THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

DRAFT NATIONAL DIGITAL EDUCATION STRATEGY

2024/25 – 2029/30

This document is submitted for review and collection of stakeholders' inputs as part of the process to improve the National Digital Education Strategy

June, 2024

EXECUTIVE SUMMARY

The Government of the United Republic of Tanzania has set out its Vision 2025 with the last part expressed in a five-year development plan for 2020-2025 as well as the overarching Information and Communication Technology (ICT) Policy 2024 and the Education Policy and Training 2014 version 2023 all emphasising the importance of using ICT in improving education in Tanzania. Tanzania's National ICT in Education Strategy is a comprehensive plan that aims to integrate ICT into all levels of education to improve the quality of teaching and learning in the country. It outlines how ICT should be adopted and utilised to improve education and training across all levels. This strategy undertaking is prepared by the Ministry of Education, Science and Technology (MoEST) in collaboration with stakeholders from the public and private sectors as well as the civil society, development partners and local communities.

The Strategy is based on the vision of "*providing improved learning outcomes through a digitally enabled education system*". The strategic mission of this plan is: "Enhance access to quality teaching, learning and administration at all levels of education through the use of ICT, thereby contributing significantly towards the achievement of intended learning outcomes and national development. The overall objective of the strategy is to use ICT to improve teaching and learning in all levels of education in Tanzania.

Furthermore, the strategy analyses seven core pillars: (1) Infrastructure and Access; (2) ICT Integration in the Curriculum; (3) Digital Content Development; (4) Digital Assessment; (5) Human Resource and Capacity Building; (6) Innovation, Research, and Entrepreneurship; and (7) Emerging Technologies. To ensure the successful implementation of the digital education strategy across all levels, the core pillars are enabled by six support pillars: (1) Technical Support and Maintenance (2) Partnership and Resource Mobilization; (3) Change Management; (4) Data Management and Analytics; (5) Security, Privacy, Safety and Ethics; and (6) Governance, Management and Regulatory Framework. The core pillars and supporting pillars are unpacked with strategic objectives and strategies. They are implemented using cross-cutting aspects through: (1) Monitoring, Evaluation and Learning; and (2) Sustainability plan to facilitate the annual targets.

This strategy is designed as a rolling, five-year plan, with the expectation that the Strategy's Governance and Management Committee review the plan annually and where necessary re-define targets for subsequent years, based on progress made at the time of the review to continue improving digital education in Tanzania.

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ABBREVIATIONS

AI	Artificial Intelligence
BEMIS	Basic Education Management Information System
BOOST	Boost Primary Student Learning Project
CBM	Conveyor Belt Marking
eGA	e-Government Authority
EMIS	Education Management Information System
ESDP	Education Sector Development Plan
ETP	Education and Training Policy
FDC	Folk Development College
IAE	Institute of Adult Education
ICT	Information and Communication Technology
ICT CFT	Information and Communication Technology Competency Framework for Teachers
HEET	Higher Education Economic Transformation
LAN	Local Area Network
LGA	Local Government Authority
LMS	Learning Management System
MEL	Monitoring, Evaluation and Learning
MDAs	Ministries, Departments and Agencies
MoCIT	Ministry of Information, Communications and Information Technology
MoEST	Ministry of Education, Science and Technology
MoWTC	Ministry of Works, Transport and Communications
NACTE	National Council for Technical Education
NF-TCPD	National Framework for Teacher Continuous Professional Development
ODeL	Open Distance e-Learning
OER	Open Educational Resources
PO-PSM	President's Office, Public Service Management and Good Governance
PO-RALG	President's Office, Regional Administration and Local Government
PReM	Primary Record Manager for Primary
PReMS	Primary Record Manager for Secondary

QA	Quality Assurance
SEQUIP	Secondary Education Quality Improvement Project Continuous Professional Development
SIS	School Information System
TCPD	Teacher Continuous Professional Development
TIE	Tanzania Institute of Education
UNESCO	United Nations Educational, Scientific and Cultural Organization

GLOSSARY

Performance: Refers to the several key indicators that can be computed and utilized for evaluating the educational system's performance at various levels, using the data available in the education statistics data bank. These indicators constitute an important component of a management information system.

Educational Institutions: Refer to places where people of different ages gain an education, including preschools, primary schools, ordinary and higher secondary schools, colleges, and universities.

Educator: Refers to a person who provides instruction or education. Could be a teacher, instructor, tutor, Lecturer, or professor.

Learner: Refers to a pupil, student or an individual who is engaged in the process of learning new skills and knowledge.

Emerging Technology: Refers to technologies that are currently developing, or that are expected to be available within the next five to ten years, and is usually reserved for technologies that are creating, or are expected to create, significant social or economic effects.

E-waste: Refers to electronic products that are unwanted, not working, and nearing or at the end of their “useful life.”

Digital Contents: Refers to any content presented in digital form, including audio, video, and images, as well as articles, dictionaries, and educational courses.

ICT Infrastructure: Refers to equipment and software necessary to implement and operate systems and networks for communication services as well as support applications, digital content, and e-commerce.

EMIS: This is a system for the collection, integration, processing, maintenance and dissemination of data and information to support decision-making, policy analysis and formulation, planning, monitoring and management at all levels of an education system.

ICT Integration: Refers to the extent to which information and communication technologies have been adopted into the learning environment and the degree of impact on the physical or virtual classroom pedagogies.

Learning Platform: Refers to information systems that schools, colleges, institutions, and universities, can use for teaching and learning.

Pillars: Refers to the main areas of focus of the strategy that could be core or support

FOREWORD

Tanzania recognizes the importance of Information and Communication Technology (ICT) for improved access, inclusiveness, equity, quality and relevance of education. In our interconnected world, knowledge and information are becoming essential for the development of a society, as is the ability to communicate. A key piece of this is for citizens to harness the strengths, and mitigate the pitfalls of ICT tools. We have to prepare our children and society as a whole to benefit from and contribute to our country's social economic development in the information age. We must therefore prepare them to take advantage of the full range of ICT, from radio, TVs, smartphones, tablets, computers, and smart classrooms to the Internet and AI, to build the foundation for a well-educated and learning knowledge society.

The Government has developed this Digital Education Strategy for Tanzanian Schools, Colleges and Universities to enable the integration of ICT in the respective levels of education in Tanzania. It is guided by the overall objectives of national policies, including the Tanzania National ICT Policy of 2024 and the Education and Training Policy 2014 version 2023. Also, its benefits can only be reaped through the concrete strategies and collaboration of all relevant stakeholders. This is why we have consulted a wide range of stakeholders in the development of this strategy, from the public and private sectors to civil society and academia.

This strategy should act as a guide for all levels of education while involving our communities, investors, implementers and all key partners and beneficiaries in the sector. It gives a snapshot of what is required for the integration of ICT in education to have an impact on reducing the digital divide and improving curriculum delivery for better learning outcome achievement. We hope that this Strategy provides a framework for future partnerships with all key stakeholders to harness the power of ICT integration in education for the realisation of Tanzania's educational objectives.

Permanent Secretary
Ministry of Education, Science and Technology

CHAPTER ONE

INTRODUCTION

1.1. Background

Competencies encompassing knowledge, skills and attitudes are increasingly vital in today's global economy, characterised by globalisation and rapid technological advancements. Recognizing this reality, the Government of Tanzania has prioritised education and leveraged Information and Communication Technology (ICT) to enhance global competitiveness and sustainable development. Through initiatives like the Tanzania Development Vision 2020 - 2025, the country aspired to cultivate a well-educated society and transition into an industrialised middle-income economy, thus elevating the quality of life for its citizens. Aligning with this vision, the National Five-Year Development Plan underscores the imperative of enhancing education and training systems, including curriculum reforms to meet labour market demands and integrating research and development with economic activities.

In pursuit of inclusive and equitable education, both nationally and globally, frameworks like the Sustainable Development Goals (SDGs) and UNESCO Education Strategy provide guiding principles. SDG Goal No. 4 underscores the importance of quality education and lifelong learning opportunities for all, while UNESCO's strategic objective emphasises developing education systems that promote inclusivity and lifelong learning. Central to achieving these objectives is the significant expansion of infrastructure and access to ICT, particularly in developing countries. Within this context, enhancing educational administration, teaching methodologies, and overall quality through ICT emerges as a thematic priority.

