ADEA

STUDY ON THE USE OF ICT IN EDUCATION AND REMOTE LEARNING DURING CRISES AND THE REQUIRED INVESTMENT FOR DIGITAL TRANSFORMATION FOR AFRICAN COUNTRIES

COUNTRY PROFILE REPORT
MOZAMBIQUE

Ushirika wa Maendeleo ya Elimu Barani Afrika
الرابطة لأجل تطوير التربية في إفريقيا
Association for the Development of Education in Africa
Association pour le développement de l'éducation en Afrique
Associação para o Desenvolvimento da Educação em África

Study on the Use of ICT in Education and Remote Learning during Crises and the Required Investment for Digital Transformation for African Countries

MOZAMBIQUE

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ABBREVIATIONS

ANEP	The National Authority for Vocational Education
AUC	African Union Commission
CIUEM	Eduardo Mondlane University Informatics Centre
CPD	Data Processing Centre
CPF	Country Partnership Framework
DE4A	Digital Economy for Africa
DINET	National Directorate for Professional Technical Education
DL	Distance Learning
DNPO	National Directorate of Planning and Budget
DPCTESTP	Provincial Directorates for Science and Technology, Higher Education and Technical Professional Training
DPEDH	Provincial Directorates of Education and Human Development Provincial
ECE/EPE	Pre-School Education
ESMF	Environmental and Social Management Framework
ESP	Education Sector Plan
ETP	Educational Technology Plan
EU	European Union
FDI	Foreign Direct Investment
FASE	Education Sector Support Fund
HE	Higher Education
GB	Gigabyte
GPE	Global Partnership for Education
IFC	International Finance Corporation
INCM	Instituto Nacional das Comunicações de Moçambique
INEFP	National Institute for Employment and Professional Training Institutes
INTIC	National Institute of Information Communication Technology
IFEPLAC	Institute for Vocational Training and Labour Studies
ITU	International Telecommunication Union
LDC	Least Developed Country
LMS	Learning Management Systems
MCTESTP	Ministry of Science, Technology, Higher Education and Professional Training
MINEDH	Ministry of Education and Human Development
MITRAB	Ministry of Labour, Employment and Social Security
MoReNet	Mozambique Research and Education Network
MoZSkills	Improvement of Skills Development in Mozambique
NFTVET	Non-Formal TVET
NREN	National Research and Education Network
ODL	Open and Distance Learning
OIS	Open Innovative Schooling
PEE	Education Strategic Plan
RAMP	RIA's African Mobile Pricing
SCL	Student Centred Learning
SDEJT	District Services for Education, Youth, and Technology
STEM	Science, Technology, Engineering and Mathematics
TVET	Technical and Vocational Education and Training
UDL	Universal Design for Learning
UEM	University Eduardo Mondlane
UP-Maputo	Universidade Pedagógica de Maputo
USSD	Unstructured Supplementary Service Data
WBG	World Bank Group

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EXECUTIVE SUMMARY

Mozambique lies in the southeast of Africa, occupying an area of 800,000 square kilometres and stretching almost 2,000 kilometres from North to South. About 70% of the 28 million inhabitants are rural area dwellers. The country has more than 2,500 kilometres of coastline along the south-western rim of the Indian Ocean. It has ample arable land, water, energy, and gas and mineral resources; three deep seaports; and a large labour pool potential. Geo-strategically situated with six border countries, Mozambique represents a channel to global markets. In addition, the country's strong ties to the regional economic engine of South Africa underscore the importance of Mozambique's economic, political, and social development to the stability and growth of the region (World Bank, 2017).

The challenge then is to diversify the economy away from its current focus on capital-intensive large projects and low-productivity subsistence agriculture. A shift is required toward a more diverse and competitive economy while strengthening key drivers of inclusion such as improved quality education (World Bank, 2017).

The Gross Domestic Product (GDP) grew on average by 8% in the last two decades, driven by large scale investments in the extractive industry. The 2016 debt crisis had major consequences on the macroeconomic environment and on the Government's capacity to deliver public services[1]. Although the economy has since stabilised, it remains highly vulnerable to commodity and climate shocks, and to political volatility. Mozambique's high poverty rate is sustained by natural disasters and has been exacerbated by the Covid pandemic. Two severe cyclones and lower coal production contributed to a downturn in economic growth from 3.4% in 2018 to an estimated 2.3% in 2019. Mozambique is one of the poorest countries in the world and ranked 180 out of 189 countries in the 2017 Human Development Index (HDI).

With almost two-thirds of the population under the age of 25, the country is in the early stages of a demographic transition. It is sparsely populated with a fast-growing youthful population – 45% of the population is younger than 15 and high age-dependency ratios. This demographic transition represents a potential source of dynamism and economic growth – provided that Mozambique offers its youth that are entering the work force with access to decent work and productive employment. While the gross enrolment rate steadily expanded quantitatively, reaching 115.4% (2017) from 47% (1999), improvement of pupil learning remains a critical issue - only 4.9% of third-grade pupils in reading and writing and 7.7% of third-grade pupils in calculation meet the academic standards as specified in the 2016 National Assessment (Avaliação Nacional). The Strategic Plan for Education (SEP) (2020-2029) therefore set the improvement of the quality of education as a key goal. Currently, the literacy rate of youth in the age group of 15-24 years old is below 70%, affecting their livelihoods and capacity to find employment. The formal economy remains urban and accounts for only 32% of total employment. High levels of rural-to-urban migration result in a large concentration of poor, unemployed young people struggling to survive. A burgeoning yet unproductive youth population who are denied opportunities in the formal sector and an inadequate education system, create a constituency of young people crippled by poverty that could contribute to fragility (World Bank, 2017) and unrest.

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[1] World Bank, PID, 2017.

The ICT gap can be strongly linked to other forms of social and economic exclusion, such as low income, unemployment, poor education and isolation. Survey findings by Research ICT Africa (RIA) in its 2017 After Access report (RIA, 2020) show that the level of Internet use increases with the level of education. One of the world's least developed countries (LDCs), Mozambique has a household internet access of 1%. Broadband extension is insufficient beyond the major urban centres. The country has a high variance in mobile phone ownership and high gender gap in internet usage, with more males than females having access to both (Gillwald & Mothobi, 2019). There is a significant gap between secondary and vocational use. It is interesting to note that widespread use of Internet occurs at tertiary and vocational levels, whereas most indices trying to assess skills or e-literacy use school throughput as their indicator.

The 2017 After Access Survey, a nationally representative survey on the access and use of ICTs, indicates that Internet penetration is highly aligned with smartphone penetration, while smartphone penetration is highly aligned with GNI per capita. The COVID-19 crisis, as well as past and potential future shocks, highlight the country's vulnerability. The World Bank's Project Information Document (PID) for the project 'Mozambique Digital Governance & Economy' states that Mozambique has enormous potential for a dynamic digital economy. Positive regulatory achievements have fostered competition in the telecom market, and mobile broadband penetration has experienced rapid growth in recent years. The increased competition in the information and communication technology (ICT) market allowed an additional 9 million Mozambicans to gain access to mobile broadband. Associated economic benefits are estimated to have reached up to USD 370 million, which represents 2.7% of total GDP created in Mozambique during the 2012-2019 period (World Bank, 2020). The World Bank PID points out that Mozambique has the lowest mobile internet cost in sub-Saharan Africa (US$1.97 per gigabyte), and mobile phone penetration stands at 46% of the population. Improvements in foundational digital transformation elements, combined with support to start-ups and existing businesses, can help the Mozambican economy harness digital data and modern technologies, generate new content, link individuals with markets and with government services, and address the challenges the country is facing on public service delivery and job creation.

Digital transformation can support social protection programmes that target households in need. The domestic digital economy would also be key to generating opportunities for the youth population, while also providing cost-effective technological solutions, adapted to the local market and needs. Noting however that ICT infrastructure development and coverage do not necessarily ensure digital beneficiation, but demand-side factors such as digital skills, education and affordability are equally critical elements to ensure a sustainable ICT sector that would in turn support further education, skills, and human resource development (World Bank, 2020).

The COVID-19 has had a strong impact on learners' access to education and their learning outcomes. All schools were closed on 23 March 2020 immediately after the identification of the first cases of coronavirus infection in the country. To address the situation, the Ministry of Education and Human Development (MINEDH) set guidelines for school managers and teachers to ensure that students had access to some form of learning. However, the different stakeholders – parents/caregivers, teachers, school managers and community leaders – were not prepared to implement MINEDH's measures or to deal with the consequences of the pandemic on the delivery of education (UNICEF, 2021).

The transition to distance learning remains challenging in a context of limited access to basic information channels and infrastructure with 74% of children living without electricity, while only 2% have access to the Internet, 35% have access to radio, and 22% have access to television.

Access to information is even more limited for rural children as Mozambique's educational system is already battling poor educational outcomes and limited use of the information technology in education and learning. Technology has the potential to solve many challenges related to access, cost and quality of education. EdTech solutions that use software and hardware to improve classroom education and enable remote education, have provided some relief to teachers, students and families struggling to cope with the new reality of COVID-19, and the existing education crisis in many Least Developed Countries (LDCs).

1. INTRODUCTION

The first phase of this consultancy involved an extensive literature search to identify relevant information for the preparation of country reports over a 5-day period.

The reports are structured to include:

- National policies, strategies and programmes that exist in the country for the use of ICT in education.
- A brief description of the current level and types of ICT infrastructure being used in the education sectors including primary, secondary, technical and vocational education and training, tertiary and non-formal sub-sectors.
- A list of the major initiatives underway.
- A list of major partners.
- Identification and description of factors that enable and constrain the use of ICT.
- Impact of COVID-19 on the education sector and role of ICT.

Data collection was largely done via desk research, using published sources on the Internet, and to a much lesser extent given that country teams comprised of policymakers and researchers with ground knowledge were not initially set up or organised as anticipated, through telephone and e-mail discussions with country-based contacts, where available to the consultant.

Prior to the preparation of the final report, drafts of individual country reports, including the present Mozambique country report, will be submitted to ADEA for review and comment.

