



Inclusive Education and Digital Skills Development for Learners with Disabilities in Africa's Emerging Global Economy

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ABSTRACT

The transition to a digital and knowledge-driven global economy has increased the demand for advanced technological competencies and adaptable workforce skills. However, many learners with disabilities in Africa continue to face significant barriers to quality education, digital inclusion, and meaningful participation in the labour market. This paper examines the role of inclusive education in promoting digital skills development and enhancing workforce readiness among learners with disabilities. Drawing on existing literature, policy documents, and global best practices, the study explores how accessible learning environments, assistive technologies, and inclusive pedagogical approaches can improve educational outcomes and employability prospects. The paper argues that inclusive education is not merely a social justice imperative but a strategic pathway for harnessing the talents and contributions of persons with disabilities in Africa's emerging digital economy. It further highlights the need for coordinated policy reforms, investment in digital infrastructure, teacher capacity development, and stakeholder collaboration to ensure equitable access to 21st-century skills. The study concludes that strengthening inclusive education systems will enhance social inclusion, economic participation, and global workforce competitiveness across the continent.

Keywords: Inclusive Education, Digital Skills Development, Learners with Disabilities, Global Workforce Participation, Digital Inclusion, Africa.

1. INTRODUCTION

The rapid transformation of the global economy through digitalisation, automation, artificial intelligence, and knowledge-intensive production has fundamentally altered the skills required for education, employment, and social participation. Digital competencies are increasingly regarded as essential components of contemporary human development because individuals are expected to access information, communicate, solve problems, collaborate, create digital content, and participate in increasingly technology-mediated economic activities. Consequently, education systems are under growing pressure to equip learners with competencies that extend beyond traditional literacy and numeracy to include digital literacy, information literacy, communication skills, critical thinking, creativity, adaptability, and technology-enabled problem-solving. In Africa, where young people constitute a substantial proportion of the population, the capacity of education systems to develop these competencies has important implications for economic transformation, employability, social inclusion, and participation in the global economy.

However, the benefits associated with digital transformation are not automatically distributed equally. Learners with disabilities frequently encounter multiple and interconnected barriers that restrict their participation in education and limit their ability to acquire the skills required in contemporary labour markets. Globally, children with disabilities remain among those most likely to be excluded from education, with discrimination, stigma, inaccessible learning environments, inadequate support services, and insufficient consideration of disability in educational planning continuing to constrain their opportunities (UNICEF, n.d.). In Africa, these challenges are particularly significant because educational systems already contend with resource constraints, infrastructure deficits, teacher shortages, socioeconomic inequalities, and substantial rural–urban disparities. Evidence from several African countries indicates that children with disabilities experience lower rates of



school enrolment and completion and poorer learning outcomes than learners without disabilities (UNESCO IICBA, 2023).

The emergence of digital education presents both an opportunity and a potential source of further exclusion. When appropriately designed, digital technologies can remove or reduce barriers that have traditionally prevented learners with disabilities from participating fully in educational activities. Screen readers, text-to-speech applications, speech recognition, captioning, accessible digital textbooks, alternative communication technologies, adaptive learning platforms, and other assistive technologies can enable learners with different forms of disability to access educational content and communicate more effectively. UNESCO has consequently emphasised the potential of information and communication technologies (ICT), artificial intelligence, and assistive technologies to strengthen educational inclusion and provide more personalised learning opportunities for persons with disabilities (UNESCO IITE, 2025a, 2025b).

Nevertheless, technology should not be regarded as an automatic solution to educational exclusion. Digital learning environments can reproduce existing inequalities when devices, connectivity, accessible content, assistive technologies, electricity, technical support, and digital skills are unavailable or unaffordable. UNESCO's guidelines on the inclusion of learners with disabilities in open and distance learning emphasise the importance of accessibility in the design and delivery of technology-mediated education, particularly where digital learning is expected to overcome geographical, social, financial, and disability-related barriers (UNESCO, 2023). Thus, the question is not simply whether African education systems are adopting digital technologies, but whether these technologies are being introduced in ways that enable learners with disabilities to participate meaningfully and acquire relevant competencies.

This issue has become increasingly important because the relationship between education and employment is being reshaped by technological change. The contemporary labour market increasingly values digital competence, adaptability, continuous learning, and the capacity to work with technology. For persons with disabilities, acquiring these competencies can create new pathways into employment, entrepreneurship, remote work, and other forms of economic participation. At the same time, inadequate digital preparation can deepen existing labour-market inequalities. The International Labour Organization (ILO) reports that persons with disabilities continue to experience substantial barriers to decent work and that young persons with disabilities are particularly vulnerable to exclusion from employment, education, and training. Addressing these inequalities requires access to the digital, green, and other skills increasingly demanded by contemporary labour markets (ILO, 2023, 2025).

The significance of inclusive digital skills development is therefore not restricted to the classroom. It has implications for the broader social and economic participation of persons with disabilities. The ILO's recent work on disability-inclusive technical and vocational education and training (TVET) in Africa argues that inclusive skills-development systems can strengthen the capacity of persons with disabilities to acquire competencies required for decent work and economic independence (ILO, 2025a). Similarly, research and policy discussions on assistive technology increasingly recognise that access to appropriate technologies can influence not only educational participation but also employment opportunities and workplace inclusion (ILO & ATscale, 2025).

The African context makes this discussion particularly urgent. The continent is experiencing rapid growth in digital services, mobile technologies, online learning, digital entrepreneurship, financial technology, artificial intelligence, and technology-enabled employment. At the same time, many African economies continue to face significant challenges relating to unemployment, underemployment, skills mismatches, unequal access to education, and digital inequality. The ILO identifies improved skills and technology as important components of inclusive African labour-market development and emphasises the need for skills ecosystems that connect education, training, lifelong learning, and employment policies (ILO, n.d.).

Recent developments also demonstrate increasing international recognition of the disability dimension of digital education. UNICEF's Digital Education Strategy 2025–2030 explicitly identifies disability as one of the digital divides that must be addressed if digital education is to produce equitable learning opportunities. The



strategy calls for human-centred and equity-driven approaches that expand access to quality learning and strengthen the acquisition of 21st-century skills (UNICEF, 2026). UNESCO's work in Africa similarly emphasises digital pedagogical transformation, teacher competence, national ICT-in-education policies, and the development of students' digital skills, while its current programmes increasingly stress human-centred and inclusive technology integration (UNESCO, 2025).

Despite these developments, a significant gap remains between policy commitments to inclusion and the practical experiences of many learners with disabilities. Inclusive education policies may exist without sufficient funding, trained personnel, accessible infrastructure, appropriate curricula, or effective monitoring mechanisms. Similarly, digital education initiatives may expand access to devices and online platforms without adequately addressing accessibility requirements. The result is a risk of creating a digital inclusion paradox in which technologies intended to democratise education inadvertently exclude those who cannot interact with them because of disability, poverty, inaccessible design, or inadequate digital support.

This paper therefore examines the relationship between inclusive education and digital skills development for learners with disabilities in Africa within the context of an emerging global economy. It argues that inclusive education should be viewed not merely as a matter of educational rights or social welfare but as a strategic component of human-capital development and economic transformation. Providing learners with disabilities with equitable opportunities to develop relevant digital competencies can improve educational participation, strengthen employability, facilitate entrepreneurship and remote work, and enable greater participation in the social and economic life of African societies.

The paper further examines the major barriers that constrain inclusive digital skills development, including inaccessible educational infrastructure, inadequate teacher preparation, limited access to assistive technologies, affordability constraints, weak digital infrastructure, discriminatory attitudes, curriculum limitations, and gaps between disability-related policies and their implementation. It also considers the potential contribution of assistive technologies, inclusive pedagogy, digital learning platforms, teacher capacity development, industry partnerships, and policy reform. By connecting inclusive education with digital skills and future-of-work debates, the paper seeks to demonstrate that disability inclusion should occupy a more central position in Africa's digital transformation agenda.

Ultimately, the argument advanced in this paper is that Africa cannot fully realise the potential of its emerging digital economy while a significant segment of its population remains excluded from acquiring the knowledge and skills required to participate in that economy. Building genuinely inclusive education systems is therefore both a social justice obligation and an economic necessity. The challenge is to move beyond nominal inclusion toward education systems in which learners with disabilities can access, participate in, and benefit from the digital transformation on equitable terms.

2. CONCEPTUAL CLARIFICATIONS

2.1 Inclusive Education

Inclusive education refers to an educational approach in which all learners, regardless of their abilities, disabilities, socioeconomic circumstances, gender, language, ethnicity, or other characteristics, are provided with meaningful opportunities to participate in quality education within supportive learning environments. Rather than treating learners who experience disability as requiring separate educational systems, inclusive education seeks to identify and remove barriers within the education system itself. UNICEF describes inclusive education as an approach in which children learn together in the same classrooms and schools while receiving the support and accessible learning resources required to participate effectively (UNICEF, n.d.).