ICT assumes a pivotal role in fostering 21st-century skills and facilitating the implementation of a Competency Based Curriculum (CBC). This integration is not only emphasised in educational policies but also reflected in education and training frameworks. The ETP of 2014 version 2023 and ICT Policy 2024 underscores the seamless integration of ICT in education and training as a means to enhance learning outcomes across all levels. Thus, harnessing ICT potential becomes imperative not only for individual skill development but also for the broader educational landscape's transformation, aligning Tanzania's educational aspirations with global trends.

ICT integration in Tanzania's education sector has evolved gradually, influenced by global digital trends and local socio-economic factors. The COVID-19 Pandemic has accelerated this evolution, particularly in higher education, where e-learning platforms and digital assessment systems have become prevalent. To support this transition, investments in digital infrastructure, teacher training, and content development have increased significantly. Overall, Tanzania's journey with ICT in education has shifted from basic infrastructure development to a more sophisticated approach focused on integration, content creation and pedagogical innovation.

In recent years, there has been a concerted effort towards inclusive ICT policies aimed at ensuring equal access, particularly in bridging the urban-rural gap and addressing gender disparities. Initiatives such as the Rural Energy Agency (REA) program have extended power to schools in rural areas, contributing to more equitable access. For instance, all primary and secondary school teachers have been provided with tablets to facilitate teaching and learning in primary and secondary schools and Teachers Colleges, as reported by the Basic Education Statistics and the ministry press release. This also applies to the Higher Education Economic Transformation (HEET) project of higher education institutions that among others are enhancing ICT integration in teaching and learning by investing in more ICT infrastructure, systems, facilities and capacity building.

Also, in recent years we have witnessed Public-private partnerships, involving international organisations, local telecom companies, and technology firms, playing a pivotal role in advancing ICT integration in education. These collaborations have mainly supported infrastructure development digital content creation and capacity building, contributing to the scaling of ICT initiatives. Building on these partnerships, the Government is focusing on strengthening regulatory frameworks and policies to further embed ICT in educational practices. Additionally, efforts are directed towards enhancing educators' training in digital pedagogies and promoting innovation in digital content creation at all levels of education of which its success requires a concerted and country-wide digital education strategy.

1.2. The Situational Analysis

The integration of ICT in education is pivotal, promising to transform teaching and learning at all levels of education. This situational analysis assesses the current landscape, focusing on trends, challenges, and opportunities. It aims to offer a comprehensive overview of ICT use in education, including the effectiveness of existing initiatives and factors influencing adoption. Through this analysis, we aim to understand the evolving dynamics of ICT integration and develop strategies to enhance its impact on educational outcomes across all levels of education.

1.2.1. Policy Context Analysis and National Documents

1.2.1.1 Tanzania Development Vision 2025

The Tanzania Development Vision 2025, pinpoints five main attributes that will enable the country to achieve a middle-income country. One of the strategies to realise this long-term development agenda is to establish a well-educated and learning society. The TDV 2025 emphasises the promotion of science and technology education, to enhance productivity through continuous learning and publicity campaigns. Furthermore, the vision emphasises the promotion of ICT to build appropriate skills

and capabilities; and adequate investment to improve the quality of science-based education and to create a knowledgeable society. In general, the Tanzania Development Vision 2025 explicitly notes the new opportunities that ICT is opening up and can be harnessed to meet the goals as well as all five attributes stipulated in the vision.

1.2.1.2 Education and Training Policy 2014 Version 2023

The **Education and Training Policy (**ETP) considers having strategies for strengthening the development of STI and ICT in teaching and learning. Moreover, ETP insists on the curricula for science and technology to motivate students to realise the importance of science and technology in society. It also provides a link to science in schooling with careers that directly involve science and technology. Moreover, it provides improving sustainable technological development and other possible societal applications of science that require the support of scientifically and technologically informed citizens. The policy further emphasises the need to develop simulation techniques using ICT and enhance the education system to develop capacities for online and distance education. The policy also emphasises introducing ICT as a basic subject in primary education and maintaining it throughout basic and tertiary education as well as improving equal participation of girls and boys in studying mathematics, science, and technology.

1.2.1.3 The National ICT Policy 2024

The National ICT Policy give evidence to support two areas: The first area on "ICT Human Capital Development", under the "Strategic ICT Leadership and Human Capital Development", the policy statements (3.1.2.2) states that the Government shall: *Ensure effective use of ICT in teaching and learning throughout the formal and informal education system.* The second area is on "Infrastructure Development" under the Broadband Access and Infrastructure Development", the policy statement (3.2.2.2) states that the government shall: - *Ensure safe and reliable ICT infrastructure development countrywide;* and *Ensure e-ready infrastructure developed countrywide which supports provision of ICT services.* These statements show the high level of commitment of the Government towards ensuring the infrastructure for the use of ICT in teaching and learning. The National ICT Policy Objectives and Statements that are the driving force in developing this strategy are (a) promote and develop ICT human capital, digital skills and talents among Tanzanians to become active players in the digital transformation agenda, (b) strengthening the institutional, legal and regulatory environment for governance of the ICT sector covering strengthening of the legal framework for the governance of the ICT Sector; (c) enhancing frameworks for Strategic Governance and Management of ICT at the national level.

The Government is also committed in the National ICT Policy 2024 to provide a reliable, affordable, secure, interoperable, and sustainable hard digital infrastructure countrywide for universal and meaningful connectivity covering creating an enabling environment for the public and private sector to sufficiently invest in hard digital infrastructure. The Government is also committed through the National ICT Policy 2024 to strengthen integration in planning and implementation of hard digital infrastructure projects and promote sharing of infrastructures in delivering digital services, continue expanding and strengthening National ICT Broadband Backbone Infrastructure and its services to deliver broadband services efficiently, ensuring financing mechanisms for affordability and accessibility of computing devices and digital services to marginalized groups in rural and underserved urban areas, promoting the development of people-centric and integrated soft digital infrastructure and services; and enhance private sector participation in developing ICT solutions.

Furthermore the Government is committed to promote ICT research and development by ensuring sustainable funding mechanisms that facilitate ICT research and development initiatives, ensuring widespread access to cutting-edge technologies for ICT research and development, promoting collaboration among educational institutions, researchers, industries, and government agencies, and capacitating researchers with necessary ICT research and development skills.

Moreover, the Government is committed through the National ICT Policy 2024 to establish a responsive and adaptive environment for the development and utilization of new and emerging technologies including Artificial Intelligence (AI) and related technologies. Some of the policy objectives include: (a) developing frameworks for the adoption and governance of new and emerging technologies, (b) investing in developing new and emerging technologies in ICT solutions and services, (c) building capacity for the development and use of new and emerging technologies including AI, and creating an enabling and holistic strategic framework for AI that encourages innovation, (d) development of home-grown ICT innovations, products and services covering quality improvement of local ICT innovations, products, and services; and promotes and supports the development of online content with local context. Finally, Government is committed through the National ICT Policy 2024 to (a) promote PPP investments in developing the ICT sector, (b) facilitate capacity in public institutions to engage in PPP investment projects in the ICT sector; and (c) prioritise and publicise critical ICT investment areas for investment using PPP.

1.2.1.4 Five-Year Development Plan III 2021/22 – 2025/26

The third Five Year Development Plan (FYDP III) 2020/21 – 2025/26 includes a strategic intervention to strengthen the quality of education provision by increasing the use of ICT towards improving quality of life as aligned with Vision 2025. This requires

the provision of infrastructure and tools to proceed at an appropriate pace in parallel to the delivery of capacity-building activities that will ensure that education stakeholders are well-equipped to effectively leverage the investments made in this area.

1.2.1.5 Education Sector Development Programme (2021/22 – 2025/26)

The Education Sector Development Programme (ESDP) aimed at transforming the sector into an efficient, effective, outcome-based system and ensuring equitable access to education and training for all, including the most disadvantaged in line with Sustainable Development Goal Number 10 (SDG 10). The priorities included equitable participation and completion of fee-free basic education for all, with particular attention to marginalized groups, children with disabilities and out-of-school children and completion of twelve years of education through universal access up to lower secondary education

1.2.1.6 Ruling Party Manifesto 2020-2025

The ruling party manifesto recognizes the benefit of the great development of technology in the world in the economic and educational reforms. It emphasises strengthening ICT integration in teaching and learning in basic education by providing training to all teacher trainees in Government teacher colleges. It also emphasizes establishing centres (incubators) and special technology clusters as well as developing and supporting graduates of such centres to start companies. Additionally, it insists on strengthening the centre for research, innovation and ICT development, including building capacity and increasing the use of new digital technologies and artificial intelligence. Moreover, the manifesto emphasizes strengthening collaboration with private sectors to build expertise in digital technology, manufacturing and the use of robots in all fields of ICT and the field of "Artificial Intelligence".