There are obvious limitations of studies utilising secondary data. Data sources are themselves limited and those available might be incomplete and not current. In this study, the subsequent primary data collection process using interviews with key informants and partners as well as the administration of surveys, is intended to ensure that the limitations are minimised.

1.1. The review and survey process

This country profile forms the initial stage of a mixed methods data collection process employed to gather secondary data for the ICT in Education project. This first stage of the study entails a careful review of secondary documents gathered from a range of sources including public government items dealing with the country's economic and social, legal framework, ICT infrastructure, the availability of ICT tools within the country's education sector system strategy as well as teachers and students' capabilities.

The development of the country profile is based on a review of secondary literary sources that provides an initial profile that offers a baseline and frame of reference for understanding the key issues, for the country's experiences, priorities and challenges regarding ICT and remote learning strategy specifically as has been accelerated by the COVID-19 experience. The literature sources assist in identifying information gaps that will inform the second phase of the study which involves a primary data collection process. To this end, the country profiles inform the development of instruments as well as provide a backdrop for the interpretation of the data collection comprising surveys and focus interviews to be conducted in the second phase of the study.

This review of literature provides a background to what policy initiatives are in place, budgetary allocations, key challenges, and lessons learnt. It will also show the country's interpretation and response regarding ICT in Education, remote learning, and COVID-19 with implications for the country's resiliency levels and the required investment to attain a standard level of resilience. In addition, the literature review provides initial information about the partners engaged in this area and will inform the detailed partner mapping, for which the primary research activities will enable the identification of further key expert informants and partners to provide ways forward for the study.

The ICT in education study relies on the use of both primary and secondary data collection for profiling and suggesting proposals for the use of ICT in education in African countries after the COVID-19 pandemic, across the subsectors of basic education, TVET and higher education. There is specifically focus on : (1) existence and breadth of ICT policies and strategies; (2) availability and utilisation of ICT infrastructure in learning facilities; (3) the level of the workforce's digital competence including learners' abilities; (4) the availability of electronic systems for learning and assessments; (5) the existence of e-education materials; (6) partners engaged in supporting the use of digital technology in education; (7) challenges related to implementing e-education; (8) and examples of success stories and good practices.

Ultimately the data gathered per country from this mixed methods study will be analysed according to the following thematic areas: (1) common SWOC analysis on the use of ICT in education and remote learning; (2) required enabling factors to support the strong national resilience to future crisis; (3) the key gaps concerning ICT infrastructure, e-learning systems, the ICT literacy of both learners and students, and e-curricula; (4) opportunities for initiating and enhancing regional programmes for e-education; (5) key partners and stakeholders currently engaged in supporting the use of digital technology per country, area of support they are engaged in; and (6) best practices that might be replicated.

2. BACKGROUND

2.1. Overview

Mozambique lies in the southeast of Africa, occupying an area of 800,000 square kilometres and stretching almost 2,000 kilometres from North to South. About 70% of the 28 million inhabitants are rural area dwellers. The country has more than 2,500 kilometres of coastline along the south-western rim of the Indian Ocean. It has ample arable land, water, energy, and gas and mineral resources; three deep seaports; and a large labour pool potential. Geo-strategically situated with six border

countries, Mozambique represents a channel to global markets. In addition, the country's strong ties to the regional economic engine of South Africa underscore the importance of Mozambique's economic, political, and social development to the stability and growth of the region (World Bank, 2017).

While rapid growth and poverty reduction went hand in hand immediately after the civil war ended in 1992, the pace of poverty reduction slowed significantly after 2003. It was compounded in 2016 with the discovery of previously undisclosed public debt, amounting to 10% of GDP. Growth was driven by large capital-intensive public and private investment projects with limited linkages with the rest of the economy. It therefore benefited few, urban-based elites, with little sustained formal employment creation. It increased inequality and a markedly uneven distribution of poverty that is concentrated in rural areas and among illiterate female-headed households. The challenge then is to diversify the economy away from its current focus on capital-intensive large projects and low-productivity subsistence agriculture. A shift is required toward a more diverse and competitive economy while strengthening key drivers of inclusion such as improved quality education (World Bank, 2017).

The Gross Domestic Product (GDP) grew on average by 8% in the last two decades, driven by large scale investments in the extractive industry. The 2016 debt crisis had major consequences on the macroeconomic environment and on the Government's capacity to deliver public services[2]. Although the economy has since stabilised, it remains highly vulnerable to commodity and climate shocks, and to political volatility. Two severe cyclones and lower coal production contributed to a downturn in economic growth from 3.4% in 2018 to an estimated 2.3% in 2019. Mozambique is one of the poorest countries in the world and ranking 180 out of 189 countries in the 2017 Human Development Index (HDI).

The country depends on Foreign Direct Investment (FDI) for more than 20% of its GDP invested in oil and mining and is thus extremely vulnerable to any sharp decline in oil prices and prolonged standstill on investment activity.

With almost two-thirds of the population under the age of 25, Mozambique is in the early stages of a demographic transition. It has a fast-growing population of young people and high age-dependency ratios. This demographic transition represents a potential source of dynamism and economic growth - provided that the country can offer its young workers entering the work force with access to productive employment. The formal economy remains urban and accounts for only 32% of total employment. High levels of rural-to-urban migration result in a large concentration of poor, unemployed young people struggling to survive. A burgeoning yet unproductive youth population who are denied opportunities in the formal sector and an inadequate education system, creates a constituency of young people crippled by poverty, that could contribute to fragility (World Bank, 2017) and unrest.

The gross enrolment rate steadily expanded quantitatively, reaching 115.4% (2017) from 47% (1999). However, improvement of pupil learning remains a critical issue – only 4.9% of third-grade pupils in reading and writing and 7.7% of third-grade pupils in calculation meet the academic standards as specified in the 2016 National Assessment (Avaliação Nacional). The literacy rate of youth in the age group of 15-24 years old is currently below 70%, affecting their livelihoods and capacity to find

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[2] World Bank, PID, 2017.

employment. The Strategic Plan for Education (SEP) (2020-2029) therefore set the improvement of the quality of education as a key goal.

A combination of natural disasters, ongoing insurgent attacks, and frequent political conflict has made Mozambique the world's sixth-most worsening country over the past decade on the 2020 Fragile States Index. Between 2017 and 2020, 171 schools were affected by school attacks that destroyed 45 schools and affected 75,000 students and 1,500 teachers (Education Cannot Wait, 2021).

Mozambique has been impacted by a series of cyclones and tropical storms up to a year prior to the onset of COVID-19 and then again in 2021 after the onset of the pandemic. The COVID-19 crisis, as well as past and potential future shocks, highlight the country's vulnerability. The World Bank's Project Information Document (PID) for the project 'Mozambique Digital Governance & Economy' states that Mozambique has enormous potential for a dynamic digital economy. Positive regulatory achievements have fostered competition in the telecom market, and mobile broadband penetration has experienced rapid growth in recent years. The increased competition in the information and communication technology (ICT) market allowed an additional 9 million Mozambicans to gain access to mobile broadband. Associated economic benefits are estimated to have reached up to USD 370 million, which represents 2.7% of total GDP created in Mozambique during the 2012-2019 period (World Bank, 2020).

The coronavirus pandemic (COVID-19) has had a strong impact on learners' access to education and their learning outcomes. All schools were closed on 23 March 2020 immediately after the identification of the first cases of coronavirus infection in the country. To address the situation, the Ministry of Education and Human Development (MINEDH) set guidelines for school managers and teachers to ensure that students had access to some form of learning. However, the different stakeholders – parents/caregivers, teachers, school managers and community leaders – were not prepared to implement MINEDH's measures or to deal with the consequences of the pandemic on the delivery of education (UNICEF, 2021).

3. REVIEW AND SURVEY HIGHLIGHTS

Mozambique is significantly underdeveloped, especially in rural areas. This is evidenced by the use and adoption of telecommunication services. With rural inhabitants as subsistence farmers, the urban–rural divide is significant. This is reflected in the access to infrastructure, with most rural households (66%) reporting that they do not have access to electricity, while only a third (32%) of urban households reported the same. Despite the rural access strategy to require the third telecommunications entrant, Movitel, to cover the under-serviced Northern provinces, the penetration of ICT services and devices remains extremely low nationally. There are considerable urban/rural and location gaps in access of telecommunications. In 2018, about six in ten households stated that they could not afford the necessary devices required to access the Internet. The 2017 After Access Survey, a nationally representative survey on the access and use of ICTs, indicates that Internet penetration is highly aligned with smartphone penetration, while smartphone penetration is highly aligned with GNI per capita. Mozambique, one of the world's least developed countries (LDCs) (UN, 2021), has a household internet access of 1%.

Rural households rarely have access to telecommunications. The country has a high variance in mobile phone ownership and high gender gap in internet usage, with more males than females having access to both (Gillwald & Mothobi, 2019). Broadband extension is insufficient beyond the major urban centres. The ICT gap can be strongly linked to other forms of social and economic exclusion, such as low income, unemployment, poor education and isolation. Survey findings by Research ICT Africa (RIA) in its 2017 After Access report (RIA, 2020) show that the level of Internet use increases with the level of education. It is interesting to note that widespread use only happens at tertiary and vocational levels, whereas most indices trying to assess skills or e-literacy use school throughput as their indicator. In Mozambique, there is a significant gap between secondary and vocational levels use.

