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Usability of the KRA website.

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Abstract

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Many governments around the World have adopted the e-government strategy to offer better services to their citizens and to cut costs by streamlining government processes and to promote transparency. This has been made possible by the growth and development of ICT which has introduced better methods of offering services to the society.

On a bid to catch up with the developed nations, many developing countries have set out to increase the usage of technology in government services. They have however been met with a variety of challenges in the successful implementation of electronic service and need studies to be conducted to understand the major challenges that they need to overcome to better succeed in their e-government development goals.

Kenya is one the many other developing countries that have made major development in e-government. In spite of the challenges it has faced, the government has continuously pushed for the development of its e-government services. In this thesis the researcher aims at understanding the current situation of e-government development of Kenya by focussing on a major government e-portal, the KRA website. The researcher tries to find usability issues of the portal.

The researcher first describes the purpose of an e-government and the benefits that it harbours, then finds literature on studies done in developing nations to understand the current situation and then applies usability testing methods to find issues with the KRA website. The researcher uses a mixed research method to collect qualitative and quantitative data and uses the usability heuristics to recommend possible changes that could be done to improve the website.

Keywords
E-government portal, Usability, Heuristic evaluation

Table of contents

1 Introduction

1.1 Background

ICT has brought many changes to how organisations partake in their day-to-day business and how they offer their services to people. The internet has played a big role in how these services are offered and how businesses interact with their customers. In today's digital age society, information flows in both directions, from customers to businesses and vice versa due to the improvements and advancements in technology. Countries all over the World are moving from traditional industry and are adapting and complying to more desirable ICT infrastructures. It has created an information global economy that influences different sectors to operate in higher efficiency. This new industry has allowed individuals to seek personalized services and hence reduces the cost in time and money for both the customer and the service provider. Many governments have also ceased the opportunity to adapt to the newer and more efficient methods of delivering their services. Service delivery improvements have been such as providing citizens with frequently updated websites where they can get up to date information on matters such as tax information or other relevant information such as response to national emergencies. Other benefits include integration of different government services, reduction in administration costs, one single and integrated view of citizens across all government services and quick adaptations to meet the needs of the public (Karunasena & Deng, 2012). E-governments benefit all stakeholders by providing more convenient avenues of accessing government services, increasing opportunities for the public to participate (Heeks & Bailur, 2007).

Recently, the government of Kenya has been pushing the agenda to increase e-government services to increase productivity by streamlining processes and to offer efficient services to citizens all over the country even in marginalized remote regions (MOH News, 2023).

In this report the researcher will be discussing the usability of the Kenya revenue authority system which was introduced in the 2014 and has been in continuous development with the most recent features being added in April 2023 (kra.go.ke).

Usability can be defined as the quality attribute that assesses how easy user interfaces are to use and the word usability also refers to the methods for improving ease of use during the design process.

This paper uses a mixed method of collecting quantitative data and qualitative research methods to find issues in usability for the Kenya revenue authority. The methodologies used include conducting a usability study with 5 participants. As described by (Nielsen J, 2012) conducting user test to identify design problems we typically need about 5 participants. According to (Nielsen J, 2012), user testing is the most effective and basic method for studying usability. The study is conducted by first identifying representatives of users and asking the representative users to perform certain tasks with the goal of observing them while they achieve certain tasks that have been predetermined.

1.2 Purpose of research

The Kenyan government has in the recent past years had many campaigns to raise awareness of the e-government portal to the public (President.go.ke, 2023), and as the number of users increases within the population, the need for good usability has increased. On the other hand, for the government to successfully implement the portals and achieve its goals for use of the portal, it has to continually improve and develop based on user studies and user feedback. The purpose of this study is to evaluate the usability of the Kenyan revenue authority by having it as the case study. The KRA website is part of the e-government services and therefore the findings of this study can aid in improving its usability, while at the same time allowing other services offered through the e-government to make comparisons and improve their own areas and hence providing better overall online services and increasing user satisfaction.

1.3 Overview of thesis

This thesis consists of six sections. The first section presents the background topic and introduction to the topic and the main goals of the study.

The second chapter defines usability and also defines e-governments and examines studies done on e-governments portal in developing countries and the value of e-government services to the public.

The third chapter defines the research problem and outlines the research methods applied in this study and the research process.

The fourth chapter describes the KRA website as the e-government portal. The usability evaluation method used is described and the issues detected are discussed according to Jakob Nielsen Heuristics principle.

The fifth chapter analyses the usability evaluation results and remarks on each usability issue.

Finally, the sixth chapter summarizes and concludes the research findings and offers recommendation for future design changes of the KRA website.

2 Theoretical Framework

In this chapter the researcher introduces and discusses usability and e-government and discusses their benefits.

2.1 Usability

Usability is defined as how well a user accomplishes given tasks in a given product, it is as a result of intentional, research based, and user tested design decisions made with the goal of making the product as easy as possible to use for the users and meeting their expectations and needs. Usability is a component of user experience design and other important quality attributes include utility which refers to the designs functionality and emphasizes on whether the product does what it is intended to do. Together usability and utility determine the usefulness of a product. Usability has been adopted by many other industries that have complicated systems to use such as architecture, consumer electronics, computer software, road signs and more (Interaction Design Foundation, 2016). Other definitions of usability are:

As defined by (ISO 25010, 2022) ISO software and data quality. The degree to which a product can be used by specified users to achieve great goals with effectiveness, efficiency and satisfaction in a specified context of use. Sub-characteristics defined are:

i. Appropriateness recognizability – How much the users can recognize whether a product or system is appropriate for their needs.
ii. Learnability – How much a product or system can be used by specified users to achieve specified goals of learning to use the product or system with effectiveness, efficiency, freedom from risk and satisfaction in a specified context of use.
iii. Operability – How much a product or system has attributes that make it easy to operate and control.
iv. User error protection. How much a system protects users against making errors.
v. User interface aesthetics – How much a user interface enables pleasing and satisfying interaction for the user.
vi. Accessibility – How much a product or system can be used by people with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use.

According to (Nielsen J, 2012) the word usability also refers to the methods of improving the ease-of-use during the design process. Usability is a quality attribute that has five components he defines the quality components as follows.

i. Learnability – How easy it is for users to accomplish basic tasks the first time they use a system.

ii. Efficiency – How quickly the users can perform the tasks once they learn the design.
iii. Memorability – How quickly users can re-establish efficiency after a period of not using the system for a while.
iv. Errors – How many errors a user makes and how severe they are, and how easily can they recover.
v. Satisfaction – How pleasant is it to use.

2.1.1 Early laws on usability

There are two scientific laws that are the foundation of modern usability. They came into place many years before the invention of the internet. These laws are Hick's Law and Fitts's Law. Hick's Law states that, "as the number of choices increases, so too does the amount of time it takes for a reaction" (Hick, 1952). Fitts's law states that "the time required to move to a target is a function of the size of the target and distance to the target" (Fitts, 1954).

2.1.2 Application of Hick's and Fitts's laws in website design

When the effort to make a decision outweighs the benefits of making it, a user will quit using the website It also takes more effort to move a cursor to objects that are farther apart or to click on to objects that are too small. It is important to make buttons for commonly used activities larger and to move them closer together and group them to minimise how far a user move the cursor to click on the preferred button (Martin Lind, 2022).
In website design it is imperative to consider, limiting the number of options in a navigations list and interactive options, minimising the amount of choices the user need to make can improve the experience greatly, grouping elements together allows for the user to have the most important objects close to them and allows them to navigate easily and efficiently through a website, other web elements should be at a reasonable distance and white is good, the homepage can be minimalistic but bold to serve the main purpose or objective.

2.2 Importance of usability testing in software

There are many benefits that come with usability testing of software, some of them as stated by (testingxperts, 2022) include, providing insight on the learning curve of the product, defining the ease of use for the product or software, understanding any issues that might be experienced by the end user that were no thought about in the designing phase, understanding how end users interact with the system, it allows for the input of all stakeholders including the end users in the decision of the design based on the interactions and helps to settle any design debates with factual information, tested products can effectively

lure users and customers and sustain their interest in the brand and allow for trust and loyalty to the product over other competitors.

2.2.1 Costs of poor usability

For e-commerce website, a user would leave the site if it is too hard for them to find what they want or if the website is hard to read or if it does not answer the users questions. Leaving means that they do not buy anything. On the other hand, if the users stays long enough on a poorly designed website, they might make errors which would result in the user asking for assistance by calling or emailing. A poorly designed e-commerce can also lead user to purchasing the wrong items and thereby increases the products return rate. In a worst-case scenario bad usability can cause a frustrated user to never come back again and talk ill of a websites service and therefore cause brand damage.
While better usability does not increase purchase intent, it plays an important role on the user experience, and which can affect on whether the users come back and recommend your products to other potential customers or not (Caicedo D, 2017).
On an article by (Paunovic G, 2019) of Forbes, when the security software company MacAfee began integrating usability testing to learn more about its customers and their needs, the company saved over 90% in support expense costs.
Another report by interaction design foundation shows that Etsy, a global online marketplace routinely tests different versions of user interfaces to constantly improve the platforms usability as well as business metrics. Its continues position as one of the leading online marketplaces is as a result of rigorous focus on usability, research and testing.
The world's most successful companies such as AirBnB, Netflix, Amazon continually test and iterate their products (Linowski J, 2020).

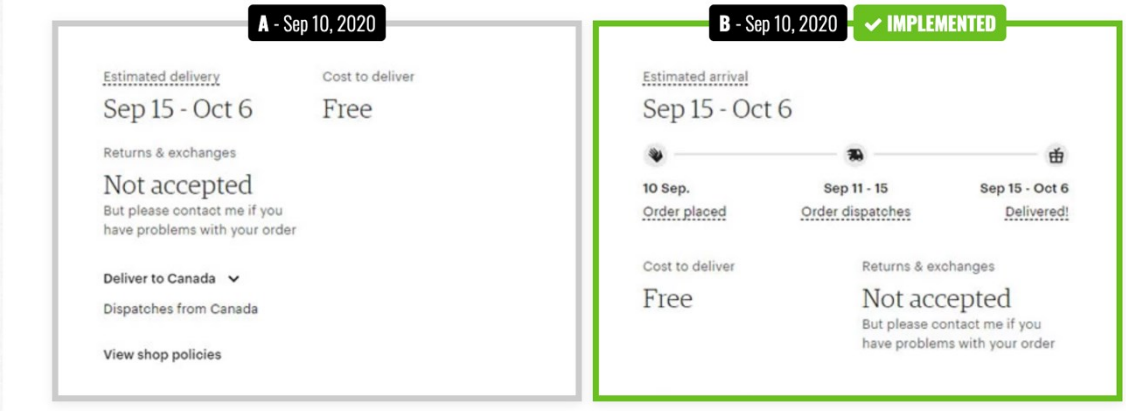

Figure 1. Etsy A/B tests a winning shipping timeline (adapted from goodui.org)

2.2.2 Other key aspects to consider for usability.

In addition to content Google search central (2023) states that, other web development and design considerations are servers that can host pages fast. Pages that load quickly were thought to have gotten higher ranking on Google search than pages that load slowly. These assumptions come from knowing that Google wants to serve pages that have better user experience. On the page experience documentation, Google clarifies that a websites speed may not be highly impactful on the pages ranking at all times, but it still is a ranking factor. Servers can influence how quickly a page can load depending on its capacity and specialization. During downtime a website is completely inaccessible to the users, even though this can happen to any website, a website with reliable servers will have minimal downtime, thereby enhancing the usability.

Using ALT tags in HTML allows developers to convey additional information about images that are not displayed as the main text. They also help with screen reader narration for the visually impaired users.

Another thing to consider is the 404 page. The default 404 page is not very helpful when users encounter broken links. It gives users the impression that they have come to a dead-end. A good website should check regularly for broken links and fix them, but they can also have a well-designed 404 page that will try to assist the user to return to a positive experience.
Websites should have font size and color that allow for easy reading for the users, high level of contrast with the background and large enough font sizes will make it easy for the users to read.

Branding the website with company logo helps user to know that they are on the right page online. Based on eye movement patterns, the ideal place for the logo is the top left corner of the website where users who read from left to right will arrive at first.

Layout colors should be consistent in order to convey branding and have an aesthetic appeal. They must also deliver on readability and convey a hierarchy of information.

Navigation on websites is crucial for the users to move from the entry to the desired location with ease. Search functions can aid in larger websites and facilitate smooth navigation to users.

Content should be organized in manageable chunks and have consistent heading type with throughout the website. Allowing for a consistent experience. Paragraphs should be clear and easily recognizable to prevent users from being overwhelmed with a wall of text.

2.2.3 Importance of usability on government websites

Even though government websites are different from e-commerce businesses, there are key principles of usability still apply. A local government website is how government official want to portray their city or county in a digital sense. A usable website creates a great first impression to citizens visitors and businesses. A usable website also helps people to efficiently obtain the information they require and accomplish tasks online, thereby enhancing public trust in government. In cases where individuals are unable to locate what they are looking for on the official government website, they will turn to making business calls or in-person visits to the office. In the end, this drives up the cost of government by increasing the cost of all transactions (Lind M, 2022).

