

# Course unit: SCS 3101 - Introduction to Computer Systems

**Module name/Topic:** Ethics in inclusion and accessibility of computing

**Contributors:** Paul Rabala, Elisha Abade, Selina Ochukut, Reagan Onditi, Charles Katua

**Duration:** 1 hr

**Reviewed by:** Paul Rabala

## Module Description

Computer technology has greatly transformed the way we live, work and interact with one another. The speed, accuracy and resilience of computers have transformed different industries. Such computer benefits should be experienced by users without discrimination. Hence, a good computer system should not be designed to solve user problems but also to make them accessible to all potential users. The hardware, software and networks should also be designed to cater for all users regardless of their Gender, disability or geriatrics. Computer technology and digital accessibility should be used for bridging the gap and empowering inclusivity for all users.

## Module learning outcomes:

By the end of the course the learner should be able to:

1. Define inclusion and accessibility in the context of computing
2. Explain effects of lack of inclusion and accessibility in use of computers
3. Apply methods of achieving inclusion and accessibility in computing
4. Discuss the impacts of computing on inclusivity and accessibility

## Topic/Module content:

## **1. Introduction**

Welcome learners to this segment of study where we are going to learn more about ethical issues in inclusion and accessibility of computers and services. In this lesson, we are going to discuss some of the discriminations among different computer users and how ethics can be used to bridge the gap between different categories of users despite their social, physical and (gender, disability, age) differences. We will finally learn some of the benefits individuals and organizations gain by applying ethics in inclusion and accessibility of computer systems.

We can begin by first understanding inclusivity and accessibility in computing.

## **2. Inclusivity**

Computer or ICT services should not only be available and affordable, but also accessible to as many people as possible. They should be designed to meet the needs of as many people as possible, including those with disabilities, different gender, older generations and so forth. In most instances, in the design of computing technologies, there is a high chance of excluding geriatrics and people with disabilities. This group includes people such as the deaf, the lame, neurological limitations, cognitive limitations, temporary or situational impairment and blind or those with low vision.

While developing ICT and creating services to diminish or eliminate barriers faced by people with disabilities, different gender and the older generation, there is a need to factor in their needs during design and development of solutions. Hardware, software and network should be as inclusive to user requirements as possible. The computer technology used should be able to aid reading, writing, communicating with others and even searching for information online.

### **3. Accessibility**

Generally, accessibility can simply be described as making things and services available to all people regardless of their age, ability or disability. While in computer or ICT, accessibility is a measure of how usable a computer system is to all people, including the elderly, those with disabilities or impairments. Accessibility therefore concerns both hardware and software and how they are configured in order to enable a person with some challenge (disabled or impaired) to use a computer system successfully.

#### **3.1 Types of Accessibility**

Accessibility of computer and ICT services can borrow from the general three types of accessibility which includes; emotional, functional and technical which apply to a wide range of industries. The three types of accessibility are briefly discussed below:

- a) Emotional accessibility is the first impression a person experiences when presented with ICT service or product. Does that person react positively or negatively, do they feel invited or rejected; in short, does the reaction meet the expectations of the original intent? Emotional accessibility and acceptance is a crucial incentive for the person to engage with the service or product. Without it, functional and technical accessibility are largely redundant.
- b) Functional accessibility defines whether a service or product is designed in such a way that a person can easily understand and manage it. Does the person experience obstacles that prevent them from achieving the task presented to them? Functional accessibility must support the user in order for a service or product to be successful. Without functional accessibility the service or product is set to fail in the long term.
- c) Technical accessibility refers to physical and software products that are engineered in such a way that they can fulfill the functional accessibility expectations. Does the user of a product experience limitations in accessing the product because of inherent faults in the product? A product that is compromised technically cannot support either of the other two accessibility components and the entire product fails. To avoid biases, technical

accessibility should consider different categories of user and products and computer services should be designed to cater for different age groups, gender and people with disability.

## **3.2 Principles of Accessibility**

In this section, we are going to appreciate the principles that govern effective inclusion and delivery of ICT products and services. These principles are known by the acronym POUR (**P**erceivable, **O**perable, **U**nderstandable and **R**obust). We will spend time understanding each principle and find out the role of each one in bringing inclusion and aiding accessibility to potential users.

### **3.2.1 Perceivable Accessibility**

Perceivable accessibility is where users can identify content and interface elements by means of the senses. The principle deals with how users perceive or interact with the computer system. Some basic means that need to be incorporated in the design of products and services are; vision, sound and touch. To explain this further, we will give some examples to help in understanding the principle.

