goal of understanding' (Smith 2006, 196). In order for researchers to understand and adequately address accessibility of E-government websites in developing countries for PWDs, we advocate for more studies that acknowledge the role of context so as to understand accessibility of E-government websites through the meanings that various stakeholders within the context assign to them. With this approach, researchers can better understand human thought and action in both social and organizational contexts (Klein & Myers, 1999); and provide actionable solutions befitting that context. Thus based on the findings, we advocate for the E-government Accessibility Development Model (EADM), that integrates the various themes that emerged from our literature synthesis: policy and law, assistive technologies, perceptions of web developers/web masters; so as to enable researchers contextualise the E-government accessibility phenomenon. By following an interpretivist approach, the model deviates from the common deterministic approach of WAIM, by arguing that technology is only one factor; its availability, affordability and purpose in a given context needs to be considered. The EADM model consists of three major categories of influences on E-government accessibility: societal foundations, stakeholder perceptions and actual web development domain of

E-government websites. Societal foundations include the value that society places on issue of accessibility evaluated through the education and training that web developers and PWDs who consume the services receive, the knowledge of government agencies regarding PWDs and subsequently the laws and policies they make with regards to the disabled. This category also includes the readily availability of AT which PWDs may employ to access E-government website and the affordability of these technologies and the training thereof. It is perceived that in countries where disability and web accessibility policies exist have more accessible websites than countries that do not (Bundrick et al, 2006; Kuzma, 2010). It is perceived that AT enhances online accessibility for PWDs however, due to the high cost of AT in developing countries; most PWDs tend to adopt readily available and affordable ones (Bengisu, 2010). In addition, PWDs require training in order to acquire the necessary skills in the use of AT; as PWDs sometimes perceive accessibility challenges due to inadequate training on AT (DRC, 2004). As such the societal foundation category determines the readiness of the public in terms of awareness of PWDs by all stakeholders; availability and affordability of AT that are contextualised to suit developing countries problems; training and education targeted not only to increase awareness but also to address the development and implementation of accessible E-government services for PWDs; and the development and implementation of policy and laws that address accessible E-government services for PWDs. The various stakeholders that are perceived important in addressing this challenge include the government who craft the policy and rule of law that is favourable for accessible E-government services for PWDs.

The next stakeholder involved in the challenge of accessible E-government services for PWDs is the web developers who are involved in the design, development and maintenance of websites and who should have had the appropriate training and education related to implementing contextualised accessible E-government services for PWDs. Most E-government systems have designers' perceptions inscribed in them (Heeks, 2005). As a results, web developers' knowledge and training on AT will enable them create websites that are compatible with these devices (West 2005). Web developers should therefore be sensitized to the challenges facing PWDs within their specific context. Web developers' perceptions inform their approach of design, for example designing from scratch for accessibility rather than retrofitting after design (Rubaii-Barrett & Wise, 2008). Web accessibility is better understood within the context of the knowledge of society and stakeholders which influence the entire web development process. The final stakeholder is the PWDs who provide the relevant information relating to specific challenges they face and their needs be addressed with regards to making E-government services accessible. The findings point to the need for web developers to not only evaluate the accessibility of their websites using automatic tools, but should also involve PWDs during the entire implementation. This is because user involvement ensures that a more user-centered design is developed with less barriers and greater usability (Bertot et al., 2008; Henry et al., 2014).