The concept therefore extends beyond physical access to school. A learner may be enrolled in a mainstream school and still experience exclusion if teaching materials are inaccessible, teachers are inadequately prepared, communication support is unavailable, or discriminatory attitudes prevent meaningful participation. Inclusive education consequently encompasses curriculum design, teaching methods, assessment procedures, school



infrastructure, learning materials, teacher preparation, support services, and the broader social environment in which learning occurs. This understanding is particularly important for learners with disabilities because educational exclusion can arise from the interaction between an individual's impairment and environmental, institutional, technological, and attitudinal barriers.

The contemporary understanding of inclusive education is also closely associated with a rights-based approach. Education is not simply a service provided to those considered capable of benefiting from it; it is a fundamental right that should be accessible without discrimination. From this perspective, inclusion requires education systems to adapt to learner diversity rather than expecting learners to overcome structural barriers on their own. UNICEF similarly emphasises that children with disabilities frequently encounter discrimination, stigma, inaccessible school services, and inadequate policymaking, all of which can restrict their educational and social participation (UNICEF, n.d.).

2.2 Digital Skills Development

Digital skills development refers to the process through which individuals acquire the knowledge, abilities, attitudes, and practical competencies required to use digital technologies effectively, safely, critically, and productively. Digital skills range from basic competencies, such as operating digital devices, navigating the internet, communicating electronically, and accessing online information, to intermediate and advanced competencies involving professional software, data management, digital content creation, programming, cybersecurity, artificial intelligence, and other specialised applications (ITU, 2022).

Digital skills should therefore not be reduced to the ability to operate a computer or smartphone. In an increasingly technology-mediated economy, digital competence involves the capacity to locate and evaluate information, communicate and collaborate through digital platforms, create and share digital content, solve problems using technology, protect personal information, and adapt to emerging technological environments. The ITU recognises different levels of digital proficiency and emphasises the importance of developing national strategies that address varied skill levels and the needs of groups that have historically been underrepresented in digital participation (ITU, n.d.).

For learners with disabilities, digital skills development has an additional dimension: **accessibility**. A learner cannot reasonably be expected to develop digital competencies when the device, software, platform, instructional material, or assessment system is inaccessible. Consequently, digital skills programmes for learners with disabilities must combine skills acquisition with accessible technology and appropriate support. Digital learning platforms, for example, should be compatible with screen readers and other assistive technologies, while instructional resources may need captions, alternative text, audio descriptions, keyboard navigation, adjustable interfaces, or other accessibility features depending on the learner's needs.

Digital skills development should also be understood as a continuum rather than a one-time educational intervention. Technological systems evolve continuously, meaning that learners require the capacity for lifelong learning and adaptation. This is especially relevant in Africa, where digital transformation is creating new occupational opportunities while simultaneously changing the skills required for existing occupations. The ILO has highlighted the growing importance of digital skills to Africa's future labour market and estimated that substantial numbers of digital jobs could emerge on the continent by 2030 (ILO, 2024).

2.3 Learners with Disabilities

The term *learners with disabilities* encompasses students who experience long-term physical, sensory, intellectual, developmental, psychosocial, or other impairments which, in interaction with environmental and social barriers, may restrict their participation in education on an equal basis with others. This conceptualisation is important because disability should not be understood exclusively as an individual's medical condition. Contemporary disability discourse increasingly recognises that limitations in participation arise from the interaction between impairments and inaccessible environments, institutional practices, and social attitudes.



UNICEF similarly conceptualises disability in terms of the interaction between long-term impairment and environmental conditions that limit participation, emphasising that many of the barriers experienced by children with disabilities are created by environments and attitudes rather than by impairment alone (UNICEF, n.d.).

This distinction has significant implications for education. A learner with visual impairment, for example, may be able to participate effectively in a digital learning environment when course materials are compatible with a screen reader, but may be excluded when instructional resources are presented only as inaccessible images. Similarly, a learner with hearing impairment may participate effectively when videos contain accurate captions or sign-language support, but may experience substantial exclusion when audiovisual content is provided without appropriate accessibility features. In these situations, the technological environment becomes a determinant of participation.

The term *learners with disabilities* is therefore used in this paper to emphasise both the diversity of disability experiences and the responsibility of institutions to create environments in which those learners can participate meaningfully. This approach also avoids treating disability as synonymous with inability. Learners with disabilities possess diverse abilities, interests, aspirations, and potential contributions to education, employment, innovation, and society. The central concern is consequently not what learners cannot do, but what educational systems can do to remove unnecessary barriers to their participation.

2.4 Digital Inclusion

Digital inclusion refers to the equitable ability of individuals and communities to access, afford, use, and benefit meaningfully from digital technologies and services. The concept extends beyond internet connectivity because simply providing a person with access to a device or network does not guarantee meaningful digital participation. The ITU identifies connectivity, affordability, accessibility, digital skills, and enabling policy conditions as interconnected dimensions of digital inclusion (ITU, n.d.).

For persons with disabilities, accessibility is particularly important. Digital inclusion requires technologies and digital services to be designed in ways that accommodate different forms of human ability. The ITU therefore identifies ICT accessibility as a foundational requirement for digital inclusion and argues that accessibility should be embedded from the outset in the design and deployment of ICT products, services, and applications (ITU, n.d.).

Digital inclusion is consequently broader than the familiar question of the digital divide. A learner may technically have access to the internet but remain digitally excluded because the available device is unaffordable to maintain, the platform is inaccessible, the learner lacks the skills required to use it, or there is insufficient technical support. For learners with disabilities, these barriers can interact and compound one another.

This distinction is central to the argument of this paper. Digital access without accessibility does not constitute genuine digital inclusion; accessibility without skills does not guarantee meaningful participation; and skills without affordable and reliable access cannot easily translate into educational or economic opportunity. Inclusive digital education must therefore address these dimensions simultaneously.

2.5 Africa's Emerging Global Economy

The concept of Africa's emerging global economy refers to the continent's increasing integration into global systems of production, trade, communication, innovation, entrepreneurship, employment, and knowledge exchange, particularly under the influence of digitalisation and technological change. African economies are experiencing significant transformations associated with mobile connectivity, digital financial services, e-commerce, information and communication technologies, artificial intelligence, online services, digital entrepreneurship, and technology-enabled forms of work.

This transformation is creating new opportunities for education and employment while simultaneously genera-



ting new demands for skills. The ILO notes that Africa's digital transformation is already influencing the future of work and that digital skills will be increasingly important as the continent's labour market evolves (ILO, 2024).

The phrase *emerging global economy* should not, however, be interpreted as implying that Africa is developing uniformly or that technological progress automatically produces inclusive growth. Significant differences exist between and within African countries in terms of connectivity, infrastructure, education quality, digital affordability, labour-market structures, and technological capacity. Rural and marginalised communities can experience substantially different digital opportunities from those available in major urban centres.

For this reason, the emerging African digital economy presents both an opportunity and a risk for persons with disabilities. Digital technologies can facilitate remote learning, online employment, entrepreneurship, digital communication, and access to information. The ILO notes that digital tools can expand employment opportunities for persons with disabilities, but warns that inaccessible technologies, unaffordable ICTs, and inadequate digital skills can prevent them from benefiting from the digital economy (ILO, 2021).

The concept is therefore used in this paper to describe not simply economic growth driven by technology, but the broader transformation of African societies and labour markets in response to digitalisation and global economic integration.

2.6 Conceptual Relationship among the Key Concepts

The concepts discussed above are interconnected rather than independent. Inclusive education provides the foundation; digital skills development provides the competencies; digital inclusion provides the conditions for meaningful technological participation; and the emerging digital economy provides an increasingly important context in which those competencies can be applied.

The relationship can be expressed conceptually as follows:

Inclusive Education → Accessible Digital Learning → Digital Skills Development → Workforce Readiness → Economic and Social Participation

However, this progression depends on enabling conditions such as affordable connectivity, accessible technologies, assistive devices, trained teachers, inclusive curricula, supportive policies, and positive social attitudes. Where these conditions are absent, the pathway can break down at any stage.

This relationship is particularly important for learners with disabilities. The ILO observes that access to digital skills is increasingly necessary for participation in the labour market, while disability-related barriers can prevent individuals from benefiting from technological transformation (ILO, 2021, 2023). Consequently, strengthening inclusive education is not simply about increasing school attendance among learners with disabilities. It is about creating a continuous pathway from educational inclusion to skills acquisition and ultimately to meaningful participation in the changing economy.

The conceptual position adopted in this paper is therefore that inclusive education and digital skills development should be treated as complementary components of disability-inclusive human-capital development in Africa. An education system that successfully enrolls learners with disabilities but fails to provide them with relevant digital competencies may achieve physical inclusion without achieving meaningful economic inclusion. Conversely, digital skills programmes that ignore accessibility and educational inequalities may benefit primarily those who are already advantaged. A genuinely inclusive approach must address both dimensions simultaneously.

