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CITIZEN CENTRIC EVALUATION OF ACCESSIBILITY OF ICT SERVICES FOR PERSONS WITH DISABILITY: A CASE STUDY OF HUDUMA CENTRES IN KENYA

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A project report submitted in partial fulfilment of the requirements of for the award of the Master of Science in Computer Science of the University of Nairobi

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Declaration

I declare that this project report is my original work except where due references are cited. To the best of my knowledge, this it has not been submitted for any other award in any University. Data from other sources has been acknowledged.

Signature: …… Date: ……..

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SUPERVISOR

This project report has been submitted in partial fulfilment of the requirement of Master of Science in Computer Science of the University of Nairobi with my approval as the University supervisor.

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Mr. Christopher Moturi

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Dedication

This study is dedicated to all the Persons with Disabilities, Disability Advocacy bodies and other stakeholders that strive to ensure an inclusive society.

Abstract

Abstract

Kenya National Bureau of Statistics survey show that an estimated 1.3 million Kenyans live with vision, hearing, mobility or cognitive disabilities. In 2013, the Kenya government initiated Huduma programme which is a single point of access to public services including electronic services and information offered by different public agencies. However, important questions arise on whether PWD are accessing e-government services at these centres and if not what needs to be done to ensure reasonable access to all. With increasing recognition for the rights for disadvantaged groups such as persons living with disability and the elderly in the society, there is need for governments to ensure that e-government services are accessible to all. This study aimed at establishing the extent to which e-government services offered at the Huduma Centres in Kenya are accessible to PWD, highlighting the various issues they face in accessing the services, drawing lessons that would expand access and proposing any solutions thereof. To conduct this study, a mixed qualitative and quantitative research approach was pursued. This finding of this study shows that although PWD are seeking services at the Huduma centres, most of these services are not accessible to PWD to a greater extent. The study how that in general accessibility barriers including lack of appropriate devices or assistive technology, skills and design of system affect the general usage of e-government services especially for citizens with disabilities. This posed great challenge to PWD in accessing key government services in these centres thus hindering PWD in fully integrating into the society. This study is significant in many aspects as it will assist in the mainstreaming of disability in Kenya by way of supporting e-government policy makers through promoting ICT accessibility to all.

Keywords: Citizen-Centric, E-government, ICT Accessibility, Persons with Disability

List of Abbreviations

AEMs	Accessibility Evaluation Methods
AT/ATs	Assistive Technology
CAK	Communication Authority of Kenya
CRPD	Convention on the Rights of Persons with Disabilities
E-government	Electronic government
G2B	Government to Business
G2C	Government to Citizen
G2G	Government Agency to Government Agency
GoK	Government of Kenya
ICT	Information and Communication Technology
ITU	International Telecommunication Union
KSL	Kenya Sign Language
MDAs	Ministries, Departments and Agencies
PWD	Persons with Disabilities
WB	World Bank

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CHAPTER ONE
INTRODUCTION

1.1 Background

Nica (2015) describes e-government as the use of information and communication technologies in the provision of public services and administration by public bodies. Different e-government delivery models have been developed and they show the various levels of interactions that exist between governments and these entities, these includes: government to citizen (G2C); government to businesses (G2B); government to government (G2G); government to employee (G2E); and government to nonprofit ogranisations (G2N).Almarabeh and AbuAli (2010) suggest that the e-government implementation is a continuing process with the development conceptualized in various stages.

Historically as reported by Abdalla et al. (2016), Kenya has struggled with poor service delivery in public service and has attempted several interventions and strategies to mitigate the problem. The employment of ICT in public services delivery in various sectors is one of these strategies that the Kenya government has been employing to enhance efficiency in public service. Kamau and Wausi (2015) observed e-government has the potential to enhance efficiency, effectiveness, accountability and transparency in service delivery. Otieno & Omwenga (2015) suggest that the use of e-government can assist governments to regain public trust and confidence in public services which are often viewed to by poor by many citizens. There are various e-government benefits to citizens as identified by Misra (2006) which include: availability of services round the clock; economical to use; fast and efficient service delivery; increased transparency; equitable and convenience.

In 2013, as an approach to improve service delivery, the government of Kenya introduced Huduma Centres with an aim of transforming public service delivery by providing key services to the citizens or public. These centres will offer services offered by various state department and agencies through online web portal and also implement a Huduma payment platform for government services as indicated in the figure 1 below.

Figure 1: Huduma Centre Model *(Source: www.hudumakenya.go.ke)*

As presented from the Huduma Kenya programme website (www.hudumakenya.go.ke) the Government of Kenya has so far established these centres in seventeen (17) out of forty seven (47) counties covering different regions with Nairobi having three centres. Similarly, statistics from Huduma Kenya website show that currently 25 services are being offered to approximately 15,500 customers daily.

Despite the benefits that are likely to be gained through increase use of ICTs in services delivery in projects such as the Huduma centres, studies shows that most implementers of e-government projects have not been paying attention to the consumers of these services. Kunstelj et al. (2007) suggest that studies have revealed that there is significant gap between expressed interest from citizens and the actual e-government information and services. One such potential users

of these services are the disadvantaged groups such as persons living with disability (PWD) and the elderly in the society.

WHO and WB (2011) reports that disability should be considered as key development issue as there exist evidence showing that PWD are often more disadvantaged social and economically than persons without disabilities. The Kenya National Bureau of Statistics National Census results of 2009 shows that approximately 1.3 million people in Kenya have some form of disability, while World Health Organization puts the estimates at more than 6 million people. Out of this, physical impairment (413,698) constitute the largest proportion followed by visual impairment (331,594) as shown in the table 1below.

Table 1 Population by Main Type of Disability and Sex, 2009

Disability	Male	Female	Total
Visual	153,783	177,811	331,594
Hearing	89.840	97,978	187,818
Speech	86,783	75,020	161,803
Physical	198,071	215,627	413,698
Mental	75,139	60,954	136,093
Others	44,073	55,233	99,306
Total	**647,689**	**682,623**	**1,330,312**
% With Disability	**3.4**	**3.5**	**3.5**

Source: National Population Census 2009 (KNBS).

Although, the Kenya National Census of 2009 lacks statistics showing how or to what extent PWD really use ICT in Kenya. Although there exist a number of laws and policies advancing the interest of PWD, these group is more often disadvantaged due challenges such as inadequate accessible infrastructure education. Njoka (2012) captures some of these challenges as: low education levels; inadequate assistive technologies; inadequate intervention strategies by government; unavailable ICT infrastructure especially in rural areas where most PWD live; and issues of designs of ICT tools limiting their accessibility. Moreover,

PWD continue to face various challenges in accessing e-government services and hence the need by governments and other actors to facilitate access to all by removing barriers to ICTs. Jaeger & Matteson (2009) suggest that with most functions of government being going online, there is need to ensure equal access to PWD.

1.2 Problem Statement

While most governments are striving to provide e-government services to their citizens, there is a growing concern that not all citizens are part of this transformative agenda leading to some form of exclusion in this information age. Today, one demographic group that is attracting a lot of interest as related to their general welfare is the people living with disabilities. Recent surveys show that an estimated 1.3 million Kenyans live with vision, hearing, mobility or cognitive disabilities. The Constitution of Kenya section 54 article 1(c) stipulates that a person with any disability is entitled to reasonable access to all places, public transport and information. In the same section, article 1(d) states that PWD are entitled to access assistive devices and technologies to reduce constraints arising from the person's disability. Moreover, with increasing recognition for the rights for disadvantaged groups such as persons living with disabilities and the elderly in the society, there is need for governments to ensure reasonable access to all in e-government services. With the introduction of Huduma Centres in Kenya, it is important to know whether PWD are accessing e-government services at these centres and if not what needs to be done to ensure reasonable access them. This study therefore aimed at establishing the extent to which the services offered at these centres are accessible to PWD, investigating the barriers facing PWD in accessing the services and suggesting ways to expand access to these services by PWD.

1.3 Main Objective

The main objective of this study was to establish the extent to which e-government services offered at the Huduma Centres in Kenya are accessible to PWD.

1.4 Specific Objectives

The study was guided by the following specific objectives:

i) To establish the extent to which e-government services offered at the Huduma Centres are accessible to PWD.
ii) To determine the effect of accessibility in general usage of e-government services by PWD in Huduma Centres.
iii) To determine whether assistive technologies affect usage of e-government services by PWD.
iv) To determine how IT skills/experience affect the usage of e-government services by PWD.
v) To establish the extent to which the design of e-government systems affect usage of e-government services by PWD.

1.5 Research Questions

The above research problem will be answered through the following questions:

i) To what extent do e-government services offered at the Huduma Centres are accessible to PWD?
ii) What is the effect of accessibility in general usage of e-government services by PWD in Huduma Centres?
iii) How do assistive technologies affect usage of e-government services by PWD?
iv) How does IT skills/experience affect the usage of e-government services by PWD?

v) To what extent does the design of e-government systems affect usage of e-government services by PWD?