By embracing user-centric design driven by usability, governments can:

i. Produce information that is easy to understand and act up on.
ii. Encourage participation by making it easy for user to connect.
iii. Create systems that facilitate transactions both internally and externally.
iv. Deliver information that can be accessed anywhere on any device.
v. Increase productivity and efficiency of internal processes.

2.3 Measuring usability

Usability can be categorized into two main groups, which are inspection methods and empirical methods (Holzinger A, 2005). The main difference between the two is that, in the inspection methods, there is need for input from usability experts while empirical method, involves the end users of the product. Inspection methods consists of heuristic evaluation, action analysis, and cognitive walkthrough, while empirical methods include, user testing, query testing and pencil and paper testing (Otaiza R, 2010). There are several methods of usability testing that are widely used nowadays, a recommended method by (Sweenery & al, 2003) of measuring usability, is dividing usability evaluation methods into user-based evaluation and expert-based evaluation. Specialists should conduct expert-based evaluations first to find the basic usability issues, and then conduct a user-based usability tests to find other issues that they might have missed or are hard to find with the previous method (Kantner & Rosenbaum, 2003). In this study the researcher applied two usability evaluation methods in order to clearly find the answers to the questions queried in this paper. As pointed out by (Usability.de, 2023) expert review cannot replace usability testing with real users and a combination of usability testing and expert review is recommended. On a study conducted by (Niranjanamurthy M, & al, 2014) on user experience

professionals, it found that, it was highly common to combine expert reviews together with usability testing. The methods are discussed in the following sub-chapters.

2.3.1 User-centred evaluation method

This method of evaluation is an empirical evaluation method that involves the end users to test the system design. It is mainly used to service any or all of three main objectives, supporting decisions, verifying the quality of a product, and detecting problems (Schellens & De Jong, 1997).

2.3.2 Expert review evaluation method

The main methods used for expert reviews are heuristic evaluation using the ten heuristics by Jakob Nielsen and cognitive walkthroughs. As explained by (Beres J, 2021), the best way to review a website depends on each individual website and the expert does not have to rely on a specific checklist, he also adds that any analytical data or any other information can be helpful in making a good review. Expert review evaluations are done by a usability expert who is trained and experienced and analyses the product based on knowledge of usability heuristics and principles. The analysis can also be used to create an interview manual for usability tests that may come later (Usercentrix, 2023). Advantages of an expert review are that it is not expensive, it takes a little amount of time, it requires only one or two experts and because it does not need the recruitment of test participants and conducting of usability testing, it is very cost effective (Beres J, 2021).

2.4 E-government

There is no general term that is universally accepted for the term e-government (Al Rashidi, 2013). Previous e-government studies that have been done reveal that authors portray e-government by drawing from their own perspective and viewpoints (Kamau, 2016). What is of consensus is that e-government offers information and services by applying ICT to citizens, organisations and employees (Palvia & Sharma, 2007). E-government is a term that is derived from electronic government. It is defined as the use of electronic communication devices such as computers and the internet to provide to provide public services to the citizens and other persons in a similar region. The term consists of digital interactions between citizens and their governments C2G, between government and other government agencies G2G, between governments and its citizens G2C, between government and its employees G2E, between governments and businesses G2B. (Jeong, 2007) This interaction consists of citizens communicating with all levels of government from province, state, national to international facilitating citizen involvement in government using ICT.

Specifications for user requirements have been recommended by the ISO standards 13407 and 924 (ISO, 1999; 1998) as follow:

Services should be relevant to the users. It must be clear to every user of the product, how it works and what is designed for, and it should be easy for the user to recognize and identify how to use a system but should also be able to access help if needed.

Technical aspects such as technology and equipment should be accessible to the user. The level of technology should be as low as possible for a one-stop government platform, and the citizens can access it using a minimum amount of technical equipment.

Users should be able to rely on their systems to deliver as they have been designed to and therefore the system should be predictable and should give adequate feedback so that the user always understands what is going and the system should deliver results within reasonable amount of time.
Finally, a system should be multilingual and users should not be restricted to using only one language. The user should be able to choose which language they want to use. A reasonable trade-off is offered for how many languages a system can use depending on the context.

2.5 Types of e-government services

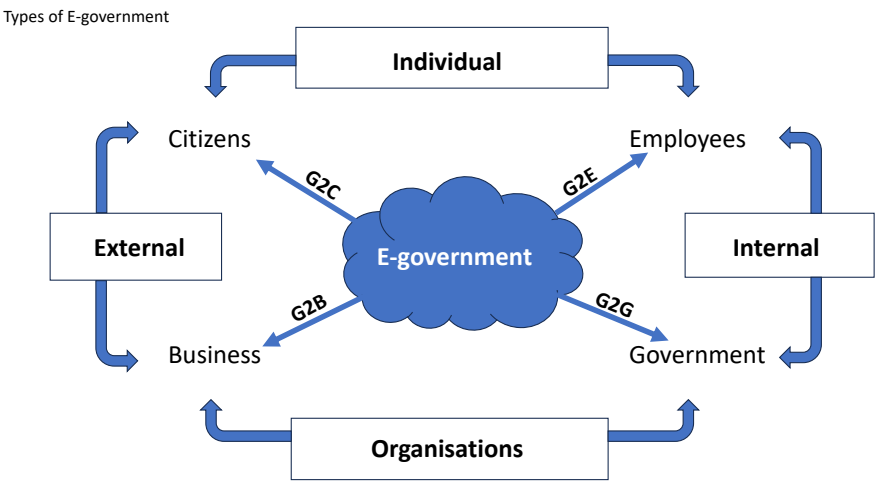

Figure 2. Types of e-governments (adapted from Haskell-Dowland & al, 2014)

As shown on figure 2 above there are four main types of e-government services. Each type focuses on specific stakeholders and their respective needs, aiming to improve service delivery, efficiency and transparency, while enhancing citizen engagement, business facilitation, employee management and intergovernmental collaboration (Haskell-Dowland, P., Papadaki, M., Alharbi, N., 2014).

G2C (Government to Citizens): Involves using digital platforms and technologies to deliver public information directly to individuals. This includes online portals for citizens to access services such as application of documents such as renewal of passports, driving licenses, filing for taxes online, accessing public information and participation in online consultations. G2C e-government aims at making government services accessible, convenient for the citizens and allowing them to access services from anywhere.

G2B (Government to Business): It involves providing online platforms and services that facilitate business registration, licensing, permits, tax filing, procurement and other government services. It aims at simplifying administrative procedures and improve ease of doing business. G2B enables faster processing times, improved efficiency, and increased transparency in business related transactions.

G2E (Government to Employees): It refers to the use of digital technologies to manage and streamline government internal operations. It involves systems that facilitate employee training, employee performance management, payroll management, leave applications and communication within civil servants. It aims at enhancing efficiency, productivity, and engagement of government employees by providing them with digital tools that manage their work-related processes and accessing relevant information.

G2G (Government to Government): It focusses on providing digital interaction between different government agencies or departments. It involves sharing of data, resources and services among government entities and enhances collaboration, coordination, and efficiency in governance. G2G e-government includes electronic data exchanges, communication systems in different departments, shared databases, and collaborative platforms.

In this study the author looks at the KRA website which is a government portal which encompasses all the types of e-government in the services that it offers, with the main focus being usability.

2.6 Development of e-government in Kenya

The first e-government strategy was formulated in 2004 and was approved in December of the same year. The main aim was to create order and harmony in government ICT initiatives which were in disharmony with each department of the government pursuing their own agenda which resulted in waste of resources through duplication (Wamoto F, 2015).

According to the (Kenya E-Government Strategy, 2004), the aim of e-government was to offer better and efficient delivery of government information and services to the citizens and promote productivity among public servants, encourage participation of citizens in government and to empower the citizens in line with economic development priorities that were outlined in other government programs.

The specific government objectives (Kenya E-Government Strategy, 2004), were as follows;

i. Improve collaboration between government agencies through reduction in the duplication of efforts and enhance efficiency and effectiveness of resource utilization.
ii. Improve Kenya's competitiveness by providing timely information and delivery of government services.
iii. Reduce transaction costs for the government, citizens and the private sector through the provision of products and services electronically.
iv. Provide a forum for citizens' participation in Government activities.

According to a report released by United Nations (e-government survey 2022), Kenya is ranked at position 113 of the 193 participating nations, at the EGDI (e-government development index). Kenya improved from rank 116 in 2020 and rank 122 in 2018. Kenya's EGDI value in 2022 was at 0.558. The report shows that Kenya still has room for improvement when compared to the global EGDI value of 0.61. However, looking at the E-Participation Index (EPI), Kenya does much better, being ranked at position 64 of 193 participating nations, with an EPI value of 0.579 compared to 0.445 value which is the global average. The EPI derived as a supplementary index to the United Nations E-government survey. The EPI is a multi-faceted framework composed of three core components, those are e-information, e-consultation and e-decision-making. The e-participation framework is further described as:

i. E-information means enabling participation by providing public information to the citizens and access to information upon demand.
ii. E-consultation means engaging citizens in contribution to and deliberation on public policies and services.
iii. E-decision-making means empowering citizens through co-design of policy option and co-production of service components and delivery modalities.

According to the UN E-government Knowledge base, the purpose of the EPI is to offer insight on how different governments are using online tools in promoting interaction between governments and people for the benefit of all.

2.7 Benefits of e-government portal

There are great benefits to government offering e-services and all its stakeholders such as employees, businesses, government agencies, and citizens. These benefits mostly fall under economic, social, and political themes (Dwivedi et. al, 2012).

Economically, e-government implementations promise tangible and intangible benefits (Kamau, 2016). Tangible benefits include and are not limited to reducing the costs of users and the governments, for example having self-services can reduce costs for both parties. Other benefits include reducing the processes of service delivery, reducing bureaucratic intricacies and enhancing government accountability and transparency (United Nations, 2014). Social benefits include empowering citizens with access to online information. For example, through e-government citizens in geographically secluded areas, social or cultural restrictions can access information, thus people in remote areas can have the same access to e-services just like everyone else.

Political benefits include, e-governments allowing increased public participation of citizens in political processes and enhancing transparency and build trust between governments and their citizens (United Nations, 2014).

2.8 Measuring e-government development

There are several different frameworks and benchmarking tools that show maturity of stages of e-government. These existing different models prove that there is not one specific model that is collectively accepted as the main framework for measuring e-government development (Rhode & al, 2008). The existing e-government maturity models can have stages that range from three to six and specific services can be classified to be in different stages in the different models (Kamau, 2017). All the models are in harmony in that the complexity of the technology used is directly proportional to the stages of e-government services (Al-sebie, 2011). For the purpose of this study, the researcher bases his research on the benchmarking tools that are used by the United Nations, as a performance indicator.

2.9 UN e-government benchmarking tools

According to UNDESA publications, the first UN e-government survey was conducted in 2001 and the most recent survey of 2022 is the twelfth edition. United Nations measure the development of e-government services of its member states every two years, and presents it as a survey of the E-government Development Index (EGDI). The development index assesses the development of websites in each of the member states and also incorporates characteristics such as access to infrastructure and education levels to reflect how a country is using ICT to promote access of information and inclusion of its population. The EGDI comprises of three important measurements of e-government. Those are how a government provides online services, how well it's telecommunications connection infrastructure is developed and how well its population is educated in computer technology. According to the United Nations e-government development database (UNeGovDD), the EGDI is not a measure of government development in absolute sense, but a performance rating relative to other governments.

The chart below shows each of the three components.

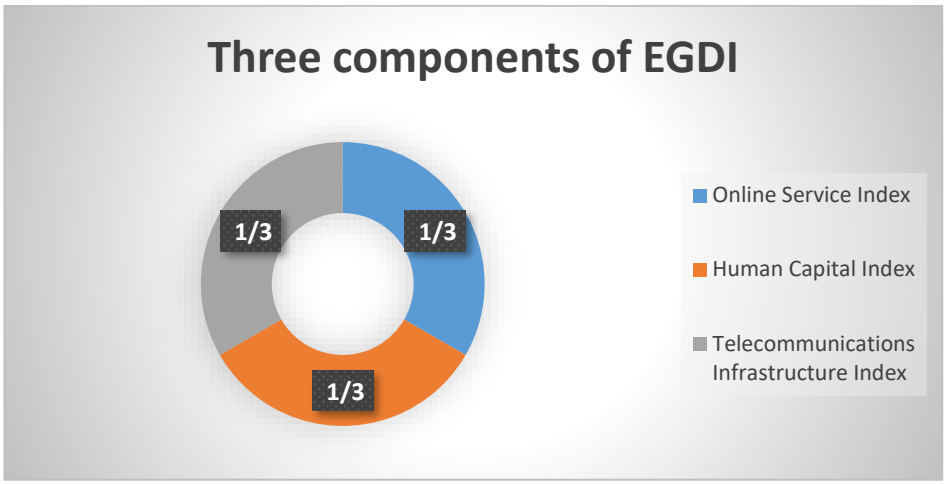

Figure 3. The three components of e-government development index (adapted from UN e-government development knowledgebase)

According to UNeGovDD, in mathematical terms, EGDI is a weighted average of three normalized scores of three most important dimensions of e-government which include;

i. Scope and quality of online services. (OSI)
ii. Development status of telecommunication infrastructure. (TII)
iii. Inherent human capital (HCI)

The composite value of each component index is normalized to fall within the ranges of 0 to 1. Countries are grouped into four levels as follows:

i. Very high EGDI, values from 0.75 to 1 inclusive
ii. High EGDI, values from 0.50 to 0.749 inclusive
iii. Middle EGDI values from 0.255 to 0.499 inclusive

iv. Low EGDI values from 0 to 0.249 inclusive

The ratings are further broken down within each of these four categories in descending order, from high to low.