1.2.1.7 Sustainable Development Goals (SDGs) - 2030

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. SDG 4 Clearly states that, by 2030, there must be a substantial increase in the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship, This will be indicated by the proportion of youth and adults with information and communications technology (ICT) skills, by type of skill.

1.2.1.8 African Union Agenda 2063 - The Africa We Want

Africa's Agenda, 2063 Aspiration 1, Goal 2 emphasizes developing well-educated citizens and skills revolutions underpinned by science, technology and innovation. The Agenda also emphasises the need for Africa to revise and adapt its development

vision in the face of changing global contexts such as the ICT revolution. This policy provides strategies to enhance the capacity of policymakers and education managers on the integration of ICT in education, training and management.

1.2.1.9 UNESCO Guidelines for ICT in Education Policies and Master Plans – 2022

UNESCO recognizes that ICT is an important tool to provide new and more flexible ways of accessing quality teaching, learning contents and other education resources/opportunities. Some of the areas where ICT can play a key role in education and training sector to facilitate and accelerate the achievements of SDG - 4 as mentioned in the *UNESCO Qingdao Declaration 2015* include: (a) expanding access to quality educational opportunities and advancing inclusion, (b) enhancing the relevance and quality of learning, (c) building ICT –enabled lifelong learning pathways, (d) strengthening education and learning management systems and monitoring learning processes, and support the acquisition of digital literacy knowledge, skills and competences, which are foundational to success in education and training contexts. UNESCO provides also various ICT –based policies and guidelines in education such as the *ICT in Education Policy Toolkit -2018*, *ICT Competency Framework for Teachers (version 3)* – 2018 to guide the development of thematic policies and masterplans on building teachers' capacities in making pedagogical use of ICT. On Open Education Resources (OER) as a cross-cutting policy area, the *UNESCO Recommendations on Open Education Resources – 2019* document outlines key action plans to promote the use of OER in education and training sectors. In addition, the *UNESCO Guidelines on the Development of OER Policies 2019* provides guidance to policy -makers on the planning of OER policies. Moreover, the UNESCO *AI and education: Guidance for policy-makers* (UNESCO, 2019; UNESCO, 2020) provide a comprehensive recommendations for planning policies on AI and education.

1.2.2ICT Integration in the Education Sector

1.2.2.1 Basic Education

(a) Pre and Primary Education

The Tanzanian government emphasises integrating ICT into education to improve skills and learning outcomes for all students, fostering inclusivity for those with diverse challenges. Efforts made to date by the Government include building science laboratories with ICT facilities to enhance STEM teaching and learning in primary schools. In 2020, 1,696 schools, mainly public and national, received science and ICT equipment. Moreover, the government provided ICT training to primary education trainee teachers to enhance teaching methodologies.

In 2023, there were 17,700 computer desktops and 10,384 laptops in primary schools. Of these, 12,205 (61.9%) primary schools were connected to the national grid.

Additionally, in 2023, 148 pre-primary and primary school teachers received training on incorporating ICT into their teaching practices.

The Impact of a Tech-Supported, School-Based Teacher Continuous Professional Development (TCPD) Model on Learning Outcomes in Tanzania and MEWAKA (Mafunzo Endelevu kwa Walimu Kazini) projects have been providing technology-supported, decentralized, and school-based TCPD to improve teaching and learning in rural primary schools in Tanzania. So far, 2,500 teachers have been trained under the MEWAKA project, enhancing their ability to utilize digital technology in education. Additionally, 3,000 teachers are registered and actively use the TCPD system.

The TCPD system leverages the Learning Management System (LMS) to facilitate continuous professional development for teachers in remote areas with limited internet connectivity. This system allows teachers to access training materials, participate in online discussions, and receive feedback from mentors, significantly enhancing their professional skills and teaching practices. The BOOST Primary Student Learning Project aims to improve equitable access to quality learning in pre-primary and primary education by providing capacity building in curriculum, learning assessment, and teacher management, as well as leveraging ICT to support teachers and classroom teaching. As part of this initiative, 200 pre-primary and primary teachers and 200 school administrators received training on using ICT in teaching and learning. The Tanzanian government has also launched other initiatives to integrate digital technology into primary education, including the deployment of interactive digital content and e-learning platforms in classrooms, and the establishment of ICT resource centers to support ongoing teacher training and development in digital literacy. These efforts reflect a comprehensive strategy to enhance the use of digital technology in primary schools across the country.

(b) Secondary Education

At the secondary education level, both government and non-government secondary schools were equipped with 31,445 computer desktops and 10,932 laptops. However, only 4,276 (72.2%) of these secondary schools were connected to the national grid.

Various specialized training and capacity-building programs have been implemented across different levels of basic education. In 2021, UCSAF delivered ICT training to 650 public secondary school teachers, focusing on integrating ICT into teaching and learning, as well as basic troubleshooting skills. Through the Tanzania Secondary Education Quality Improvement Project (SEQUIP) project, the Government has trained 15,282 secondary school teachers (26.08% women, 73.92% men) out of a target of 20,000. SEQUIP emphasizes digitally-enabled effective teaching and learning; and the adoption of digitally-enabled teaching of STEM subjects. Furthermore, the Government provided ICT training to 4,500 teachers from 1,300 secondary schools in 2023, aiming to enhance their competencies in utilising ICT for teaching and learning purposes. The SEQUIP has facilitated training on using ICT in teaching and learning to 500 students in secondary school.

The Government has undertaken several initiatives to create e-content, particularly tutorial videos, for teaching practical aspects of science subjects such as Biology, Chemistry, and Physics. These e-contents incorporate multimedia elements like video, audio, or animation to facilitate comprehension of complex topics by learners. In the fiscal year 2023/24, the Government focused on developing digital content for primary education, specifically producing 58 lessons. These lessons aim to enhance the teaching and learning of fundamental skills like reading, writing, and arithmetic (3Rs).

The government developed and uploaded digital textbooks for Forms 1 to 6 covering various subjects to an online library accessible for free. Additionally, 53 books and 17 digital contents received certification for use in basic education. In 2022/23, the government enhanced the digital library of the Tanzania Institute of Education (TIE), expanding its capacity to host diverse digital content formats and adding new books. This library, accessible at https://ol.tie.go.tz, provides free access to books, facilitating easier accessibility for users.

1.2.2.2 Technical and Vocational Education Training

The Government has been integrating ICT in technical and vocational training colleges to enhance teaching and learning. TVET colleges have been equipped with computer laboratories. Furthermore, in 2021, the Government connected 27 out of 32 VETA colleges and 35 Teacher Colleges in the National ICT Broadband Backbone (NICTBB) to facilitate teaching and learning through ICT. In 2022/23, the Government distributed 700 computers in TVET colleges to strengthen ICT integration in teaching and learning. In 2023/24, the Government developed an ICT in education strategy for basic education, Folk Development Colleges (FDC) and Teacher Colleges - ICT 2023. The Learning Management System (LMS) for in-services Teachers Continuous Professional Development (TCPD) has been developed with digital modules, manuals, and various books to enhance teaching and learning through the Internet. The Teachers Education Support Project (TESP) programme was initiated by the Government to improve teachers' training and build digital infrastructure in teaching colleges. TESP has provided training to more than 1,300 trainers and equipped all 35 public colleges with IT equipment connecting them to the national internet backbone. Capacity building was also provided to 530 tutors from 17 Teacher Colleges on the use of ICT in teaching and learning.

1.2.2.3 Higher Education

Higher Learning Institutions (HLIs) in Tanzania have been undergoing significant transformations through various government initiatives aimed at enhancing digital education and administrative efficiency. Notably, the Higher Education for Economic Transformation (HEET) project is spearheading these efforts, focusing on modernizing academic program delivery and administrative processes to improve learning outcomes and labor market alignment of priority programs.

In 2022, the Tanzanian government, through the Tanzania Commission for Universities (TCU), issued the "Guidelines for Online and Blended Delivery Modes of Courses for University Institutions." These guidelines aimed to successfully guide the development and use of digital content in higher education. This initiative led to substantial growth in ICT programs, with 161 ICT courses offered by accredited institutions and ICT graduates making up 5% of total graduates, a fourfold increase compared to 2016. The HEET project has been pivotal in this transformation, significantly investing in state-of-the-art ICT infrastructure and upgrading learning resources and equipment across various HLIs.

One of the critical aspects of the HEET project is the adoption and enhancement of Learning Management Systems (LMS) such as MOODLE. Most HLIs in Tanzania have adopted these open-source platforms to support blended learning, distance education, and flipped classrooms. Among the institutions surveyed, 13 have upgraded their LMS using HEET funds, while 4 are developing new LMS platforms. This focus on LMS is crucial for expanding access to education and improving learning outcomes.