1.6 Research Scope

Owing to certain practical or methodological constraints, a researcher might decide to limit a study to a certain population of respondents or to a particular period of time. The focus of the study was on government to citizen (G2C): particularly on the services that the user directly interact with such registration of access to government and business name registration among others. The study was also confined looked at the environment and ICT facilities available at these centres and related accessibility issues (*Display systems, Queue management systems among others*). This study appreciated that it might not possible to cover all ranges of disabilities however it covered persons with visual, hearing or physical impairments as the extent to which they are affected varies from case to case, however, it looked at common ICT accessibility issues for PWD

1.7Justificationof the Research

Otieno & Omwenga (2015) reports that Kenya has been making significant steps in the employment of e-government in public service, but still face various challenges like many other developing countries affecting implementation of e-government. Zahid et al (2013) claim that most researchers have ignored one important aspect of digital dived that exist between general people and PWD. From existing literature, there is relatively less research on the accessibility of e-government by PWD in public sector in Kenya although the country is making significant attempts in adopting e-government and extending services to the citizens. This study is important will inform policy makers, disability advocacy groups, non-government organisations and government agencies on the challenges faced by PWD in accessibility of e-government services and provide practical recommendations on how to expand e-government accessibility in

Kenya for PWD. The study was also of value to the PWD, as it gave them a platform to express the challenges they experience in accessing e-government services offered at the Huduma Centres. This will in turn lead to informing the future designs of e-government services in Kenya, in a bid to improve accessibility of the services by PWDs.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature and is divided into several sections. First, it gives an overview of e-government, e-government in Kenya, opportunities and challenges facing the sector in general from citizens' perspective. It also provides an overview of citizen service centres and looks at PWD in Kenya, ICT accessibility issues for PWD. It also explains a range of evaluation methods for accessibility of ICT for PWD, accessibility model and the conceptual framework that guided the study.

2.2 Overview of E-government

Chun et al. (2010) predicts that ICT can to transform how governments and citizens interact. Similarly, InfoDev (2009) suggest that emerging ICTs bring services closer to the citizens and facilitate easy transactions where individuals can transact on a self-service basis. As Deloitte and Touché (2013), observed, citizens are becoming more conscious their rights by demanding government to be more efficient and effective in service delivery. In return governments are being forced to change their traditional ways of delivering this services through ensuring access of information online, automating of government processes and allowing citizens to access these services online.

Alshehri et al. (2012) suggested, these differences in definitions represent important considerations or priorities in the government strategies. Whereas, Kamau & Wausi (2015) describe e-government as the use of ICT in provision of public services.

From existing literature, e-government has different models of delivery based on type of relationships between government and other key stakeholders. As explained by InfoDev (2009), e-government aims at making interactions between

government and citizens easier, convenient, transparent, and less expensive. Chen & Zhang (2011) report that the early formulation of e-government performance measures begins with a heuristic assessment of e-government maturity. There are different e-government maturity models developed by various scholars or institutions shown in the table below.

Table 2: Models of e-government

Model	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Gartner (2000)	Web presence	Interaction	Transaction	Transformation	
UN/SPA (2002)	Emerging presence	Enhanced presence	Interactive	Transition	Seamless(Networked)
Layne & Lee (2001)	Catalog	Transaction	Vertical integration	Horizontal integration	
Anderson & Henriksen (2006)	Cultivation	Extension	Maturity	Revolution	
Hiller & Belanger (2001)	Information provision	Two-way communication	Transaction	Integration	Political participation
Siau (2005)	Web presence	Interaction	Transaction	Transformation	E-democracy

Source: Ganapati & Reddick (2013).

E-government readiness depends on a number of factors as explained by The WB (2004) such level of infrastructure development; responsive civil service to the changing business environment, internet penetration, prevailing legal framework, and political commitment.

2.3 Citizen-Centric E-government Service

Otieno & Omwenga (2015) report for e-government projects to be seen as successful, it is imperative for analysis implementation challenges be looked from a citizen-centric perspective. Likewise, Sigwejo & Pather (2016) suggest "citizen-centric government service delivery has become a trend for most governments and that citizen-centric model is an emerging one that considers citizens to be at the centre and offers them a single interface to access all (or a range of) government services".

Otieno & Omwenga (2015) observe that the focuses on provision of e-government delivery is today viewed from two perspectives the supply and demand side. The supply side emphasize factors such ICT infrastructure and policies whereas the demand side looks at issues such quality of service, privacy, trust, and other needs of the citizens. This shift in e-government provision is further highlighted by Alshawi et al. (2007), who assert that "e-government initiatives are different in their goals and objectives and the assessment of these benefits vary according to the different perspectives of the stakeholders for the value of these benefits".

In developing countries as asserted by Sigwejo& Pather (2016) things could be different as they still lag behind as compared to already developed countries with more sophisticated technologies and more connected citizenry. This study focuses in establishing the extent of accessibility of ICT services by PWD at Huduma Centres in Kenya. Alshawi et al (2007) note that although accessibly is key in "influencing the citizens' perspective of e-government services" studies shows this is not the case with government either doing little or ignoring the role it plays in ensuring access to all.

2.4 E-government Evaluation Models with a Citizen-Centric Approach

Ogutu & Irungu (2013) state that there are many frameworks on IS/e-government evaluation which have been developed each handling the subject of evaluation from a different perspective. Sigwejo & Pather (2016) argue that "citizen's needs and expectations for social changes will remain the driver for better government service delivery through the use of ICTs". Alshawi et al. (2007) claims that traditional evaluation approaches focuses on other factors such as return on investment and cost but "fails to reveal the full value of e-government projects without considering the perspectives of all the e-government stakeholders and the e-government value measures consisted of all the evaluation factors perceived by each of the stakeholders". Other evaluation approaches or models

proposed by other scholar with a citizen focus are summarized on the table 3 below.

Table 3: E-Government Evaluation Models with a Citizen-Centric Approach

Context	Finding/Model/Dimensions	Reference
Web-based e-government services	Developed a theory model for evaluating the performance of e-government services. The model serves also to understand the success or failure of e-government portals in serving citizens.	Wang, et al., (2005)
Government website	Evaluation Instrument: Security and privacy; Usability; Content; Services; Citizen participation; and Features.	Middleton (2007)
	Develop tool to evaluate website.	Eschenfelder and Miller (2007)
	Proposes a socio-technical toolkit for evaluation of e-government websites that address issues of openness and trust in e-government systems.	Eschenfelder and Miller (2005)
	Develop an Instrument (multi-item) known as e-GovSqualfor evaluation of website service. Website design; Navigation; Communication; Site aesthetics; Information quality; and Security.	Kaisara and Pather (2011)
E-services	Reference Process Model (RPM)	Tsohou et al. (2012)
	Four Dimensional Quality Framework (C2ST): Coordination, Control, Sharing, Transparency	Corradini et al. (2009)
	MAQM: to evaluate the portal and e-service quality by users in an adaptive manner. MAQM (Model for Adaptive Quality Measurement) comprises different ontologies including concepts regarding quality aspects, questions and questionnaires, portal characteristics and problems encountered by users while using the portal.	Magoutas and Mentzas (2009) Magoutas et al. (2010)
E-government services	Proposes an evaluation model based on AHP technique. Assess in an objective manner the change in service quality as a result of e-Government project implementation.	Ray and Rao (2004)
	Proposes holistic (COBRAS) evaluation Framework; Cost; Opportunity, Benefit; and Risk, Analysis for satisfaction.	Osaman et al. (2011)
	Develops a framework for evaluation-led design of e-projects that complements traditional approaches to IS evaluation. The framework is based upon Moor's concept of public value.	Grimsley and Meehan (2007)
	Develop e-GovQual multi-item scale evaluating e-government service quality, using four factors: Reliability; Efficiency; Citizen support; and Trust.	Papadomichelaki and Mentzas (2012)
	g-CIS: Customer Satisfaction Index for E-government (g-CSI) model is an integrated model of: National Customer Satisfaction Index (NCSI) in Korea and American Customer Satisfaction Index (ACSI). Based on this model Perceived Quality (Information, Process, Customer, Service, Budget Execution, and Management Innovation) and User Expectation will lead to user satisfaction, which is the moderator for user complaints and other outcomes such as: trust; and reuse	Kim et al. (2005)
Public value of e-government	Proposes an evaluation framework for evaluating e-government public value. Framework comprises with four dimensions; Delivery of public service; Achievement of outcomes; Development of trust; and Effectiveness of public organizations.	Karunasena and Deng (2009)

Context	Finding/Model/Dimensions	Reference
Evaluating e-government	Proposes e-government assessment framework (EAM) with components: e-Government maturity level; e-Government stakeholders; and Assessment dimensions.	Esteves and Joseph (2008)
Evaluating multidimensional web-based e-government	Multi-Dimensional Web-based e-government evaluation strategy in four major classes: Usability; User feedback; Usage data; and Web and Internet performance data	Wood et al. (2003)
E-government initiatives	Devises EGOVSAT model to evaluate citizen's satisfaction with e-government services. The model comprises with three factors: Utility; Efficiency; Customisation.	Horan and Abhichandani (2006)
Government services	Expectancy-Disconfirmation Model (EDM): Party Identification (Party ID); Political Ideology; Trust; and Expectations.	Motgeson (2012)

Source: Sigwejo &Pather (2016)

2.5 E-government Context in Kenya

In 2003, the Government of Kenya developed and adopted an Economic Recovery Strategy for Wealth and Employment Creation which was a plan meant to guide the Government's economic policies for five years by identifying key activities that would create an environment to support the recovery of the Kenyan economy (Government of Kenya, 2003). This plan had several pillars, key among them infrastructure where ICT and telecommunications. This plan focused on creating an enabling environment for growth in ICT and proposed the establishment of an Inter-Ministerial Committee whose function was to promote the use of ICT government agencies and bodies so as to enhance efficiency and good governance.

The Government of Kenya, established the e-government directorate under the Office of President whose functions included: improving service delivery using ICT and making government more transparent. With the establishment of directorate of e-government, the Kenya government achieved a number of milestones. Wafula (2007) some achievements of these achievements with respect to the component of government to government (G2G) included publishing 235 information on central government ministry web sites; on-going training, mainly computer literacy for government officers; integrating existing financial management systems, human resource systems, payroll systems, and email systems; and building local area networks and intranets in government. In 2013,

Government of Kenya established the Information and Communication Technology Authority (ICTA) by bring together former bodies and departments that were driving the ICT agenda in government with its main mandate being rationalising and streamlining the operations and management of ICT functions in state department and agencies. Today, Kenya has made some significant strides in e-government services delivery with the UN E-government survey of 2014 ranking Kenya top ten in Africa, but little improvement on the global ranking.