3. THEORETICAL PERSPECTIVES

The relationship between inclusive education, digital skills development, disability, and participation in the



emerging global economy can be understood through several complementary theoretical perspectives. This paper adopts the Social Model of Disability, Capability Approach, and Human Capital Theory. These theories provide different but interconnected explanations of disability inclusion. The Social Model of Disability explains how environmental and institutional barriers contribute to exclusion; the Capability Approach focuses on people's substantive opportunities to achieve valued outcomes; while Human Capital Theory establishes the economic significance of education and skills development. Together, the three perspectives provide a useful framework for examining why inclusive digital education should be considered both a social justice concern and an investment in Africa's future workforce.

3.1 Social Model of Disability

The Social Model of Disability emerged principally from the work of disability scholars and activists who challenged the traditional medical understanding of disability. A major contribution came from Oliver (1990), who argued that disability should not be understood simply as an individual medical problem but as a consequence of social and environmental barriers that restrict the participation of people with impairments. From this perspective, an impairment may be a characteristic of an individual, whereas disability is produced or intensified by social arrangements that fail to accommodate human diversity.

The Social Model therefore shifts attention from asking what is “wrong” with a person to asking what barriers prevent that person from participating fully in society. These barriers may be physical, institutional, technological, communicative, cultural, or attitudinal. Shakespeare (2014) acknowledges the importance of this shift while also noting that disability is complex and cannot always be explained exclusively through social structures. Nevertheless, the model remains highly influential in contemporary disability policy and inclusive education.

Applied to education, the Social Model suggests that learners with disabilities should not be regarded as inherently incapable of participating in mainstream educational environments. Instead, educational exclusion may result from inaccessible buildings, inappropriate teaching methods, inflexible curricula, inaccessible learning materials, inadequate communication support, negative attitudes, and insufficient assistive technologies. A learner with visual impairment, for example, may encounter significant educational barriers where textbooks and digital materials are unavailable in accessible formats. The difficulty therefore does not necessarily arise from the learner's impairment itself but from an educational environment that has failed to accommodate the learner.

The relevance of the Social Model becomes even greater in digital education. Digital platforms are frequently presented as inherently inclusive because they can provide learning opportunities beyond the physical classroom. However, digital environments can themselves become sources of exclusion when websites, learning management systems, software applications, electronic documents, videos, or online assessments are inaccessible. The model therefore requires digital education to be evaluated not merely according to whether technology is available but according to whether learners with different abilities can meaningfully interact with it.

The Social Model also provides a useful explanation for the importance of assistive technologies. Screen readers, speech-to-text applications, captioning systems, alternative input devices, magnification technologies, and other accessibility tools can reduce environmental barriers and enable learners with disabilities to participate more independently. However, technology alone cannot eliminate exclusion where institutional policies, teacher attitudes, affordability constraints, or inaccessible curriculum structures remain unchanged.

For this paper, the Social Model of Disability provides the foundation for arguing that inclusive digital education requires the systematic identification and removal of technological, institutional, pedagogical, physical, and attitudinal barriers. It also challenges African education systems to move away from approaches that place the responsibility for adaptation primarily on learners with disabilities.



3.2 Capability Approach

The Capability Approach, principally associated with Sen (1999) and further developed by Nussbaum (2000, 2011), provides another important theoretical perspective for understanding inclusion. The approach distinguishes between the resources or opportunities available to individuals and their actual capability to convert those resources into outcomes that they value.

Sen (1999) argues that development should be understood in terms of expanding people's substantive freedoms and capabilities rather than simply increasing income or material resources. Nussbaum (2011) similarly emphasises the importance of ensuring that individuals possess genuine opportunities to achieve central human capabilities and participate meaningfully in society.

The Capability Approach is particularly relevant to learners with disabilities because equal provision of resources does not necessarily produce equal opportunities. For example, providing every learner with a laptop may appear equitable, but a learner who cannot operate the device because the software is incompatible with a screen reader does not have the same practical opportunity as other learners. Similarly, providing internet access does not necessarily constitute digital inclusion if the available platform is inaccessible or the learner lacks the skills required to use it effectively.

This distinction between resources and substantive opportunities is central to understanding disability-inclusive digital education. Learners with disabilities may require additional resources or forms of support to achieve comparable educational opportunities. Such support does not necessarily represent preferential treatment; rather, it can be understood as a mechanism for converting formal equality into substantive equality.

The Capability Approach therefore encourages policymakers and educators to ask deeper questions about educational outcomes. Instead of asking merely whether learners with disabilities have been enrolled in schools or provided with digital devices, policymakers should ask whether these learners have the actual capability to learn, communicate, develop digital competencies, pursue further education, obtain employment, and participate in society.

This perspective is particularly important in Africa, where digital inequalities frequently intersect with poverty, rural isolation, gender inequality, inadequate infrastructure, and disability. A learner may theoretically have access to digital education while lacking electricity, reliable connectivity, assistive technology, affordable data, technical support, or a trained teacher. Formal access consequently does not necessarily translate into meaningful capability.

The Capability Approach thus strengthens the argument that inclusive education should be evaluated according to what learners with disabilities are genuinely able to do and become, rather than merely according to the resources formally allocated to them. Digital skills development becomes meaningful when learners can convert acquired skills into educational progression, employment, entrepreneurship, communication, independence, and broader participation in society.

3.3 Human Capital Theory

Human Capital Theory provides the economic foundation for understanding why investment in education and skills development is important to individuals and societies. Becker (1964) conceptualised education, training, knowledge, and skills as forms of human capital that enhance individuals' productive capacities and can generate economic returns. Schultz (1961) similarly argued that investments in human capabilities contribute significantly to economic development.

Within this framework, education is not only a social institution but also an investment that increases the knowledge and productive capabilities of individuals. Skills acquired through education and training can improve employability, productivity, income-generating capacity, and economic participation. At the national level, investment in human capital contributes to the development of a more capable workforce and can support innovation and economic growth.



Human Capital Theory is particularly relevant to the issue of learners with disabilities because exclusion from quality education can result in the underdevelopment of a significant portion of a country's potential workforce. When learners with disabilities are denied opportunities to acquire relevant knowledge and skills, the consequences extend beyond the individual. Families, communities, employers, and national economies may also lose potential contributions.

The digital transformation of the global economy further increases the importance of this perspective. Traditional educational competencies are increasingly complemented by digital literacy, data literacy, information management, communication technologies, computational thinking, cybersecurity awareness, and other technology-related skills. As these competencies become more important in employment and entrepreneurship, failure to provide learners with disabilities with opportunities to acquire them can reinforce existing labour-market inequalities.

The Human Capital perspective therefore supports greater investment in accessible digital education, teacher training, assistive technologies, inclusive curricula, and digital infrastructure. Such investment should not be viewed solely as expenditure directed toward a socially vulnerable group. It can also be understood as an investment in the productive capacity of the wider population.

However, Human Capital Theory must be applied carefully to disability inclusion. Reducing the value of inclusive education solely to its economic returns would overlook the fundamental rights and dignity of persons with disabilities. Education has intrinsic social, cultural, civic, and personal value that cannot be measured entirely through employment or income. Consequently, Human Capital Theory is most useful in this paper when combined with the Social Model of Disability and Capability Approach.

3.4 Complementarity of the Three Theories

The three theoretical perspectives provide complementary rather than competing explanations of inclusive digital education.

The Social Model of Disability explains the source of exclusion by directing attention toward environmental, technological, institutional, and attitudinal barriers. It challenges the assumption that disability-related educational difficulties are primarily the result of individual limitations (Oliver, 1990; Shakespeare, 2014).

The Capability Approach explains what meaningful inclusion should achieve. It moves the discussion beyond formal access toward substantive opportunities, asking whether learners with disabilities possess the real freedom and resources required to learn, develop skills, participate, and pursue valued life outcomes (Sen, 1999; Nussbaum, 2011).

Human Capital Theory explains the economic significance of developing those capabilities. It highlights the contribution of education and skills development to individual productivity, employability, innovation, and economic development (Becker, 1964; Schultz, 1961).

The relationship can therefore be represented conceptually as:

Removal of Barriers → Expanded Capabilities → Skills Development → Workforce Participation → Social and Economic Inclusion

Within this framework, inclusive education represents the process through which barriers are reduced; accessible digital technologies provide important tools for expanding educational participation; digital skills constitute a significant form of contemporary human capital; and meaningful workforce participation represents one important outcome of successful inclusion.

3.5 Application of the Theoretical Perspectives to the Present Paper

The theoretical framework provides a basis for analysing the challenges and opportunities associated with



digital skills development among learners with disabilities in Africa.