The HEET project also emphasizes the modernization of administrative processes through digital technology. Fourteen institutions have implemented or are planning to implement Student Information Management Systems (SIMS) to manage student data and academic records efficiently. This modernization is vital for streamlining administrative services, improving data management, and supporting decision-making within institutions.

The HEET project has made substantial progress in developing ICT infrastructure across HLIs in Tanzania. The Tanzania Education and Research Network (TERNET) emerges as the primary provider of internet connectivity for seven institutions under the HEET project, followed by the Tanzania Telecommunications Corporation Limited (TTCL) for five institutions, and Vodacom for three institutions. This distribution ensures diverse and reliable internet service provision essential for digital learning and administrative functions.

Bandwidth sizes across these institutions vary significantly. Four institutions have bandwidth sizes ranging from 101 to 500 Mbps, suitable for a variety of online activities. However, three institutions have bandwidth sizes of less than 50 Mbps, which may be inadequate for demanding applications such as high-definition video streaming or large-scale online assessments. Additionally, three institutions have bandwidth between 501 to 1000 Mbps, and two institutions have more than 1000 Mbps, indicating a substantial investment in high-speed internet to support advanced digital learning environments. With the implementation of the HEET project, there is hope for increased bandwidth and improved connectivity across all institutions,

ensuring that even those with currently inadequate bandwidth will be able to support robust digital learning and online activities.

WiFi coverage is another critical component of ICT infrastructure under the HEET project. WiFi connectivity is most commonly available in libraries (18 institutions) and administrative buildings (17 institutions), ensuring efficient access to online resources for students and staff. Lecture halls and classrooms also have significant coverage, reported by 14 and 13 institutions, respectively. This extensive WiFi availability facilitates the integration of digital tools into teaching and learning, enhancing interactive lectures, access to online course materials, and the use of LMS platforms.

Additionally, the project supports the implementation of Massive Open Online Courses (MOOCs) platforms, with two institutions planning to integrate MOOC platforms to complement existing LMS implementations and offer multimedia-enhanced content. Furthermore, 18 out of 19 institutions receiving HEET funding are planning to upgrade their digital libraries, indicating a strong commitment to enhancing digital infrastructure. These upgrades will ensure that students and faculty have access to the latest educational resources, further supporting the digitization efforts.

1.2.3 ICT Facilities and Infrastructure

1.2.3.1 National ICT Broadband Backbone

Tanzania has completed the National ICT Infrastructure Backbone (NICTBB) as an important strategic vehicle to enhance the use of ICT in teaching and learning. By mid-2023, Tanzania was connected to four active submarine cables which land in Dar es Salaam: SEACOM, Eastern African Submarine Cable System (EASSy), Seychelles East Africa System (SEAS) and 2Africa Cable. By mid2023, the country had six (6) Internet Exchange Points (IXPs) operated by Tanzania Internet Service Providers Association (TISPA) located in Dar-es-Salaam, Dodoma, Mwanza, Arusha, Mbeya and Zanzibar to ensure all local traffic remain locally routed.

The National ICT Infrastructure Backbone provides reliable, efficient, and cost-effective accessibility and Internet connectivity to enhance teaching and learning across all education institutions. In 2022/23 the Government renovated ICT laboratories and connected 15 Government Teacher Colleges to NICTBB. The Government has also strengthened the use of ICT in higher education institutions by implementing the following: Procured backup software, data storage in NICTBB and strengthened the capacity of the Internet from 50 Mbps to 60 Mbps and improved the Internet backup link to reach 1Gbps at various HLIs.

1.2.3.2 National Internet Data Center

The National Internet Data Center (NIDC) is a state-of-art tier-3 data centre connected with an upgraded Multiprotocol Label Switching (MPLS) National backbone with the

support of Seacom and EASSY submarine cables to offer multiple redundancy schemes and ensure the availability and reliability of Internet services. The NIDC provides the ideal data storage and backup as well as computing and connectivity to the government and private sector. The presence of NDC is an opportunity for the education sector to store digital teaching and learning resources which can be accessed anytime anywhere. Plans are underway to connect all educational institutions to the NIDC.

1.2.4 SWOT Analysis

The integration of ICT in education and training is essential for preparing learners for the demands of the modern world. In Tanzania, the Strengths, Weakness, Opportunities and Threats/Challenges (SWOT) analysis indicates that there are several internal factors (strengths and weaknesses) that can be considered by the Government and other development partners in the effective ICT integration in education and training. However, there are also external factors (opportunities and challenges) at various levels that can enable or hinder the successful implementation of ICT in education and training.

These factors hamper informed decision-making and policy formulation, impacting the overall effectiveness of educational interventions. Therefore, this strategy is developed to overcome the aforementioned internal and external factors of integrating ICT in education and training in Tanzania. In summary, Table 1 provides internal factors (strengths and weakness) and Table 2 external factors (opportunities and challenges) in ICT integration in education and training contexts. These factors are also in line with the African Union Digital Education Strategy and Implementation Plan 2023 – 2028, Education Sector Development Programme (2021/22 – 2025/26), Tanzania Development Vision 2025, Education and Training Policy 2014 Version 2023, National ICT Policy 2024, Five Year Development Plan III 2021/22 – 2025/26, Ruling Party Manifesto 2020-2025, Sustainable Development Goals (SDGs) – 2030, African Union Agenda 2063 - The Africa We Want, National Digital Economy Framework 2023-2033, UNESCO and the Education Sector Development Programme (2021/22 – 2025/26).

Table 1: Strengths and Weakness of ICT Integration in Education and Training

Core Focus Area	Strengths	Weakness
Infrastructure and Access	• Commitment of the Government Leadership to facilitate the development of ICT infrastructure in education and training • Expansion of the National ICT Broadband Backbone (NICTBB) • Establishment of a National Internet Data Centre (NIDC) • Existence of computing infrastructures in some schools and TVETS • Existence of computing infrastructure in all universities • Existence of eGA standards and guidelines on ICT infrastructure and systems	• Inadequate implementation of ICT infrastructures at all levels
ICT Integration in the Curriculum	• Availability of institutions for developing and implementing the curricula	• Low adoption of ICT integration in the curricula
Human Resource and Capacity Building	• Existence of local education and training institutions at all levels to produce human resources with the required digital literacy skills and knowledge • Strong partnerships with development agencies/partners to implement digital literacy and skills development projects/initiatives • Existence of National ICT Policy 2024 that emphasizes the digital literacy and skills development	• Limited digital literacy and Skills development programmes

Core Focus Area	Strengths	Weakness
Platforms and Digital Content Development	• Existence of institutions producing experts for digital content development • Existence of Tanzania Institute of Education (TIE) that develops digital contents for basic education	• Low adoption of the use of digital contents for

		teaching and learning
Data Management and Analytics	• Availability of digital information systems for teaching and learning at all levels	• Poor quality of data in the digital education management systems • Limited data use capacity among educators and learners
Emerging Technologies	• Existence of Tanzania digital economy strategic framework 2024-2034 • Existence of donor-funded projects that support the adoption of emerging technologies • Strong political will on the application of emerging technologies for socio-economic development	• Low adoption of emerging technologies in education and training
Research, Innovation and Effective PPP	• Strong support from the Government and donors in research and innovation • Existence of institutions to conduct research and innovations in the country • Existence of national governance and policy frameworks to support research, innovation and development • Existence of Tanzania Development Vision 2025 that recognises the importance of research and innovation in ICT	• Poor ICT infrastructure to support research and innovation
Gender Inclusiveness	• Existence of National Strategy for Gender Development	• Inadequate resources to implement gender inclusiveness in education

Table 2: Key challenges/Issues and opportunities of implementing digital education

Core Focus Area	Challenges/Issues	Opportunities
Infrastructure and Access	• Limited bandwidth and network coverage for schools/rural areas • Higher cost of connectivity and devices • A limited number of schools connected to the NICTBB • Poor digital infrastructure leads to limited access to technology, especially in rural or underserved areas • Limited access to energy sources especially for schools in rural areas • Disintegrated education management information systems and infrastructure in institutions • Lack of Internet connectivity, and computer labs in schools	• Telecom service coverage countrywide • Mobile penetration in the country • Rural electrification programme • Increasing access to devices • The current expansion of the NICTBB infrastructure
ICT Integration in the Curriculum	• Lack of ICT competency-based curriculum in schools	• Development of ICT integrated curriculum
Human Resource and Capacity Building	• Limited adoption of teachers' digital competency frameworks • Limited resources to provide digital literacy and skills for educator • Inadequate training for educators to advance and upgrade their digital knowledge and skills • Lack of ICT competency framework for delivering digital literacy and skills at schools, TVETs, and college • Limited opportunities for coding at schools • A limited number of educators with hands-on experience to teach digital literacy and skills and mentor students	• Digital literacy and Skills development programmes • Inclusion of ICT courses in the revised primary school curricula • The current mobile device penetration in households