Table 4: Top 10 ranked countries in Africa in E-government Kenya

Country	EGDI	2014 Rank	2012 Rank
Tunisia	0.5390	75	103
Mauritius	0.5338	76	93
Egypt	0.5129	80	107
Seychelles	0.5113	81	84
Morocco	0.5060	82	120
South Africa	0.4869	93	101
Botswana	0.4198	112	121
Namibia	0.3880	117	123
Kenya	0.3805*	119	119
Libya	0.3753	121	191
Regional Average	**0.2661***		
World Average	**0.4712***		

Source: United Nations, 2014

2.6 Challenges of E-government in Kenya from Citizen Perspective

Otieno & Omwenga (2015) report that Kenya has made significant progress in the use of e-government but still face several challenges that affect successful implementation of e-government. Alshehri & Drew (2010) identified inadequate IT infrastructure, lack of proper legal framework governing the use ICT and inadequate programs aimed at selling e-government benefits and advantages as among the barriers to the adoption and diffusion of e-government services. Nkwe (2012) suggest that these challenges impact negatively on the organizations' abilities to provide services to citizens.

Table 5: Summary Barriers in Adoption of E-government Services

Categories	Barriers
Technical Barriers	• ICT infrastructural weakness • Privacy • Security • Trust • Accessibility
Organisation Barriers	• Lack of qualified personnel and training • Resistance to change to electronic ways • Lack of policy and regulation for e-usage • Lack of partnership and collaboration between the governmental agencies
Social Barriers	• Cultural differences and digital divide
Leaders and Management Support	• Inadequate leadership support leading to failure of e-government projects
Financial Barriers	• Limited financial spending of ICT • High cost of ICT and high-priced services of telecommunications

Nkwe (2012) suggest that these challenges negatively impact on the organizations' capabilities to offer e-government services to citizens.

2.7 One Stop Shop/ Citizens' Service Centres Models

Sumbwanyambe, Nel & Clarke (2011) report that most developing and developed countries are adopting universal service policies to reduce the digital divide among the country's information "haves" and "have-nots". Abdalla et al. (2016) report that the concept of citizen service centres are meant to facilitate clients to access information and service transactions in one location. Countries continue to take different approaches to delivering online services such as self-service through internet or a hybrid of automated and manual process.

2.8 Huduma Kenya Programme

In Kenya, the Huduma centres bring together various government services from different government bodies under one roof and they are adopting a mixed model with some services already automated while others are manual. Abdalla et al. (2016) note that the establishment of the centres was geared towards enhancing public service delivery to the citizens and businesses. Statistics from Huduma Kenya website show that these centers have become popular with

Kenyans with approximately 15,500 Kenyans accessing services through the various centres across the country. Despite the perceived progress in Huduma Kenya Programme, the success of such initiatives depends on how citizens accept these services. AlAwadhi & Morris (2009) state that government decision makers need an understanding of the factors that would encourage use ICT rather than common delivery methods.

2.9 Persons with Disabilities in Kenya

The Constitution of Kenya 2010, describe disability "as any physical, sensory, mental, psychological or other impairment, condition or illness that has, or is perceived by significant sectors of the community to have, a substantial or long-term effect on an individual's ability to carry out ordinary day-to-day activities". Likewise, the PWD Act, 2003, state that "disability" means "physical, sensory, mental or other impairments, including any visual, hearing, learning or physical incapability, which impacts adversely on social, economic or environmental participation." The Kenya National Population Census (2009) shows that the disability rate in Kenya is 3.5% which is approximate 1.330,312 million persons with Disabilities. Out of this, the number of male with disability is 647,689 while female is 682,623. In 2007, the Kenya Government carried out a survey for PWD which was meant to provide current statistics for easier planning, monitoring and evaluating of government programmes thus improving the general welfare of PWD. The survey, revealed that there were more PWD residing in rural than in urban areas. The survey also found out that 15% of PWDs were likely experience challenges caused by environmental factors on a daily basis and 3% on a weekly basis and 65% of PWD regarded the environment as major problem in their daily lives.

2.10 ICT Accessibility for PWD

ISO 9241-171 (2008b) defines "accessibility as the usability of a product, service, environment or facility by people with the widest range of capabilities". Petrie &

Bevan (2009) refers to accessibility as the "use of eSystems by people with special needs, particularly those with disabilities and older people". Whereas, Brajnik (2008) suggests that for a web page to be considered accessible, users with disabilities should be able to use it to achieve their intended goals just as the non-disabled people. Jaeger & Matteson (2009) defines "accessibility as equal access to information and communication technologies (ICTs) for PWD". Statistics indicate that there are an estimated one billion persons living with disabilities, with approximately 80% of them in developing nations. Jaeger & Matteson (2009) suggest that for ICTs to be considered accessible they should be allow access to all users and be compatible with assistive devices and technologies that PWD may use.

There are several accessibility standards for ICT products and services that measure accessibility through a checklist attributes such as the Web Content Accessibility Guidelines (WCAG 2.0). However, for most ICT products or services, there is still no set of internationally agreed standards although there are several attempts by various stakeholders to implement them.

Challenges in Accessing ICTs for Persons with Disabilities

Although there has been significant advancement in the ICT, PWD continue to face challenges in accessing these services. These includes absence of assistive technology including training on how to use them, inaccessible products and services, inadequate policies governing use accessible ICTs and absence of proper implementation strategies.

2.11 Accessibility Evaluation Methods and Models

Brajnik (2008) suggest that for an evaluation method to be considered appropriate it should yield accurate predictions of all the accessibility issues that are likely to face a user accessing a website and they can be analytic, empirical,

or both. Henry (2016) categorises these methods as standards review, usability testing, design walkthroughs, screening techniques and heuristic evaluation. Whereas, Brajnik (2008), group methods accessibility as screening techniques, conformance review, barrier walkthrough, subjective assessment, and user testing. The writer further develop a classification that can contrast these evaluation methods as show in the figure below. This section will discuss some of accessibility evaluation methods giving their benefits and disadvantages.

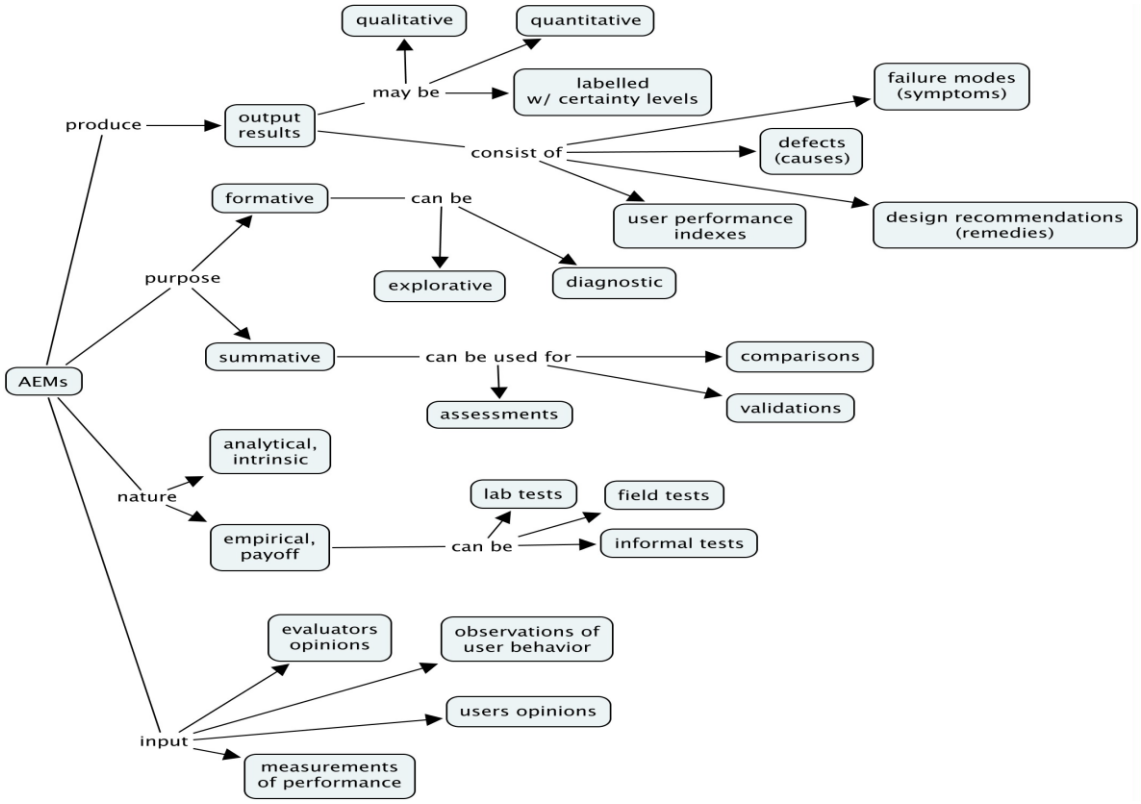

Figure 2: The Taxonomy of Accessibility Evaluation Methods

a) Conformance to Guidelines or Standards

This method is also referred to as guidelines, expert or standards review. Brajnik (2008) state that this method checks on the conformity of how web page satisfies a checklist of set out criteria. Petrie & Bevan (2009) argue that one should use this method "to ensure that initial prototypes and initial versions of final implementations meet appropriate guidelines and standards and do not contain

basic accessibility and usability problems". In conducting evaluation using this method Brajnik (2008) suggest that one should establish the right sample of web pages to be evaluated, run markup validators those pages, validate the pages against the set criteria, examine the pages with a range of graphical, textual and voice browsers, and finally anaylse and summarise the results. Some benefits of this method includes low cost when automatic testing tools are used and it can cover a wide range of diverse issues for different users

b) Screening Techniques

Henry (2016) state that screening techniques are less costly and simpler method in identifying potential issues on accessibility. Whereas, Brajnik (2008) describe them as informal empirical techniques based on using an interface in a way that some sensory, motor or cognitive capabilities are artificially reduced.

c) Subjective Assessment

Brajnik (2008), state that in using this method, the assessor engages several users who are then instructed on how to explore and use a specific website or web pages and finally the users interviewed face to face or through a questionnaire to find out the problems they face. This method is advantageous as it cost less and does not require more experienced evaluators.

d) Barrier Walkthrough

Brajnik (2008) looks at this method is an analytical technique which focuses on heuristic walkthrough. Consequently, the author describes an accessibility barrier as "any condition that makes it difficult for people to achieve a goal when using the website in the specified context".

e) User Testing

This method is also referred to as evaluations with users by some writers. Petrie & Bevan (2009) state that this method can be used 'to provide evidence of the accessibility and usability of an eSystem in real use by the target audience at either all stages of development or at the final stage of development'.