The United Nations Children's Fund (UNICEF), in collaboration with Universidade Pedagógica de Maputo (UP-Maputo), carried out the 'Rapid Learn Telephone Survey' from August to September 2020 across all provinces of Mozambique. It resulted in 1,644 completed interviews with a sub-sample of 2,289 caregivers and response rate of about 71%. The survey found that the COVID-19 pandemic had caused shocks in the form of disruptions in family income and food insecurity for most of the sampled households, which could exacerbate poverty and malnutrition, undermining children's participation in distance learning. The survey identified five main shocks: (i) increased prices of major food items; (ii) increased prices of farming/business inputs; (iii) illness, injury, or death of the income-earning member; (iv) disruption of farming, livestock and fishing activities; and (iv) a drop in prices of farming/business outputs. Close to two thirds of respondents declared food insecurity. In addition, job loss was more prevalent in the south than in the centre and north regions (25% in the south against 15% and 12% in the centre and north, respectively). The drop in prices of farming/business outputs was more common in the north and centre regions (28% in the north) than in the south (15%).
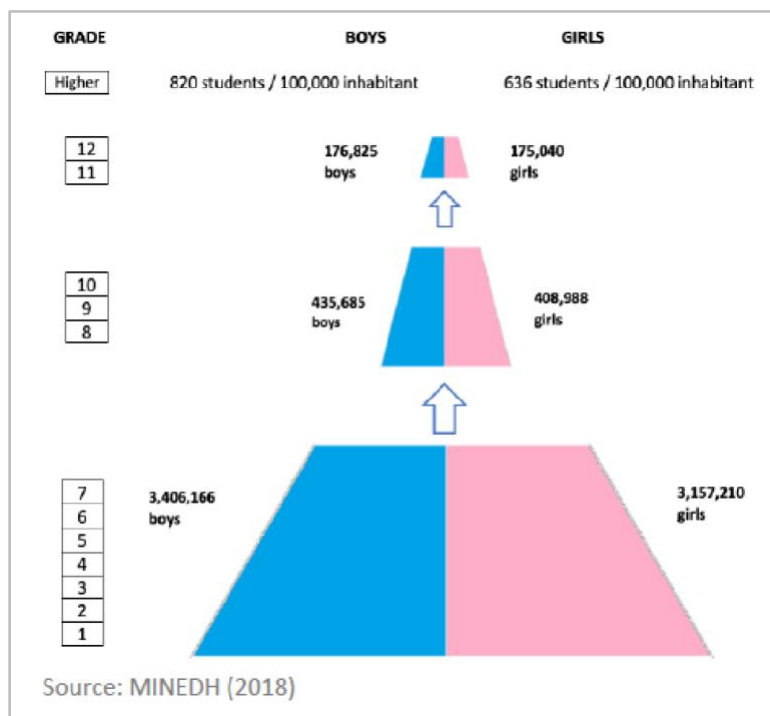
Figure 1: School access and retention in Mozambique

The most common coping strategy was that of engaging in additional income-generating activities (22%) followed by reducing consumption (11%). However, for unclear reasons, 37% of respondents

reported not doing anything to face the shocks. The inertia has had implications on children's engagement in distance learning (UNICEF, 2021a).

Aligned with the national and international development Agenda, the Strategic Plan for Education (PEE) 2020-2029 aims to train *"citizens with knowledge, skills, moral, civic and patriotic values capable of contributing to the development of a cohesive society adapted to the constantly changing world"*.

Its three priorities are to:

1. **Ensure inclusion and equity in access, participation, and retention** for all (children, youth, and adults) by providing access to a complete cycle of school readiness, primary and lower secondary education.
2. **Ensure the quality of learning** by ensuring that all acquire basic literacy, numeracy, and life skills.
3. **Ensure transparent, participatory, efficient, and effective governance** by enhancing the capacities of ministry of education's staff to enable education sector planners and managers to practice evidence-based policy and strategy[3]

The ESP also addresses the impact of natural disasters, which affected the implementation of the previous plan. A Global Partnership for Education (GPE) grant of US$ 15 million for 2020-21 through UNICEF aimed to set up a crisis management strategy by providing distance learning programmes through radio, television and online education programmes. The strategy was meant to ensure psycho-social support to children experiencing stress, anxiety and trauma caused by school closures. The grant aimed to enable the re-stocking textbooks in priority locations when schools reopen, and provision of remedial classes to target students who have fallen behind, including those with special educational needs.

4. EDUCATION SECTOR IN MOZAMBIQUE

4.1. The System of Education in Mozambique

Education is one of the social sectors belonging to the priority area of social and human capital in the Mozambican Government's agenda for national development. The Education Sector, as defined by the National Directorate of Planning and Budget (DNPO), is divided into two categories: General Education, and TVET and Higher Education. General Education is administered by the Ministry of Education and Human Development (MINEDH). It includes pre-primary education, primary education, teacher training for primary education, secondary education, distance education, school libraries, and general education sector administration. TVET and Higher Education subsectors are overseen by the Ministry of Science, Technology, Higher Education, and Technical Professional Training (MCTESTP).

Mozambique invests a significant fraction of its public budget in education with expenditure representing about 17.9% of the State budget, and 5.8% of the GDP (UNESCO Institutes figures for 2018). However, over 90% of the sector budget is allocated to salaries and related expenses, leaving little margin for larger investment and financing of inputs to improve learning. Basic learning materials

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[3] www.globalpartnership.org

(including textbooks) and school functions (excluding salaries) still depend quite heavily on external support. While 94% of girls in Mozambique enrol in primary school, more than half drop out by the fifth grade due to child marriage and early pregnancy, only 11% continue to study at the secondary level, and just 1% continue to college.

In 2018, Mozambique made education compulsory by law for children between age 6 and 15 years and the number of students enrolled in 2019 almost tripled. According to the Ministry of Education and Human Development, the number of students increased from 2,496,996 in 2000 to 6,938,434 in 2019 The Gender Parity Index is 0.91 for upper primary and lower secondary education. However, over 70% of children and adolescents do not complete basic education, with gross completion rates stagnating for the past 10 years. Over one-third of students drop out before reaching grade 3, with a higher dropout rate for girls. An estimated 140,000 children are out of school (UNESCO UIS data for 2019).

Mozambique revised its National Education System (SNE) Law in December 2018, establishing a new structure for the sector, increasing mandatory education from seven to nine years and abolishing fees for lower secondary, thus alleviating school-related costs. The primary education cycle was reduced from seven to six years, and the secondary education cycle increased from five to six years, whereas preschool was recognised as a sub-sector of education, although not a requirement to enter primary school. Higher Education, which comes under the Ministry of Science, Technology, Higher Education, and Technical Professional Training (MCTESTP), consists of universities, higher-learning institutes, teacher colleges, scholarships, as well as technical vocational education and training (TVET) (UNICEF, 2019). The six subsystems are: (i) Pre-school Education; (ii) General Education; (iii) Adult Education; (iv) Professional Education; (v) Teachers Education and Training; (vi) Higher Education. They have specific objectives and target diverse groups of learners.

The Education Sector planning and budgeting is guided by the 2012-2019 Education Strategic Plan (PEE) that prioritises (i) access to quality primary education and (ii) greater attention to early childhood development.

Beyond the two main priorities, the education strategy also emphasizes post-primary education for economic development; diversification of school curriculum; introduction of technology in teaching; good governance of education resources; and improved management of education institutions and education systems at the district level[4] (UNICEF, 2019b).

Global evidence shows that most children who attend school in resource-deprived contexts learn to read better in the language they speak at home. Since only 1 in 10 Mozambican children speak Portuguese at home, providing bilingual education in early grades is critical to improving reading. The government of Mozambique has made bilingual education a priority, but implementation has been difficult due to a lack of training for teachers and understanding among parents and communities. The Ministry of Education and Human Development (MINEDH) is therefore working with USAID to implement data-driven reforms designed to improve reading outcomes in the early grades. Since 2016, USAID has worked with MINEDH to implement a bilingual education policy, as well as to improve early-grade reading instruction and increase parental and community engagement (USAID, 2021).

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[4] MINEDH. Education Strategic Plan (PEE) 2012-2016. Page 35.

Early childhood education interventions have increasingly become a priority of the Mozambican government to support all children to reach their full potential. One of the top priorities of the 2012-2016 (expanded to 2019) Mozambique's strategic plan for education is integration of pre-primary education in the National Education System and "encouraging a holistic and integrated approach at Government level, aimed at the development of children in the pre-school age (0-5 years)". The intent is to guarantee that each child is well-prepared to enter the education system. Numerous challenges include the lack of pre-primary institutions, especially in the Zambézia province. The poverty rates in Zambézia are among the highest in Mozambique and the province has one of the largest child populations in the country (UNICEF, 2017). Where education institutions do exist, they often suffer from infrastructure issues, including lack of water and power, lack of materials, first aid supplies and canteens (UNICEF, 2019).

The revised National Education System Law (2018) recognised, for the first time, preschool as a subsystem of education, consolidating ECD (Early Childhood Development) as a priority of the sector. Currently, only 4% of 3-5 years old children have access to ECD programmes, among wealthier families and in urban settings. The inclusion of preschool as a new subsystem in the revised education law creates a conducive environment for its development and expansion to reach the most disadvantaged and rural areas of Mozambique.

4.2. Primary Education

The government remains committed to investing in education. Yet, efficiency challenges still plague the system. Almost two million primary-school-age children do not attend school. More than one third of students drop out before Grade 3 and less than half complete primary, well below the average in Sub-Saharan African countries. In upper primary, the gender gap increases, as more girls abandon school prematurely. In terms of access, only 3.5% of children between 3 and 5 years were enrolled in preschool in 2019, but the number of students in primary education doubled between 2004 and 2018.

From the early days of national independence in 1975, the central aim of the educational policy in Mozambique has been to ensure that all school-age children have access to school and can remain there until they have completed their basic education. Mozambique therefore extended access to primary education and reached a net rate of school coverage of almost 100%. However, the outstanding increase in school enrolment rates has not seen any improvement in the quality of education. A study conducted by the United Nations University (UNU) identified and analysed the factors that might explain the paradox of 'schooling without learning.' The findings point to weak state capacity to deliver quality education and high dependence on external aid. There is also low community involvement in the learning process and low participation of parents and communities in school management. These factors impact on the quality of education in primary schools (Mário et al, 2020).