For the first time in 2022, the survey broke down the Online service Index into five subcategories. This allows for a more detailed assessment and allow the member states to have better understanding of what areas of improvement to target in the future for the overall better results of the EGDI.

These five subcategories are indicated in the chart below,

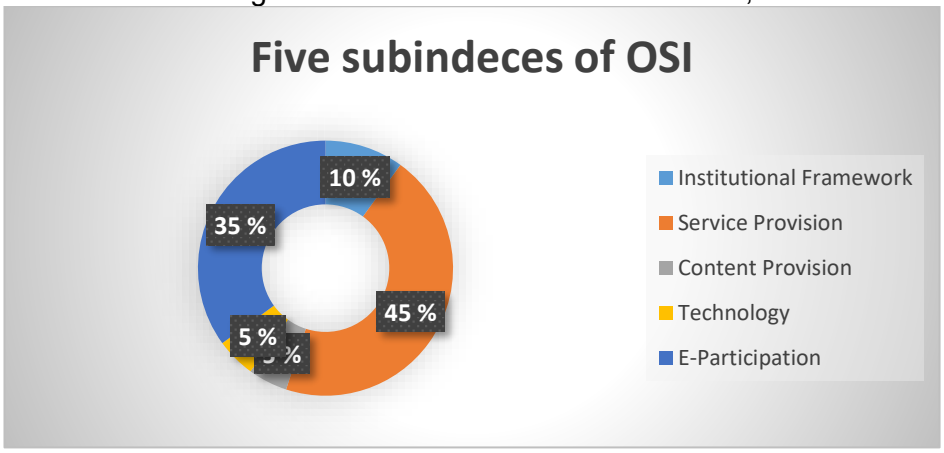

Figure 4. The five subindeces for the measuring of online services index (adapted form UN e-government knowledgebase)

According to the UNDESA publication on global trends in e-government, the UN e-government survey of 2022 reflected that, 60 countries have high EGDI, 73 countries have high EGDI, 53 countries have middle EGDI and seven have low EGDI.

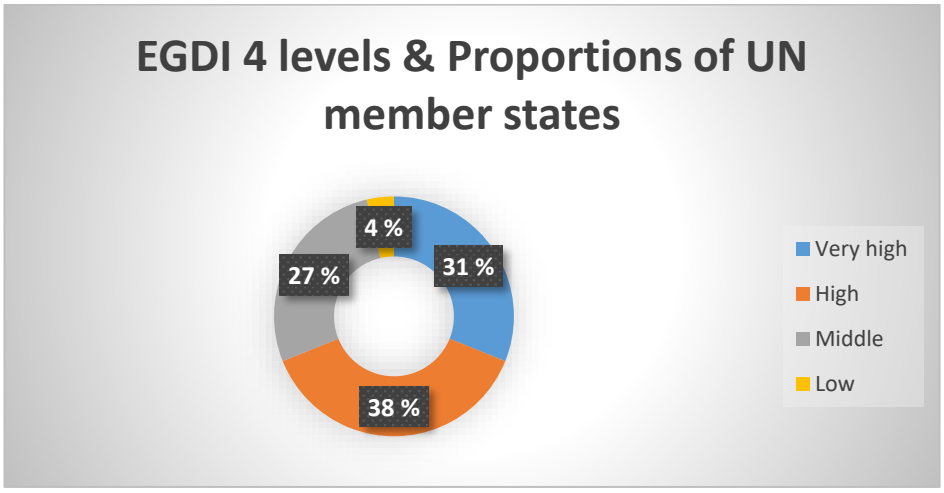

Figure 5. Proportions of 193 countries in the four main categories of EGDI (adapted from UN EGDI survey, 2022)

2.10 E-government in developing countries

There is quite a gap between developing and developed countries in e-government (Abubakr M, 2021). Previous studies done on the state of e-governments show that developed countries focus more on Telecommunication Infrastructure Index (TII), Infrastructure Component, Online Services Quality (OSI), and Human Capital Index (HCL) and thereby getting their citizens to trust the government online services and have satisfaction from government services. (Majeed B & al, 2019). In developing countries, there is a lack of awareness about computer science and ICT technologies which is a key challenge that is concerned in the implementation of e-government (Odat, 2012). The corruption in developing countries can restrict the capacity of e-government projects to match the expectations of stakeholders through harming the morale of people which damages the government standards and to supervise the general administrative system. (Aladwani, 2016). The most basic hindrances and obstacles for e-governments in developing countries are ICT infrastructure, policy and law, financial resources, digital illiteracy, and human resources. (Mohammed & al, 2016). Other studies (Mates & al, 2013) show that between 60 and 80 percent of government projects in developing countries that are implemented, fail to reach their goals. Probabilities for the causes of failure, depending on their context may vary from political issues, social factors, cultural factors, and institutions regulatory. (Al-Naimat & al, 2012).

3 Research methodology

The empirical part of this thesis consists of a mixed method of research, involving qualitative data and quantitative data collection. The qualitative data is used extensively in this research and to answer with a degree of accuracy the questions that the researcher is attempting to answer. The researcher makes use of quantitative research to get a clearer image of the type of the users the subject website has. These additional findings from the quantitative research will act as a validation to the qualitative research findings and the user profile. Understanding end user pain points through research relies mostly on qualitative methods but in recent years, many tech companies have adopted mixed methods, which include quantitative methods of research to justify the qualitative research. (Kyne D, 2021).

3.1 Research problem

This study aims at evaluating the level of usability of the Kenya Revenue Authority website which is the system that acts as a portal to several other websites where citizens can access government services. The study will aid in discovering usability issues that may occur on the website. The findings will provide recommendations for how to improve the quality of the website.

With regard to the above, the author attempts to answer the following questions:

i. What kinds of usability issues exist in the KRA website?
ii. How can it be improved?

3.2 Research method

The most effective usability study is usability study is usability testing where the end users are involved (Rubin & Chisnell, 2008) and data collected through observation because the users can say what they think which does not always correspond with what they want to do (Nielsen, 1993). This study uses the lab-based usability testing which comprises of qualitative research methods. There were five participants that were chosen (Nielsen, 2012) for this study and each participant was issued a minimum of three tasks (Rubin & Chisnell, 2008) to accomplish using the website. (Sauro J, & al, 2016) Points out that researchers should not be stopped from using statistics to quantify data to inform on design decisions even if the size of the sample is as few as two to five users. The lab-testing moderated method that is used in this research, can have expensive setups which can be costly and time consuming and may require collocation of users and observers which can be prohibitive in international testing (Sauro J, & al, 2016). The three critical things needed

in a think aloud usability test are having the representatives, giving them tasks to accomplish and being silent and allow them to do the work (Nielsen, 2012).

3.3 Usability Testing of the KRA website

In this study usability testing was used to test whether users could use the website and to find out their experiences while doing so. This involved:

i. Identifying representative end users of the website.
ii. Giving the representative users tasks to attempt completing.
iii. Observing the users as they attempt the tasks assigned to them.

The researcher observed each user quietly and took notes while observing the users' reactions and facial expressions and body language. The users were also briefed in the beginning of the test to ensure that they were comfortable with the test environment. The researcher followed a strict process to eliminate biases while guiding the participants.

3.3.1 Testing process

The testing process followed the following steps;

i. Developing a test plan.
ii. Recruiting participants.
iii. Setting up the testing environment.
iv. Preparing test materials.
v. Conducting tests.
vi. Briefing the participants.
vii. Analysing data and observing.
viii. Report findings and recommendations.

3.3.2 Developing the test plan

A test plan plays a crucial role in the study, the researcher needs to understand that having a good test plan legitimizes the study by offering a strong foundation and the test plan acts like a blueprint for the tests conducted. The test plan defines the resources required and outlines the procedures to be taken and makes sure that the research stays on the right path and does not get skewed. The test plan for this study included;

i. The purpose and objective of the test.
ii. Research questions.
iii. Participants profile.
iv. List of tasks.
v. Test environment.
vi. Data to be collected and evaluation measures.

3.3.3 Recruiting participants

Although online usability tests are possible, the researcher felt that it was necessary to do the test in a physical environment where he could observe the interviewees body language and facial expression to get clear and concise results, because these would portray

the emotions and feelings of the users. Five participants were needed to conduct the usability testing (Nielsen, 2000). The researcher sent messages on social media platforms and groups for Kenyans living in Finland to find interested parties who were willing to participate.

3.3.4 Test tasks

In determining the tests to be attempted on the website, the researcher took into consideration.

i. The target users of the website.
ii. Frequently performed tasks, where problems may exist.
iii. Tasks that are encompassed in usability.

The tests and the questions were presented to the participants in a context manner which created a real-life scenario to follow as a simulation of an actual users event.

3.3.5 The test environment set up

The testing environment was agreed upon by the researcher and each participant individually. There were no tests conducted in the same location. Both parties agreed on where and when the test would be conducted, and the researcher investigated if the test environment would be conducive enough or not. The researcher chose to do the research in a real-world environment case scenario where participants of the study would be using the website just as they would at the comfort of their devices and familiar environments.

3.3.6 Testing room and layout

According to (Sauro J, 2018) a dedicated usability lab needs space that is large enough to accommodate two to three people. The furniture should be comfortable enough for the test taker, moderator, and a modular desk that can be set in different configurations depending on the test environment needed. The room should have a one-way mirror where observers can see the test takers, but the test takers cannot see the observers. A good lab needs microphones that can pick up what the test takers say and what the facilitators say too. High resolution cameras are recommended to capture and record the important moments in the usability tests. The room should also have reliable internet connection and good computers. He also explains that this kind of a facility may not be available to all organisations and therefore outsourcing usability testing to organisations that specialize in testing can be a good idea.

For the purposes of this study, a complicated test environment such as the one described above was not feasible, so the researcher tried to simulate a similar but simpler

environment, by considering most important specifications. The main requirements with the volunteered participants were that they should have a minimum of the following in their test environment of choice.
The items mentioned below were the minimum requirements for a testing environment.

i. A quite room with no disturbances.
ii. A computer.
iii. A desk and two chairs.
iv. Internet connection.

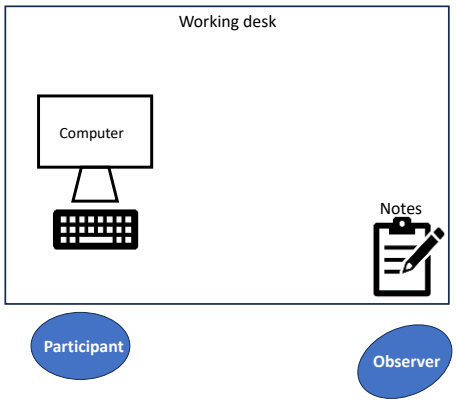

Figure 6. Testing room set up

3.3.7 User profiling

The researcher sent messages out on social media looking for volunteers who were willing to participate on the survey. Because of the logistics difficulties and challenges, only volunteers within Helsinki area were selected for interviewing. However, the researcher noted that the volunteered participants were good enough to represent the population of users of the KRA website because they are originally from different regions of the country in Kenya and have different backgrounds as illustrated on table 1 below. Other factors that affected selection was the availability of time and testing environment. The user also made use of an online survey to get more participants from Kenya, to validate the data and the user profile from the test participants.

Table 1. Test user profile

	Partici-pant 1	Partici-pant 2	Partici-pant 3	Participant 4	Partici-pant 5
Gender	Male	Male	Female	Male	Female
Age	35	28	38	40	24
Occupation	Software engineer	QA Tester	Nurse	Account-ant	Stu-dent
Computer skills	Excellent	Excellent	Good	Good	Good
Level of education	Higher educa-tion	Higher Educa-tion	Higher Educa-tion	MBA	Col-lege
No. of times they have used KRA website	> 5	> 5	> 5	> 5	< 5

3.3.8 Testing session

Before the testing started each user was briefed on the purpose of the test, procedures to be followed, their rights. Matters relating to privacy were discussed thoroughly to ensure participants understood how the researcher was handling any private data collected, to give or deny consent.

Each meeting for the interviews was done in an environment of the participants choosing where they felt most comfortable and was conducive for the testing. Each participant was given the tasks to accomplish and was encouraged to “think aloud”. After completion or abandonment of each task the participant was given another task until they completed or abandoned the three tasks assigned. After all the tasks were completed, the researcher would ask follow-up questions on any information that needed in-depth clarification.