First, the Social Model of Disability directs attention toward the accessibility of African educational environments and digital systems. The relevant question is not simply whether digital technologies have entered African schools but whether those technologies have been designed and implemented in ways that accommodate learners with diverse abilities.

Second, the Capability Approach provides a basis for examining whether learners with disabilities have genuine opportunities to benefit from digital education. This requires consideration of factors such as affordability, connectivity, assistive technology, teacher support, accessible content, digital literacy, and socioeconomic circumstances.

Third, Human Capital Theory establishes why these issues matter for Africa's economic transformation. If digital skills increasingly determine access to employment and entrepreneurship, excluding learners with disabilities from digital skills development can result in the underutilisation of human potential and reinforce existing inequalities within the labour market.

Taken together, these perspectives suggest that the objective of inclusive digital education should not be limited to increasing enrolment or providing devices. The broader objective should be to create an educational ecosystem in which learners with disabilities can access technology, acquire meaningful digital competencies, convert those competencies into productive capabilities, and participate on more equitable terms in the emerging economy.

4. INCLUSIVE EDUCATION AND THE CHANGING NATURE OF WORK

The nature of work has undergone significant transformation as a result of digitalisation, automation, artificial intelligence (AI), globalisation, and the expansion of knowledge-based economic activities. Technological developments have altered how organisations recruit workers, organise production, communicate, deliver services, and create value. Consequently, educational systems are increasingly expected to prepare learners for labour markets characterised by technological change, continuous learning, flexible employment arrangements, and growing demand for digital competencies. The World Economic Forum (2025) identifies technological change, AI and information processing, robotics and automation, and broader economic and demographic developments among the major forces expected to reshape employment and skills demand in the coming years.

For Africa, these changes present both opportunities and challenges. The continent has a large and youthful population, expanding digital markets, increasing mobile connectivity, and a growing technology sector. These developments create opportunities for employment, entrepreneurship, innovation, and participation in global digital value chains. However, the benefits of digital transformation depend significantly on whether education and training systems can equip people with relevant competencies. The International Labour Organization (ILO, 2024) notes that Africa's digital transformation is generating new opportunities while simultaneously creating new requirements for digital skills and adaptation. Education must therefore evolve alongside the changing structure of the economy.

4.1 From Traditional Education to Workforce Readiness

Traditional education systems have often focused on foundational academic knowledge, examination performance, and preparation for relatively predictable occupational pathways. Although these functions remain important, the contemporary labour market increasingly requires individuals to demonstrate a broader combination of technical, digital, cognitive, interpersonal, and adaptive competencies. The World Economic Forum (2025) identifies analytical thinking, technological literacy, creativity, resilience, flexibility, and lifelong learning among the skills expected to remain important in an increasingly technology-driven economy.

This transformation creates a direct connection between inclusive education and workforce readiness. If learners with disabilities are excluded from opportunities to acquire contemporary competencies during their



formative educational years, their disadvantage may continue into vocational training, higher education, and employment. Educational exclusion can consequently become a pathway to economic exclusion.

Inclusive education can interrupt this cycle by ensuring that learners with disabilities receive opportunities to acquire competencies relevant to contemporary employment. This includes not only traditional academic skills but also digital literacy, communication, problem-solving, collaboration, information management, and the ability to use appropriate technologies. UNESCO (2020) emphasises that inclusive and equitable quality education is essential to ensuring that all learners can develop the knowledge and skills required for participation in society.

The implication is significant: workforce inclusion begins substantially before entry into the labour market. It begins in classrooms, laboratories, vocational centres, libraries, and digital learning environments where learners acquire the capabilities that eventually influence their employment opportunities.

4.2 Digitalisation and New Employment Opportunities for Persons with Disabilities

Digital transformation can create new possibilities for persons with disabilities by reducing some of the physical and geographical barriers traditionally associated with employment. Remote work, online entrepreneurship, digital freelancing, e-commerce, virtual collaboration, and technology-enabled services can provide alternative pathways to economic participation.

For example, digital platforms can allow individuals to provide services without necessarily travelling to a conventional workplace every day. A person with a mobility impairment may be able to perform programming, graphic design, data analysis, writing, customer support, digital marketing, or other knowledge-based tasks remotely, provided that appropriate technology and workplace accommodations are available. Similarly, digital entrepreneurship can allow individuals to establish businesses that operate through online markets.

The ILO (2021) observes that digital technologies can create employment opportunities for persons with disabilities by enabling flexible work arrangements and improving access to information, communication, and employment services. However, the organisation also cautions that these opportunities are not automatically inclusive. Inaccessible technologies, inadequate digital skills, limited connectivity, and affordability constraints can prevent persons with disabilities from benefiting from digital transformation.

Thus, digitalisation presents a dual possibility. It can become an instrument for reducing disability-related employment barriers, or it can reproduce those barriers in a new technological form. The outcome depends substantially on whether accessibility and inclusion are incorporated into digital education, technological design, employment policies, and workplace practices.

4.3 The Importance of Digital Skills for Workforce Readiness

Digital competence has become increasingly important across occupational sectors. Even jobs that are not traditionally classified as technology occupations may require workers to use digital communication platforms, electronic records, productivity software, online payment systems, data-management tools, or other digital technologies.

This development means that digital skills should not be regarded as specialised competencies relevant only to programmers, engineers, or ICT professionals. Basic digital competence increasingly forms part of general employability. The ILO (2023) emphasises that digitalisation is transforming occupational structures and that workers require opportunities to acquire and update skills throughout their working lives.

For learners with disabilities, this requirement creates an urgent educational challenge. If digital education is inaccessible during childhood and adolescence, learners may enter adulthood without the technological competencies necessary to compete for employment. The resulting disadvantage can become cumulative



because digital skills influence access to further education, professional training, job-search platforms, entrepreneurship, and workplace technologies.

Inclusive education therefore needs to adopt a lifelong skills perspective. The objective should not simply be to enable learners with disabilities to complete formal education but to prepare them for continued learning and adaptation throughout their working lives.

4.4 Artificial Intelligence and the Future of Disability Inclusion

Artificial intelligence represents one of the most significant developments shaping the future of education and employment. AI-powered systems can support personalised learning, automated transcription, speech recognition, text-to-speech conversion, language translation, image recognition, and other functions that may improve accessibility for persons with disabilities.

For learners with disabilities, these technologies can potentially provide new forms of educational support. Speech recognition may assist learners who experience difficulties with conventional keyboard input, while automated captioning can improve access to audiovisual learning materials for learners with hearing impairment. AI-supported text-to-speech systems can assist learners with visual or reading-related difficulties, while intelligent educational systems may provide more personalised learning experiences.

However, AI also creates new risks. If algorithms are trained using biased or insufficiently representative datasets, they may perform poorly for individuals with certain disabilities. Similarly, AI-based educational and recruitment systems may introduce new forms of discrimination if accessibility and fairness are not considered during their design and deployment. The ILO (2025) consequently emphasises that AI can be both an opportunity and a challenge for persons with disabilities, depending on how technologies are developed and governed.

The growing importance of AI strengthens the case for inclusive digital education. Learners with disabilities should not merely be passive recipients of technological developments. They should have opportunities to understand, use, evaluate, and where possible contribute to the development of emerging technologies. This requires education systems to provide appropriate digital competencies from an early stage.

4.5 Remote Work and the Geography of Employment

The expansion of remote and hybrid work has challenged traditional assumptions about where employment must take place. Digital communication platforms, cloud-based applications, virtual collaboration systems, and online service delivery enable some occupations to be performed across geographical boundaries.

For persons with disabilities, this development can be particularly significant because conventional workplaces may contain physical, transportation, communication, or environmental barriers. Remote work can reduce some of these barriers by allowing individuals to work from environments that are more compatible with their accessibility needs.

Nevertheless, remote work should not automatically be interpreted as synonymous with inclusion. A remote worker still requires reliable electricity, internet connectivity, appropriate devices, accessible software, technical support, and sufficient digital competence. These requirements can be particularly difficult to satisfy in communities where digital infrastructure remains inadequate.

In Africa, where substantial digital inequalities exist between urban and rural communities, remote employment could therefore have contradictory effects. It can broaden employment opportunities for some persons with disabilities while excluding others who lack the infrastructure and skills required to participate. Inclusive digital education must consequently be linked to broader policies addressing connectivity, affordability, electricity, assistive technology, and digital infrastructure.



4.6 Inclusive Education as an Investment in Africa's Workforce

The connection between education and employment provides a strong economic justification for strengthening disability-inclusive education. When learners with disabilities receive quality education and relevant skills, they are better positioned to continue into vocational education, higher education, entrepreneurship, or employment. Conversely, when educational systems exclude them, the resulting loss extends beyond educational outcomes.

The exclusion of persons with disabilities from education and employment represents an underutilisation of human potential. The ILO (2023) highlights the persistent employment disadvantages experienced by persons with disabilities, including lower labour-force participation and greater barriers to decent work. Such inequalities indicate that education systems, labour markets, employers, and governments must work together to address the structural factors that restrict participation.