Since the end of the civil war in 1992, the Government of the Republic of Mozambique (GRM) has been rebuilding its education system with the goal of providing universal access. Under the policy of free and compulsory primary education, the primary education net enrolment ratio has expanded from 52% in 1999 to 94% in 2016, with a gross enrolment rate of 118% in 2020 (UNESCO Institute of Statistics; http://uis.unesco.org/). The gross enrolment rate in lower primary increased from 59% in 1988 to 92.1% in 2000. While access increased, the quality of learning did not follow suit. Additionally, the rapid expansion placed intense pressure on school management, teaching personnel, and the

overall quantity and quality of effective classroom instruction, resulting in overcrowded multi-shift schools (65 pupils per teacher, on the average) and accompanied by poorly trained and unmotivated teachers (MINEDH, 2017), growing student/teacher ratios, and plummeting reading and maths test scores. Due to teacher absenteeism, limited instructional time, and other negative factors, Mozambican schools have on average, 30 days of actual instructional time per 193-day school year.

School-age population by education level	
Pre-primary	2,938,727
Primary	6,096,907
Secondary	3,758,706
Tertiary	2,925,519

- Compulsory education lasts 0 years from age 0 to age 0
- For primary to post-secondary education, the academic year begins in February and ends in February
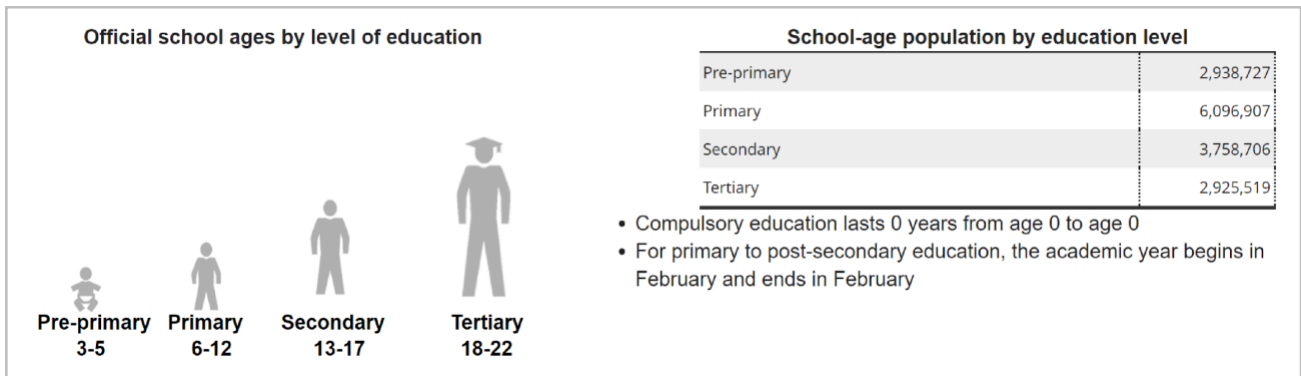
Figure 2: Age breakdown of learners

Source: UNESCO, UIS.

The overall primary school completion rate in Mozambique is alarmingly low. In 2018, only around a quarter of all pupils completed the seven years of basic education. The overall literacy for Mozambicans over 15 years old is 58% (45% for females). Completion rates have stagnated within the last 3 years due to inadequate infrastructure, poor teaching methodologies, limited instruction and time in school and high absenteeism among students, teachers, and school administrators. As a result, less than 5% of students demonstrate the desired grade-level reading proficiency by grade 3 (USAID, 2021).

From 1975 to 2018, the number of primary schools increased from 1,000 to 12,768, and enrolment has more than tripled to over 6.5 million students currently. Unfortunately, the educational quality did not improve with increased access to schooling. In 2016 only 4.9% of children achieved the required reading and writing skills, dropping from 6.3% in 2013. Every year, 1.4 million children are enrolled in school, so the pressure on the Mozambican education system is extremely high. There is a lack of qualified teachers, administrative staff and head teachers, and the high rate of absenteeism among school staff is a fundamental problem. Illnesses, including HIV, are the main reason for staff absenteeism.
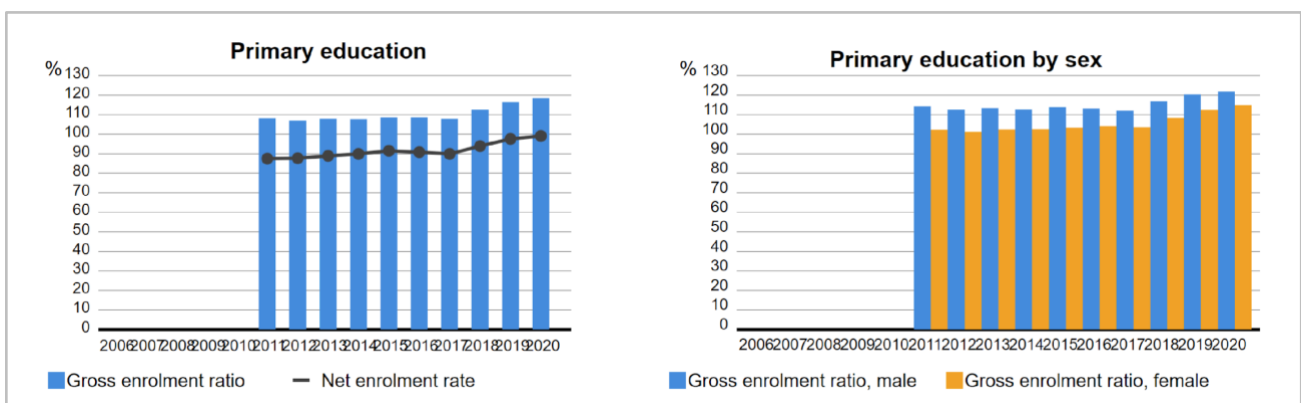
PRIMARY EDUCATION	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Gross enrolment ratio (%)										
Total	108.22	106.9	107.86	107.6	108.63	108.65	107.81	112.6	116.38	118.42
Female	102.28	101.23	102.39	102.5	103.43	104.14	103.63	108.41	112.37	114.93
Male	114.2	112.62	113.35	112.72	113.84	113.16	112	116.79	120.38	121.9
Net enrolment rate (%)										
Total	87.5	87.7	88.9	89.9	91.5	90.8	89.9	93.9	97.6	99.1
Female	84.7	85	86.2	87.3	88.8	88.7	88.2	92.5	96.3	…
Male	90.3	90.5	91.6	92.5	94.3	92.8	91.5	95.4	98.9	…

Figure 3: Schooling enrolments by gender

Source: UNESCO UIS.

The above figure shows significant improvements towards universal education with the gross and net enrolments improving over the past 10 years. However, as the following table shows, boys show a higher enrolment rate in primary schooling than girls as well as a higher survival rate to the last grade than girls. Significantly, the girls transition rates from primary to secondary schooling show that girls transition more than boys.

Table 1: Transition rates by gender

	TOTAL	MALE	FEMALE	
School life expectancy ISCED 1-8 (years)	9.97	10.47	9.49	(2017)
Percentage of repeaters in primary (%)	6.9	7.3	6.4	(2020)
Survival to the last grade of primary (%)	43.07	43.47	42.66	(2019)
Gross intake ratio into the last grade of primary (%)	58.2	61.3	55	(2020)
Effective transition rate from primary to lower secondary general education	68.7	66.4	71.3	(2018)

Source: UNESCO UIS.

According to the Mozambique Ministry SACMEQ 2017[5] report, Universal access to primary education was achieved shortly after independence but it dropped significantly in the subsequent years due to the economic crisis and civil unrest. Most primary school pupils attend school on a double shift basis. The common basic learning materials are scarce or absent in many schools. The quality of educational facilities is often poor and a large proportion of teachers at all levels is under-qualified for the posts they hold. Twenty-one per cent of all teachers at lower primary level and seventeen per cent of upper primary level teachers are untrained and the majority received only ten years of academic preparation and one year of professional training (SACMEQ 2017).

4.3. Secondary Education

Mozambique's educational levels are among the lowest in the world. Less than 4% of the population has received some secondary education, by far the lowest in Southern Africa. Gross rates of

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[5] Carlos Lauchande, Gloria Manhica, Celso Mateus, (2017) in SACMEQ IV, National Reports, Mozambique. Mozambique Ministry of Education

secondary education have remained below 40% in the last seven years and net rates have followed the same pattern, being around 20% (MINEDH, 2020). At 26%, Mozambique's gross enrolment in secondary education is the lowest in Southern Africa, six per centage points behind Angola, the next-lowest country. Barely eight per cent complete secondary, and just 136 of every 100,000 go on to university highlighting the skills shortage that the country faces.

School dropout and attendance are associated with both demand and supply-side factors. Financial constraints and school-associated costs, distance to school and poor school infrastructure and materials are the main factors leading to high dropout and low attainment.

Distance to school is a key obstacle throughout the country, especially for girls. On average, 65% of the population aged 10 to 19 years old lives 5 km or more from the nearest lower secondary school, and 52% lives more than 10 km away. There are currently only 0.1 secondary schools and 1.2 classrooms per 1000 children aged 10 to 19 in Mozambique.

There are large geographical differences in terms of school availability, with the Northern and Centre regions showing the largest deficits. School infrastructure also presents big shortcomings. 40% of schools do not have proper toilet facilities and at least 30% do not have access to water. This has a larger impact on girls and is usually reported as one of the main obstacles for girls to attend schools (World Bank, 2020b). Ensuring that every person has the appropriate skills for an ever-growing digital and globalised world, is essential to promote inclusive labour markets and to engender innovation, productivity, and growth.