The table below gives a summary of pros and cons of the above discussed accessibility methods.

Table 6: Summary of pros and cons of AEMs

Pros	Cons
Conformance Review (CR)	
• Low cost • Diagnostic • Suitable for formative and summative evaluation • Identifies a large spectrum of problems	• Requires skilled evaluators • Does not support the evaluator in assigning severities • Not practical with lots of pages • Conformance does not mean accessibility • Unable to catch important usability problems. • Guidelines may be complex to read, too abstract, too many • With inexperienced evaluators, it is less effective than other methods
Subjective Assessment (SA)	
• Low cost, low difficulty • Can be done remotely • Good correctness	• Not systematic (problems and/or pages) • Highly dependent on users' experience • Users may not be aware of certain problems • Poor description of problems • Low thoroughness • Requires users with different disabilities
Screening Techniques (ST)	
• Low cost • Suitable for formative evaluation	• Time consuming for web developers • Singles out certain disabilities • Yields developers opinions • Highly dependent on developers experience • Cannot be used for summative evaluation
User Testing (UT)	
• Low cost, low difficulty • Supports learning • Higher correctness than CR • Yields severity ratings	• Higher cost than analytical methods • Logistics is complicated • Mixes accessibility with usability problems • Should not be done remotely

Source: Brajnik (2008)

Accessibility Model

Brajnik Accessibility Model

In discussing the role of accessibility model, Brajnik (2008) state that a model of accessibility should answer the following questions. What is accessibility? How can it be realised and maintained? The author further proposes that an accessibility

model should attempt to address these questions and encompass the following components as illustrated in the figure below.

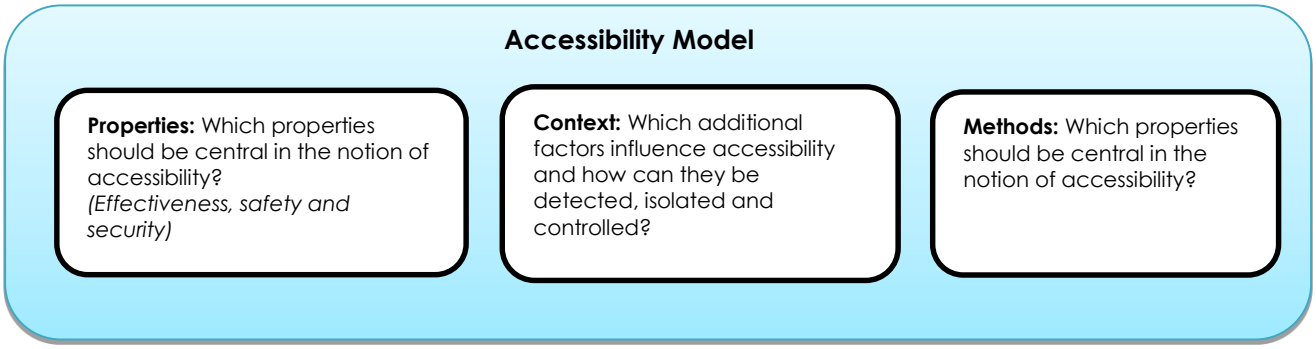

Figure 3: Accessibility Model as Proposed by Brajnik (2008)

In discussing the component of properties in accessibility model, Brajnik (2008) suggest that this should be derived from the definition points of the term accessibility focusing on "measurable user-performance parameters, sets viable, relative thresholds and restricts the claim to certain users and goals". The author further suggest that context should focus on the "who", "what" and "how" questions: These include disability type, level of experience in using the website or the assistive technology, user goals, the general environment where the user is working from, the devices and interaction modalities.

2.12 Conceptual Framework

Hersh 2014, suggest that there is limited attention to the evaluation of inclusive technologies for PWD. This statement is collaborated with limited studies on evaluation of inclusive technologies for PWD. Hersh 2014, presented a systematic framework aimed at evaluating ICT-based learning learners and inclusive ICT-based learning technologies PWD. Figure 4 below presents a framework for the evaluation of inclusive ICT technologies or ICT-based learning technologies for disabled people.

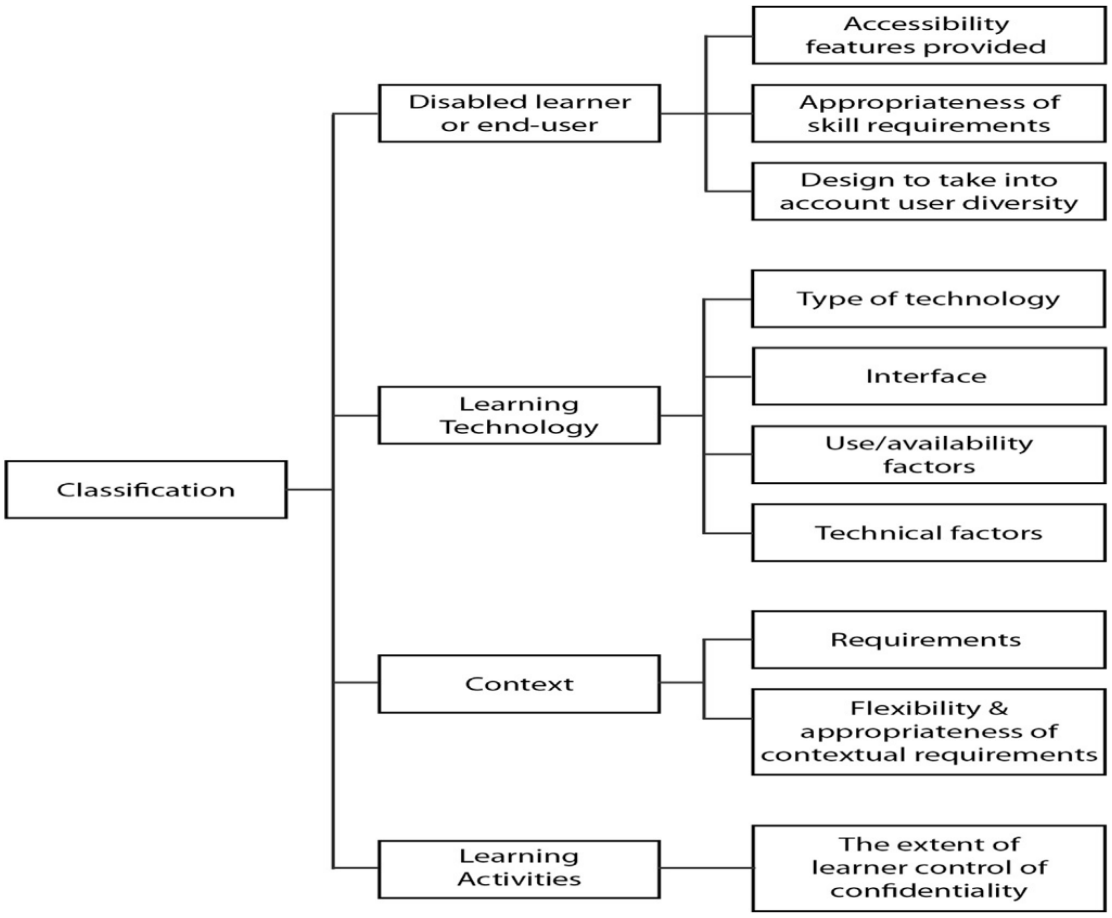

Figure 4: Evaluation Methodology of Technologies for PWDs (Detailed)
Source: Hersh (2014).

Hersh 2014, argue that this model can be used in other areas including carrying out both individual and comparative evaluations of ICT based learning technologies for PWD. The author further argues that although the framework is applied in evaluation of learning technologies for PWD students and inclusive learning technologies, it can also be used in evaluating other uses of ICT like e-government. This framework was adopted in the Kenyan context to help in evaluating various features (such as usability and accessibility) of e-government technologies and the available assistive technologies for persons with disabilities, who are seeking the e-government services at the Huduma Centres. This proposed framework in this study borrows the most appropriate parameters from the considered frameworks relevant to the issue of PWD.