From a Human Capital Theory perspective, investment in inclusive education can therefore contribute to the development of a larger and more diverse skilled workforce (Becker, 1964). From the Capability Approach, it expands individuals' substantive opportunities to pursue education, employment, entrepreneurship, and independent lives (Sen, 1999). From the Social Model of Disability, it removes institutional and environmental barriers that unnecessarily restrict participation (Oliver, 1990).

These perspectives converge on an important point: the inclusion of learners with disabilities is not a peripheral issue in Africa's workforce-development agenda. It is part of the continent's broader human-capital and economic-development challenge.

4.7 The Risk of a Two-Tier Digital Workforce

Despite the potential benefits of digital transformation, there is a risk that Africa could develop a two-tier digital workforce in which individuals with adequate access to quality education and technology benefit from emerging opportunities while disadvantaged groups remain excluded.

Learners with disabilities are particularly vulnerable to this outcome because disability can intersect with poverty, gender, geographical isolation, limited educational provision, and inadequate access to assistive technologies. Where these disadvantages accumulate, digital transformation may widen rather than reduce existing inequalities.

The World Bank (2016) identifies digital technologies as having the potential to promote development, inclusion, and economic opportunity, while also warning that technological benefits depend on the presence of appropriate skills, institutions, and enabling conditions. This observation is particularly relevant to disability inclusion. Technology cannot produce inclusive growth independently of the social and institutional systems through which it is introduced.

The policy implication is that digital transformation must be accompanied by inclusive human-capital development. Providing connectivity without developing skills, or providing digital devices without ensuring accessibility, is unlikely to produce sustainable inclusion.

4.8 Inclusive Education and the Future of African Workforce Participation

The relationship between inclusive education and employment should therefore be understood as a continuum rather than as two separate policy areas. Educational inclusion creates opportunities for learners with disabilities to acquire foundational knowledge. Digital skills development builds competencies relevant to contemporary economic participation. Vocational and higher education provide opportunities for specialisation, while inclusive employment policies and accessible workplaces allow individuals to translate their capabilities into economic participation.



The pathway can be conceptualised as:

Inclusive Education → Accessible Digital Learning → Digital Competence → Further Education/Vocational Training → Employability → Decent Work/Entrepreneurship → Economic Participation

Breakdowns at any stage can affect the subsequent stages. For example, inadequate inclusive education may limit digital skills development; inadequate digital skills may restrict access to vocational training; inaccessible vocational systems may reduce employability; and discriminatory employment practices may prevent qualified individuals from obtaining work.

Consequently, improving workforce participation among persons with disabilities requires interventions that span the entire education-to-employment pathway.

The emerging global economy presents Africa with an important opportunity to rethink disability inclusion. Rather than viewing persons with disabilities primarily through the lens of vulnerability or dependency, governments and institutions can recognise them as current and future contributors to innovation, entrepreneurship, knowledge production, public service, and economic development. Inclusive education is one of the principal mechanisms through which this shift can occur.

The central challenge is therefore not whether learners with disabilities can participate in Africa's digital future, but whether African societies will provide the educational, technological, institutional, and economic conditions necessary for them to do so.

5. DIGITAL SKILLS DEVELOPMENT AMONG LEARNERS WITH DISABILITIES IN AFRICA

Digital skills development has become an increasingly important component of contemporary education because digital technologies now influence how people learn, communicate, work, access public services, conduct business, and participate in social life. For learners with disabilities, however, acquiring digital competencies requires more than simply providing access to computers, mobile devices, or internet services. It requires educational environments in which technologies, instructional materials, teaching practices, and assessment systems are accessible and responsive to diverse learning needs. In the African context, this requirement is particularly important because disability-related barriers often intersect with broader challenges involving poverty, inadequate infrastructure, teacher shortages, limited connectivity, and unequal access to educational resources.

Digital skills development should therefore be understood as an integral component of inclusive education rather than as an isolated ICT intervention. When learners with disabilities acquire appropriate digital competencies, they may gain greater independence in accessing information, communicating with others, completing educational tasks, acquiring further skills, and eventually participating in employment and entrepreneurship. Conversely, exclusion from digital learning can reinforce existing educational and socioeconomic inequalities.

5.1 Digital Competencies Required in the Emerging Economy

The skills required in the contemporary economy extend considerably beyond basic computer operation. Digital competence encompasses the ability to access and evaluate information, communicate through digital platforms, create digital content, use digital tools to solve problems, collaborate online, protect personal information, and adapt to emerging technologies (European Commission, 2019; UNESCO, 2023).

At a foundational level, learners require basic competencies such as operating digital devices, navigating operating systems, using word-processing applications, accessing the internet, sending electronic messages, and managing digital files. These competencies provide the foundation upon which more advanced skills can be developed.



Intermediate competencies may include spreadsheet management, digital presentation, online collaboration, digital content creation, information management, basic data analysis, online research, and responsible use of social media and digital communication platforms. Advanced competencies may include programming, cybersecurity, database management, data science, artificial intelligence, digital design, software development, and other specialised technology-related skills.

For learners with disabilities, however, digital competence must incorporate accessible technology use. A learner who is visually impaired, for example, may require proficiency in using screen readers and keyboard navigation alongside conventional digital skills. A learner with hearing impairment may need to become familiar with captioning and visual communication technologies. Learners with physical disabilities may require alternative input technologies or adaptive interfaces.

This means that digital skills frameworks should not assume that every learner interacts with technology in the same manner. Inclusive digital education should instead recognise multiple pathways through which learners can achieve comparable competencies. The objective should be functional competence rather than conformity to a single method of interacting with technology.

The growing importance of artificial intelligence further expands the range of competencies required. Learners increasingly need to understand not only how to use digital tools but also how to evaluate information generated by automated systems, recognise potential bias, protect personal data, and use AI responsibly. UNESCO (2023) argues that AI-related education should incorporate human-centred values, ethical awareness, and appropriate competencies. These principles are especially important for learners with disabilities because technological systems can either support inclusion or reproduce exclusion depending on how they are designed and implemented.

5.2 Accessible Digital Learning Environments

The development of digital skills depends substantially on the accessibility of the learning environment. A learner cannot develop meaningful digital competence where the digital tools used for instruction are themselves inaccessible.

Accessibility involves designing digital platforms, content, devices, and communication systems so that people with different abilities can use them effectively. The World Wide Web Consortium (W3C, 2023) identifies principles of perceivability, operability, understandability, and robustness as fundamental to accessible digital content. These principles have direct relevance to educational environments.

For example, digital learning materials should provide alternative text for meaningful images, captions for audiovisual content, appropriate heading structures, keyboard accessibility, sufficient navigational consistency, and compatibility with assistive technologies. Electronic documents should also be produced in accessible formats rather than simply being scanned images that cannot be interpreted by screen-reading software.

Accessible learning environments are particularly important as African educational institutions increasingly adopt learning management systems, online assessment platforms, digital libraries, educational applications, and virtual classrooms. If these systems are not designed according to accessibility principles, the digitalisation of education may unintentionally create new forms of exclusion.

Accessibility must therefore be incorporated at the design stage, rather than being treated as an additional feature to be introduced after a technology has already been deployed. This principle is consistent with the broader concept of universal design, which encourages the development of environments and products that can be used by the widest possible range of people without requiring extensive modification (UNESCO, 2023).

5.3 Assistive Technologies and Digital Skills Development

Assistive technology constitutes one of the most important mechanisms through which digital learning can become accessible to persons with disabilities. The World Health Organization and UNICEF (2022) define



assistive technology broadly to include products, systems, and services that help individuals maintain or improve functioning and independence. Examples include wheelchairs, hearing aids, communication devices, screen readers, magnification software, alternative keyboards, speech-recognition systems, and other adaptive technologies.

Within education, assistive technologies can transform learners' ability to access information and participate in classroom activities. A learner with visual impairment can use screen-reading technology to interact with electronic texts, websites, and software applications. Learners with hearing impairment can benefit from captioning and transcription systems, while learners with physical disabilities may use alternative input devices to operate computers.

Assistive technologies can consequently support not only educational participation but also the development of independent digital skills. This distinction is important. Technology should not simply perform tasks on behalf of learners; it should, where appropriate, enable them to develop the capacity to perform tasks independently.

However, access to assistive technology remains a major challenge in many low- and middle-income countries. The World Health Organization and UNICEF (2022) report significant unmet needs for assistive products globally, with availability and affordability remaining major barriers. These challenges can be particularly severe in African contexts where imported technologies may be expensive and specialist technical support may be limited.

The challenge therefore extends beyond purchasing devices. Sustainable assistive technology provision requires appropriate assessment of users' needs, training, maintenance, technical support, replacement mechanisms, and integration into educational systems. Without these complementary services, even donated or subsidised technologies may remain underused.