3.4 Data collection

As pointed out in chapter 3.2, the data came from two sources, the usability testing with five participants and the online survey conducted using webropol.

3.4.1 Privacy and regulations

The researcher made sure that the data collected for the purposes of this research, could not be used to identify any specific individual from the test participants or respondents of the survey. Furthermore, the data collected during this research will be deleted and de-stroyed after the evaluation of the thesis. Participants were informed about this and asked of their consent in participation. All the participants of both survey and test consented.

3.4.2 Observation

The researcher used observation as a method to collect data on the participants of the test. The most crucial things that the researcher paid attention to were as follows:

i. Website loading time in second, and the reactions and remarks of the participants while they waited.
ii. How well they were successful at completing the tasks.
iii. Number of clicks that they had until task completion.
iv. Time taken to complete tasks.
v. Number of errors made until completion of tasks.
vi. User delays before making decision on what to do next.
vii. Users body language, facial expressions and remarks.
viii. Any other relevant observations while taking the test.

3.4.3 Data Collected

The study used the metrics for evaluating usability data and other qualitative data proposed by (Sauro J, 2016). Data collected will be analysed and used to evaluate the website and give recommendations for improvement.

The data collected was;

i. Website loading time.
ii. Tasks success rate.
iii. Task completion time.
iv. Number of clicks per task.
v. Frustrations.
vi. Participants facial expressions, body language
vii. Number of errors made.
viii. User satisfaction.

3.4.4 Limitations to the study

Data collected from lab-based moderated testing can be affected by the fact that the test participants can presume that they are the subject of the test. The participants can be discouraged from completing the tests if they feel that other previous tests are too challenging for them. To take measures to counter these scenarios, the researcher made sure that the test subjects were in a familiar environment of their choosing as long as it was conducive for the test and briefed the test participants thoroughly to make sure that they understood they were not the test subject. Another thing would be that all the study participants used computers to complete the test scenarios while in real life situations some users may be using mobile devices to complete the same kind of scenarios.

The KRA website has a log in section which hold confidential information. This study was limited to the sections of the website that are publicly available and no sections after log in pages were examined due to privacy and confidentiality of data.

3.4.5 Ethics considerations

The study did not collect any personal information that would give out the participants identity or private information. Participants in this study were asked to give consent of their willingness to participate in this study and were informed about the anonymity of data collected.

The researcher accurately presented and referenced all other secondary data.

3.5 Data analysis

Data collected was analysed and used to evaluate the website and give recommendations for improvement and also used by the researcher to draw a conclusion. The data was analysed in the following steps:

Categorizing data: While looking for the best way to analyse the data the researcher decided to create categories to where insights would go under based on the question and the tasks that the test participants were undertaking.

Writing down the insights: The researcher went through all the notes he had taken while conducting the interviews and collects insights on each of the participants answers, reactions and responses.

Coding insights: The researcher then used the Miro app to color code the insights, from each participant, each participant was assigned a specific color of sticky notes. Each one of these sticky notes was then put into one category, which it’s related to.

3.6 Survey

The researcher conducted an online survey to validate the findings of the usability test and the test participant’s profile. With the survey, the researcher wanted collect data to understand the actual users of the KRA website. The data collected included the age of the users, gender, occupation, computer literacy, and their satisfaction level of the KRA website. The survey was conducted using the surveying tool called webropol. There were twelve questions on the survey in total. Two of the questions were open ended where the respondents would write down in an input field with their own words describing their satisfaction level. The findings from these two open ended questions in the survey were used by the researcher to understand the users pain points on the website.

The survey received one hundred and ninety-two responses. This number of responses was sufficient for a quantitative study, considering that it is well over the forty participants guideline that is recommended for usability study (Budiu R, 2021). To predict the behaviour of a population, a researcher needs about forty data points to have a reasonable prediction that can be trusted.

4 Kenyan e-government portal

On a recent report by a renown Kenyan government website, the Kenyan government had added 839 service on to its e-government portal called e-citizen. The government had a goal to onboard 300 services every week to meet a target goal of 5000 services being offered on the e-government portal by June 2023, the report further continued to explain that the government was working together with the kenya revenue authority to ensure that they were onboarding more people onto the KRA system, to have more citizens using the online services (Kenya news agency, 2023). The KRA portal was chosen by the researcher to measure usability based on the fact that it plays a major role in e-government development in Kenya as noted on a statement released by the government news agency above. The findings of this research can be used as a guidance for the KRA website and other government websites may use the insights of this research in their implementations too.

4.1 KRA website description

The KRA website (kra.go.ke), is the Kenyan governments website which offers citizens services such as finding government information on taxes, filing taxes, finding information about government bids and e-procurement. This is a vital website that mainly offers G2C services to users as mentioned earlier in chapter 2.4.

The websites homepage has a navigation menu which opens up other pages on the complex website. The website has a default theme of red, white, and dark grey text. The website has a section that is updated with latest and most relevant news about taxes and policies. Below that is a section with the most important links to other relevant e-services.

The website offers many services, for example citizens and organisations can register for a personal identification number (PIN) number which is a personal number that the revenue authority uses to identify individuals and organisations. The website also gives information on the different types of taxes and has tutorials on how to file for taxes and even offer a calculator feature which allows users to input figures on fields to ease the task of calculating different types of taxes such as import duty, VAT, or PAYE.

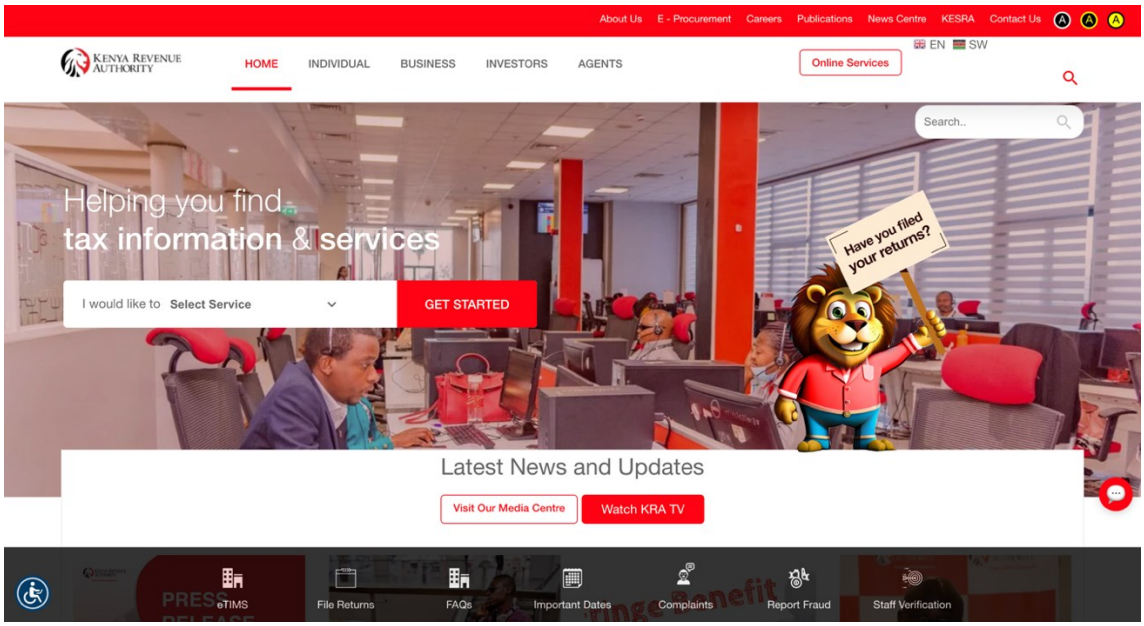

Figure 7. A screenshot of the KRA website (kra.go.ke, 2023)

4.2 Heuristics as the usability evaluation tool

According to an article by Kate Moran and Kelley Gordon, of the Nielsen Norman group, a heuristic evaluation is a method of finding design problems in a user interface. The evaluators are supposed to judge the design of a given interface based on a set of guidelines called heuristics. For usability testing, the Jakob Nielsen ten usability heuristics are recommended. Heuristic evaluations work best when conducted with a group of people, about three to five people is an ideal number of people to test the same system. (Moran K, & al, 2023).

4.2.1 Preparing for a heuristic evaluation

According to (Moran K, & al, 2023), there are a few steps to consider when preparing for the heuristic evaluation. Those steps are:

Choosing and training the evaluating team, this comprises finding a team of three to five participants to conduct the heuristic evaluation. The evaluator can consider having a practice round, which includes training using a simple design which is other than the one that is actually being evaluated. This is for the purposes of understanding what needs to be done.

The other thing to consider is how to document the evaluations. Each team member should have a copy of the evaluation document, this is where the evaluator fills in the observations one line at a time based on the heuristics.

The scope of the evaluation should be narrowed down so that it remains manageable. Narrowing down can be done by, doing one task at a time, evaluating one section of the app or site at a time, one user group if there are many diverse needs and one device type at a time in the case of testing for responsiveness on desktop or mobile.

Each team member should be evaluated independently, each person should go through the interface on their own. Each team member should go through the website as if they were the user trying to complete a task.

Each team member should look for issues such as design elements, features or choices that violate the ten heuristics. When they find issues on the interface, they can then fill in the issues on the appropriate field on the heuristic evaluation template.

Lastly the issues found can be consolidated from each test participant and similar issues clustered together using affinity diagramming.

The 10 heuristics for evaluation are as follows (Nielsen J, 1994).

1. Visibility of system status: Users should know their current system status, they understand the outcome of their prior interactions and can determine their next steps. This predictability allows the users to trust the system and the brand. Users should continuously be informed about the system status.

2. Match between system and real world: Systems should be built for specific users, the system should speak the language of the users. Icons, images, terms and concepts should be familiar and easy to understand for the users without complicated jargon.

3. User control and freedom: Users should at all times feel free to do what they want, they should be able to move back and forth the interface without being subjected to rigorous processes. A user should be able to undo an action as they please and they should have a clear exit to a starting point without getting stuck or frustrated. The exit should be clearly labelled and easily discoverable.

4. Consistency and standard: A system should follow industry standards. For users, having to learn a new system to complete some tasks means increased cognitive load. The learnability of a system should be consistent internally and externally, to make it easy for users to learn how to use the system.

5. Error prevention: A good system should prevent errors from occurring. Areas that may be prone to errors can have warning messages so that the users can confirm the actions that they are about to take. Preventing errors can reduce small frustrations. A system can have undo buttons that allow a user to undo mistakes.

6. Recognitions rather than recall: This aims at reducing a user's memory load by making the elements, actions and options in an interface visible. The user should not have to remember information from a previous section to another. A system can for example, offer help in-context rather than having the users go through a system tutorial and memorize it. A system should reduce the information that a user has to remember.

7. Flexibility and Efficiency of use: The interface navigation should be easy to use for all users. It should be customisable so that it caters for different users such as novice users and experts, people with different cultures, or people living with disabilities. A system should allow for customization and personalization.

8. Aesthetic and minimalistic designs: A system should be simple and should not have irrelevant or rarely used information. The systems should ensure that visual elements of the interface support the users' primary goals. The contents on the interface should not be crowded, because they become distractions to the user.

9. Help users recognize, diagnose, and recover from errors: Errors made should be presented to the user in a friendly way. An error message should be clear enough for the user to understand and it should also have a recommendation on how to recover and resolve the error.

10. Help and documentation: Help and documentation should be easy to find, and should be placed at the appropriate location, or it should be easy to search for. Documentation should be concise and have a list of concrete steps to follow for ease of use.

4.3 Heuristic evaluation of the KRA website

The researcher uses the heuristic principles as the evaluation guideline and points out issues that were found on the KRA website based on each principle.