Core Focus Area	Challenges/Issues	Opportunities
Platforms and Digital Content Development	• Limited application of emerging technologies (AI, video gaming, VR, AR etc) to create, share and manage digital content • Lack of multimedia resource centers to develop digital content by institutions • Limited alignment of digital content to existing curricula • Limited availability of digital open educational resources for learners • Limited pedagogical skills in developing digital content	• The current experience in digital content development by TIE • Establishment of multimedia labs at the university level through the HEET project
Data Management and Analytics	• Lack of Standards and Guidelines in Data Management Practices • Lack of data governance framework for the education sector • Availability of standards and policies to collect, store, share, and use data to support decision-making	• The educational sector digital transformation programmes at various levels
Emerging Technologies	• Low adoption of emerging technologies in digital education • Inadequate adaptive environment for the development and utilization of new and emerging technologies	• Emphasis on adopting and developing emerging technologies
Research, Innovation and Effective PPP	• Limited centres of excellence for digital technology integration in education • Lack of a national centre for research and innovation • Inadequate local innovation in the digitalization of education • Limited research in technology-based education regarding aspects of quality and inclusion • Inadequate coordination and experience sharing among partners in digital education • Limited platforms for the exchange of research and innovation efforts in digital education	• The ongoing digital education initiatives in the country • Availability of R & I support from educational stakeholders

Gender Inclusiveness	• Limited development of equitable and inclusive digital pedagogies • Inadequate technologies and platforms for promoting inclusiveness in education	• Promising efforts of inclusive digital literacy and skills at all levels

1.3 The Rationale and Justification

The Government, in collaboration with other key stakeholders, have joined efforts to foster and sustain an educational environment that promotes innovation and improved teaching and learning environment with the use of ICT throughout the country at all levels. Several challenges have affected the expansion of the deployment and use of ICT in education.

Tanzania has embarked on a new ICT Policy 2024 and revised Education and Training Policy 2014, Version 2023. The two policy documents have come up with new directions towards integrating ICT in the education and training sector. These policy documents necessitate the need for a new strategy for enhancing the effective implementation of ICT and the overall digital transformation of education across all levels.

Several ICT in education projects and initiatives have been implemented in different educational settings. The various initiatives by MoEST on ICT in education and training have largely remained uncoordinated, and segmented and often, resulted in duplicated efforts by implementing agencies. Additionally, the projects and initiatives did not cover the whole country, hence widening regional disparities and adversely affecting equity and quality. On the other hand, improper harmonisation of the projects and initiatives caused by a lack of clear guidelines has led to the random adoption of different systems and standards, unnecessary duplication of effort and waste of scarce national resources.

In 2023, the Government developed an *ICT in Education Strategy for Tanzanian Schools, Folk Development and Teacher Colleges* to tackle this challenge, however, the strategy did not cover other tertiary colleges and Universities as well as the recently developed National ICT Policy 2024.

This strategy does that and will therefore play a key role in setting the national digital education priorities, harmonising and increasing the coherence of digital education initiatives in the Tanzanian education system. It will ensure a coordinated approach in streamlining ICT integration in the education sector and ultimately improve learning outcomes for global competitiveness.

1.4 Vision and Mission

i) Vision

To improve learning outcomes through ICT.

ii) Mission

Enhance access to quality teaching, learning and administration in educational institutions through the use of ICT, thereby enabling every learner to be skilled in ICT and contribute significantly towards national development.

1.5 Objectives, Guiding Principles and Scope of National Digital Education Strategy

The main aim of this strategy is to guide the process of harnessing, deployment, and exploitation of digital technology within the education sector to improve learning outcomes.

1.5.2 Objectives

Specifically, the strategy targets to achieve the following objectives:

a) To ensure affordable and secured infrastructure to facilitate digital technology integration in Education and Training.

b) To promote an inclusive ICT integrated curriculum design and implementation.

c) To promote development and usage of digital contents to improve learning outcomes.

d) To enhance learning outcomes by leveraging technology for effective assessment and feedback.

e) To enhance the capacity of personnel to facilitate the integration of ICT in education and training at all levels.

f) To promote and institutionalize research, innovation and entrepreneurship in the use of ICT in teaching and learning.

g) Promote investment, development and use of emerging technologies to enhance teaching and learning.

h) To ensure effective change management to support digital education transformation across all level.

i) To promote collaboration, partnership and resource mobilization to facilitate ICT integration in education and training

j) To enhance centralized coordination of ICT integration in education and training at the Ministries and institutional levels

k) To use educational data to improve learning outcomes across all levels of education

l) Ensure ICT curricula are integrated with security, safety, and ethics modules and the secure, safe and ethical use of ICT in education and training

m) To ensure availability of ICT technical Support to educators and learners for sustainable ICT Teaching and learning.

1.5.3Guiding Principles

a) **Equity and Inclusion:** Promote inclusivity and equity in ICT to address the needs of all learners, including those with different backgrounds, abilities and talents, disabilities, the vulnerable and the hard-to-reach.

b) **Quality and relevance:** Provide education that prepares learners to competitively thrive in a technology-oriented and information-based global economy.

c) **Integrity:** Ensure that ICT systems in education are safe, secure and utilised honestly and uphold strong moral principles.

d) **Transparency and accountability:** Ensure that ICT in education and training programmes and resources are benefiting learners at all levels and that educators and managers take responsibility for adequate service delivery.

e) **Collaboration:** Promote public-private partnerships, networks and linkages among stakeholders.

f) **Diversity:** Ensure that all learners of different backgrounds, abilities, and talents access ICT services.

g) **Professionalism:** Ensure that educators and education managers uphold appropriate conduct, ethics, behaviour, and attitude.

h) **Research and innovation:** Ensure responsible research and innovations in ICT for education integration for decision-making.

i) **Sustainability**: Ensure the availability of competent human resources and ICT resources for teaching and training are sustainable.

1.5.4Scope of Application

This strategy applies to all levels of education: schools, Folk Development Colleges (FDC), Teacher Colleges (TCs), Technical and Vocational Education and Training Colleges (TVET), and universities. It involves local and international partnerships as well as private and public collaboration in digital education and training.

CHAPTER TWO

THE STRATEGIC FRAMEWORK

This chapter presents the proposed digital strategy education core and supporting pillars, and the associated Strategies that act as a vehicle for integrating ICT in education and training across all levels. The strategy consists of Seven 7) core pillars and seven (7) support pillars as indicated in Figure 1 followed by a description and strategies of each pillar. The core and supporting pillars, as indicated in the situational analysis are developed following important areas of integrating ICT in education and training as identified mainly in the National ICT Policy 2024 and the Education and Training Policy 2014 version 2023 [1]. These pillars are also derived from a comprehensive benchmarking and comparability of various regional and international strategies that focus on integrating ICTs in education and training. This includes the recommendation of the African Union Digital Education Strategy and Implementation Plan 2022 – 2026[2] which also requires each member state to develop a national digital education strategy.