Finally, the framework proposes Web development as the final construct. Societal foundations and stakeholder perceptions influence the entire web development process. From start of design, evaluation through to final design; accessibility is determined by guidelines and evaluation tools developers' use. Evaluation forms important stage of web development both during and after design (Arrue, Vigo, & Abascal, 2008). Selection of appropriate design guidelines and evaluation tools play a useful role in developing accessible websites (Arrue et al., 2008; Paterno & Schiavone, 2015). The process of design and evaluation helps to produce a citizen-centric design (Bertot et al., 2008). The framework argues that if all constructs are comprehensively considered, E-government services developed will be accessible to PWDs.
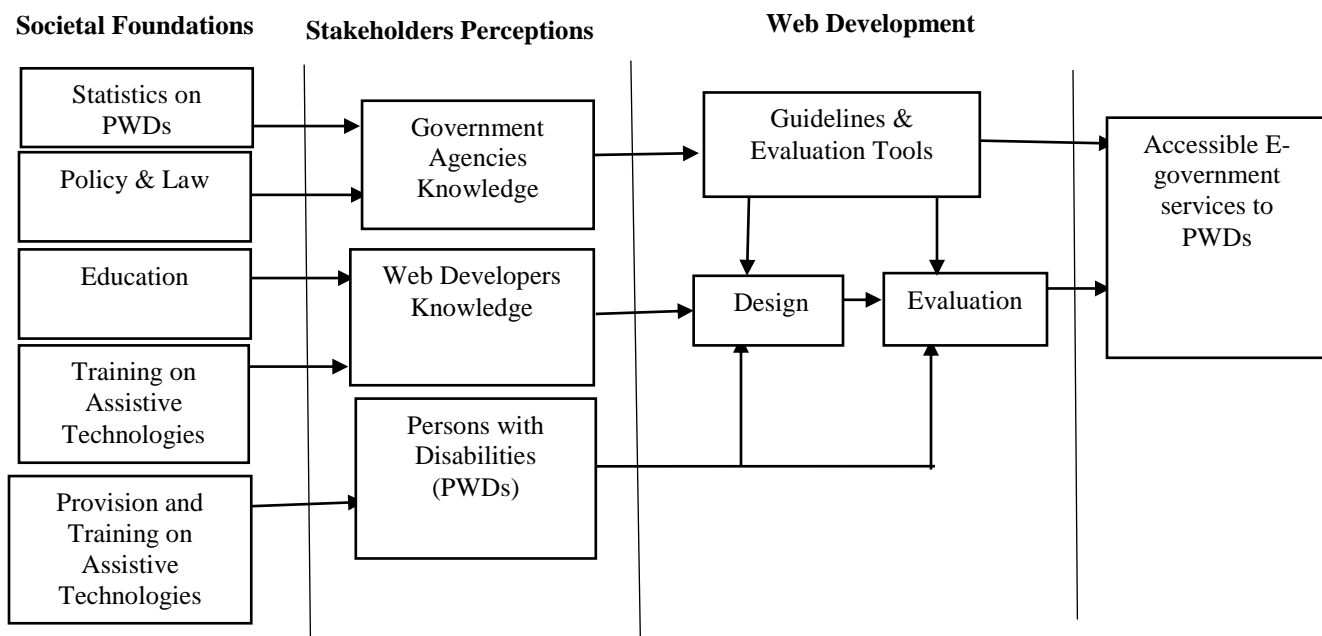
**Societal Foundations**  **Stakeholders Perceptions**  **Web Development**

- Statistics on PWDs
- Policy & Law
- Education
- Training on Assistive Technologies
- Provision and Training on Assistive Technologies

- Government Agencies Knowledge
- Web Developers Knowledge
- Persons with Disabilities (PWDs)

- Guidelines & Evaluation Tools
- Design
- Evaluation
- Accessible E-government services to PWDs

**Figure 1**- E-government Accessibility Development Model

# 5. Conclusion

The purpose of this study was to identify factors that influence accessibility during the development of E-government particularly for PWDs in developing countries with the purposes of proposing a conceptual framework for improving E-government accessibility for PWDs. Following a systematic literature review analysis, the study identifies three groups of influences; societal foundations, stakeholder perceptions and web development process. For E-government services to be accessible to PWDs, society has to place more priority on accessibility issues specifically in (1) training and education to address awareness and knowhow of web developers and policy makers in developing countries on contextual challenges facing PWDs; (2) the development and implementation of contextual policies that address contextual challenges facing PWDs; and (3) the readily availability and affordability of assistive technologies and devices employ by PWDs in accessing websites. Although the conceptual model addresses the limitation of the previous studies; we propose a future empirical work in order to refine the relevance and applicability of various constructs so as to arrive at a framework for

addressing E-government accessibility for PWDs in developing countries. To this end, our current research is using the conceptual framework as a basis for gathering evidence from case studies in a developing country context with the aim of building a model which can serve as a practical basis for developing accessible E-government for PWDs.

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