The strategic goal of the Ministry of Education and Human Development (MINEDH) is to increase the enrolment in lower secondary education from the current 60% to 85% by 2024 and 90% in 2029. This goal will clearly require expanding graduation from upper primary, and increasing the availability of schools, classrooms, and teachers (World Bank, 2020b). There are currently about 12,737 primary schools in the first cycle (grades 1 to 3), 7,921 schools in the second cycle in Mozambique (grades 4 to 7). There are 556 lower secondary and 293 upper secondary schools.
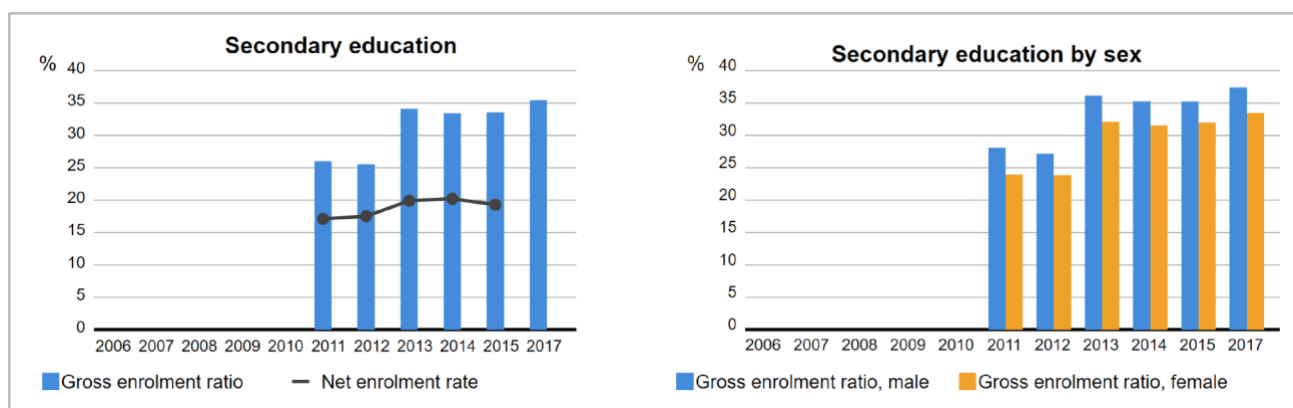
SECONDARY EDUCATION	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Gross enrolment ratio (%)										
Total	26	25.51	34.09	33.38	33.57	...	35.41	...	...	...
Female	23.94	23.85	32.11	31.54	31.95	...	33.45	...	...	...
Male	28.09	27.19	36.11	35.25	35.22	...	37.39	...	...	...
Net enrolment rate (%)										
Total	17.1	17.5	19.9	20.2	19.3	...	...	...	...	...
Female	16.4	16.9	19.4	19.9	19.3	...	...	...	...	...
Male	17.8	18	20.5	20.6	19.2	...	...	...	...	...

Figure 4: Secondary school enrolments by gender

Source: Unesco UIS.

While there is a rapidly growing demand for access to secondary schools, it is anticipated that an average class will contain upwards of 60 students. This is likely to severely limit the range of methodologies adopted by their teachers. It is far from evident that there will be technology available to support teaching (GPE, 2020). Also, low levels of educational attainment limit the potential of Mozambicans to benefit from the opportunities that new technologies offer. The country may benefit from more ambitious investments in education and fast track education scenarios, more especially for girls.

4.3.1. Strategic Plan for Education (2020-2029)

The Government approved a new Strategic Plan for Education (2020-29) focusing on primary and secondary education, which forecasts a fast expansion of secondary education following changes in the Education Law introduced in 2018 and extends mandatory and free education from seventh to ninth grade.

Coordinating with the higher education system mechanisms that ensure the supply of better trained secondary education teachers, both incoming and in-service, will be critical for the provision and expansion of quality of secondary education: this will also be addressed by MozSkills. Through the 'Improvement of Skills Development in Mozambique' (Mozskills) project of the World Bank, Mozambicans will have increased opportunities to access quality education and training at TVET and HE levels in priority areas across several technical and higher education institutions to be selected competitively. The selection will be done among existing institutions providing training in several areas including ICT. The project will support quality improvement in HE in strategic areas relevant to future economic development, with a focus on STEM (Science Technology Engineering and Math) areas, including climate change and training programmes for secondary education teachers, as well as strengthening selected flagship TVET Institutes for high-quality skills development in industrial maintenance, agriculture, and ICT sectors and by operationalizing a National Training Fund which will leverage private sector contribution for skills development especially targeting, out of school youth and employee training.

MozSkills also aims to create a conducive policy environment and strengthen institutional capacity for higher education and TVET. This component will strengthen the institutional capacity at governmental regulatory institutions HEIs and TVET institutions, in strategic planning, management, quality

assurance, monitoring & evaluation, and development of EMIS and e-learning platforms for the continuous improvement of HE and TVET sectors (ANEP, 2019).

4.4. TVET

As shown in the following table approximately one quarter of secondary students were enrolled for TVET education over the period 2011 to 2020, with the number of females lower than males.

Table 2: Enrolment rates in TVET by gender

Enrolment in technical and vocational education and training (TVET) as % of the total enrolment in secondary education										
Total	7.82	6.93	7.65	8.4	8.27	...	24.09	...	...	...
Female	6.3	5.5	6.4	6.8	7	...	17.2	...	...	...
Male	9.1	8.1	8.8	9.8	9.5	...	29.8	...	...	...

Source: Unesco UIS.

The TVET system in Mozambique comprises different public and private providers and is offered as formal or non-formal training. Formal TVET includes the basic level equivalent to lower secondary education (10 grade equivalent); the medium level, which corresponds to upper secondary education (equivalent to 12 grade); and the polytechnic level, which corresponds to higher education.

Technical schools and institutes offer formal three-year TVET programmes at the secondary education level in commerce, industry, and agriculture. The aim is to train skilled workers for the labour market. Students who have successfully completed the lower secondary education level can proceed to an upper secondary TVET programme lasting three years. The upper secondary TVET programme is also open to applicants who have completed academic lower secondary programmes. Tertiary education is accessible to graduates of upper secondary TVET programmes.

The TVET system in Mozambique is governed by the Ministry of Science, Technology, Higher Education and Professional Training (MCTESTP) and the Ministry of Labour, Employment and Social Security (MITRAB) through the National Institute for Employment and Professional Training Institutes (INEFP). The INEFP is responsible for non-formal TVET programmes. Non-formal TVET programmes are offered in the form of short-term vocational training programmes (in commerce, agriculture, and industry) and are targeted to youth who have dropped out of primary and secondary schools, as well as workers from companies. There are ongoing improvements to the non-formal education system, including attempts to recognise non-formal education in the national qualification framework (NQF) through a Recognition of Prior Learning (RPL) system. The National Directorate for Professional Technical Education (DINET), under the MCTESTP, is responsible for the formal TVET system.

Technical skills are highly valued by Mozambican firms. The results of a recent enterprise survey indicate that firms need, on average, almost nine weeks to fill a managerial vacancy, almost eight weeks to fill a professional vacancy and five weeks to fill a vacancy at the technical level (such as plant and machine operators and assemblers, clerical support, and service and sales) (World Bank, 2020c).

In 2006 the Mozambican Government launched a Technical Vocational Education and Training (TVET) Reform programme known as PIREP (Programme Integrado da Reforma da Educação Profissional), which received funding from the World Bank and several bilateral partners (Spain, Germany, The Netherlands, Italy, Portugal, Denmark, Canada, and others). The TVET reform aimed to train young Mozambicans to become competent participants in a rapidly changing economy. The 1st phase of PIREP ended in 2011 and more than 50 qualifications in three levels have already been developed in seven fields including ICT. All students enrolled in vocational and technical schools, irrespective of the qualification, must study ICT modules. Besides, there are ICT Qualifications to train middle level professionals in Web Programming and Computer Network. Combining technical competencies with digital skills, PIREP is one of the most important ICT programmes in the education system (World Bank, 2019). The new TVET system is demand driven, integrating education and work, and is inclusive of girls and women, and urban and rural youths. It has a competency-based curriculum designed with wide involvement of the private sector.

MoZSkills' TVET activities are consistent with the Ministry of Science, Technology, Higher Education and Professional Training (MCTESTP) Strategic Plan for Professional Education (2018-2024), which highlights the need to increase access, quality of training to enhance the employability of graduates and governance and financing of the system including through increased collaboration with the private sector.

4.5. Higher Education

There are currently 53 higher education institutions—19 accredited universities, 27 institutes, 4 schools and 3 academies. Student enrolment in higher education in 2020 stood at 240,000 students and is projected to grow to 380,000 by 2030. While the private sector accounts for 58.5% of all HEIs, the public sector accounts for most student enrolment (61.5%). Despite the growth in student enrolment, the Gross Enrolment Ratio for higher education in Mozambique was only 7.3% in 2018, below the estimated average for sub-Saharan Africa of 9.4%, and far below the world average of 38.8% for the same year.

Mozambique has a rapidly expanding working-age population. Youth unemployment represents a sizeable economic loss. Providing young people with quality education and training opportunities will enhance their employability as well as economic growth. While the portion of public education funding dedicated to the higher education system increased from 15.3% in 2009 to 18.4% in 2014, a 2019 UN University study found that university graduates in Mozambique most often described their entry into the job market as difficult. Often, the jobs that they could find (usually 18 months after graduation), did not correspond to their qualifications or skills set, had low job security and poor pay. 18 months after graduation, 23% of graduates were still unemployed (Mouzinho et al, 2019). Women and persons with disabilities face difficulties, compounded by gender biases and accessibility issues as shown in the following figure and table.
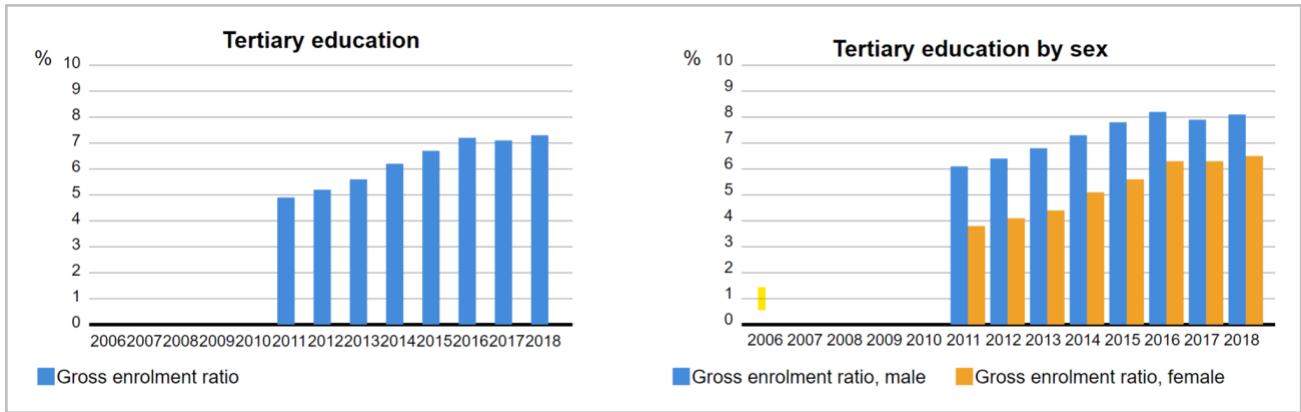
Figure 5: Enrolment rates in tertiary education by gender

Source: UIS.