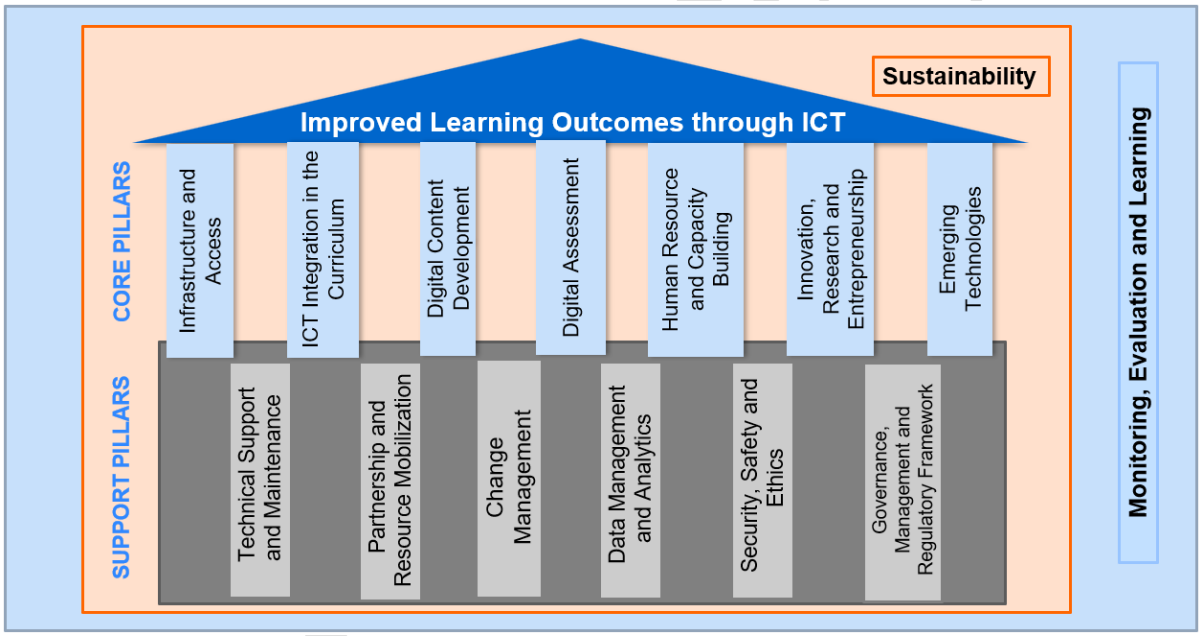

Figure 1: Core and Support Pillars of the National Digital Education Strategy

[1] United Republic of Tanzania – National ICT Policy 2024: https://www.mawasiliano.go.tz/uploads/documents/sw-1693455522-DOCUMENT%20TO%20UPLOAD%20DRAFT%20AUGUST%20NICTP.pdf

[2] African Union - Digital Education Strategy and Implementation Plan (2022): https://au.int/sites/default/files/documents/42416-doc-1._DES_EN_-_2022_09_14.pdf

2.1 Core Pillars and the Strategies

2.1.1 Infrastructure and Access

Infrastructure is an integral component of digital technology in education and training for enhancing education access. However, despite government efforts such as national fibre optic to all regions and tablets to all teachers, the number of computing devices is still inadequate and the cost of internet connectivity for education remains prohibitive. The Government in collaboration with relevant stakeholders will adopt the following strategies:

i. Promote digital connectivity to all education and training institutions;
ii. Facilitate accessibility of digital devices for teaching and learning to all education and training institutions;
iii. Ensure the availability and usage of secured digital educational platforms/systems;
iv. Facilitate the usage of educational digital content storage facilities;
v. Facilitate provision of affordable Internet and digital facilities to educational institutions; and
vi. Ensure access to reliable sources of power to educational institutions to enhance usage of ICT.

2.1.2 ICT Integration in the Curriculum

A curriculum that clearly states the importance of ICT in improving teaching and learning outcomes should guarantee that educators and learners develop the necessary digital competencies. This kind of curriculum incorporates ICT-integrated standard guidelines and pedagogies, and it guides evaluation in a way that ensures the curriculum's learning objectives are met. To help new educators incorporate ICT into their professional practices also provides possibilities for professional development.

The Government in collaboration with stakeholders will implement the following strategies:

i. Promote the integration of ICT into the curriculum across all levels Promote the use of digital educational technologies in the classrooms and administration across all levels;
ii. Develop standards and guidelines for blended, remote, open, distance and e-learning for adoption by all education institutions;
iii. Promote the use of digital educational technologies in the classrooms and administration across all levels;
iv. Establish quality assurance standards on ICT integrated curriculum development, implementation and assessment;

v. Promote an inclusive environment that enhance the use of ICT in teaching and learning at all levels of education and training; and
vi. Enhance leaners engagement by incorporating interactive and collaborative digital education technologies

2.1.3 Digital Content Development

The goal of this pillar is to enhance innovative teaching and learning in all areas of the curriculum using ICT. The use of innovative technology-based pedagogical methodologies and ICT as well as digital content in the classroom can improve learning outcomes. Digital content, blended curricula and other e-learning resources are critical components in teaching and learning. The Government has put strategies for the development and management of digital content and blended curricula for improving learning outcomes.

The Government in collaboration with other stakeholders will use the following strategies:

i. Develop guidelines for digital content development to enhance teaching and learning across all levels;
ii. Promote the development of digital contents for different modes of delivery across all levels of education;
iii. Promote the use of digital content in teaching and learning; and
iv. Promote the development and use of Open Educational Resources (OER) with a focus on digital content.

2.1.4 Digital Assessment

The digital assessment not only simplifies the evaluation process but also empowers learners to engage in self-assessment through online or web-based assessments. ICT enables educators to assess learner's learning effectively and efficiently. Using digital assessment, educators can provide rapid feedback, customise learning circumstances, and enhance learners' engagement.

In ensuring, ICT is used in assessment, the Government in collaboration with stakeholders will implement the following strategies:-

i. Develop guidelines to enhance digital assessment across all levels;
ii. Promote the development of digital tools assessment;
iii. Promote the use of digital tools for assessment across all levels; and
iv. Develop quality assurance tools for ensuring reliability and fairness in digital assessments.

2.1.5 Human Resource and Capacity Building

Successful integration of ICT into the learning environment depends on the ability of technical personnel, educators and learners to develop, customise, and use technology appropriately and encourage cooperative interaction and collaborative learning. Therefore, it is important to create an inclusive environment where learners, educators, and technical and administrative personnel are originally well-trained (pre-service) and continuously equipped (in-service) with the required digital skills and competencies (knowledge, skills, and altitude) to exploit the functional potential of ICT in education and training.

The Government in collaboration with stakeholders will implement the following strategies:

i. Ensure availability of technical ICT Personnel to promote the use of ICT integration in education;
ii. Develop an ICT Competency Standards for educators to support integration of ICT in education and training;
iii. Ensure education institutions prepare adequate and competent personnel with good digital literacy and skills to support the integration of ICT in teaching and learning at all levels;
iv. Strengthen Resource Centers to support educators and learners on the use of ICT integration in education and training at all levels;
v. Develop and implement training programs for continuously building the capacity of educators on the integration of ICT in education and training at all levels; and
vi. Ensure retention of competent staff in technology integration in education.

2.1.6 Research, Innovation and Entrepreneurship

Technology is changing dramatically, and educators and learners need to continually research how emerging technological innovations can be of use in ICT in education and training. Research and innovation in ICT is a critical component in the development of inclusive education. The Government needs to create an environment that facilitates innovative and effective ICT solutions that meet the needs of all educators and learners. A conducive and inclusive learning environment provides learners and educators with opportunities for research and innovation in digital education.

To achieve this goal, the Government in collaboration with education stakeholders will adopt and implement the following strategies:

i. Promote research, innovation and entrepreneurship in the use of ICT in teaching and learning across all levels of education; and
ii. Institutionalize research, innovation and entrepreneurship in the use of ICT in education and training.

2.1.7 Emerging Technologies

New and emerging technologies such as artificial intelligence (Al), blockchain, virtual/mixed/augmented reality, drones, robotics, Internet of Things (loT), Big data, quantum computing, cybersecurity, autonomous vehicles, 6G, Cognitive Ratio (CR), and 3D printing are revolutionizing every sector. Each of these technologies represents a significant breakthrough, and when integrated with other technologies, their inherent potential benefits add more value. They are typically employed to create new products and services in different application domains such as finance, healthcare, agriculture, production automation, and entertainment in a transformative way. AI has particularly taken the world by storm and will continue to exert its presence for a long time to come. The acceptance of AI's impact as a transformative force stems from a combination of technological advancements, market trends, and policy developments that collectively underscore AI's significance and pervasive influence in today's society.

Emerging technologies represent a diverse range of tools and innovations applied within educational contexts to enhance teaching and learning experiences. These technologies offer accessibility and the potential for fostering meaningful engagement, collaboration, and active participation among learners.

The following strategies will be implemented by the Government in collaboration with other education stakeholders to promote the adoption of emerging technologies in education and training:

i. Develop guidelines for the acquisition and usage of emerging technologies in digital education and training;
ii. Promote investment on enabling environment for the adoption of emerging technologies in teaching and learning at all levels of education;
iii. Capacitate educators and technical personnel in developing and utilising emerging technologies;
iv. Promote research on development, application and utilization of emerging technologies in education;
v. Promote the development and the use of emerging technologies to enhance teaching and learning at the institutional level;
vi. Sensitize education institutions and communities on the use of emerging technologies in education and training;
vii. Promote public-private partnerships for the development and provision of emerging technologies across all levels of education and training; and
viii. Promote establishment of digital innovation centres at national and community levels.