4.3.1 Visibility of system status

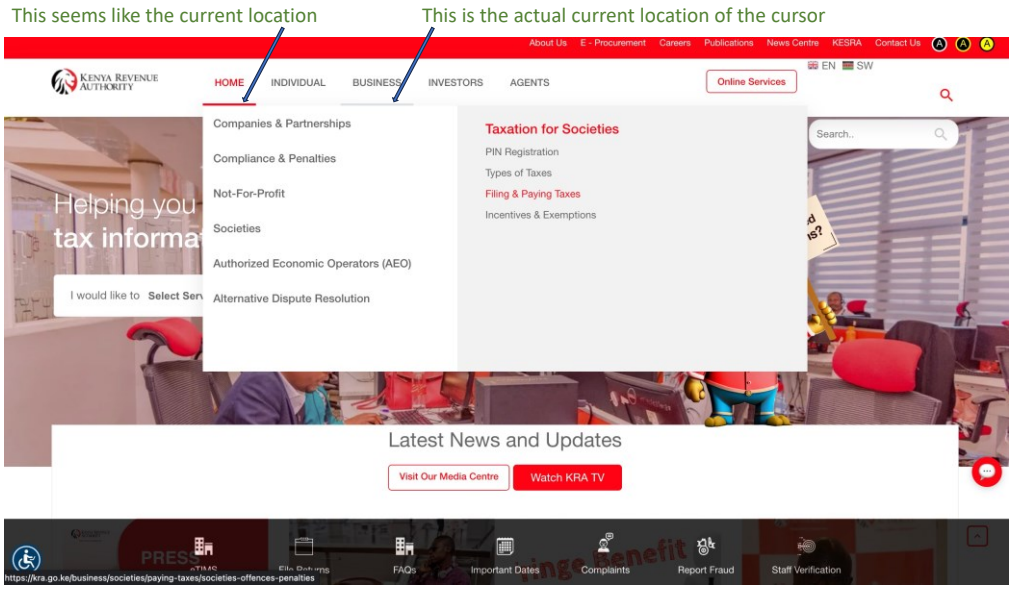

Figure 8. KRA website home page (adopted from kra.go.ke, 2023)

The cursor on the main menu tends to mislead the user, while it eventually changes after it has been clicked, there are several layers of pages that a user goes to before the system properly updates the users on where exactly they are. On the figure 8 above, the

menu seems to indicate that the user is on the homepage with the highlight under the home button, however the user in this case has opened the pages under the business tab and has chosen societies which is a sub-heading and is about to click on filing and paying taxes which is the page that is highlighted in the red text. The system does not clearly show the path that the user has passed to get to here. It also does not show highlight the correct button on the menu where the user is currently viewing. The other thing that participants pointed out is that the text is in a red color which in most cases indicates error. It is clear that the theme of the page is red and white, but the texts highlighting in red seem to mislead users to thinking that they have already clicked that link already or are making an error.

4.3.2 Match between system and real World

When a user scrolls down the homepage, near halfway the page there is a dynamic navigation bar which seem to be portraying real time data on foreign exchange or forex. The figure are slowly flowing from right to left as new figures for different foreign exchanges show up. The issue is that the foreign exchange rates they show there do not seem to be up to date. At the current time while taking this screenshot, the exchange rates are as follows: 1USD = 151,74KShs. 1 Pound STG = 185,49KShs. Just to name a few that do not match the figures showing on the website.

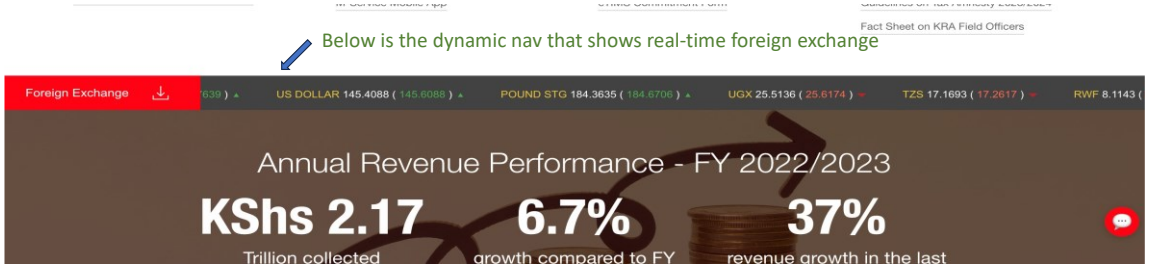

Figure 9. Figure showing a daynamic navigation on the KRA website (adopted from kra.go.ke, 2023)

4.3.3 User control and freedom

The research did not find any problems with user control and freedom.

4.3.4 Consistency and Standards

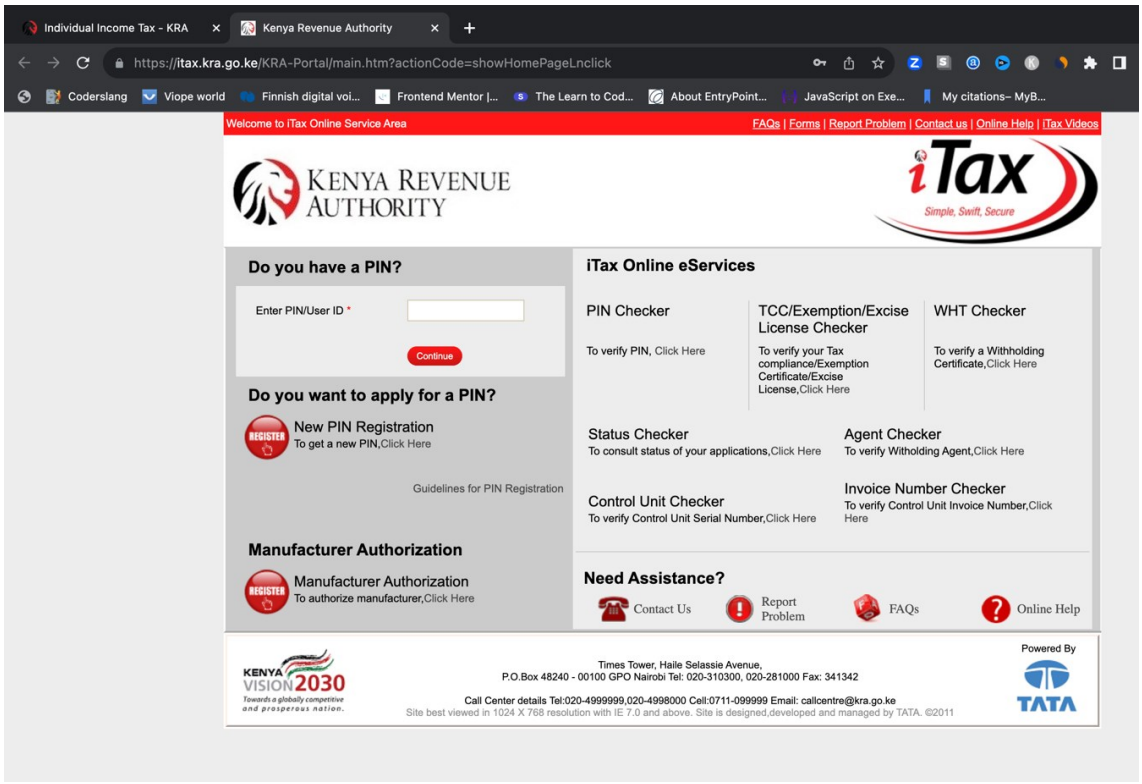

Figure 10. The log in page of the Kenya revenue authority tax system (adopted from kra.go.ke, 2023)

On figure 10 above, the user tried to click on the filing taxes link and it opened in a new tab. This is inconsistent with the same link clicked from a shortcut at the bottom of the page, shown in figure 11 below, where they have the accessibility menu. The accessibility menu allows the user to go the log in page of the iTax system (tax log in page) while maintaining to be on the same tab, allowing the user ease of coming back to the original page in case of unwanted mistakes.

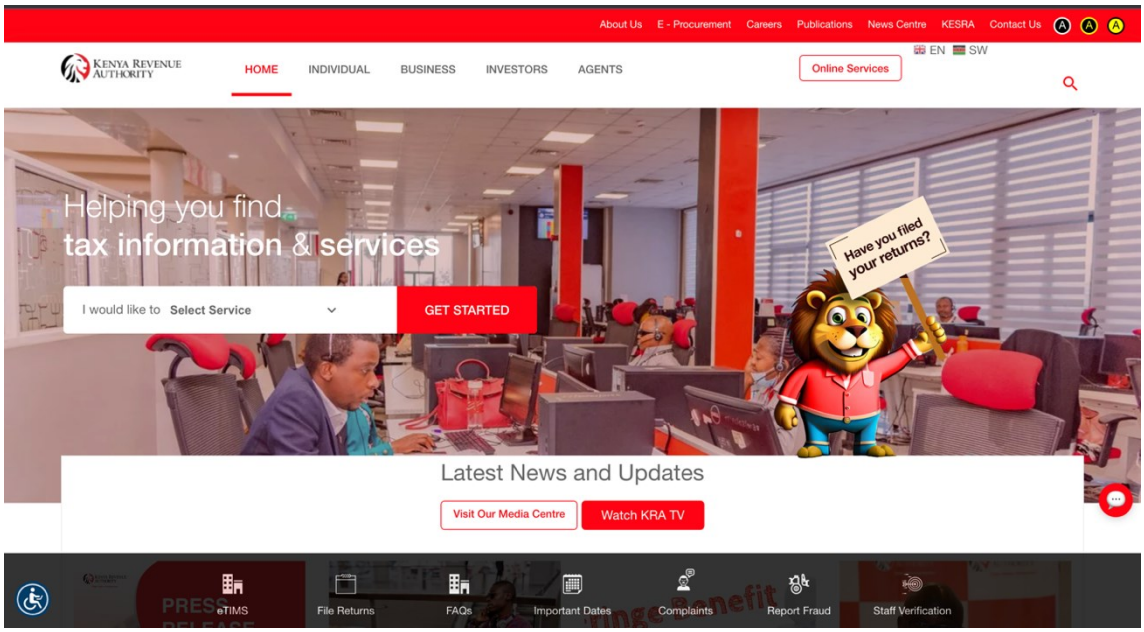

Figure 11. Homepage of the KRA website with the accessibility menu at the bottom (adopted from kra.go.ke, 2023)

4.3.5 Error prevention

The researcher did not find any issues with this heuristic.

4.3.6 Recognition rather than recall

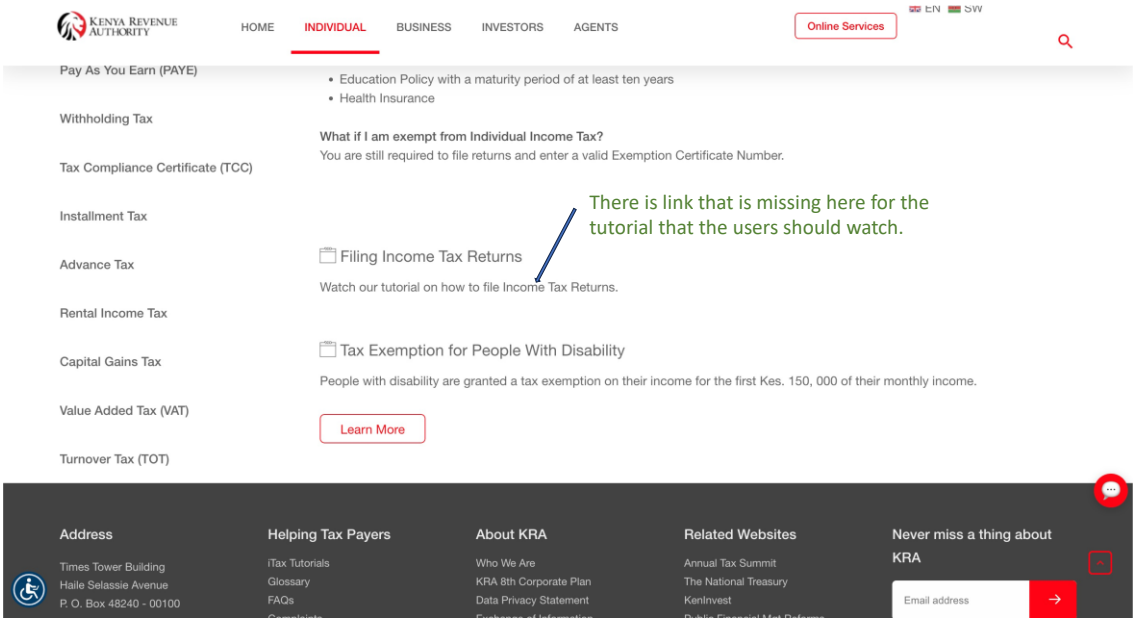

Figure 12. A missing link on the KRA website (adopted from kra.go.ke, 2023)

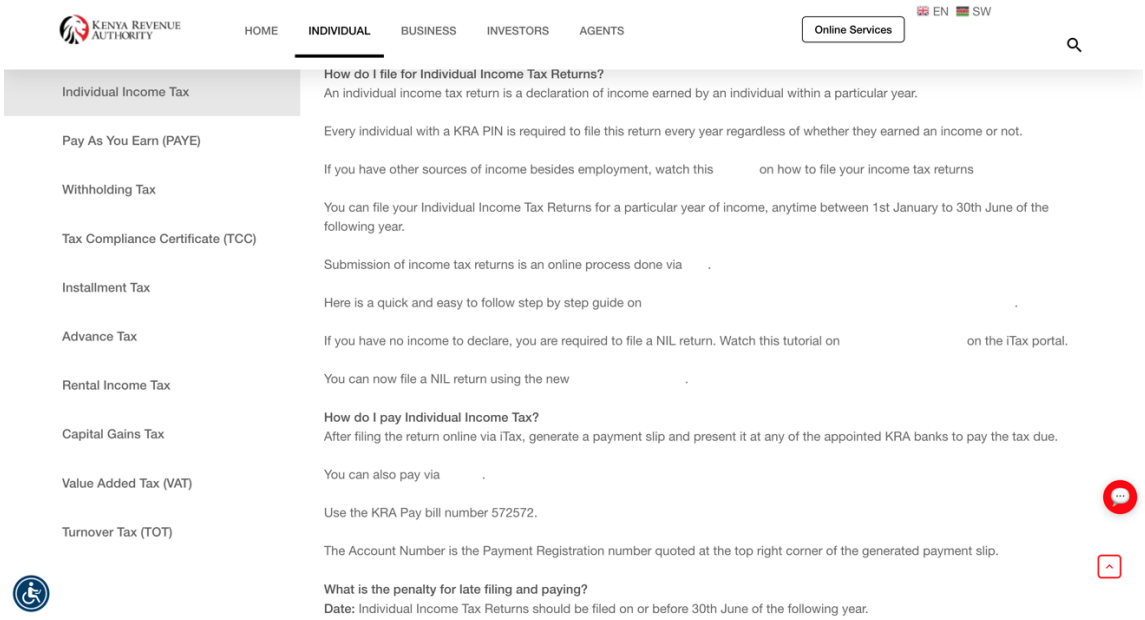

Figure 13. Missing links on KRA website (adopted from kra.go.ke, 2023)

On figure 12 and 13 above, the website is directing users to finding relevant information about a tutorial, however there is no link that is connected to the information portrayed here. So the user has to find the link in another way or try and remember how to get back to where the links for relevant information were. This would cause frustrations to the users and can also cause cognitive load which can be tiring and unpleasant for users.