Examples

- a) A Word document contains a number of non-English words and phrases. If the languages are not indicated, how can developers present the text to achieve inclusivity?

Answers:

**Distinguishable:** Make it easier for users to see and hear content including separating foreground from background.

**Text Alternatives:** Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.

**Adaptable:** Create content that can be presented in different ways (for example simpler layout) without losing information or structure.

- b) A website's navigation consists of a number of links that are displayed in a different order from page to page. If a user has to relearn basic navigation for each page, how can she effectively move through the website?

Answers:

**Distinguishable:** Make it easier for users to see and hear content including separating foreground from background.

**Time-based Media:** Provide alternatives for time-based media.

The scenarios can be solved by the following Perceivable considerations

### 3.2.2 Operable Accessibility

Operable accessibility is the second principle and ensures that a user can successfully use controls, buttons, navigation, and other interactive elements of a computer system. The principle is well implemented through the use of voice recognition, keyboards, screen readers among others. Again, to explain this further, we will give some examples to help in understanding the principle.

#### Examples

- a) Mouse-dependent web content will be inaccessible to a person who cannot use a standard mouse.

Answers:

**Keyboard Accessible:** Make all functionality available from a keyboard.

Keyboard accessibility is one of the most important principles of Web accessibility because it cuts across disability types and technologies

**Enough Time:** Provide users enough time to read and use content.

- b) People with low or no vision also rely on the functionality of the keyboard. They may be able to manipulate a mouse just fine, but it doesn't do them much good because they can't see where to click on the screen. The keyboard is much easier for a person who is blind to manipulate.

Answers

**Seizures:** Do not design content in a way that is known to cause seizures.

**Navigable:** Provide ways to help users navigate, find content, and determine where they are.

The two scenarios can be solved by the following Perceivable considerations

### 3.2.3 Understandable Accessibility

Understandable accessibility ensures that users are able to comprehend the content, and learn and remember how to use ICT services and products which should be consistent in its presentation and format, predictable in its design and usage patterns, and appropriate to the audience in its voice and tone. To explain this further, we will give some examples to help in understanding the principle

**Examples:**

- a) A website's navigation consists of a number of links that are displayed in a different order from page to page. If a user has to relearn basic navigation for each page, how can they effectively move through the site?

Answer

**Predictable:** Make Web pages appear and operate in predictable ways.

- b) A site makes use of numerous abbreviations, acronyms, and jargon. If these are never defined, how can users with disabilities (and others) understand the content?

Answers

**Readable:** Make text content readable and understandable.

**Input Assistance:** Help users avoid and correct mistakes.

The two scenarios can be solved by the following Understandable considerations

### 3..2.4 Robust Accessibility

Robust accessibility ensures that computer services and products are robust enough that it can be interpreted reliably by a wide variety of users, allowing them to choose the technology they use to interact with websites, online documents, multimedia, and other information formats. Users should be allowed to choose their own technologies to access computing services and products. Let us consider some examples to explain this principle.

#### Examples:

- a) A document format is inaccessible to a screen reader on a particular operating system. If a user employs that OS for day-to-day tasks, how can she gain access to the document?

Answer

**Robust solutions:** Maximize compatibility with current and future user agents.

The scenario can be solved by the following Robust consideration

### 3.3 Benefits of Accessibility

Design and development of computer services and products with inclusion and accessibility in mind, greatly benefit all categories of members. Some of these benefits especially to the aged,

different gender and people with disability include but are not limited to; increased quality of life, enhanced better social integration, improved usability of the computer services and products. In general, improved accessibility provides opportunity to the challenged groups to be more independent thereby lowering the level of dependency from others. Accessibility also helps tap from the greater pool of talents from challenged individuals, thereby reducing their social dependency.

#### **4.0 Advantages of Accessibility and Inclusion**

After appreciating the benefits of accessibility, it is therefore necessary for us to appreciate some advantages that inclusion and accessibility of computer systems offer to the users. Some of these advantages include:

- a) Offering equal opportunities: digital inclusion and accessibility provides users with equal opportunities to participate in all aspects of life. This promotes independence of users in undertaking their responsibilities, thereby improving innovation and performance.
- b) Improved productivity: inclusion and accessibility to computing services improves efficiency and productivity for individuals users, especially the old, female and disabled. It enables them to overcome challenges and perform tasks more effectively in their areas of interest and specialization.
- c) Increased user base: talents and skills from many users are tapped into the market by aiding the elderly, female and disabled computer users.
- d) Promotes ethics in ICT: several laws on non discrimination have been passed by national and international bodies. Inclusion and accessibility of computing services is one of the ways in which designers and implementers of ICT services conform to the legal requirements on social responsibility.