2.2 Supporting Pillars and the Strategies

2.2.1 Change Management

To ensure effective publication and change management as a potentially key element of ICT in education, the following strategies should be considered:

i. Develop a change management mechanism to achieve the transformation of ICT integration in education and training;
ii. Promote effective communication within and across education institutions and key stakeholders to facilitate smooth integration of ICT in Teaching and learning; and
iii. Create awareness on the use of ICT to facilitate the teaching and learning process.

2.2.2 Partnership and Resource Mobilization

The Government in collaboration with education stakeholders worked hard to provide physical and financial resources to facilitate the quality of teaching and learning in different levels of education to improve the quality of learning outcomes. However, this effort was not coordinated to cater for the need for equity and inclusive resource allocation at all levels of education.

The key to the successful implementation of this National digital education strategy is to ensure partnership and allocations of necessary budgets for the various investments and activities outlined in this strategy.

The following are the key strategies to be considered by the Government to maintain equity resource mobilisation:

i. Strengthen collaboration with other education stakeholders to make sure that resources are available and distributed accordingly;
ii. Promote resource mobilization to support ICT integration in teaching and learning at all levels of education;
iii. Facilitate internships and apprenticeships of ICT integration in education to provide real-world practices; and
iv. Promoting the use of digital platforms to facilitate for collaborations and partnerships in ICT in education and training.

2.2.3 Governance and Management and Regulatory Framework

The rationale for governance and management in the integration of ICT in teaching and learning is centred on structured planning, streamlined governance and management frameworks, and alignment with institutional strategies. This ensures effective direction and oversight of technology use, promoting accountability, ethical

practices, and optimal integration of ICT tools to enhance the teaching and learning experience. Involving stakeholders and ensuring harmonisation further supports these objectives. As such, the following will be the strategies for ensuring effective governance and management to integrate ICT in teaching and learning.

i. Establish a centralised coordination of ICT integration in education and training at the Ministries and institutional levels; and
ii. Ensure the availability of guidelines for ICT integration in education and training at all levels.

2.2.4 Data Management and Analytics

Data management and analytics play a crucial role in digital education, offering valuable insights into student learning outcomes, teaching effectiveness, and overall educational performance. The Government of Tanzania employed different data management systems to manage data across all levels of education in the country. At the basic education level, Data for Basic education are managed by the Basic Education Management Information System (BEMIS). The School Information System (SIS) collects, stores and manages real-time data that can be used for decision-making at the school, district and national levels. Also at this level, the Online Examination Marking System provides an evaluation for final students while the Primary Record Manager (PReM) provides data for primary students and Primary Record Manager Secondary (PReMS) for secondary students. At higher learning institutions there are several systems to manage students' Admission, registration, assessments, payments and other administrative matters. These systems are also connected with national and other institutions such as GePG for fee collection. They are also connected with NECTA and TCU systems for seamless access to admission processing. Data analytics enables the implementation of personalized learning pathways based on students' unique learning styles, preferences, and abilities. Data analytics can inform curriculum design and implementation optimization by identifying areas of the curriculum that are particularly effective or challenging for students. Based on the analysis of student performance data and feedback, educators can make data-driven decisions to revise and improve instructional materials, assessments, and learning activities. Data analytics can inform resource allocation decisions by identifying areas where additional resources, such as instructional materials, technology infrastructure, or personnel, are needed.

Despite having these systems, the education information systems in Tanzania face various challenges including data quality, accuracy, budget allocation, interoperability and integration, security and privacy, inaccuracy and incomplete data.

To address these challenges, the Government need to adhere to the following strategies:

i. Promote harmonized education data collection and information sharing mechanisms at all levels of education and training;
ii. Establish mechanisms to support confidentiality, integrity and availability of educational data across all levels; and
iii. Promote learning analytics to improve teaching and learning outcomes at all levels of education.

2.2.5 Security, Safety and Ethics

To implement a National Digital Education strategy, the Government requires careful consideration of security, safety, and ethics to ensure accountability and responsible use of technology in education. The rapid development and widespread use of ICT including the prevailing social networks and AI applications, despite their benefits, have raised security, safety and ethical concerns, impacting the integration of ICT in education.

Effective integration of ICT in teaching and learning requires the government to address these concerns by stressing the following strategies**:**

i. Ensure ICT curricula are integrated with security, safety, and ethics modules at all levels of education; and
ii. Enhance security, safety and ethics in the use of ICT in education and training

2.2.6 Technical Support and Maintenance

For effective implementation of ICT in education, a technical support and maintenance team for each level of education should be established. Moreover, each educator needs to have training in simple troubleshooting procedures. Unlike universities, institutions that fall under basic education do not have technical and maintenance support teams. So to maintain the smooth running of teaching and learning in education the following strategy should be taken into consideration:

i. Establish technical support centres for assistance on issues related to ICT integration in education at all levels; and
ii. Foster peer ICT technical support networks where educators and learners can share best practices for using digital educational tools.

Institutional Arrangements

This chapter highlights institutional arrangements/ for the effective implementation of the strategy. The implementation of the strategy requires a multi-sectoral approach in financing, management and coordination, as well as internal systems to strengthen the capacity at national and institutional levels. The Management structure of education in Tanzania is mainly handled under two Ministries, which are the Ministry of Education, Science and Technology (MoEST) and the President's Office, Regional Administration and Local Government (PORALG). Categorically, MoEST has the overall responsibility in the implementation of this strategy and is generally responsible for policy formulation, planning, setting up guidelines, rules, and regulations, issuing circulars, undertaking monitoring and evaluation as well as accreditation, supervision, and inspection of quality assurance. It also oversees the provision of TVET, teacher education, and higher education sub-sectors as well as adult and non-formal education policies as provided through the Institute of Adult Education. PORALG oversees the delivery and attainment of targets set for pre-primary, primary, secondary as well as adult and non-formal education, all coordinated nationally under the Division for Education Administration and mainly implemented through Local Governments Authorities. These two ministries will be responsible for the implementation of the strategy, however, in doing it, will collaborate with relevant government and non-government institutions, local and international development partners and other key stakeholders.

3.1 National Digital Education Steering Committee

The national steering committee will be established with membership drawn from MoEST, PO-RALG and relevant stakeholders. The committee will be led by the Permanent Secretary of the Ministry of Education, Science and Technology. The committee will comprise the following members:

a) The Permanent Secretary-MoEST,
b) The Permanent Secretary-PO-RALG,
c) The Permanent Secretary-MICT
d) Commissioner of Education-MoEST
e) Director of Education Administration-PO-RALG
f) Director of Higher Education-MoEST
g) Director of Technical and Vocational Education-MoEST
h) Director of Science Technology and Innovation-MoEST
i) Director of Basic Education-MoEST
j) Director of Administration and Planning, DAP – MoEST

k) Director of Administration and Planning, DAP – PoRALG
l) Executive Director, HESLB
m) Director General, Commission of Science and Technology- COSTECH
n) Executive Secretary, Tanzania Commission of University-TCU
o) Executive Secretary, NACTVET
p) Executive Secretary, NECTA
q) Director General, TIE
r) Head of ICT Unit-MoEST,
s) Head of ICT Unit-PO-RALG
t) Head of ICT Unit-TIE
u) Head of ICT Unit-NECTA
v) Head of ICT Unit-TCU
w) Head of ICT Unit-COSTECH
x) Head of ICT Unit- NACTVET,

The steering committee will:

i. Provide leadership in the implementation process;
ii. Provide oversight in the implementation of this strategy;
iii. Nurture and Oversee partnership and resource mobilisation for the implementation of the strategy;
iv. Organize and attend a meeting to evaluate the implementation progress of the strategy twice a year,
v. Prepare and submit medium-term and annual reports on the implementation

3.2 National Digital Education Operations Committee

There will be an established ICT Integration in Education Operations Committee. The Committee will be the secretariat to the steering committee. The committee will be chaired by the Director of Science and Technology with the secretariat of the Head of the ICT unit in the Ministry of Education, Science and Technology. The Members of this Committee will be:

i. Director of Science and Technology- MoEST,
ii. Head of ICT Unit-MoEST - Secretariat
iii. Director of ICT-PO-RALG,
iv. Head of ICT Unit-TIE,
v. Director of ICT-NECTA
vi. Head of ICT Unit-TCU,
vii. Director responsible for ICT matters - COSTECH, and
viii. Head of ICT Unit-NACTVET

The roles of this ICT Integration in education operations committee shall be to:

i. Prepare annual work plans and budgets on ICT integration in education and training activities for approval by the relevant Ministry or head of institutions;
ii. Provide framework, standards, guidelines and support for ICT integration in education and training in the organisation;
iii. Initiate, implement and propose a review of the national ICT integration in education and training policies, strategies and guidelines;
iv. Conduct and coordinate research and development to expand the use of ICT in education and training;
v. Co-ordinate ICT activities in education and training;
vi. Ensure implementation of systematic, comprehensive development and expansion of adequate ICT infrastructure;
vii. Ensure implementation of public and private sector investments in ICT in education and training;
viii. Implement ICT quality standards, guidelines and procedures, and conduct monitoring and evaluation for all ICT in education and training processes; and
ix. Prepare annual reports on ICT in education and training activities and present them to the National ICT in Education Steering Committee.