4.3.7 Flexibility and Efficiency of use

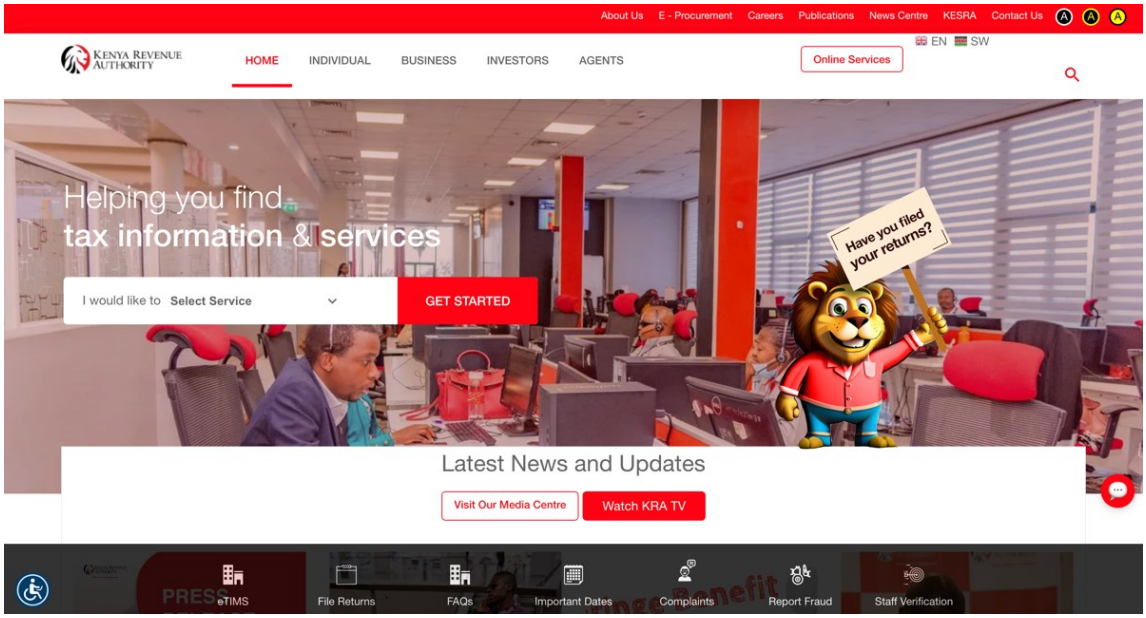

Figure 14. Homepage of the KRA website with the original theme (adopted from kra.go.ke, 2023)

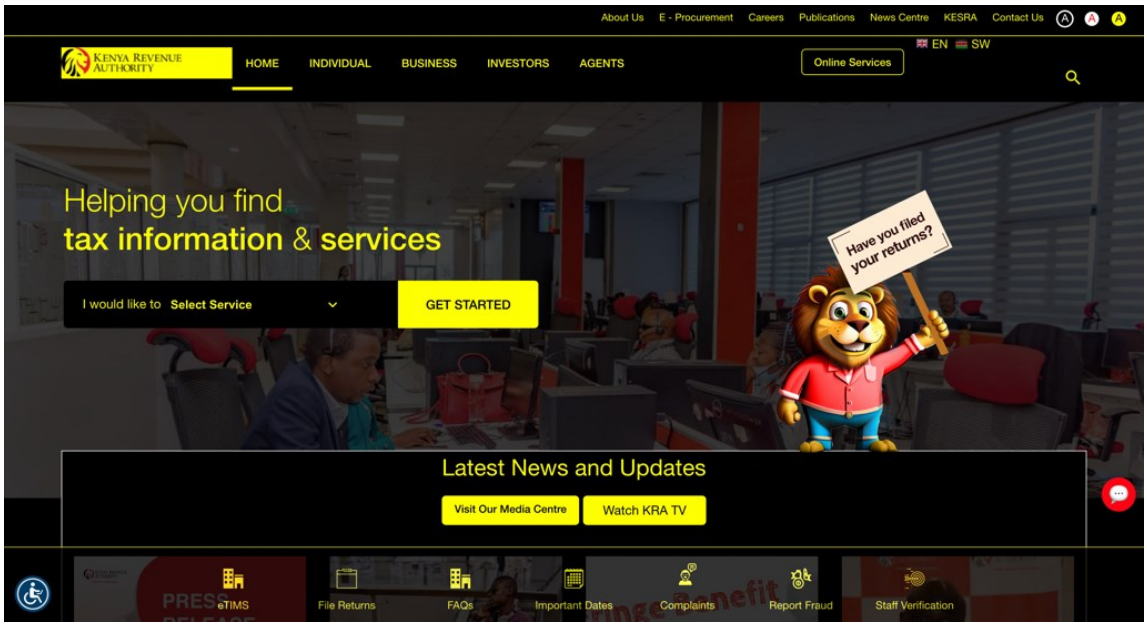

Figure 15. Homepage of the KRA website in different theme color (adopted from kra.go.ke, 2023)

The website has several different themes that users can choose from and decide which one they prefer to use as shown on figures 14 to 17, however one issues that was discovered was that the websites would revert back to the original version without the user input.

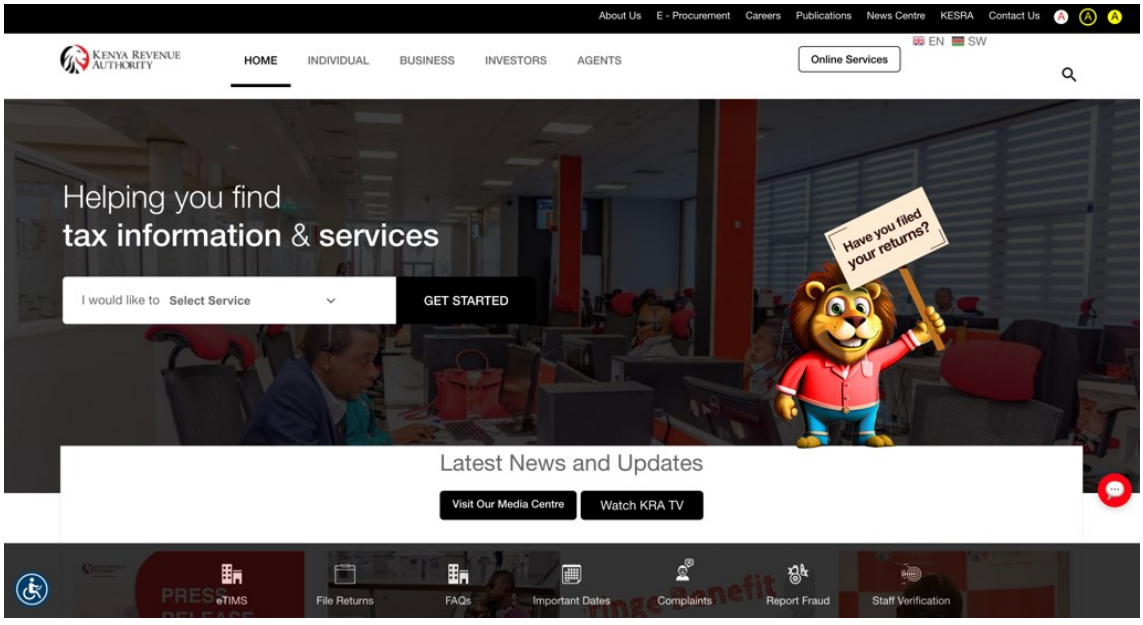

Figure 16. Homepage of the KRA website in different theme color (adopted from kra.go.ke, 2023)

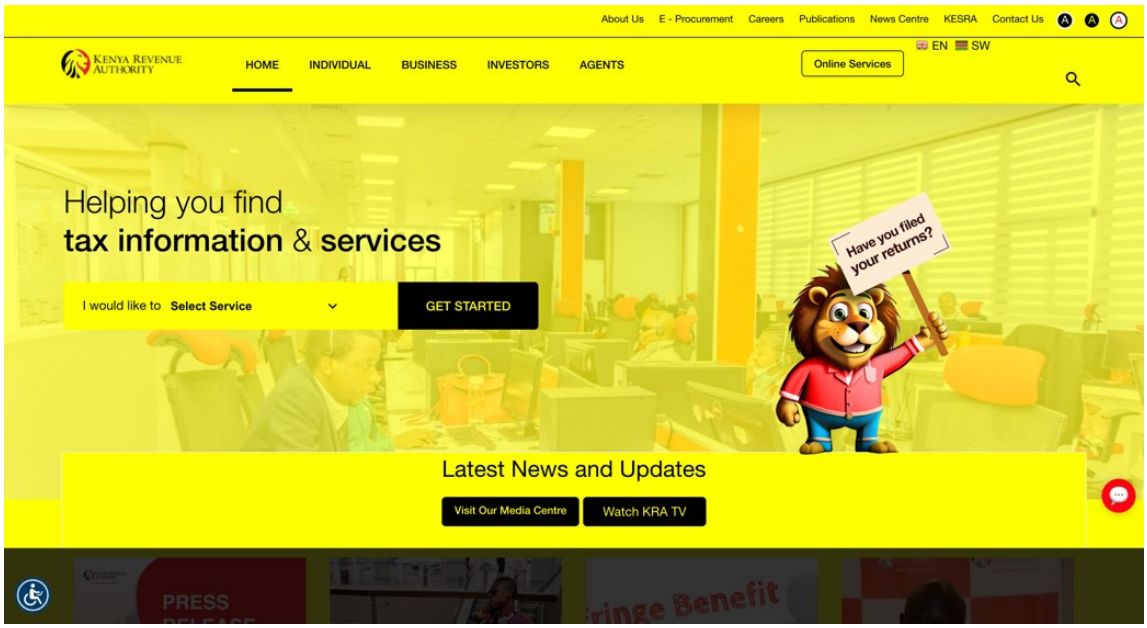

Figure 17. Homepage of the KRA website in different theme color (adopted from kra.go.ke, 2023)

The other issue with these different themes is that they become counter-intuitive, for example, the theme on figure 15 above, the accessibility menu seem to have disappeared and is not visible to the user until a user puts the cursor near the icon that the menu for different services appear. This is an issue that is caused by the changing of the theme color.

4.3.8 Aesthetic and minimalistic design

The participants of the usability study confirmed that the website has too much information on the home page. A first-time visitor or a novice user can easily get overwhelmed will all the information. Some of the information is repetitive and redundant, causing the sight to seem crowded with information that is not necessary. A good example is shown below in figure 16.

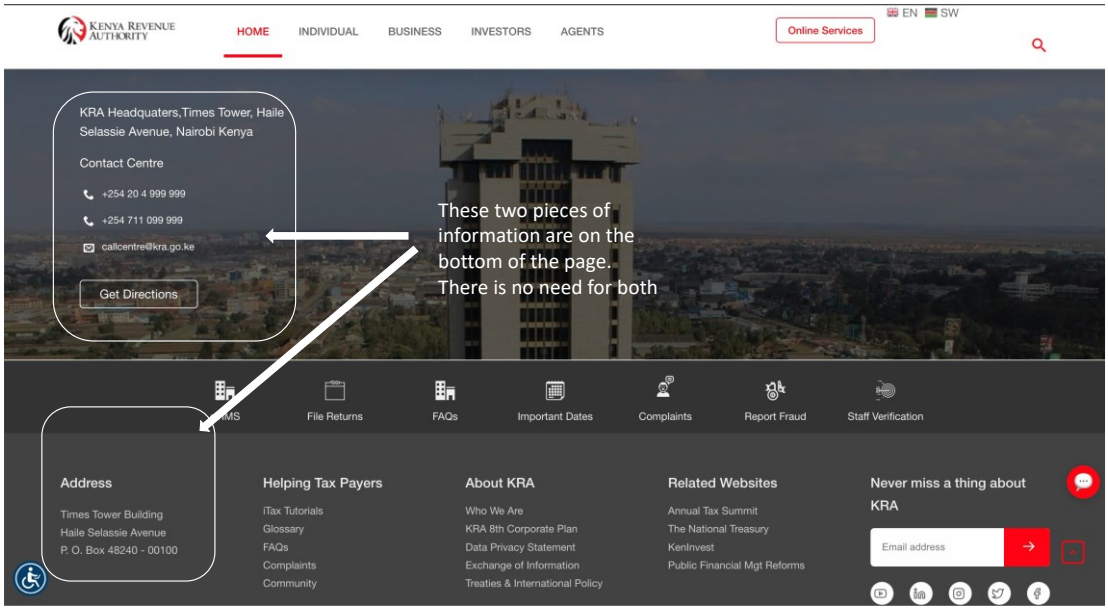

Figure 18. A KRA website page and the footer (adopted from kra.go.ke, 2023)

On figure 18 above the same information on the page is also presented on the footer and header. This similar information appears several times.