Table 7: Summary Evaluation Methodology of Technologies for PWDs

Accessibility features provided	*The extent of compatibility and usability with assistive technology e.g. screen readers, keyboard with shortcuts, switch or other keyboard emulation and pointing device(s)*
	Provision of text representations of visual and audio features, magnification and/or options to choose the colour of text and background
	The extent of the cognitive and other demands and memory requirements,
	Provision of sign language or other communication support
	The ability to turn stimulation e.g. visual and sound effects, colour, scrolling text, animation on and off and with the non-stimulation option the default.
	The extent of accessibility of features for teachers and experts, including course creation, administration and editing.
Appropriateness of skill requirements	*Literacy, numeracy and language skills*
	Computer/IT skills
	Background/general knowledge or other skills
	Physical skills to use the tool or technology
	Subject specific knowledge
Design to take into account user diversity	*Consideration of age related factors and age appropriateness*
	Consideration of gender and any differences in requirements based on gender.
	Consideration of cultural factors, the needs of different cultures and, in particular, the culture of the main target audience(s)
	Consideration of educational background and experience, particularly of the main target audience(s)
Type of technology	*Flexibility e.g. platform independence or compatibility with a range of different platforms*
	Range and appropriateness of the facilities provided by the technology
Interface	*Compatibility with different types of input and output e.g. mouse and keyboard, screen reader, Braille keyboard (input); screen/visual display, Braille display, speech (output).*
	The amount of training required to use the interface and whether this is appropriate for the facilities provided
	The diversity of the user groups it is suitable for and the appropriateness of any restrictions
	Availability of customisation options
	Languages supported
Use/availability factors	*Cost*
	Ease of availability
	Reliability and robustness
Technical factors	*Compatibility with and ability to import and export data from other software*
	Compatibility with different operating systems
	Lack of restrictiveness of memory and other technical requirements
	Availability of accessible documentation such as user manuals, training, on-line help and helpline

	Cost and frequency/difficulty of maintenance/updating requirements
Requirements	*Ease of setting up*
	The extent of compatibility with different, including older, versions of hardware and software
Flexibility and appropriateness of contextual requirements	*Support for a/synchronous and on/off line learning or the appropriateness of any restrictions*
	Support for individual, group, teaching supported learning and learning communities or the appropriateness of any restrictions
	Extent of flexibility or appropriateness of restriction to a particular type of learning e.g. use in vocational, re/training, rehabilitation, qualification-related education and/or informal learning
Other	*The extent of learner control of confidentiality*

This framework was adopted in the Kenyan context to help in evaluating various features (such as usability and accessibility) of e-government technologies and the available assistive technologies for persons with disabilities, who are seeking the e-government services at the Huduma Centres. This proposed framework in this study borrows the most appropriate parameters from the considered frameworks relevant to the issue of PWD.

CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter presents the methodology used in conducting the study. It discussed research design, target population, sample size, data collection procedures, data analysis techniques and ethical considerations in this study.

3.2 Research Design

The study adopted descriptive research design. Robson (2002) points out that descriptive study portrays an accurate profile of persons, events or situation. It is one of the best methods for conducting research in human contexts because of portraying accurate current facts through data collection for testing hypothesis or answering questions to conclude the study. The descriptive design was therefore appropriate for this study since it helped in collecting data in order to answer the questions of the current status and describe the nature of existing conditions of the subject under study. Descriptive research design also facilitated the use of a questionnaire to collect both quantitative and qualitative data for the study. This research method helped collect data in order to answer questions to establish the extent to which e-government services offered at the Huduma Centres portal in Kenya are accessible to PWD, highlighting the various issues they face in accessing the services, drawing lessons that would expand access and proposing any solutions thereof.

3.3 Target Population

Mugenda & Mugenda (2012) describe target population as the particular entity of people, objects or units to which as researcher can reasonably generalize his or her research findings. This study focused on PWDs using e-government services at Huduma Centres since the findings are to reflect a true representation of accessibility of these services. The study population consisted of approximately 2000 members of the Association of the Physically Disabled in Kenya (APDK) and

approximately 1500 members of Kenya Society for the Blind and members of Kenya National Association for the Deaf.

3.4 Sampling Procedures and Sample Size

Kothari (2004) defines a sample as a small proportion of an entire population; a selection from the population. The basic idea of sampling is that by selecting some of the elements in the population, we may draw conclusions about the entire population. Sampling frame provides a list of elements from which the sample is actually drawn. The sampling frame in this study was 4950 subjects who included 2000 members of APDK, approximately 1500 members of Kenya Society for the Blind and approximately 1450 members of Kenya National Association for the Deaf. These were approximate numbers, however, the number of PWDs who use the e-government services at Huduma Centres is not known. The sample size for this study was therefore calculated using the following two formulas: that is, Formula for sample size without finite population correction and formula for sample size with finite population correction.

$$n_0 = \frac{Z^2 p(1-p)}{e^2}$$

Where: n_0 = Required sample size

Z = Confidence level at 95% (standard value of 1.96)

p = is population proportion

e = Margin of error at 5% (standard value of 0.05).

$$n_0 = \frac{1.96^2 \times 0.5 \times (1-0.5)}{0.05^2} = 384$$

The study also adopted this formula for sample size with finite population correction (fpc) as shown below.

$$n = \frac{n_0 N}{n_0 + (N - 1)}$$

Where

n is the sample size with the finite population correction factor

n_o is the sample size without the finite population correction factor

N is target population

$$n = \frac{384 \times 4950}{384 + (4950-1)} = 356$$

The sample size distribution of the respondents is shown in Table 6 below.

Table 6: Sample Size

Target Population	Number	Sampling	Sample Size
Members of APDK	144	30%	43
Members of Kenya Society for the Blind	108	30%	32
Members of Kenya National Association for the Deaf	104	30%	31
Total	**356**		**106**

3.5 Data Collection

This study relied on primary data collection through use of structured questionnaires. The questionnaire was structured to enable the researcher to get reasonable opinions on the stand of the various respondents on the extent of accessibility of e-government services by PWD. Respondents were required to express their opinion on a Likert scale ranging from 1 to 5 (completely disagree to strongly agree).

Questionnaires are considered for the study since they provide a high degree of data standardization, they are relatively quick to collect information from people in a non-threatening way and they are cheap to administer. According to Kombo

& Tromp (2006) a self-administered questionnaire is the only way to elicit self-report on people's opinion, attitudes, beliefs and values. The researcher personally administered the questionnaire to the respondents.

3.6 Pilot Study

Pilot test was conducted to detect weakness in design and instrumentation and to provide alternative data for selection of a probability sample (Mugenda & Mugenda, 2008). A pre-test of the questionnaire was done prior to the actual data collection. The developed questionnaire was checked for its validity and reliability through pilot testing. The research subjected the questionnaire to 10 respondents to participate in the pilot study. The objectives of pre-testing was to allow for modification of various questions in order to rephrase, clarify and or clear up any shortcomings in the questionnaires before administering them to the actual respondents. It helped the researcher to correct inconsistencies arising from the instruments, which will ensure that they measure what is intended.

3.6.1. Reliability of the Instrument

Mugenda & Mugenda (2003) define reliability as a measure of the degree to which a research instrument yields consistent results or data after repeated trials. Reliability test measures the internal consistency of the questionnaire. An instrument is reliable when it can measure a variable accurately and obtain the same results over a period of time. Reliability test will also help establish the internal consistency of the instrument. Reliability will be calculated with the help of Statistical Package for Social Sciences (SPSS). Cronbach's alpha will be used whereby a co-efficient of above 0.7 will imply that the instruments are sufficiently reliable for the measurement (Tavakol & Dennick, 2011).

3.6.2 Validity of Instrument

Mugenda & Mugenda (2012) define validity as the degree to which the data collected in a study accurately represents the variable been measured. Validity of the questionnaire will be established by the researcher and supervisor

reviewing the items. The instruments will also be scrutinized and approved by the panel supervisors.

3.7 Data Analysis and Presentation

Mugenda & Mugenda (2012) defines data analysis as the process of cleaning and summarizing data so that it becomes information that can be easily interpreted and conclusions made to support decision making. Statistical Package for Social Science (SPSS) Version 20 was used to aid in analyzing all the data collected through the questionnaire.

This study will generate qualitative and quantitative data. The data was analyzed using descriptive statistics. Descriptive statistics included frequency distribution tables and measures of central tendency (the mean), measures of variability (standard deviation) and measures of relative frequencies. The qualitative data generated from the open ended questions was categorized in themes in accordance with research objectives and reported in narrative form along with quantitative presentation. The quantitative data was presented using tables, charts and graphs.

3.8 Ethical Considerations in Research

Disability is a sensitive subject and therefore personnel running the evaluations need to be sensitive to the needs of the particular groups, such as visually disabled people, people in wheelchairs etc.in this regard, the research participants was allowed to make an informed decision on whether to participate in the research process or not. This implies that the researcher did not force or coerce the sample into participating in the research process. Secondly, the responses from the respondents were considered anonymous responses. This implies that the respondents were not required to give their names on the questionnaires they fill. This prevented victimization of the respondents for participating in the research study.

CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the results and findings as analyzed from the data collected. The data analysis was based on the study objective which sought to establish the extent to which e-government services offered at the Huduma Centres in Kenya are accessible to PWD and highlight the various issues PWD face in accessing these services. The responses were analyzed using descriptive statistics and results were presented in tables, pie charts and bar graphs.

4.2 Demographic Information

This section presents the demographic information of the respondents who took part in the study. The respondents' demographic information reflects the relevant attributes of the population; it forms the basis under which the study can rightfully access the relevant information. The respondents' information captured included: gender, age, level of education and disability type.

4.2.1 Gender of the Respondents

The respondents were asked to indicate their gender. The results of the respondents' shows that majority of the respondents (61.8%) were male while 38.2% were female.

4.2.2 Age of the Respondents

This section shows the age of the respondents who took part in the study. The age of the respondents was captured in structured age brackets. The results are presented in Table 8.

Table 8: Age of the Respondents

Age Bracket	Frequency	Percent
Below 25 years	-	-
26-35 years	60	88.2
46-55 years	8	11.8
55 years and above	-	-
Total	**68**	**100.0**

The study results in Table 5 shows that majority of the respondents (88.2%) ere aged between 26-35 years of age while 11.8% indicated that they aged between 46-55 years.

4.2.3 Level of Education

Table 9: Level of Education

Education Level	Frequency	Percent
Primary	-	-
Secondary	-	-
Tertiary (college)	40	58.8
University	28	41.2
Total	**68**	**100.0**

The findings in Table 6 show that majority of the respondents' level of education is from Tertiary (college) level. On the other hand, 41.2% of the respondents indicated that they had reached University level. This shows that majority of the respondents who took part in the study were well educated, hence they understood the information asked, thus it improves the reliability of the information.