5.4 Inclusive Pedagogy and Teacher Capacity

Teachers play a central role in translating digital technologies into meaningful learning experiences. The availability of accessible technologies does not automatically produce inclusive education if teachers lack the knowledge and confidence required to use those technologies effectively.

Teacher capacity therefore constitutes a critical component of digital inclusion. Teachers require training in digital pedagogy, disability awareness, accessibility principles, assistive technology, differentiated instruction, and inclusive assessment practices. UNESCO (2020) emphasises that teachers are central to the implementation of inclusive education and require appropriate preparation and professional support.

In the context of digital education, teachers should be able to identify accessibility barriers and modify instructional approaches accordingly. For instance, an educator using video-based instruction should understand the importance of captions for learners with hearing impairment. Similarly, a teacher distributing electronic documents should understand how document structure affects accessibility for learners using screen readers.

Inclusive pedagogy also requires teachers to avoid assuming that learners with disabilities require lower academic expectations. Instead, appropriate accommodations should be provided while maintaining meaningful learning objectives. This distinction is crucial because excessive lowering of expectations can unintentionally reinforce stereotypes concerning the abilities of learners with disabilities.

Professional development should consequently combine technical skills and inclusive pedagogical competence. Training teachers to operate digital platforms without teaching them how to use those platforms inclusively is insufficient.

5.5 Curriculum Design and Digital Inclusion

Curriculum design is another important determinant of digital skills development. A curriculum that treats



digital competence as an optional or peripheral subject may fail to prepare learners for an increasingly technology-dependent economy.

Inclusive curricula should integrate digital competencies across different areas of learning while ensuring that digital activities are accessible to learners with disabilities. Rather than restricting learners with disabilities to simplified forms of digital education, institutions should provide pathways through which they can progressively acquire advanced competencies according to their interests and capabilities.

This is particularly important because disability does not determine intellectual or occupational potential. Learners with disabilities may pursue careers in engineering, law, education, business, data analysis, information technology, creative industries, research, public administration, and numerous other fields. Curriculum structures should therefore avoid directing learners with disabilities prematurely toward a narrow range of occupations based solely on assumptions about disability.

A flexible curriculum can provide opportunities for learners to explore different digital fields while allowing appropriate accommodations. Such an approach aligns with the Capability Approach because it expands the range of educational and occupational possibilities genuinely available to learners (Sen, 1999).

5.6 Digital Skills and Employability

The ultimate significance of digital skills development extends beyond academic achievement. Digital competence can influence employability, entrepreneurship, access to information about job opportunities, and participation in emerging forms of work.

The ILO (2021) identifies digital technologies as having the potential to improve employment opportunities for persons with disabilities, particularly where technology enables flexible work arrangements and reduces barriers associated with physical workplaces. Nevertheless, the organisation also identifies inaccessible technology, inadequate skills, and affordability as important constraints.

For learners with disabilities, therefore, digital skills development should be connected to realistic employment pathways. Schools, vocational institutions, universities, employers, technology companies, and disability organisations can collaborate to provide practical exposure to digital work environments. Internship programmes, project-based learning, digital entrepreneurship initiatives, mentorship, and career guidance can help learners understand how acquired skills can be converted into employment opportunities.

The development of digital skills should also include career-oriented competencies, such as creating professional digital profiles, preparing electronic applications, communicating professionally online, participating in virtual meetings, managing digital portfolios, and using online employment platforms. These competencies can improve learners' ability to navigate increasingly digital recruitment systems.

5.7 Digital Entrepreneurship and Self-Employment

Digital entrepreneurship provides another pathway through which digital skills can contribute to economic participation. In contexts where formal employment opportunities are limited, digital platforms can provide opportunities for self-employment and small-business development.

Learners who acquire competencies in areas such as graphic design, digital marketing, content creation, web development, data services, online tutoring, e-commerce, or software development may eventually use these skills to establish independent sources of income. For persons with disabilities, entrepreneurship can provide greater control over working conditions and potentially allow work environments to be adapted to individual accessibility requirements.

However, entrepreneurship should not be romanticised as a substitute for inclusive employment. Not every person with a disability has access to capital, reliable internet, appropriate technology, business networks, or



market opportunities. Consequently, digital entrepreneurship initiatives should be supported by financial inclusion, business training, mentorship, accessible infrastructure, and appropriate policy measures.

5.8 Digital Skills Development and Lifelong Learning

Technological change means that digital skills cannot be treated as competencies acquired once and retained permanently. New platforms, applications, AI systems, cybersecurity threats, and occupational technologies continue to emerge. Learners therefore need the ability to update their knowledge throughout their educational and professional lives.

The concept of lifelong learning is particularly relevant to persons with disabilities because technological developments can create both new opportunities and new accessibility challenges. Continued access to training can enable individuals to adapt to changing technologies rather than becoming excluded when existing systems become obsolete.

African education policies should therefore move beyond a narrow school-based conception of digital skills development. Digital inclusion should extend across primary and secondary education, vocational education, higher education, adult education, workplace training, and community-based learning.

5.9 The African Context: Persistent Structural Barriers

Despite the potential of digital technologies, significant structural barriers continue to constrain digital skills development among learners with disabilities across Africa. These barriers include inadequate electricity supply, limited broadband coverage, high costs of internet access, shortages of digital devices, limited access to assistive technologies, insufficient teacher training, inaccessible educational content, poverty, and rural–urban inequalities.

These challenges should not be viewed separately. They frequently interact. For example, a learner living in a rural community may experience limited access to electricity, poor internet connectivity, inadequate educational facilities, and a shortage of teachers trained in disability-inclusive digital education. Even where a digital device is available, these surrounding constraints may prevent meaningful use.

The Alliance for Affordable Internet (2021) has highlighted the continuing affordability challenges associated with internet access in many low- and middle-income countries, while the ITU (2022) continues to identify disparities in meaningful connectivity and digital skills as important dimensions of the global digital divide.

For learners with disabilities, these general digital inequalities can be compounded by the additional costs associated with accessibility. A standard digital device may not meet a learner's needs, requiring additional software or hardware. Consequently, equal treatment in the form of identical devices may not produce equitable outcomes.

5.10 Toward a Disability-Inclusive Digital Skills Ecosystem

The development of digital skills among learners with disabilities requires an ecosystem rather than isolated interventions. Schools alone cannot resolve all the barriers involved. Effective inclusion requires collaboration among governments, educational institutions, technology companies, disability organisations, families, telecommunications providers, employers, development partners, and communities.

Such an ecosystem should include:

- accessible digital infrastructure;
- affordable internet connectivity;
- appropriate assistive technologies;



- accessible digital educational content;
- trained teachers and support personnel;
- inclusive curriculum design;
- disability-responsive digital-skills programmes;
- accessible vocational and higher education;
- career guidance and employment services;
- digital entrepreneurship opportunities; and
- policies that promote accessibility and non-discrimination.

The significance of this ecosystem approach is that digital exclusion is rarely caused by a single factor. Consequently, isolated interventions are unlikely to produce sustainable outcomes.

6. BARRIERS TO INCLUSIVE DIGITAL SKILLS DEVELOPMENT IN AFRICA

Despite the potential of digital technologies to improve educational inclusion, learners with disabilities in Africa continue to face structural, technological, economic, and social barriers. These barriers rarely operate independently; rather, they often reinforce one another. UNESCO (2020) notes that disability, poverty, location, inadequate infrastructure, and discriminatory attitudes can interact to produce educational exclusion. In sub-Saharan Africa, children with disabilities continue to experience lower educational participation and completion than their peers, with inadequate infrastructure and limited teacher preparation among the important contributing factors (Wodon et al., 2018).

6.1 Inadequate Digital Infrastructure and Connectivity

Reliable electricity, internet connectivity, appropriate devices, and digital learning facilities are fundamental to digital skills development. Yet access remains uneven across African countries and between urban and rural communities. Learners in underserved areas may have limited opportunities to use computers, access online resources, or participate in technology-supported instruction (ITU, 2022).

For learners with disabilities, inadequate infrastructure can have an even greater effect because accessible learning may require additional devices, software, or technical support. UNESCO (2021) notes that ICT-based learning can exclude learners with disabilities when connectivity, equipment, assistive devices, and accessible materials are unavailable. Thus, expanding digital education without addressing infrastructure inequalities may reproduce existing educational disparities.

6.2 Affordability and the Cost of Digital Access

The cost of devices, internet services, electricity, software, and assistive technologies remains a major barrier to digital participation. Digital inclusion therefore depends not only on whether technologies exist but also on whether learners and their families can afford to use them consistently (ITU, 2022).

The financial burden can be greater for learners with disabilities because some require specialised devices or software in addition to ordinary digital equipment. The WHO and UNICEF (2022) report substantial global unmet need for assistive technology, particularly in low- and middle-income countries. When these additional costs are combined with household poverty, digital learning may become inaccessible to those who need it most.