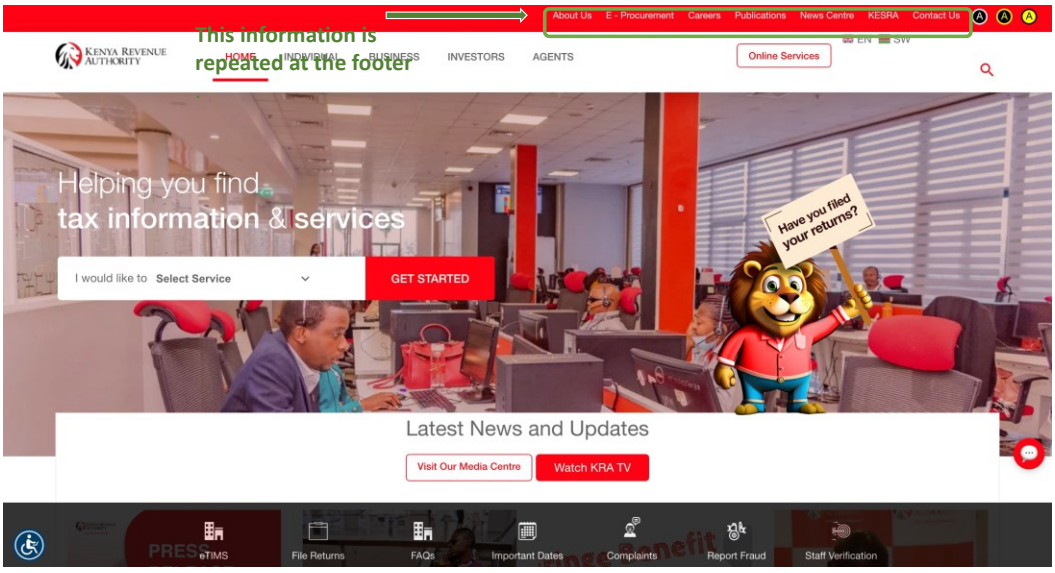

Figure 19. KRA homepage with header issues highlighted (adopted from kra.go.ke, 2023)

Another issue that was noted was the use of images as a background, the image seen in figure 19 has a lot of activity going on in the background, which tends to make the website seem crowded and complex. A participant in the usability test mentioned that the website made them feel anxious.

4.3.9 Help users recognize, diagnose, and recover from errors.

Because of the theme that is used on the website, the links that are provided in the website all seem to appear highlighted in a red color. This becomes a problem because users might not know that those are links, they might appear as some information that has a warning so that users should not open it. Furthermore, these links do not have a visual effect of changing color when visited. A user who distinguishes that links at first glance, might still get confused and lost after clicking a few of them because it seems as if the links have all been visited.

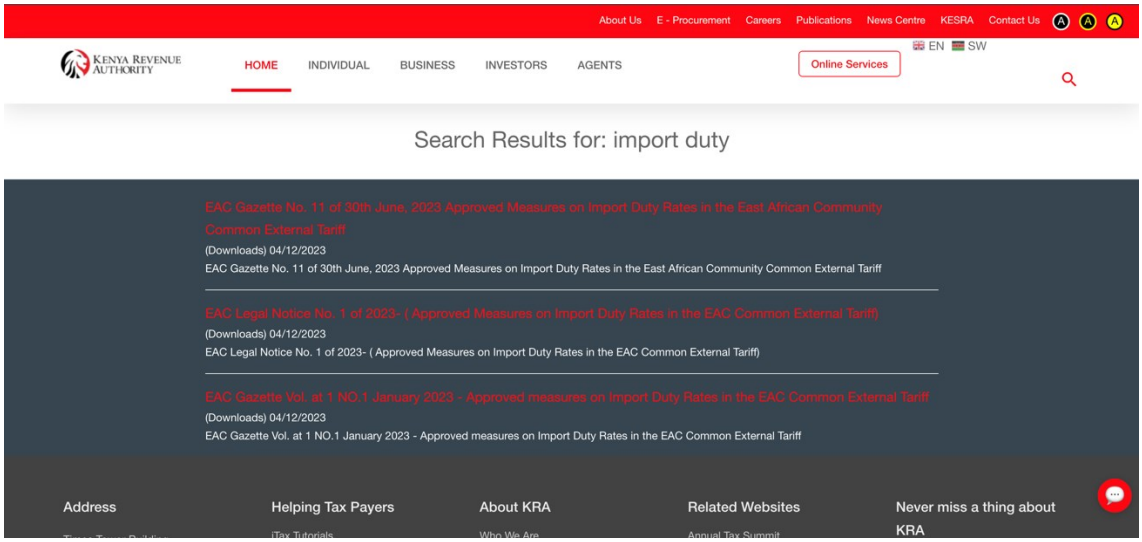

Figure 20. Links that are a result from the website search function (adopted from kra.go.ke, 2023)

4.3.10 Help and documentation.

Some video tutorials were offered within the system, while other video tutorials had links that led to external platforms like YouTube. Having a link that leads to an external resource, makes the user face unwanted distractions by being diverted to another platform or website with a completely different domain name. The website also has descriptions that have directions to use a tutorial but there is no link to direct users to the tutorial. As shown in figure 21 below.

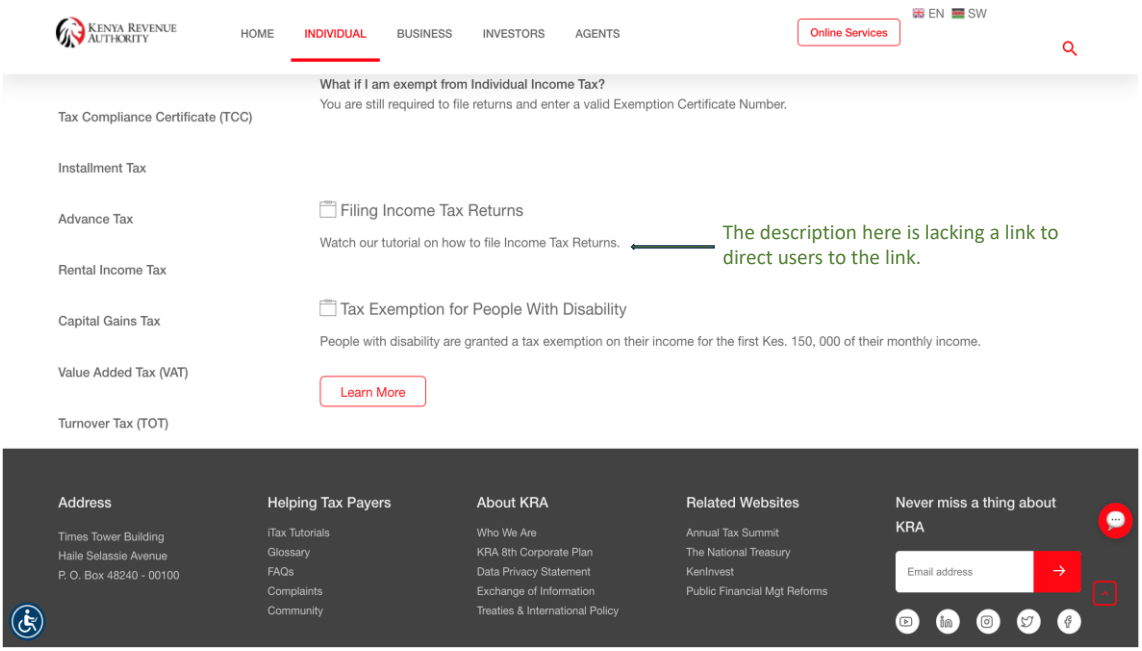

Figure 21. KRA website with tutorial link missing (adopted from kra.go.ke, 2023)

5 Data analysis

For the question that this study aimed to answer, the researcher chose to use the mixed methods as described earlier in this report to collect data. There were qualitative and quantitative data. The latter aimed at validating the data collected in the former. There were one hundred and ninety-three respondents to an online survey that aimed to seek and understand the type of user that use the systems the most, their age and occupation, this was mainly to validate the participants profile for the usability lab testing. Furthermore, the data collected on the survey aimed to understand the satisfaction level of the users and find out what kind of issues they have encountered using the KRA website. The details of both methods will be analysed consecutively in this chapter starting with the quantitative data followed by qualitative, and finally the researcher will provide the findings.

5.1 Descriptive analysis

In the following chapter the researcher presents the data that describes the users or the respondents of the survey which received one hundred and ninety-three responses. This data collected was used to validate the test participants who were selected to conduct the usability testing and to give more insight on the website from the actual users of the system.

5.1.1 Gender

Out of the 193 respondents, 58% were male and 42% were female.

5.1.2 Age of respondents

From the data collected from the sample of 193 respondents, the age was distributed as follows, 15% of respondents were between the age of 18 and 23, and 20% were between the ages of 24 to 29, 17% were between the ages of 30 to 35, and 26% were between the ages of 36 to 41, 10% were between the ages of 42-47 and 6% between the age of 48 to 53, 4% were between the ages of 54 to 59 and only 2% were between the ages of 60 to 65, there were no respondents over the age of 65.

5.1.3 Residency

From the survey 94% of the respondents said that they live in Kenya and 6% of the respondents said they were Kenyan citizens living abroad.

5.1.4 Computer literacy level

The literacy levels on the survey were self-reported and based on the question, the respondents could choose between four options, those were, excellent computer skills, good computer skill, average skills, and no skills at all. The answers showed that 33% had excellent computer skills, 40% had good computer skills, and 26% were average, while only 1% said they had no computer skills. A follow up question in chapter 5.1.5 tried to validate the computer literacy of the respondents by asking what kind of tasks they performed online. As discussed in chapter 2.4, e-government services should be clear to the user to understand what the services are for and how to use them and the technical requirements in technology for receiving the services should be at a minimum (ISO, 1999).

5.1.5 Type of tasks performed online

On this question, respondents had an option to choose several of the tasks that were presented to them, and the results were, 55% of the respondents do online shopping, 91% are on social media, 35% were learning online, 18% were working online, 54% were conducting research online and 50% were conducting banking online. The results of this question can be used to validate the previous question asked in chapter 5.1.4 about the computer literacy of the respondents, by considering that more than 50% of the respondents conducted online activities such as online banking, online shopping, and online research.

5.1.6 Occupation

43% of the respondents were employed, 5% were retired, 29% were businesspeople and 23% were students.

5.1.7 Usage of the KRA website

77% of the respondents said they had used the website and 23% of the total said they had not used the website yet.

5.1.8 Devices used on the website.

14% of the respondents who had used the website said they use mobile devices, while a majority of 64% used computer to access the website, and 22% of the respondents said that they use both computers and mobile devices.

5.1.9 Satisfaction level of the website

On a Likert scale ranging from 1 to 5, with 1 being unsatisfied and 5 being very satisfied, 52% of the respondents said that they were very satisfied with the website, 31% said they were satisfied, and 14% said they were neutral, 2% said they were not satisfied while only 1% of the respondents were very unhappy with the website.

5.2 Usability test findings

The researcher used affinity mapping, (appendix 4) to group the common findings and observations of the test together. This was the first phase of the analysis of the qualitative data collected for the usability. This categorizing of data was for helping in being able to capture insights and write them down as mentioned earlier in chapter 3.5. This would also help in getting an understanding of the severity of the issues, based on the test questions taken by the participants and their success rate. The issues severity would then be rated with an H for high, M for medium and L for low (Pernice K, 2018).

From the qualitative data collected, the researcher discovered the following issues listed in the table 2 below.