4.2.4 Disability Type

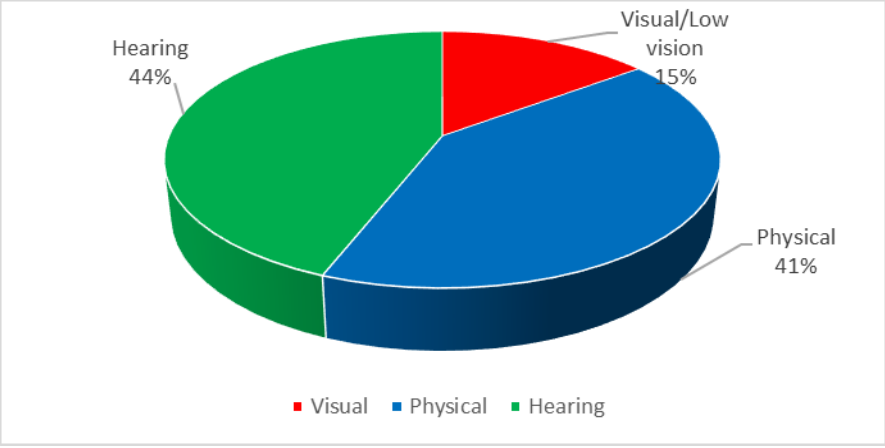

Figure 5: Disability Type

On the disability type, the findings in Figure 6 show that 44.1% had hearing/speech impairment while 41.2% indicated that they had a physical disability. On the other hand, 14.7% of the respondents indicated that they had a visual impairment.

4.3 Accessibility and Usage of E-government Services

This section sought to establish the extent to which e-government services offered at the Huduma Centres are accessible to PWD.

4.3.1 Seeking services at Huduma Centres

The study enquired from the respondents whether they had sought any services at Huduma Centres. The findings show that majority (77.9%) of the respondents reported that they had sought e-government services at Huduma Centres. Only 22.1% of the respondents had not sought any service at Huduma Centres.

4.3.2 Rating of Accessibility of the Services

The respondents were asked to indicate the extent to which the e-government services at Huduma Centres were accessible. The findings are presented in Table 10.

Table 10: Rating of Accessibility of the Services

Rating	Frequency	Percent
Quite accessible	8	11.8
Somewhat accessible	35	51.4
Not Accessible	25	36.8
Total	**68**	**100.0**

The study results in Table 11 show that majority of respondents (51.4%) who had sought e-government services at Huduma Centres rated the services as somewhat accessible. On the other hand, 36.8% of the respondents rated the services as not accessible. 11.8% indicated that the e-government services were quite accessible.

4.3.3 Accessibility of E-Government Services

The respondents were asked to indicate their extent of agreement with various statements on accessibility of e-government services at Huduma Centres. A five point Likert scale was used to interpret the results, whereby 1 represented strongly disagree while 5 represented strongly agree. The findings are presented in Table 11.

Table 11: Accessibility of E-Government Services

Statements	Mean	Std. Deviation
The environment and facilities at Huduma Centres are conducive for PWD seeking e-government services	2.95	0.811
There are infrastructure that assist PWD at Huduma Centres	3.23	0.427
The Huduma portal system is accessible and usable by PWD	3.35	0.971
PWD can access and use e-government services to achieve their specified goals with effectiveness and efficiency	3.35	0.481

The study findings show that the respondents neither agreed nor disagreed whether the environment and facilities at Huduma Centres were conducive for PWD seeking e-government services; and on whether there were infrastructures that assist PWD at Huduma Centres, this is shown by the mean scores 2.95 and 3.23 respectively. The respondents were also when asked whether the Huduma portal system was accessible and usable by PWD; and on whether PWD could access and use e-government services to achieve their specified goals with effectiveness and efficiency; this is shown by mean scores of 3.35 respectively.

4.3.4 Challenges of Accessibility and Usage of E-government Services

The study sought to establish whether the challenges of accessibility affected usage of e-government services by PWD in Huduma Centres. The findings are presented in figure 6.

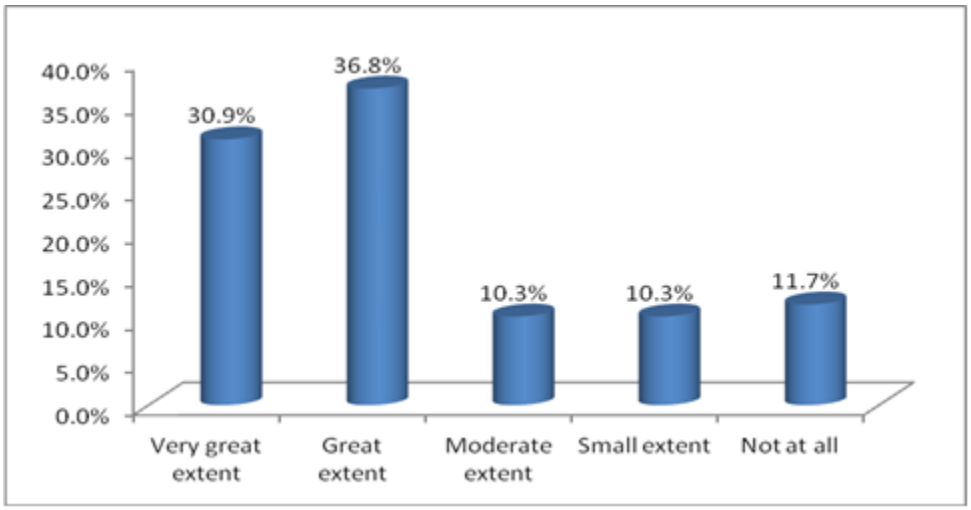

Figure 6: Challenges of Accessibility and Usage of E-government Services

The study findings show that 36.8% of the respondents indicated that the challenges of accessibility affected usage of e-government services by PWD to a great extent while 30.9% indicated to a very great extent. On the other hand, 10.3% indicated that the challenges of accessibility affected usage of e-government services by PWD to a moderate extent and small extent respectively, while 11.7% indicated not at all.

The respondent stated that they faced serious challenges in accessing services such a registration of access to government procurement for youth, women and PWD which required that user to fill the application online for further processing at the centres. Other respondents stated that the services such as the queue management system are designed in such a manner that most PWD cannot access it.

4.4 Assistive Technologies and Usage of E-government Services

4.4.1 Challenges Experienced

The respondents were asked to indicate the challenges they experience when seeking e-government services at Huduma Centres. The findings are presented in Table 12.

Table 12: Challenges Experienced

Challenges	Yes		No	
	Frequency	Percent	Frequency	Percent
Cannot see screens	8	11.8	60	88.2
Cannot Navigate websites (press buttons on a phone, or a mouse on a computer)	15	28.3	38	71.6
Cannot use touch screen keyboards	8	11.8	60	88.2
Cannot read electronic books and emails	7	10.3	61	89.7
Cannot hear callers or automated electronic messages	33	48.5	35	51.5

The study results in Table 11show that majority of the respondents (48.5%) could not hear callers or automated electronic messages while 28.3% could not navigate through websites (press buttons on a phone, or a mouse on a computer). On the other hand, 11.8% of the respondents reported that they could not see screens while 10.3% indicated that they could not read electronic books and emails.

4.4.2 Assistive Devices for those that Cannot See

The study sought to establish whether there are assistive devices available in the Huduma Centres for persons that cannot see or use typical screen and those that cannot hear. A five point Likert scale was used to interpret the results, whereby 1 represented not at all while 5 represented very great extent. The findings are presented in Table 13.

Table 13: Assistive Devices for those that Cannot See

Assistive Devices for those that Cannot See	Mean	Std. Deviation
Screen readers for computers and mobile phones	1.00	0.000
Converters of information into speech or Braille display	1.00	0.000
Gesture-based screen readers for touch screen tablets and phones	1.00	0.000
Tactile markers, tactile and/or audible feedback	1.00	0.000
Text to speech functionality devices	2.44	0.917
Screen magnifiers to adjust font sizes	2.72	0.458

The study results show that the respondents indicated that assistive devices such as screen readers for computers and mobile phones, converters of information

into speech or Braille display and Tactile markers, tactile and/or audible feedback and devices such as gesture-based screen readers for touch screen tablets and phones were not available at all. This is shown by mean scores of 1.00 respectively. The respondents further indicated that, text to speech functionality devices and screen magnifiers to adjust font sizes were available in the in the Huduma Centres to a small extent; this is shown by the mean scores 2.44 and 2.72 respectively.

Table 14: Assistive Devices for those that Cannot Hear

Assistive Devices	Mean	Std. Deviation
Volume adjustment and speakers and Hearing aids	1.00	0.000
Video relay services	1.00	0.000
Visual or vibrating alerts	1.75	1.323
Video/TV captioning and signing	1.00	0.000
Auto text, SMS and MMS	2.33	0.954
Voice recognition to activate voice commands for computers and cell phones	1.60	1.218
Adapted keyboards and mouse	1.00	0.000

The study results show that assistive devices such as volume adjustment and speakers and hearing aids, video relay services, video/TV captioning and signing, visual or vibrating alerts and voice recognition to activate voice commands for computers and cell phones were not available at all in the Huduma Centres; this is shown by the mean scores 1.00, 1.75 and 1.60 respectively. On the other hand, the respondents indicated that auto text, SMS and MMS, were available to a small extent, as shown by the mean scores 2.33. For instance, some users indicated that they are forced to use money to pay some able persons to do things they would have comfortably done for themselves incurring unnecessary cost to access some of these services.

4.4.3 Extent Assistive Technologies affect Usage of E-government Services

The study sought to establish the extent to which availability of assistive technologies affect usage of e-government services in the Huduma Centres by PWD. The findings are presented in figure9.