6.3 Limited Access to Assistive Technologies

Assistive technology can enable learners with disabilities to access information, communicate, learn, and participate more independently. However, availability, affordability, maintenance, and technical support remain major challenges. The WHO and UNICEF (2022) estimate that more than 2.5 billion people globally need at least one assistive product, while access remains particularly limited in low- and middle-income countries.

In education, the absence of appropriate assistive technologies can prevent learners from benefiting from otherwise available digital resources. UNICEF (2022) identifies inadequate access to assistive technology, inaccessible school environments, and other structural barriers as factors restricting educational participation among children with disabilities.

The challenge is therefore not simply to provide assistive devices but to establish systems for assessment, procurement, training, maintenance, and replacement. Without these supporting mechanisms, technology provision may remain temporary or ineffective.

6.4 Inadequate Teacher Capacity

Teachers are central to the successful integration of digital technologies into inclusive education. However, many teachers lack sufficient preparation in both digital pedagogy and disability-inclusive teaching. UNESCO (2021) reports that teachers in several African contexts require additional training in assistive technologies, accessible digital textbooks, and adapting instructional materials for learners with disabilities.

Teacher preparation should therefore cover more than basic ICT operation. Educators need knowledge of accessibility standards, assistive technologies, differentiated instruction, accessible assessment, and inclusive digital resources (UNESCO, 2025). Without such competencies, teachers may unintentionally reproduce barriers even when schools possess digital equipment.

6.5 Inaccessible Digital Content and Platforms

Digitalisation does not automatically produce accessibility. Websites, electronic documents, learning management systems, videos, applications, and online assessment platforms may be difficult or impossible for some learners with disabilities to use.

For example, uncaptioned videos may exclude learners with hearing impairment, while image-based documents without alternative text may be inaccessible to learners who use screen readers. UNESCO (2025) therefore emphasises accessibility in the design of ICT-based learning environments for persons with disabilities.

Accessibility should consequently be incorporated from the beginning of curriculum and technology design rather than treated as an additional feature after implementation. This principle is consistent with inclusive education's broader objective of removing barriers rather than expecting learners to adapt to unsuitable systems (UNESCO, 2020).

6.6 Social Stigma and Attitudinal Barriers

Negative attitudes toward disability remain an important barrier to educational inclusion. UNICEF (2022) reports that negative beliefs, social norms, and behaviours concerning disability continue to affect children with disabilities in several African countries. Such attitudes can influence enrolment decisions, classroom participation, teacher expectations, peer relationships, and access to educational resources.

Stigma may also discourage learners with disabilities from participating actively in technology-related activities when they are perceived as incapable of acquiring advanced digital skills. Such assumptions are



inconsistent with the principles of inclusive education, which recognise learner diversity as a strength rather than a deficiency (UNESCO, 2020).

Changing attitudes therefore requires disability awareness among teachers, students, families, administrators, employers, and communities. Technological investment alone cannot resolve exclusion that is fundamentally social.

6.7 Rural–Urban and Socioeconomic Inequalities

Digital opportunities are unevenly distributed across geographical and socioeconomic groups. Urban schools are generally more likely to have better connectivity, digital facilities, and access to specialised services than schools in remote communities. Learners with disabilities in rural areas may therefore face multiple disadvantages simultaneously.

UNICEF (2022) found that disability-related barriers in several Eastern and Southern African countries interact with weaknesses in service provision, limited resources, and inadequate data. Similar inequalities are evident in digital education, where connectivity and affordability determine whether learners can access technology-supported learning (ITU, 2022).

These inequalities demonstrate why national digital education strategies must incorporate geographical and socioeconomic differences. A policy designed primarily around well-connected urban schools may have limited relevance for learners with disabilities in rural and underserved communities.

6.8 Policy–Implementation Gaps

Many African countries have adopted laws and policies supporting disability rights and inclusive education. However, the existence of policy does not necessarily guarantee implementation. UNICEF (2022) found that countries across Eastern and Southern Africa generally have laws and policies addressing the needs of children with disabilities, while significant implementation gaps remain.

These gaps may involve inadequate funding, weak institutional coordination, limited monitoring, insufficient data, and shortages of trained personnel. UNESCO (2020) similarly argues that inclusive education requires systemic change rather than isolated policy statements.

The implication is that African governments must move from policy commitment to measurable implementation. Inclusive digital education requires clearly defined standards, dedicated funding, teacher-development programmes, accessible procurement policies, monitoring mechanisms, and reliable data on learners with disabilities.

6.9 Interconnected Nature of the Barriers

The barriers discussed above are interconnected. A learner may have access to a school but lack an accessible device; have a device but lack internet connectivity; have connectivity but encounter inaccessible learning content; or have accessible technology but encounter a teacher who lacks the skills to use it effectively.

This interconnectedness means that isolated interventions are unlikely to produce sustainable inclusion. UNESCO (2025) consequently advocates an integrated approach involving ICT infrastructure, teacher competence, inclusive learning environments, and learner-centred practices.

The central issue is therefore not simply access to technology, but meaningful and sustained access to accessible digital learning. Addressing this distinction is essential if digital transformation is to reduce rather than reproduce educational inequality among learners with disabilities in Africa.



7. THE ROLE OF ASSISTIVE TECHNOLOGIES IN DIGITAL SKILLS DEVELOPMENT

Assistive technologies represent an important bridge between inclusive education and digital participation. They can enable learners with disabilities to access information, communicate, interact with digital platforms, and develop competencies that would otherwise be difficult to acquire. However, their effectiveness depends on affordability, availability, appropriate assessment, user training, technical support, and integration into educational systems (WHO & UNICEF, 2022).

7.1 Assistive Technologies as Enablers of Educational Participation

Assistive technologies can reduce barriers associated with different forms of disability. Screen readers and magnification tools can support learners with visual impairments; captioning and transcription can improve access for learners with hearing impairments; while alternative input devices can support learners with physical disabilities (WHO & UNICEF, 2022).

These technologies can therefore transform digital learning from a potentially inaccessible environment into one in which learners can participate more independently. UNESCO (2025) emphasises that ICT and AI-supported technologies can strengthen accessibility and personalised learning when appropriately integrated into inclusive educational environments.

7.2 From Access to Digital Competence

The purpose of assistive technology should extend beyond enabling learners to complete individual academic tasks. Effective use can help learners develop transferable digital competencies that remain valuable beyond school.

For instance, a learner who develops proficiency in screen-reader software may later use similar accessibility technologies in higher education or employment. Likewise, familiarity with accessible communication and productivity tools can facilitate participation in remote work and digital entrepreneurship.

Assistive technologies should therefore be viewed as tools for capability development, not merely compensatory devices. Their integration into education can contribute to greater independence, confidence, and workforce readiness.

7.3 Challenges of Assistive Technology Provision

Despite these benefits, assistive technology provision remains inadequate in many low- and middle-income settings. Cost, limited supply chains, insufficient technical expertise, lack of maintenance, and low awareness can restrict access (WHO & UNICEF, 2022).

African education systems should consequently adopt a more comprehensive approach that links assistive technology to inclusive education policy, teacher training, procurement, infrastructure, and technical support. Without these complementary measures, providing individual devices will have limited long-term impact.

7.4 Assistive Technology and the Digital Economy

The relevance of assistive technology extends beyond education. As employment increasingly depends on digital systems, accessibility tools can influence whether persons with disabilities can participate in professional environments. The ILO (2021) notes that digital technologies can expand employment opportunities for persons with disabilities while also creating new barriers when technologies are inaccessible.

Consequently, early exposure to assistive technologies within education can help establish a foundation for later participation in the digital economy. The objective should be to ensure that learners with disabilities leave

educational institutions not merely with certificates, but with the digital competencies and technological independence required to participate meaningfully in contemporary society.

8. AFRICAN POLICY AND INSTITUTIONAL RESPONSES

8.1 International and Regional Policy Frameworks

Inclusive education for learners with disabilities is supported by international human-rights and development frameworks. The United Nations Convention on the Rights of Persons with Disabilities (CRPD) establishes inclusive education and equal participation in employment as important rights (United Nations, 2006). These principles require education systems to remove barriers rather than expecting learners with disabilities to adapt to inaccessible systems.

At the continental level, the African Union (AU) has increasingly linked education, skills development, technology and economic participation. Agenda 2063 identifies education and skills development driven by science, technology and innovation as priorities for Africa's transformation (African Union, 2015). It also explicitly connects social protection and economic participation with the inclusion of persons with disabilities (African Union, 2015).

The Continental Education Strategy for Africa 2026–2035 (CESA 26–35) provides the current continental education framework. It emphasizes inclusive, equitable and relevant education and seeks to strengthen the skills required for Africa's social and economic transformation (African Union, 2025).