Table 2. Usability issues discovered and their severity based on the usability test results

No.	**Usability issues discovered**	**Severity**	**Researchers' comments**
1	The navbar cursor issue	H	The navbar menu does not clearly inform the user where they are in the menu. The cursor is also very sensitive and moves too fast across the different menu, creating confusion and frustration for the users. 100% of the test participants were frustrated by this feature.
2	Color theme	M	Comments from the test participants indicated that the test participants preferred a more subtle color over the red theme.
3	Search function	H	The search function does not work to direct users to specific pages within the website, rather directs users to documents that

			are attached to the website. This could be improved to provide users with ways to find pages quicker within the website.
4	Missing links	H	There are pages on the website that tell users to click on links that are not available. This can be easily fixed with adding links to the necessary places.
5	Red color links	H	Links can be changed to a different color and only turn into red as an indication that a user has already visited that link.
6	Background images	M	The pages seem saturated with clutter because of the background images. The opacity of the images can be reduced to make text more clear and readable, or the images can be replaced with more subtle images
7	PDF files	H	The website has PDF files that users can download and fill to send to the revenue authority. This can be fixed by having the PDFs turned into HTML forms where users can fill and submit online forms.
8	Tutorials on another platform	M	The tutorial videos should not be diverting users to other websites like YouTube, they should be within the website so users can view them there.
9	Font size	H	The font size on the website is too small, it should be increased to ease strain on the eyes.
10	Theme color reverting without user input	M	The theme colors change back to original red color without the

			user's intention to do so, this is frustrating to the users.
11	Dynamic navigation	L	The information that is on the dynamic navigation should be up to date for increased accuracy on current information. These builds trust with the users.

6 Conclusion

The main aim of this study was for the researcher to identify usability issues with the KRA government portal. The KRA website serves as the main entry point to several other government e-services such as filing of tax returns, paying importation duty, application of PIN number, registration of businesses, and applications for other relevant government services such as applications for title deeds, passports, driving licenses, vehicle registration logbooks and many more. The researcher applied two methods of data collection to achieve the goal and successfully managed to interview five willing participants for the usability testing in a lab and also conducted a survey successfully receiving one hundred and ninety-three responses. The results from these two methods allowed the researcher to have concrete information of usability issues on the KRA website. The usability issues that were found that had a high severity and impact on the usage of the website were minimal, however according to literature review 2.2.1 these issues can be costly. Other usability issues discovered had a medium to low severity and may have impact on adoption by citizens especially if they are novice technology users.

From literature review in chapter 2.4, there are recommendations for the features that e-government services include, and this acted as a guide this research. The KRA website has a lot of importance because it offers G2C, G2E, G2B services described more in detail in chapter 2.5 to its users. However, there are improvements that can be done since Kenya's e-government performance is lagging below the global average, based on findings from the UN survey discussed in chapter 2.6. This study also confirms the previous studies done on e-government in developing countries discussed in chapter 2.10, according to the respondents of the survey chapter 5.1.7, over twenty percent of the respondents said they had not used the KRA website, and the reasons as seen in appendix 2 being that they do not have enough knowledge to use the website. This indicates that there is work to be done by the government to educate the population on how to use these systems and to reduce digital illiteracy.

The finding in this study can be used to guide fix the issues found on the website and it can also be as a guide for other e-government websites to avoid similar issues.

6.1 Future development ideas

While conducting usability tests, the researcher, developed conditions for the usability testing environment for each individual participant, initially this came about as a perceived problem because in literature, these kinds of tests have been done in designated usability testing lab. However, the researcher only set the main conditions for the test environment

that were necessary for the successful testing process, discussed in chapter 3.3.6. If the test participant had the minimum requirements for the right environment, then the tests were conducted at their own comfort environment, with their own devices and tools. This kind of testing could prove more useful because it may eliminate the limitations mentioned in chapter 3.4.4, and researchers can gain more clearer results by conducting usability testing in environments where the user or test participants are in their usual environment set up when they interact with the systems being tested for usability. This is something that could be tried and tested more in the future to see if outcomes can be different or not.

Data collected from the survey showed that majority of the younger adults between the ages of eighteen to twenty-six, are not familiar or are not using the government e-services. While the youth are the naturally the future of a nation the government can try and involve the younger people more in these services to ensure that they are the early adopters and the developers of the technologies for the future.

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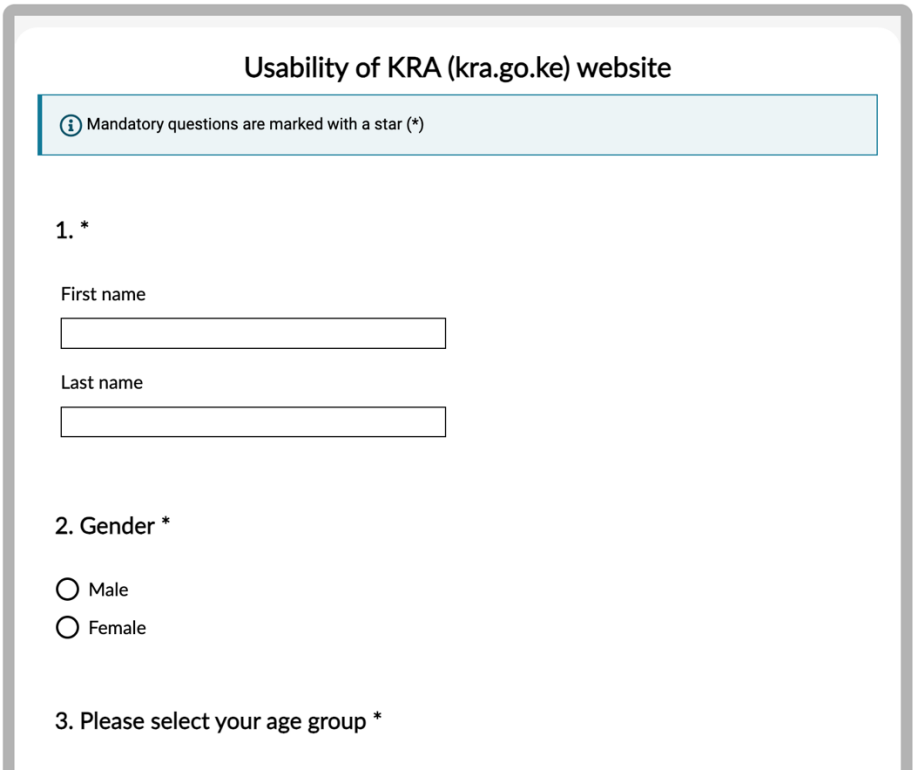
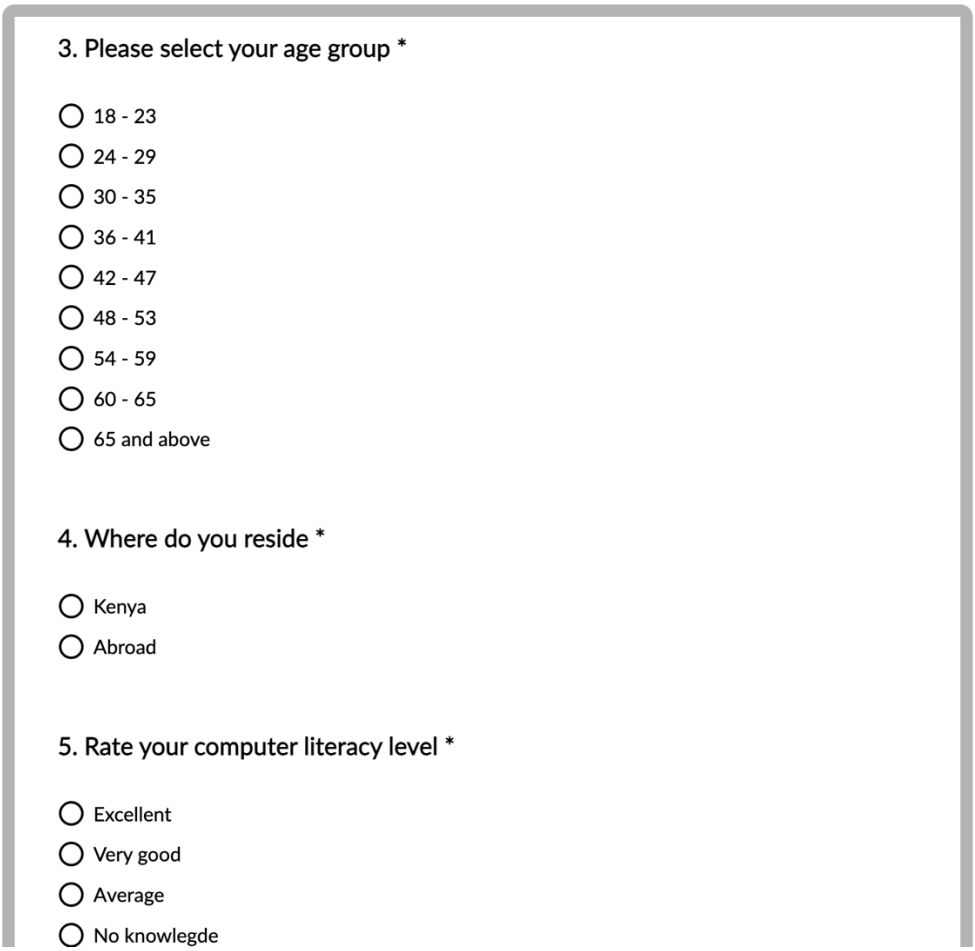
Appendices

Appendix 1. Screenshots of the usability of KRA website online survey questions.





6. What kind of tasks do you perform online? You can select several

- [ ] Shopping
- [ ] Social Media
- [ ] Learning online
- [ ] Working online
- [ ] Research
- [ ] Banking

7. What is your occupation? *

- ○ Employed
- ○ Retired
- ○ Business person
- ○ Student

8. Have you used the KRA (kra.go.ke) website? *

- ◉ Yes
- ○ No

9. What devices do you use to visit KRA website?

- ○ Mobile
- ○ Computer
- ○ Both

10. Scale your satisfaction on the KRA website.

- ○ 5 - Very satisfied
- ○ 4
- ○ 3
- ○ 2
- ○ 1 - Not satisfied

11. Briefly explain the rating in previous question. (optional)

Submit

Appendix 2. Responses to why people do not use the KRA website from survey.

What are the main reasons you don't use it
Number of respondents: 28

Showing 28 out of 28 responses Show less or see all text answers in Word or PDF

	Responses
	The website is complicated so I visit the office.
	Because I have no tie with it, plus my life is just fine without it
	Because I have lived and worked abroad my adult life so I haven't had to file for taxes in Kenya.
	- If I need information on something to do with taxes, I ask my friends who are in accounting and finance. I haven't had a reason to go to the website yet.
	I have never thought of using it since am not in business
	Not easy to access
	Am not very familiar with it
	No reason
	Im still a student
	Not registered
	Student
	I am a student therefore not registered with kra
	NOT REGISTERED TO KRA
	I file my returns through a cyber cafe
	I wasn't knowledgeable on how to use it.
	I am not familiar with it
	I don't have any business linked to it
	No reason but I use other people to make returns
	I have never been employed in Kenya and therefore never earned taxable income.
	I've never heard of it
	Have not heard about it
	I wanted to learn more about it first
	I still haven't applied
	Am not familiar with it
	Am not familiar with it
	I don't know about it
	I don't have a job or a bank account yet
	Not sure what's it's for

Appendix 3. Positive Comments from survey on usability of KRA website.

Briefly explain the rating in previous question. (optional)
Number of respondents: 32

Showing 32 out of 32 responses Show less or see all text answers in Word or PDF

Responses
Satisfactory customer journey experience, with responsive UI/UX for all visual requirements including visually impaired persons.
I fill my returns easily and efficiently without any complications
The website is easy to navigate and also in filling the tax returns.
Its not slow and works simply perfect with me
Its user friendly. Though need to improve especially on dead line days.....the system is always fluctuating....
Easy to use, pretty straightforward.
Good enough
fast services
SATISFIED WITH THE SITE
It's efficient. Keep it up.
Good while filing returns
I use the site for filing ToT
Okay and operates well without any issues
Superb
It's the best
Im not so familiar with the site
Good systems
Good
Simple and straight forward
Straight forward site
Random server downtimes
very good
The instruction are really not that directive
Instructions not really well illustrated
The website offers quick services, for instance, I got my KRA pin from the website and it only took a few minutes.
The satisfaction is average
I really enjoyed using the kra website since it was also easy to use,,on a scale of 10 I give it a 10 outa 10
It is the best I get to file my returns
Am satisfied with it
It is good
It is easy efficient and effective for usage that's why I give it a three
The website is user friendly and all services are easily accessible which satisfies my every need

Appendix 4. Questions asked for creating a scenario for usability testing

Assume you are a non-governmental organisation and find information on how you can register for a PIN.
Try and fill in a form. Assume that you are a customer that wants to fill in a form to become a customs agent. Try and fill in the form.
Change the color of the website to a color that you prefer.
Try and log in to pay your taxes.
Try and a watch a tutorial on filling your taxes.

Appendix 5. Table of tasks success rate from usability testing

	Task 1	Task 2	Task 3	Task 4	Task 5	Average
Participant 1	0	1	1	1	0	60 %
Participant 2	1	0	1	1	1	80 %
Participant 3	0	1	1	1	1	80 %
Participant 4	0	1	1	1	1	80%
Participant 5	1	1	1	1	0	80%
Average	40 %	80 %	100 %	100 %	60 %	

Appendix 6. Affinity diagramming for the usability test results