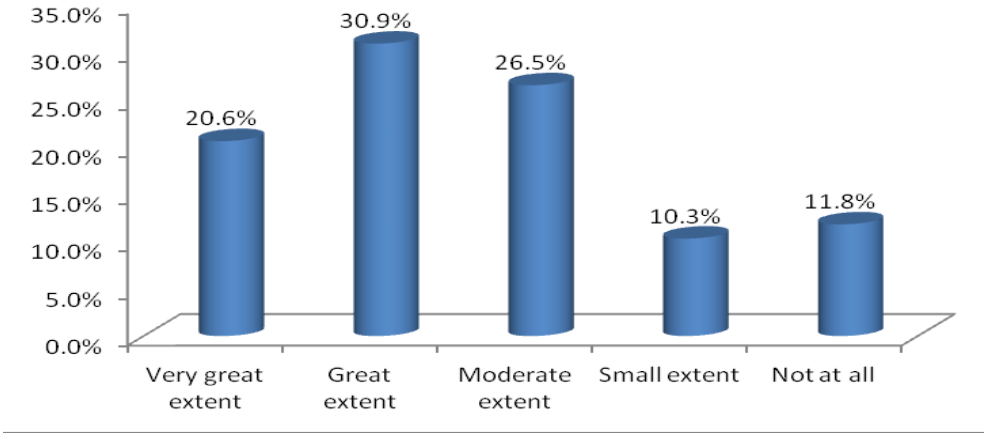

Figure 7: Extent Assistive Technologies affect Usage of E-government Services

The study findings show that 30.9% of the respondents indicated that availability of assistive technologies affected usage of e-government services by PWD to a great extent in the Huduma Centres. This was supported by 20.6% who indicate to a very great extent. On the other hand, 26.5% reported that availability of assistive technologies affected usage of e-government services by PWD to a moderate extent while 11.8% indicated not at all. The respondents further stated that about the Huduma centres, all the assistive devices for deaf people or those hard of hearing are not available; neither do these centres have sign language interpreters which make them totally not accessible to the deaf community. On the other hand, some respondents indicated that Huduma Centre's Assistive technologies have been available for the physical disabled, except for those with visual and hearing impairment. Deaf friendly Assistive technologies are still needed, as well as the interpreters. They explained the disabilities differ from one person to the other, thus the extent to which assistive technologies affect use Huduma Centres by PWD may differ.

4.5 IT skills/Experience Affect the Usage of E-government Services

In this section, the study sought to determine how individual IT skills or experience affect the usage of e-government services by PWD.

4.5.1 Computer Experience

The respondents were asked to indicate their computer expedience (in years). The results are presented in Figure 4.6.

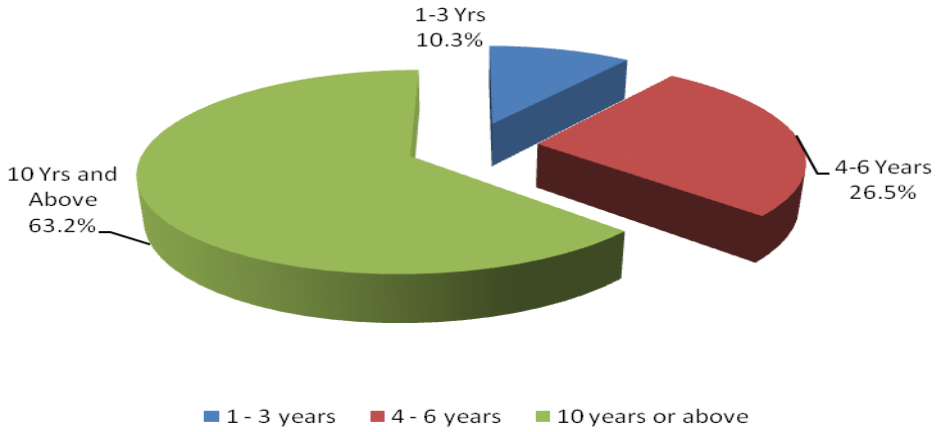

Figure 8: Computer Experience

The study finding in Figure 10 show that majority of the respondents (63.2%) had computer use experience of 10 years. On the other hand, 26.5% of the respondents reported that had computer use experience of between 4-6 years while 10.3% indicated they had experience of between 1-3 years. This shows that majority of the PWDs who took part in the study were computer literate.

4.5.2 Frequency of Use of internet

The respondents were asked to indicate how frequent they use the internet. The responses are presented in Table 15.

Table 15: Frequency of Use of internet

Frequency	Frequency	Percent
Very frequently	53	77.9
Frequently	7	10.3
Occasionally	8	11.8
Total	**68**	**100.0**

Majority of the respondents (77.9%) as shown in Table 12 indicated that they use the internet very frequently while 10.3% indicated frequently. Only 11.8% of the respondents indicated they use the internet occasionally. The study further enquired from the respondents how IT skill and experience influence usage of e-

government services in Huduma centres. The respondents stated that the experience helped them navigate through websites.

4.5.3 Extent IT Skills Affect Usage of e-Government

The study sought to determine whether IT skills/experience affect usage of e-government services by PWDs at the Huduma Centres. A five point Likert scale was used to interpret the results, whereby 1 represented strongly disagree while 5 represented strongly agree. The findings are presented in Table 16.

Table 16: Extent IT Skills Affect Usage of e-Government

Statements	Mean	Std. Deviation
Inadequate IT skills/experience hinder users to navigate through the e-portal website	4.00	1.546
Inadequate IT skills/experience hinder effective use of computer and mobile phones	4.00	1.289
Inadequate IT skills hinder users from use of assistive devices	4.00	0.954

The study findings in Table 15 show that the respondents agreed that inadequate IT skills or experience hinder users to navigate through the e-portal website; and that also hinder effective use of computer and mobile phones by PWD, as shown by mean score of 4.00 respectively.

4.6 Design of E-government Systems and Usage of E-government Services

The study sought to establish the extent to which the designs of e-government systems affect usage of e-government services by PWD, at the Huduma Centres.

4.6.1 Design of E-government Platform and Access of Services

The respondents were asked to indicate whether current design of e-government platform in the Huduma Centres hinder access of the services by PWD. Majority of the respondents (63.2%) indicated that the current design of e-government system/platform affect access of services by PWDs, in the Huduma Centres. Only 36.8% of the respondents indicated that the design of the e-government system

did not affect access of services by PWDs. The respondents explained that due to inadequate computer Adaptive Technology knowledge, it is hard to navigate through the different programs. The deaf respondents also revealed that they need Kenya Sign Language (KSL) interpreters at Huduma Centres. The respondents further stated that the e-government system/platform should be designed with all users in mind and a strong emphasis given to accessibility. More visual signs and alerts should also be included in the centres and interpreters employed, at least one per centre.

4.6.2 Extent Design of E-government Systems Affects Usage of E-government Services

The respondents were asked to indicate their level of agreement on statements on design of E-government systems and usage of E-government Services by PWDs, at the Huduma Centres. A five point Likert scale was used to interpret the results, whereby 1 represented strongly disagree while 5 represented strongly agree. The findings are presented in Table 18.

Table 17: Design of E-government systems affects Usage of E-government Services

Statements	Mean	Std. Deviation
The Huduma portal/website/systems have not been designed as per the required guidelines and standards for use by PWD	4.13	.962
There is no participation by PWD in the design and development of E-government systems	3.75	1.320
The current E-government services do not consider or address attributes of PWD.	3.40	1.343

The respondents agreed that the Huduma portal, website and systems had not been designed as per the required guidelines and standards for use by PWD; and that there was no participation by PWD in the design and development of e-government systems; this is shown by the mean scores 4.13 and 3.75 respectively. However, the respondents were neutral when as ked whether the current e-government services consider or address attributes of PWD; this is shown by the mean score 3.40.

Table 18: Effect of Design of e-government systems on usage by PWD

Extent	Frequency	Percent
Very great extent	8	11.8
Great extent	28	41.2
Moderate extent	7	10.3
Small extent	25	36.8
Total	**68**	**100.0**

The study findings show that 41.2% of the respondents indicated that the design of e-government systems affect usage of the services by PWD at the Huduma Centres to a great extent. This was supported by 11.8% of the respondents who indicated to a very great extent. However, 36.8% indicated that the design of e-government systems affect usage of the services by PWD at the Huduma Centres to a small extent while 10.3% indicated to a moderate extent.

4.6.3 Whether Proper Designing Would Enhance Usage of E-government Services

The respondents were asked to indicate whether the designing of e-government systems that address challenges of PWD would enhance usage of E-government services. The study findings show that all the respondents (100%) indicated that proper the designing of e-government systems that address challenges of PWD would enhance usage of e-Government Services.

The respondents explained that PWD want a system where their issues are properly handled in a realistic manner. With Computer Adaptive Technology skills, the visually impaired will manage to access the e-government services with ease. The centres should also offer Braille to blind people or KSL interpreters for those with hearing impairment. With an improved system that accommodates PWD, there will be increased accessibility of the services. Once this is achieved then the usage would improve.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of the Findings

Objective 1*: To establish the extent to which e-government services offered at the Huduma Centres are accessible to PWD*

On the extent to accessibility of e-government services to PWD, the findings indicate PWD, continue to face various accessibility challenges on access to key services at the Huduma Centres.

Objective 2*: To determine the effect of accessibility in general usage of e-government services by PWD in Huduma Centres.*

The study findings revealed that the challenges of accessibility affected usage of e-government services by PWD to a great extent thus hindering access to these services. The main challenges faced by the respondents included in accessing services such a registration of access to government procurement for youth, women and PWD which required that user to fill the application online for further processing at the centres. Other respondents stated that the services such as the queue management system are designed in such a manner that most PWD cannot access it.