**NOTE:** Including people with disabilities in everyday activities and encouraging them to have roles similar to their peers who do not have a disability is important for building the capacity of youth, especially youth with disabilities, and making society more inclusive for all individuals.



## **5.0 Impacts of computing in inclusivity and accessibility**

Computing field has in the recent past experienced rapid development and steady rise in the use of both products and services. Surprisingly, the trend in the developing world is much faster despite the challenges such countries face. Unfortunately, the good story is not true with the special groups such as geriatrics, gender and disabled. Previous studies reveal that about 20% of the special group are enrolled to study computer science or work in the ICT companies. In fact it is even worse with the disabled category since many computer companies produce computer products and services which are user friendly to them. The older generation also lack applications which are tailored to them.

Several studies have tried to understand the causes of the problem and best this discrepancy can be solved. Several factors were identified and they can be summarized as; lack of appropriate and specialized infrastructure, equipment and software for the people with disabilities (PWDs), lack of mentorship (role models) to encourage the special group that it is possible, unavailability of specialized ICT equipment and applications to use which is combined with high prices and general frustrations in getting them, very few specialized training institutions and qualified personnel for the group. Finally, geriatrics, female gender and the disabled are generally excluded by society and very few computer (both hardware and software) designers consider them. It is therefore very important to note that for inclusion and accessibility to be achieved, such barriers must be eliminated and the operation environment leveled for all users.

### **Case Studies:**

1. The government of Kenya is planning to roll out all government services to be accessed through digital platforms. As a computing professional, you have been tasked with the job of evaluating the different ethical issues of inclusion and accessibility that may arise from the deployment of government services using different digital platforms. You are to advise the government on what mitigation measures it should take in order to ensure that government services will be inclusive and accessible to all its citizens.

- 
2. You are an ICT technologist at Rongo School for the blind and the school is in the process of procuring computers for the students in bid to comply with the Competency Based Curriculum (CBC). Develop comprehensive specifications for the ICT equipment required by the students.

## Assignments /Quizzes:

Learners are advised to choose the correct answer. The correct answers will be given at the end of the questions

1. Which of the following group of computer users should not be considered when implementing inclusivity and accessibility in Kenya?

A. Government B. Senior citizen C. People with disabilities D. None of the above

2. The steps given are key in creating a computing system. (i) Develop (ii) Analyze (iii) Design (iv) Evaluate (v) Implement

Choose the correct sequence that will help realize inclusion and accessibility?

A. (i), (ii), (iii), (iv), (v)      B. (i), (ii), (iii), (iv), (v)      C. (ii), (iii), (i), (v), (iv)  
D. (ii), (iii), (i), (iv), (v)

3. Which of the following statements best explains the main purpose of inclusion in computing?

A. To limit access to modern information technology

B. To create a digital divide in the world

C. To promote equal participation in society through technology

D. To promote exclusive communities through technology

4. The main goal of inclusivity and accessibility of computer services and products is to - ?

A. Create awareness of the new developments in computer technology

B. Create and improve capacity to use ICT by different groups of users

C. Classify ICT systems

D. Update users on the progresses in ICT

5. Three of the following factors have contributed to the slow implementation of inclusion and accessibility in computing. Which one is NOT?

A. Lack of policies on inclusion and accessibility

B. Lack of specialized equipment

C. Lack of mentorship

D. Lack of appropriate software applications

(Answers 1. D 2. C 3. C 4. B 5. A )

## References

1. *Accessibility Toolkit for Open Educational Resources (OER): Accessibility Principles.* (n.d.). <https://guides.cuny.edu/accessibility/whyitmatters>
2. *A Policy Framework for Bridging the Gender Divide in Digital Technology Courses and Careers in Kenya.* (2023). <https://www.brookings.edu/wp-content/uploads/2023/02/Brookings2022-KenyaFinal-WEB.pdf>
3. *The ICT Opportunity for a Disability-Inclusive Development Framework.* (n.d.). [PDF document]. [https://www.itu.int/en/action/accessibility/Documents/The%20ICT%20Opportunity%20for%20a%20Disability\\_Inclusive%20Development%20Framework.pdf](https://www.itu.int/en/action/accessibility/Documents/The%20ICT%20Opportunity%20for%20a%20Disability_Inclusive%20Development%20Framework.pdf)