8.2 Disability Rights and Inclusive Education

The African Union's Protocol on the Rights of Persons with Disabilities in Africa provides a regional rights framework for addressing discrimination and exclusion (African Union, 2018). Its significance lies in strengthening African responsibility for disability inclusion rather than relying exclusively on international frameworks.

However, policy recognition does not automatically produce inclusive practice. Implementation requires adequate financing, institutional accountability, accessible infrastructure and monitoring mechanisms (UNESCO, 2020; UNICEF, 2022). Consequently, African countries need to translate disability rights into practical educational and digital inclusion measures.

8.3 National Education and Digital Policies

Many African countries have introduced policies addressing inclusive education, disability rights, ICT development and digital skills. Nevertheless, implementation remains uneven because of differences in infrastructure, financing, teacher capacity and institutional coordination (UNESCO, 2020; UNICEF, 2022).

National digital strategies should therefore incorporate disability accessibility from their design stage. Digital education policies that focus only on connectivity and device distribution may reproduce exclusion when platforms, learning materials and assessment systems remain inaccessible (UNESCO IITE, 2025). Accessibility should consequently be treated as a core requirement of digital education rather than an additional intervention.

8.4 Role of International and Development Institutions

International organisations contribute through policy guidance, research, capacity development and technical assistance. UNESCO has emphasized accessible digital technologies, teacher competence and inclusive learning environments as important components of technology-supported inclusion (UNESCO IITE, 2025). WHO and UNICEF similarly identify assistive technology as essential for participation in education and other areas of life (WHO & UNICEF, 2022).



The ILO extends this agenda into employment by emphasizing accessibility, digital skills and inclusive employment pathways for persons with disabilities (ILO, 2021). Recent ILO initiatives also highlight the importance of connecting digital skills development with employment services, entrepreneurship and progression into decent work (ILO, 2026).

8.5 Multi-Stakeholder Collaboration

Effective implementation requires collaboration among governments, schools, technology companies, employers, disability organisations, families and development partners. No single institution can independently address infrastructure, accessibility, teacher training, assistive technology and employment barriers (UNESCO IITE, 2025; ILO, 2021).

Partnerships are particularly important for connecting education with labour-market opportunities. Employers can contribute through internships, accessible recruitment and workplace accommodations, while technology providers can improve the accessibility of digital platforms and tools (ILO, 2021). Such collaboration can strengthen the transition from inclusive education to meaningful economic participation.

9. STRATEGIES FOR STRENGTHENING INCLUSIVE DIGITAL EDUCATION IN AFRICA

9.1 Expand Accessible Digital Infrastructure

Governments should prioritize reliable electricity, affordable broadband, accessible digital learning facilities and appropriate devices in underserved communities. Infrastructure programmes should incorporate accessibility standards from the planning stage rather than modifying systems after deployment (ITU, 2022; UNESCO IITE, 2025).

9.2 Improve Affordability of Assistive Technologies

The cost of assistive technologies remains a significant barrier. Governments and development partners should strengthen procurement, financing, maintenance and distribution systems for assistive devices (WHO & UNICEF, 2022). Subsidies and institutional support can further reduce the financial burden on learners and families.

9.3 Strengthen Teacher Digital Competence

Teacher preparation should combine digital literacy with disability-inclusive pedagogy. Teachers need practical competence in accessible content creation, assistive technologies, differentiated instruction and inclusive digital assessment (UNESCO, 2021; UNESCO IITE, 2025).

9.4 Adopt Universal Design for Learning

Digital learning materials should be designed for diverse learners from the outset. Captioned multimedia, accessible documents, keyboard navigation, alternative text and flexible assessment methods can improve participation across disability groups (UNESCO IITE, 2025; W3C, 2019).

9.5 Integrate Digital Skills into Inclusive Curricula

Digital skills should be embedded across mainstream and special education rather than treated as an optional subject. Curricula should progress from basic digital literacy to productivity tools, online communication, cybersecurity awareness, data literacy, AI literacy and employment-related competencies (ITU, 2022; World Economic Forum, 2025).



9.6 Establish Education-to-Employment Pathways

Inclusive digital education should connect learners with vocational training, internships, career guidance, entrepreneurship and employment services. This is important because digital skills have greater developmental value when they lead to meaningful economic opportunities (ILO, 2021; ILO, 2026).

9.7 Strengthen Monitoring and Disability-Disaggregated Data

Governments should collect reliable data on disability, educational participation, digital access, digital skills and employment outcomes. Disaggregated data can identify inequalities and support evidence-based resource allocation (UNICEF, 2022; UNESCO, 2020).

9.8 Promote Inclusive Innovation

African technology innovation should involve persons with disabilities in design, testing and evaluation. Participatory approaches can help ensure that digital products address real accessibility needs rather than assumptions about disability (UNESCO IITE, 2025).

9.9 Develop Sustainable Partnerships

Long-term progress requires partnerships between public institutions, private technology firms, universities, disability organisations and international development agencies. Such partnerships can combine funding, technical expertise, research capacity and employment opportunities (ILO, 2021; UNESCO IITE, 2025).

10. DISCUSSION

The literature reviewed demonstrates that inclusive education and digital skills development are closely connected. Digital technologies can reduce educational barriers through assistive technologies, flexible learning environments and accessible instructional resources (WHO & UNICEF, 2022; UNESCO IITE, 2025). However, technology alone cannot guarantee inclusion.

The Social Model of Disability explains why inaccessible infrastructure, learning materials and institutional practices can transform technological differences into educational disadvantages (Oliver, 1990; Shakespeare, 2014). This suggests that policy should focus not only on individual learners but also on the environments in which learning occurs.

The Capability Approach further demonstrates that equal access to resources does not necessarily produce equal opportunities. A learner may receive a digital device but remain excluded because of inaccessible software, limited connectivity, lack of assistive technology or inadequate support (Sen, 1999; Nussbaum, 2011). Digital inclusion must therefore be assessed in terms of what learners are actually able to do with available resources.

From the perspective of Human Capital Theory, excluding learners with disabilities from digital education represents a loss of productive human capacity (Becker, 1964; Schultz, 1961). Investment in inclusive digital skills can improve individual capabilities while contributing to a broader pool of skilled workers.

The evidence also shows that digitalisation has a dual character. It can expand access to remote work, online entrepreneurship and digitally mediated employment, but inaccessible platforms and inadequate skills can reinforce exclusion (ILO, 2021). Recent developments in artificial intelligence strengthen this duality: AI-based accessibility tools can support persons with disabilities, while poorly designed automated systems can introduce new forms of discrimination (ILO, 2025).

Therefore, the central challenge for African education systems is not simply to digitise education, but to digitise it inclusively. This requires simultaneous attention to infrastructure, affordability, accessibility, teacher competence, curriculum, assistive technology and employment pathways.



11. CONCLUSION

Inclusive education is increasingly important to Africa's participation in the emerging global digital economy. The expansion of digital technologies has created new possibilities for learning, communication, employment and entrepreneurship, but these opportunities remain unevenly distributed.

For learners with disabilities, exclusion can arise from inaccessible technologies, inadequate infrastructure, unaffordable devices, limited assistive technologies, insufficient teacher preparation and negative social attitudes (UNESCO, 2020; WHO & UNICEF, 2022). Addressing these barriers requires a shift from policies centred primarily on enrolment and physical access toward systems that promote meaningful participation and digital competence.

The paper argues that inclusive digital education should be regarded simultaneously as a rights issue, an educational priority and a human-capital investment. This position is consistent with the direction of Agenda 2063 and the current CESA 2026–2035 framework, which place education, skills, technology and inclusive development at the centre of Africa's transformation agenda (African Union, 2015, 2025).

Ultimately, Africa's digital transformation will be more sustainable when learners with disabilities are treated not as passive beneficiaries of inclusion programmes but as future professionals, entrepreneurs, innovators and contributors to the continent's global workforce.

12. RECOMMENDATIONS

1. Governments should mainstream disability accessibility into national digital education policies and implementation plans.
2. Educational institutions should provide accessible digital infrastructure, assistive technologies and learning materials to support diverse learners.
3. Teacher-training programmes should strengthen digital and disability-inclusive pedagogical competencies.
4. Governments and development partners should reduce the cost of assistive technologies, devices and internet access for disadvantaged learners.
5. Schools and universities should establish stronger pathways from digital skills development to internships, vocational training, entrepreneurship and employment.
6. Technology developers should adopt universal accessibility standards and involve persons with disabilities in product design and testing.
7. Employers should strengthen accessible recruitment, workplace accommodation and digital employment opportunities for persons with disabilities.
8. African governments should improve disability-disaggregated data collection to monitor educational access, digital skills and employment outcomes.
9. Regional and international partnerships should support research, teacher development, assistive technology provision and inclusive digital innovation.
10. Persons with disabilities and their representative organisations should be directly involved in policy formulation and programme evaluation, ensuring that inclusion strategies respond to actual needs.



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