3.3 Institutional Digital Education Committee

This committee will be chaired by the head of the institution with membership drawn from all departments and any other relevant member within and outside the institution. The staff in charge of ICT in education and training at the institutional level will be the secretary. The roles of this committee will be to:

i. Develop and review institutional ICT policy or strategies in line with the ICT in education and training policy framework and other existing ICT policies and regulations where applicable;
ii. Develop, Implement, monitor and evaluate ICT integration in education and training; and
iii. Coordinate ICT in education and training programmes in the institution.

3.4 Spearhead resource mobilisation for ICT in education and training;

MoEST, PO-RALG and individual institutions at all levels will continuously work internally and with partners on securing and planning cost-effective and sustainable resources for ICT in education and training.

i. Explore all possible allocations and funding opportunities internally and externally and devise innovations to capture, plan and optimally use them;
ii. Collect and submit data on ICT in education and training activities in the institution annually and on a need basis;
iii. Conduct ME&L of ICT in education and training in the institution;

iv. Compile and submit annual reports on ICT in education and training activities in the institution;
v. Promote research and innovation in ICT in education and training in the institution; and
vi. Conduct action research to address ICT-related concerns and opportunities brought by emerging technologies and business models.

CHAPTER FOUR

SUSTAINABILITY PLAN

The chapter focuses on the dimensions of sustainability of digital education. Sustainability, in this context, covers Institutional, Economic, Social, Technological, and Environmental Sustainability**.** It is important to scrutinise the sustainability of ICT in education across various ranges to ensure a harmonious integration that benefits present and future generations. Thus, this chapter explores the multifaceted aspects of sustainability for digital education in the country and outlines strategies to ensure its long-term practicability.

4. Institutional Sustainability

Institutional support and commitment are essential for the sustainable integration of ICT in education. Educational institutions can promote institutional sustainability by:

i. Establish clear policies and guidelines for the ethical and responsible use of ICT in teaching and learning;
ii. Integrate ICT into strategic planning processes to align technological initiatives with educational goals and objectives;
iii. Encourage training on the use of digital facilities in education and training;
iv. Enforce guidelines used in ICT integration in teaching and learning across all levels of education and training;
v. Enforce mechanisms to maintain hardware and software in education institutions; and
vi. Ensure mechanisms for regular follow-up on the integration of ICT in education and training.

4.1 Economic Sustainability

Economic sustainability in digital education evaluates the cost-effectiveness and financial viability of integrating technology into educational systems. It analyses the long-term economic implications of ICT adoption, considering factors like initial investment, maintenance costs, scalability, and resource optimization. Additionally, it explores strategies for funding ICT initiatives sustainably, fostering partnerships, and maximising return on investment in educational technology.

Ensuring economic sustainability involves addressing the financial aspects associated with the use of ICT in education. Education institutions can promote economic sustainability by:

i. Develop comprehensive financial plans that outline the costs associated with ICT adoption in education, including initial investments, maintenance, upgrades, and training;
ii. Ensure cost-benefit analysis for effective digital solutions;
iii. Develop sustainable funding models to support ongoing ICT infrastructure upgrades and maintenance;
iv. Foster public-private partnerships to leverage resources and share costs;
v. Invest in comprehensive training and support programmes to empower educators and learners to maximise the value of ICT; and
vi. Ensure monitoring and evaluation mechanisms to track the performance and impact of digital initiatives on education.

4.2 Social Sustainability

Social sustainability underscores the importance of fostering inclusive, equitable, and culturally responsive learning environments through ICT. Moreover, it addresses ethical considerations, digital citizenship, and the impact of ICT on interpersonal relationships, mental health, and well-being within educational settings. ICT integration should be inclusive and equitable, ensuring that all learners have access to technology-enabled educational opportunities. The following are the strategies to promote social sustainability:

i. Bridging the digital divide by providing access to ICT resources and connectivity for underserved communities and marginalised groups;
ii. Fostering a culture of collaboration and knowledge sharing through online platforms and virtual learning communities;
iii. Provide training for educators, learners and communities on topics such as online safety, information literacy, and digital citizenship to foster informed and ethical use of ICT; and
iv. Ensure that digital educational content is culturally relevant, representative, and inclusive to promote a sense of belonging and engagement among educators and learners in education.

4.3 Technological Sustainability

The technological sustainability aspect explores the durability, adaptability, and accessibility of ICT solutions in education. Technological sustainability focuses on the lifespan of technological tools, their compatibility with evolving educational needs, and their capacity to endure technological obsolescence. Furthermore, it addresses issues such as the digital divide, ensuring equitable access to technology for all learners,

regardless of socio-economic background or geographic location. The following are the strategies to achieve technological sustainability:

i. Promote investments in modular software platforms, cloud-based infrastructure, and open-source technologies that allow for easy customization and expansion;
ii. Ensure guidelines for regular maintenance, software updates, and troubleshooting to address technical issues and prevent disruptions to teaching and learning activities; and
iii. Enforce procurement policies and practices in place when acquiring ICT facilities for education and training purposes.

4.4 Environmental Sustainability

Environmental sustainability in ICT education evaluates the ecological footprint of technological interventions in education and seeks to minimise their adverse environmental impacts. It explores strategies for reducing energy consumption, promoting eco-friendly practices in hardware manufacturing and disposal, and integrating environmental literacy into ICT curricula. Furthermore, it advocates for the use of sustainable materials, renewable energy sources, and environmentally responsible practices throughout the lifecycle of educational technology.

The adoption of ICT in education and training brings forth environmental considerations, primarily concerning energy consumption, electronic waste, and carbon footprint. The following are the strategies to promote environmental sustainability across educational institutions:

i. Ensure the use of energy-efficient ICT infrastructure and devices to minimise energy consumption;
ii. Enforce policies responsible for electronic waste management, including recycling and proper disposal of outdated devices; and
iii. Encourage the use of digital resources to reduce paper consumption and minimise the environmental impact of printing.

CHAPTER FIVE

MONITORING, EVALUATION AND LEARNING

Monitoring, Evaluation and Learning (ME&L) is critical in informing evidence-based decision-making. ME&L also forms a basis for continuous identification of gaps, improvement, review and further research. ME&L will ensure that digital education strategies are implemented as planned and that emerging issues in ICT are promptly addressed.

Although there exist several projects on ICT in the educational sector, few substantial Monitoring and Evaluation are leading to scarce reports on the integration of ICT in Education and Training. Therefore, it is important to monitor and evaluate the use of ICT in education.

Monitoring, Evaluation and Learning (ME&L) of ICT in education will be done at all levels of education and training through different approaches outlining milestones and key performance indicators under each strategic objective. The implementation of the strategy and its achievement will be monitored and evaluated throughout the implementation period of the strategy on a daily, quarterly, semi-annually and annual basis. Each education institution is responsible for implementing, monitoring and evaluating the implementation of the strategy and reporting the progress accordingly. The MoEST will play a key role in the coordination, implementation, monitoring and evaluation of this strategy.

A monitoring and evaluation Framework will be developed as part of the Strategy implementation tool. The framework will involve the collection, compilation, synthesis, analysis and evaluation of information related to ICT in education. The information will be processed to compare the various baselines with actual implementation and findings will be disseminated to stakeholders. Effective monitoring will need a coordinated effort and close cooperation from all key players.

To monitor, evaluate and report the progress in the use of ICT in education and training, the Government and stakeholders will implement the following strategies:

i. Develop a National ME&L framework to track, measure and evaluate progress made towards the use of ICT in education and training;
ii. Enhance inclusive, gender-sensitive and evidence-based mechanisms for effective ME&L of digital education across all levels of education and training;
iii. Promote a multi-agency approach in undertaking ME&L of digital education;
iv. Enhance the integration into EMIS data for relevant decision-making; and
v. Strengthen Quality Assurance mechanisms to ensure ICT integration and usage in education institutions.

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