Objective 3*: To determine whether assistive technologies affect usage of e-government services by PWD.*

This study findings revealed that although it is crucial for PWD to use assistive technologies to facilitate access to services at these centres. The study revealed that there were no provision for these devices and technologies at the centres. For instance, majority of the respondents indicated that devices such as screen readers for computers and mobile phones, converters of information into speech or Braille display and tactile markers, tactile and/or audible feedback and

devices such as gesture-based screen readers for touch screen tablets and phones were not available at all. Majority of the respondents also indicated that lack of ATs impacted negatively on their general usage of e-government services at these centres to a great extent. For instance, some users indicated that they are forced to use money or relatives to do things they would have comfortably done for themselves.

***Objective 4**: To determine how IT skills/experience affect the usage of e-government services by PWD.*

The respondents agreed that inadequate IT skills or experience hinder access to these services by PWD. Most respondents indicated that one need to have IT skills or experience to use these services as web application.

***Objective 5**: To establish the extent to which the design of e-government systems affect usage of e-government services by PWD.*

The study revealed that the current design of e-government system/platform at these centres do not meet the needs of majority of PWD. Most respondents indicated that these services should be designed with all users in mind and a strong emphasis given to accessibility. All the respondents agreed that proper the designing of e-government systems that address challenges of PWD would enhance usage of E-government services.

5.2 Conclusions

This study set out to establish the extent to which e-government services offered at the Huduma Centres in Kenya are accessible to PWD, highlight issues in accessing these services and propose any solutions thereof. One of the principal reason for conducting assessment or evaluation of e-government services is to provide practical solutions based on the results of the evaluation for continuous improvement of these services. This study has shown that although PWD are

seeking services at the Huduma Centres, most of these services are not accessible to PWD to a greater extent. This study has shown that in general accessibility barriers including lack of appropriate devices or assistive technology, skills and design of system affect the general usage of e-government services especially for citizens with disabilities. This posed great challenge to PWD in accessing key government services in these centres thus hindering PWD in fully integrating into the society. With ratification of the UN Convention on Rights of Persons with disabilities (CRPD) by the Kenyan government and subsequent promulgation of the Constitution in 2010, the government committed herself to ensure and promote the full realization of all human rights and fundamental freedoms for persons with disabilities, without discrimination of any kind on the basis of disability. However, this study has raised important questions on ICT accessibility for PWD on e-government services provided in these centres which requires more considerations by the policy makers and implementers.

5.3 Recommendations

This study was significant in many aspects as it will assist in the mainstreaming of disability in Kenya by way of supporting e-government policy makers through promoting ICT accessibility to all. This research has several practical applications. Firstly, it recommends that ICT Authority, Huduma Kenya programme work together to ensure access to all on e-government services provided at the centres through provision of devices and assistive technologies as well as other forms of assistance, support services and facilities at the Huduma Centres to make it easy for PWD to access these services. Finally the study recommends for ICT Authority and other stakeholder to develop and implement ICT accessibility guidelines which can be adopted by other government departments and agencies.

5.4 Limitations of the Study

Although caution was exercised in this research, a number of a limitations were experienced. First, disability is as sensitive subject and some individuals did not perceive themselves as disabled or were therefore unwilling to disclose their disability status consequently leading to cases of uncooperative respondents. This study required the services of an interpreter to facilitate communication with people with hearing disabilities.

5.5 Suggestions for Further Study

More research is required to consider evaluating accessibility of these service using other techniques and approaches such as conformance to standard, expert evaluation and screening techniques among others to investigate the actual experiences and problems of PWD to ensure that they are fully taken account of and that the resulting recommendations and guidelines do meet their needs.

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Appendices

Appendix I: Letter of Introduction

Dear Respondent,

RE: DATA COLLECTION

I am a student pursuing a Masters of Science degree in Computer Science at the University of Nairobi. I am conducting a research study on "***to establish the extent to which e-government services offered at the Huduma Centres in Kenya are accessible to PWD, and highlight the various issues PWD face in accessing these services"*** to fulfill the requirements of the award of the above mentioned degree program.

Kindly respond to all the questions in the questionnaire accurately and honestly as possible. The information in the questionnaire will be treated as confidential and it is for academic purpose only.

Your co-operation is highly appreciated. Thank you

Yours Sincerely

Daniel Kabue Maina

Appendix II: Questionnaire for Users

Section A: Demographic Information

1. Indicate your gender

Male [ ] Female [ ]

2. Indicate your Age

Under 25 years [ ] 26-35 years [ ] 36-45 years [ ]

46- 55 years [ ] Over 56 years [ ]

3. Level of Education

Primary [ ] Secondary [ ] Tertiary College [ ]

University [ ]

4. Disability Type

Physical [ ] Hearing/Speech [ ] Visual (Low vision) [ ]

Others (Specify)……

Section B: Accessibility and usage of e-government services

5. Have you sought any ICT related services at Huduma Centres portal

Yes [ ] No [ ]

b). If yes, how would you rate the level or extent of accessibility of these services?

Quite accessible [ ] Somewhat accessible [ ] Not accessible [ ]

6. To what extent do you agree with the following statements on accessibility of e-government services at Huduma Centres? Use a scale of 1-5 where **1** is Strongly disagree, **2** is Disagree, **3** is Neither agree nor disagree, **4** is Agree while **5** is Strongly agree

Statements on accessibility of e-government services	**1**	**2**	**3**	**4**	**5**
The environment and facilities at Huduma Centres are conducive for PWD seeking e-government services					
There are infrastructure that assist PWD at Huduma Centres					
The Huduma portal system is accessible and usable by PWD					
PWD can access and use e-government services to achieve their specified goals with effectively and efficiently.					

7. To what extent do challenges of accessibility affect your general usage of e-government services in Huduma Centres?

Very great extent [ ] Great extent [ ] Moderate extent [ ]

Small extent [ ] Not at all [ ]

b). Explain your answer……..

……

Section C: Assistive technologies and Usage of e-government services

8. Which of the following challenges do you experience when seeking e-government services at Huduma Centres?

Challenges	Tick Where Appropriate
Cannot see screens	
Cannot Navigate websites (press buttons on a phone, or a mouse on a computer)	
Cannot use touch screen keyboards	
Cannot read electronic books and emails	
Cannot hear callers or automated electronic messages	
Other (Specify)….	

9. If you cannot see or use typical screen, to what extent are these assistive devices available in the Huduma Centres to help understand what is on the screen? Use a scale of 1-5, where **1**Not at all, **2** is Small extent, **3** is Moderate extent, **4** is Great extent and **5** is Very great extent.

Statements on assistive devices	1	2	3	4	5
Screen readers for computers and mobile phones					
Converters of information into speech or Braille display					
Gesture-based screen readers for touch screen tablets and phones					
Tactile markers, tactile and/or audible feedback					
Text to speech functionality devices					
Screen magnifiers to adjust font sizes					

10. If you cannot hear the information, to what extent are these assistive devices available in the Huduma Centres help get the information. Use a scale of 1-5, where 1 Not at all, 2 is Small extent, 3 is Moderate extent, 4 is Great extent and 5 is Very great extent

Statements on assistive devices	1	2	3	4	5
Volume adjustment and speakers and Hearing aids					
Video relay services					
Visual or vibrating alerts					
Video/TV captioning and signing					
Auto text, SMS and MMS					
Voice recognition to activate voice commands for computers and cell phones					
Adapted keyboards and mouse					

11. To what extent does availability of assistive technologies affect usage of e-government services in the Huduma Centres by PWD?

Very great extent [ ] Great extent [ ] Moderate extent [ ]

Small extent [ ] Not at all [ ]

b). Explain your answer……

……

Section D: IT skills/experience and Usage of E-government Services

12. Indicate your computer experience

None [ ] 1 – 3 years [ ] 4 - 6 years [ ]

10 years or above [ ]

13. How frequent do you use the internet?

Never [ ] Rarely [ ] Occasionally [ ]

Frequently [ ] Very frequently [ ]

14. How does IT skills/experience hinder or influence your usage of E-government Services?

……

……

15. To what extent do you agree with the following questions on IT skills/experience and usage of E-government Services at the Huduma Centres? Use a scale of 1-5 where 1 is Strongly disagree, 2 is Disagree, 3 is Neither agree nor disagree, 4 is Agree while 5 is Strongly agree

Statements on IT skills/experience	**1**	**2**	**3**	**4**	**5**
Inadequate IT skills/experience hinder users to navigate through the e-portal website					
Inadequate IT skills/experience hinder effective use of computer and mobile phones					
Inadequate IT skills hinder users from use of assistive devices					

Section E: Design of E-government systems and Usage of e-government Services

16. Do you think the current design of e-government Services in Kenya hinder access of the services by PWD?

Yes [ ] No [ ]

b). Explain your answer above……

……

……

To what extent do you agree with the following statements on design of E-government systems and usage of E-government Services at the Huduma Centres? Use a scale of 1-5 where 1 is Strongly disagree, 2 is Disagree, 3 is Neither agree nor disagree, 4 is Agree while 5 is Strongly agree

Statements on Design of E-government systems	**1**	**2**	**3**	**4**	**5**
The Huduma Portal/website/systems have not been designed as per the required guidelines and standards for use by PWD					
There is no participation by PWD in the design and development of E-government systems					
The current E-government services do not consider or address attributes of PWD.					

17. To what extent does the design of e-government systems, affect usage of the services at the Huduma Centres by PWD?

To a Very great extent [ ] To a Great extent [ ]

To a Moderate extent [ ] To a Small extent [ ] Not at all [ ]

18. Do you think designing of E-government systems that address challenges of PWD would enhance usage of E-government Services?

Yes [ ] No [ ]

b). If yes what challenges faced by PWD would you like to be addressed in the designing of E-government systems?

.....

.....

.....

.....

19. What other challenges or issues do PWD face in accessing e-government services offered at the Huduma Centres in Kenya?

.....

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.....

.....

THANK YOU FOR YOUR PARTICIPATION