Table 3: Increasing participation rates in tertiary education

TERTIARY EDUCATION	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Gross enrolment ratio (%)										
Total	4.9	5.2	5.6	6.2	6.7	7.2	7.1	7.3	…	…
Female	3.8	4.1	4.4	5.1	5.6	6.3	6.3	6.5	…	…
Male	6.1	6.4	6.8	7.3	7.8	8.2	7.9	8.1	…	…

Source: UIS.

While the above rates are increasing, they are still lower than the OECD (Organisation for Economic Cooperation and Development) norm with the female participation rate lower than for males even though more girls than boys had transitioned from primary to secondary school.

The project activities of the World Bank project, MozSkills, are well aligned with the six strategic areas identified by the Mozambique's Strategy for Higher Education (2012-2020) namely expansion with quality; improving management capacity at the HEIs level, promoting a culture of democracy and transparency in management; improving financing mechanisms and ensuring adequate infrastructure; improving teaching, research and students' services; strengthening internationalisation and regional integration, including actions to implement international assessment mechanisms, partnerships for teacher training, academic research and student exchanges. The strategic area of 'expansion of quality' integrates actions to promote growth and equitable access to HE with international standards of quality; increased diversification of HEIs; increases in the number of scholarships and intensified use of ICTs and distance learning.

4.6. Non-formal education

Non-formal education relates to adult education, though children under the age of 14 are increasingly participating in adult education programming, indicating the insufficiency of current educational programming at this level. In Mozambique, where more than half of the population lives below the poverty line, the need for effective Non-Formal TVET (NFTVET) is evident due to the dominance of subsistence agriculture that involves 80% of the economically active population, the lack of capacity

for job creation, insufficient skills development programmes (Alzira et al., 2016) and the important youth bulge.

The Ministry of Youth and Sport (MYS) is responsible for all matters related to youth, including the implementation of the National Youth Policy (2014-2023), which advocates for the government 'to adopt measures that encourage the initiatives of young people, towards the eradication of poverty, particularly in simulating income-generating activities that contribute to the development of the country's economy'.

5. ICT INFRASTRUCTURE FOR EDUCATION IN MOZAMBIQUE

5.1. Infrastructure in schools

Mozambique considered the potential in the use of Information and Communication Technologies (ICT) in education early on. Within the framework and scope of its ICT Policy, it endeavoured to encourage and develop the teaching of computer science at various levels of the National Education System (NES); as well as promote the use of internet in school whilst preparing teachers to be ICT promoters. of Information and Communication Technologies (ICT) in education. Within the scope of its ICT Policy Mozambique undertook to encourage and develop the teaching of computer science in many different levels of the National Education System (NES); to promote the use of the internet at schools; to prepare teachers to be ICT promoters. It also planned to progressively provide schools with the equipment needed to access internet and enable the implementation of the *Mozambique ICT* (2000) policy (Cossa, 2022). Consequently, Mozambique developed an Educational Sector Technological Plan (ETP) in 2011 and which is to be completed by 2026. As reported by Cossa, the ETP provides an overview of the impact of ICT on teaching models and learning paradigms in Mozambique. Pillar 1 of the ETP is on Information and Communication Technologies. It aims to leverage the National Education System (NES) through ICT and internet access, with equipment and connectivity being essential for the ETP implementation. The two key areas of action in terms of technological infrastructure provision in order for the integration on ICT in the education system consisted of 1) equipping all schools (i.e., classrooms) with computers and equipment to support new pedagogies as well as encourage learners to use computers with a proposed allocation of one computer for five learners; 2) connectivity through internet access to all schools and the development of local network infrastructures in schools.

It is evident, as this desk review shows, that the limited availability of resources does not give Mozambique the means of its ICT in education ambition. The integration of ICT in education requires electrical and telecommunications infrastructures and therefore important investments. Even though the Ministry of Education included ICT in the educational curricular, in the absence of adequate infrastructure, any progress will be stalled. Schools remain unable to make use of ICT in the teaching and learning processes due to weak internet access and lack of electricity.

5.2. Infrastructure in TVET

With regard to skills development and the digital agenda, the World Bank project 'Improvement of Skills Development in Mozambique' (2020-25) (Mozskills) will invest in Technical, Vocational Education and Training (TVET) and Higher Education (HE) subsystems to improve access and quality

of educational curriculums and skills development training in response to the country's priorities and economic sectors, through a USD 104 million grant from the International Development Association (IDA). Priority areas selected for higher education level are agriculture, engineering, oil and gas, construction, transport and logistics, services, energy, information communication technologies (ICTs), health and education. Priority areas for TVET are agriculture, industrial maintenance, services, logistics tourism and hospitality, construction, and ICTs. These areas are subject to change, based on future relevance and strategic needs. A key objective of the project is to contribute to the Digital Agenda: the World Bank will support the development of digital skills and entrepreneurship. Curriculum review, provision of equipment, training of teachers in ICT skills to enhance the use of educational technologies will be part of project activities (World Bank, 2020c).

The project will also leverage on the support to strengthen the digital skills country action plan through the Regional Digital Economy for Africa (DE4A) Initiative which forms part of the World Bank Group's support for the African Union's Digital Moonshot for Africa that aims for every African individual, business, and government to be digitally enabled by 2030.

Furthermore, the COVID-19 pandemic has highlighted the importance of access to digital technologies to enable continuity of learning across the various levels of education. Investments in the Digital Agenda for Mozambique (World Bank, 2020c) therefore aim to include:

- Skills development and support to create online content. That includes digital and online instructional skills development of educators and lecturers;
- Digital content creation;
- Selection and acquisition of Learning Management Systems (LMS) to host the content and to deliver courses;
- Setting up or strengthening a Data Centre and/or using Cloud to host the LMS;
- Connectivity to the Data Centre which could include bandwidth to university or the national research and education network (NREN) if they host the Data Centre;
- Provision of devices to teachers and students.

5.3. Infrastructure in Higher Education

Eduardo Mondlane University (UEM) introduced computer engineering to the Faculty of Engineering in the 1980s. The development of the Internet and the launch of courses on basic computer skills for teachers, students, and civil servants in general in 1993 was seen as the start of a new phase in the introduction of ICT. The university begun then to serve as an Internet provider for public institutions and provided the use of email for the academic community and non-academic staff. In the 2000s, with curricular reform and a national ICT policy and action plan, the university installed computer rooms in some faculties and promoted their use in teaching and learning (Muianga, 2019).

The Strategic Plan for Higher Education 2011–2020 stipulates that one of the main objectives of curricular reform was to promote the use of student-centred learning (SCL) in all pedagogical activities, to raise the quality of education and the relevance of the programmes offered (MINED, 2011a). The curriculum reform process introduced SCL and ICT as tools for teaching and learning, while recognising the need to provide teachers with the skills and abilities to introduce the changes and pedagogical practices necessary for this new reality.

As part of the Digital Economy for Africa (DE4A) initiative, the World Bank commissioned a feasibility study to develop an operational roadmap to connect all African higher education institutions (HEIs) to high-speed Internet. Universities and research institutions should be connected to enable the expansion of opportunities for teaching, learning and innovation to foster relevant digital skills. With a projection of 291,000 higher education students by 2025, higher education institutions will need at least 581 Gbps to serve the institutions' bandwidth requirements across the country. This will rise to 344,000 students and a 7 Tbps of bandwidth by 2030. Higher education enrolment in Mozambique grew from 103,850 students in 2010 to 239,000 students in 2020.

From a sector perspective, the following are factors that inhibit better connectivity as well as the use of ICTs in higher education: ICT as a subject has not been fully incorporated into the curricula at all levels of education. This points to a lack of awareness among higher education institutions and other government agencies about the importance and potential benefits of ICT for both learning and the country's socio-economic development. Low digital literacy among lecturers/tutors compounded by insufficient computing equipment for students and staff as well as the high cost of broadband services; limited or no training in the use of ICT in teaching and learning, and lack of appropriate digital content to support teaching and learning (World Bank/Knowledge Consulting Ltd, 2021).

5.4. Infrastructure for Non-formal education and Lifelong learning (the General Public)

Over the last five years, the country's nascent digital ecosystem has experienced an increase in the supply of new intermediaries like incubators, accelerators, and tech hubs, which provide a wide range of services for entrepreneurs and start-ups. Most active hubs and incubators, however, are concentrated in Maputo, leaving the rest of the country unattended. Despite the achievements in reducing registration times, procedures and costs, significant barriers inhibit growth of digital entrepreneurship in Mozambique, including the absence of a government-led entrepreneurship agenda. Mozambique needs to gain a larger mass of digital entrepreneurs, albeit through the non-formal learning sector, to build its digital ecosystem and kick-start its digital transformation of home-grown innovative solutions and local content. The wide Digital Literacy gap that excludes the poorest from the benefits of the digital world is a critical element that needs to be urgently addressed.

There is a variegated type of skills that are needed: technical and professional skills, including ICT specialist skills for workers who drive innovation and to support digital infrastructures and the functioning of the digital eco-system; ICT generic skills for workers and citizens alike, to be able to use digital technologies; and ICT "soft" skills, such as leadership, creativity, communication and teamwork skills, required for the expanding number of opportunities for ICT-enabled collaborative work (World Bank, 2019).

6. ICT POLICIES FOR EDUCATION IN MOZAMBIQUE

6.1. General Observations

To realise the full potential of technology to support the development of its education sector and economy, Mozambique must address several challenges (The State of ICT in Mozambique 2018 - Research ICT Africa). Mozambique has made considerable efforts to reduce data prices and ranks

24th out of 49 countries on RIA's African Mobile Pricing (RAMP) Index. However, with a mobile phone ownership of 40% and an internet penetration of only 10%, it has not reached the 20% critical mass needed to take advantage of the network effects of ICTs associated with economic growth and development, and to harness the opportunities for the public and private sectors provided by the digital economy. While effective regulation and competitive markets by the Instituto Nacional das Comunicações de Moçambique (INCM) may provide effective regulation of open and competitive markets and therefore drive affordable access to broadband networks, it is evident that most citizens are unable to afford devices or to use broadband consistently.

The use of ICT in the education sub-sectors therefore remains low, even though the utilisation of ICT has been part of the vision of the Ministry of Education in its strategic plan for education and culture, 2006 – 2010/11, with the aim to 'Make the school a development centre'. The plan at the time, recognised the importance of computer skills (as a component of Information and Communications Technology) in the labour market and proposed to provide opportunities for secondary students to develop computer skills. In addition, Mozambique's 'Technological Plan for Education 2011: Information and Communications Technologies to Enhance Education in Mozambique'[6] came in three parts: (1) a Strategy Paper with a medium and long-term view for education and ICT; (2) a Five-Year Action Plan; and a related (3) Communication and Mobilization Plan.

However, there are many obstacles still to overcome. These include severe illiteracy rates, lack of basic infrastructure, such as tele-density and electricity in many areas – there is room for significant improvement. A more diversified, productive, and inclusive economy will require greater investment in human capital. Lack of skills resulting from a poorly performing education sector represents a severe challenge.

The UNESCO Guidelines[7] suggest the use of low-cost devices for use in education using low-cost technologies in low resourced settings. These included systems built for use on basic mobile phones ('low-bandwidth'), and systems with strong offline functionality ('no-bandwidth'). Use of mobile technology for learning would offer a degree of support for under-trained teachers, and the virtual breakdown of the education system[8]. Existing learner materials in Tsonga (from South Africa) and Portuguese from Angola could be obtained to enhance learning in Mozambique.

The country's digital transformation is accelerating with 21% of the population using mobile networks to access the internet. In addition, responses to mitigate the impact of the COVID-19 pandemic has speeded up the adoption of online platforms and remote work systems. Nevertheless, there remains a significant discrepancy in connectivity between urban and rural areas in Mozambique. Maputo is the largest and best-connected city although challenges in infrastructure, market maturity and affordability cripple connectivity throughout the country. Data traffic is expensive out of Maputo: data is therefore more expensive in the north of the country than in the south.

In terms of cybersecurity, digital transformation poses threats to end-users including the Mozambican Government and the private sector. The Government has identified cybersecurity as a priority

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[6] Technological Plan for Education 2011: Information and Communications Technologies to Enhance Education in Mozambique (Ministry of Education, Republic of Mozambique, 2011),
http://www.ptemocambique.com/index.php?option=com_content&view=article&id=120&Itemid=29 8&lang=en

[7] UNESCO 2022. Guidelines for ICT in education policies and masterplans. ISBN 978-923-100518-3.

[8] Telecoms need to work with the ministry of education to ensure zero-rated data connectivity for accessing, using, downloading content from educational websites free of charge for the data consumed by accessing these websites.

component of the country's digital transformation process. It operates Maluana Park and four other data centres in the country. As part of the e-governance strategy, Maluana Park is set to centralise and host the Government's public administration computing systems. Amazon Web Services (AWS), Heroku, and Microsoft Azure are among many international companies that offer cloud services to Mozambique, but do not operate their own in-country data centres.

6.2. National ICT Policies

As indicated earlier, the starting point, or baseline, in terms of the existence of adequate infrastructures (electricity, telecommunications), equipment and the ability to use it, is still extremely low.

The lack of electricity at homes mitigates against the country's ICT policy and its commitment to achieving Sustainable Development Goal 7 of ensuring universal access to affordable, reliable and modern energy services for all by 2030. As the following chart shows the proportion of pupils with access to electricity at home is low and will be an impediment to implementing ICT in education. This is a 2017 figure and more recent figures may give a new perspective (SACMEQ, 2018)[9].
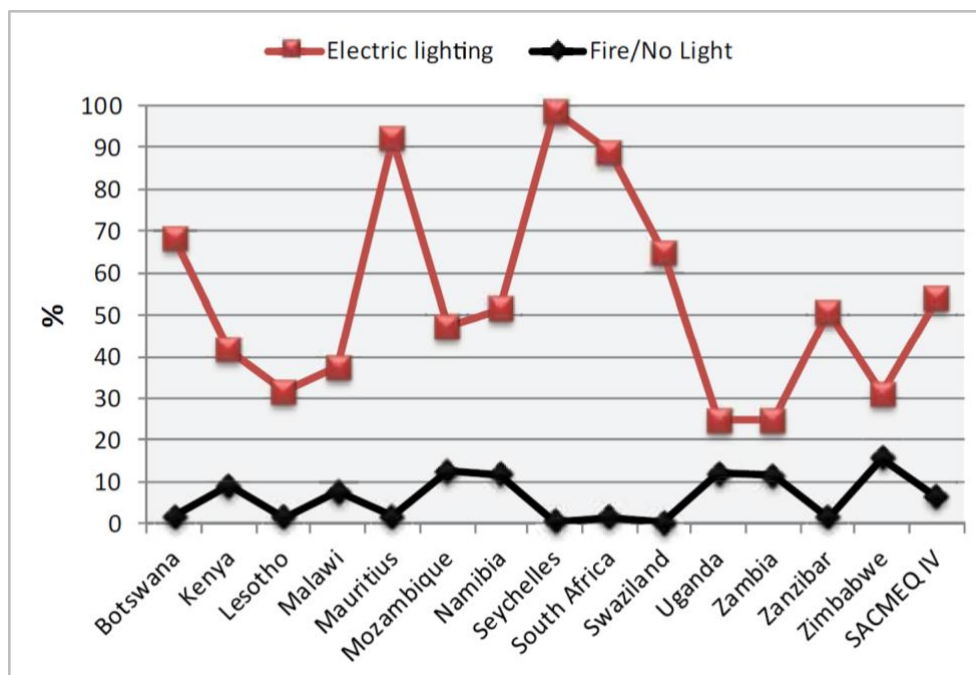
Figure 6: Pupils with access to electricity at their homes (%)

SACMEQ (2018)

The overall country electrification for the total population is 35% (2019), with urban areas benefitting of 57% electrification coverage and rural areas having an electrification of 22% (2019).

The modern phase of ICTs in Mozambique began in the 1990s with the first dial-up Internet services offered by the Eduardo Mondlane University Informatics Centre (CIUEM) in 1993. The CIUEM itself, an autonomous unit of the UEM, dates from 1983, and together with the government's Data

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[9] Department of Educational Planning and Research Services Research Unit | © SACMEQ 2017.

Processing Centre (CPD) launched several ICT initiatives. Presently, ICT policy, regulation and implementation are spread across multiple government departments and organisations. The Ministry of Transport and Communications is responsible for telecommunications policy. Responsibility for 'ICT policy,' which more conventionally includes the converging telecommunications and broadcasting or content sectors, but in this case refers to information technology (IT) and public sector use thereof, resides within the National Institute of Information Communication Technology (INTIC) – housed in the Ministry of Science and Technology.

For the government of Mozambique, the digital economy (also called the Information Society) is a key priority. ICT was consistently integrated into national development plans, with concrete benchmarks and targets to be achieved to maximise ICT's contribution to development goals. This vision was reinforced in 2017 with the National Strategy for Broadband and, in 2018 with the updated Information Society Policy of Mozambique that reiterates the importance of ICT for broader socio-economic benefits (World Bank, 2019). The Policy focused on education and human development as key areas for development, with the integration of technology in education expected to improve access and the quality of teaching and learning (Government of Mozambique, 2018).

6.3. Education Sector ICT Policies and Implementation Plan

The Government has prioritised activities aimed at increasing access to pre-primary education, reducing disparities in access to basic education, improving learning outcomes, and strengthening the provision of relevant, quality training at the post-basic level. The new Education Sector Plan (ESP) 2020-2029 is the education plan for the next ten years. Aligned with the national and international development agenda, the education sector plan (ESP) 2020-2029 aims to train "citizens with knowledge, skills, moral, civic, and patriotic values capable of contributing to the development of a cohesive society adapted to the constantly changing world" (MINEDH, 2020). Its three priorities are to: 1) Ensure inclusion and equity in access, participation, and retention by securing all children, youth, and adults' access to a full cycle of school readiness, primary and lower secondary education, 2) Ensure the quality of learning by making sure that children, youth, and adults acquire basic literacy, numeracy, and life skills, 3) Ensure transparent, participatory, efficient, and effective governance by enhancing the capacities of ministry of education's staff to enable education sector planners and managers to practice evidence-based policy and strategy. The plan also considers natural disasters, which affected the implementation of the previous plan, and includes a stronger gender focus across all priorities.

This shift from quantity to quality is directly supported by the World Bank, and at the basic education level, the key interventions in the Country Partnership Framework (CPF) that sets out the World Bank Group's (WBG) programme will aim at strengthening the ability of the system to deliver better results as measured by learning achievements. The World Bank will continue to support the delivery of early childhood development, allowing children to be better prepared for primary education. In basic education, the focus will be on the first cycle of primary education where dropout rates remain high, especially in the poorest and most rural communities, including many in the central and northern regions of the country. Strategies to improve retention and learning outcomes during the early years of primary education are expected to have stronger impacts in the poorer and more rural areas and thus disproportionate effects on poverty reduction. The World Bank plans to focus on increasing the number of professionally qualified graduates at post-basic and higher education level especially in the areas of science, technology, and agriculture, as well as strengthening the research capacities to produce research outputs of relevance to the strategic economic sectors such as oil and gas. Through

such interventions, the World Bank expects to contribute to improving the skills profile of the Mozambican population; provide better opportunities to acquire basic literacy and numeracy skills; and increase the supply of technical, market-relevant skills to enhance competitiveness and accelerate economic growth.

The Government five-year programme (2020-2024) aims to increase economic growth, productivity, and employment creation through the development of a more diversified and competitive economy, intensifying the productive sectors with the potential to increase income generation and create more job opportunities, especially for youth. The five-year government programme will focus on various sectors including agribusiness, fisheries, tourism, infrastructure-related sectors, and extractives.

7. ICT ACTIVITIES AND INITIATIVES IN PRE-PRIMARY, PRIMARY AND SECONDARY SCHOOLS

7.1. Equipment and Connectivity

As part of the Digital Economy for Africa (DE4A) Initiative, Mozambique's digital economy was assessed. The assessment indicated that Mozambique's Digital Infrastructure is still a long way from achieving broadband universal access. Broadband coverage is limited to provincial capitals and major cities, as well as main corridors of development, while rural areas lag behind. Gender disparity and urban-rural divides persist. Growth of high-speed internet is inhibited by poor infrastructure quality, while reaching out to under-served areas is challenging given the high costs of infrastructure deployment. The affordability of broadband-enabled devices as well as electrification rates are major barriers to access. Other barriers to usage are digital illiteracy and lack of local content. For Mozambique to gain a critical mass of internet users for digital transformation and to build a digital ecosystem, innovative solutions and strategic interventions and investments will be required. It is also imperative to deploy networks in under-served areas, reduce broadband costs, broaden public access, and stimulate demand by addressing the digital economy foundations with an ecosystem approach, as recommended by the World Bank (World Bank, 2019).

Given the Ministry of Education and Human Development's (MINEDH) vision for a massified, quality, secondary education system that guarantees essential skills for young people, and continuing studies for adults, insertion in the labour market and in society, the country needs to go beyond traditional solutions. Open and distance education could therefore represent an effective response to the demand for secondary education.

MINEDH, through the National Institute of Distance Education (INED), with the support of the Commonwealth of Learning (COL), piloted an Open Innovative Schooling (OIS) model in fifteen secondary schools across all regions of Mozambique in the period 2018 to 2020. The OIS model aimed to extend access to secondary education and improve school performance, both through OIS as well as face-to-face, using Information and Communication Technologies (ICT). The OIS pilot involved access to curriculum-based digital content shared as Open Educational Resources (OER) offline using a device provided by COL.

INED proposed to pilot the use of the OIS digital content to address logistical challenges and costs associated with the provision of printed self-study materials for out-of-school youth. In 2021, Cossa

et al. conducted a tracer study to ascertain student enrolment, retention, and to gauge the satisfaction of students, teachers, and managers with the OIS model. The tracer study was meant to inform future planning including the scaling up of the pilot project. The results showed that 69% of the students involved in the OIS pilot had an electronic device but 31% did not have any electronic device that they could use. 39% had a basic mobile phone, 37% a mobile phone with advanced smartphone features, 9% a desktop computer, 9% a laptop and 6% a tablet. The students appreciated that daily school presence was not required; the approach compensated for any lack of printed materials and allowed learners to study from anywhere as the learning content could be downloaded to a digital device. However, the researchers concluded that the fact that more than half of the students do not have an electronic device compatible with Aptus technology, can be seen as a weakness for the effective implementation of the project, since the OIS model implies that both students and teachers should have access to appropriate devices and skills which allow them to access, download and re-use the digital OER stored in Aptus (Cossa et al., 2021).

7.2. Teacher Professional Development and Training Programmes

There has been limited use of ICT as a tool for complementing and enhancing teacher professional development.

In 2019 Soprano Plc, a Nordic private training company pioneering global online education with an AI (Artificial Intelligence) learning environment and JAMK University of Applied Sciences launched a Finnish led teacher professional development programme in Mozambique, with Universidade Pedagógica as the local partner. The course design of the education system and implementation are provided by Soprano and JAMK. The pilot project will provide training for 200, 000 teachers, remote, and online. The parties plan to jointly develop Mozambique's education system and the quality of teaching through Finnish pedagogy and management skills, using the latest online technology to increase the number of qualified teachers and improve learning outcomes.

Several partners have supported technology supported teacher training in effort to improve the quality of teacher training. For example, in 2018, UNICEF supported the Ministry of Education's formal training programme on in-service teacher training through distance-learning. UNICEF established a partnership with the National Institute for Open and Distance Learning (IEDA) to improve the equipment and capacity of Distance Training Tutorial and Resource Centres at teacher training colleges as well as at Distance Training Tutorial and Resource Centres in selected schools at the district level. Some of the centres have received materials and equipment from UNICEF, including computers, printers, tablets, manuals, and various stationary supplies to facilitate on-the-job and distance training of teachers.

7.3. E-learning materials

As indicated earlier, the Higher Education sector consists of more than 50 educational institutions with a student cohort of about 230,000 and teaching force of about 14000 teachers. Since 2020, the sector has set out to implement e-Teaching. However, given the overall low digital literacy and lack of resources and infrastructure, there are challenges in the migration from conventional to virtual classrooms, including in the use of e-learning materials. Many teachers lack e-learning/e-teaching competencies and therefore cannot apply the necessary pedagogy for e-Teaching. For those that do have ICT skills though not necessarily the required pedagogical skills and didactics, the majority tend

to use Zoom, followed by Global Meet for video conferencing, WhatsApp to communicate and either Moodle or Google Classroom to manage and provide online content.

As mentioned earlier in this study (see 6.2) the World Bank's Digital Agenda for Mozambique will support the production of online content together with the development of digital and online instructional skills of educators and lecturers. The content will be hosted on Learning Management Systems (LMS) which will also be used to deliver courses. That will require adequate infrastructure and the provision of devices to teachers and students.

8. ICT ACTIVITIES AND INITIATIVES IN HIGHER EDUCATION IN MOZAMBIQUE

8.1. Technical/Vocational Education and Training

There is a significant gap between secondary and vocational education levels use of internet. Internet use at the secondary level of education is of 37% whereas at vocational level it is about 85% therefore fairly similar to tertiary level use (86%).
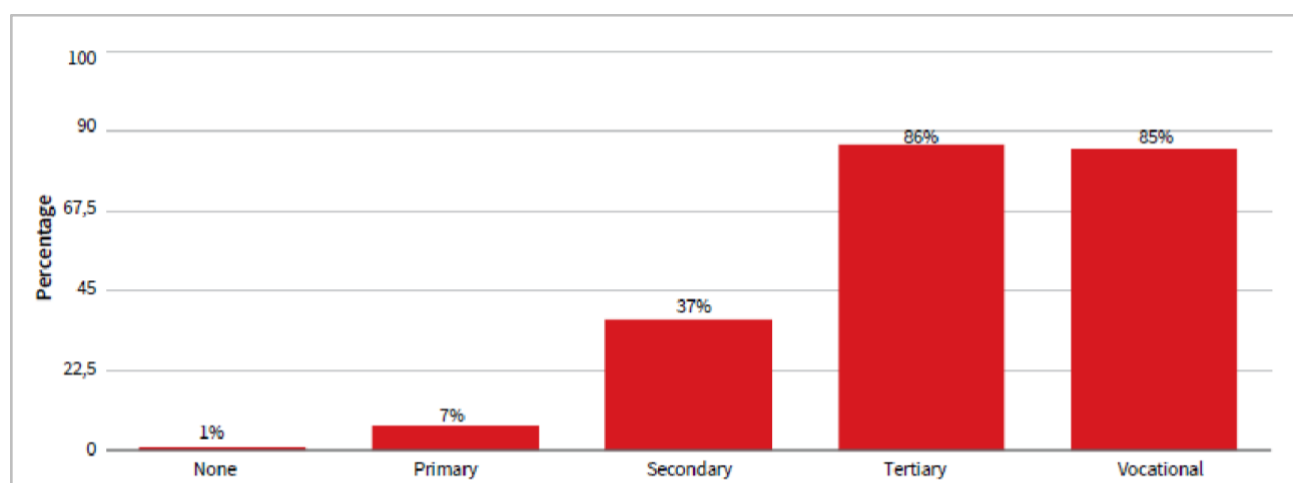
Figure 7: Internet use by level of education

RIA After Access Survey data, 2017.

Mobile ownership increases with age, with the youth more likely to own smartphones and use the Internet than the older generation. Digital beneficiation is very low in Mozambique. There are few initiatives that enhance digital opportunities, such as creation of online jobs.

8.2. Universities

The International Finance Corporation (IFC) highlighted a large unmet demand for digital skills and opportunities for the private sector in the provision of digital skills. New ways of operating will be required to access this opportunity, and the private sector has a significant role to play due to the magnitude of need and pace of change required. For example, in Mozambique, a private provider, Tecnicol, offers professional initiation courses (4-7 months) which aims to provide students with the skills and abilities needed for the job market through trainings. Employees from public and private

enterprises can also access the courses. Each year over 2,000 students are trained at Foundational Intermediate levels (IFC, 2021).

Several universities provide courses in ICT, including the public university, the Eduardo Mondlane University (UEM) – the oldest institution of higher education in Mozambique. UEM was founded in 1962 and currently enrols about 40,000 students under different programmes and provides basic, intermediate, and advanced level ICT courses. St. Thomas University of Mozambique is a private higher education institute founded about 13 years ago to provide good quality education in Mozambique. Courses offered cover different disciplines such economics and business, agriculture, humanities and information sciences and technologies.

It might be worth examining the relationship between digitalisation and youth employment in Mozambique, highlighting the problems faced in using digitalisation to address challenges of youth employment, as it is fairly evident that public policies could help create more and better jobs through digitalisation. Once again, it is stressed that it will require measures to ensure equitable and affordable access to communications infrastructure to prepare the workforce for future skills demands. The question is whether Mozambique is ready for interventions that can build an integrated digital economy in the country and enhance strategic regional value chains with digitalisation, and whether it has or could have an education sector that is able to support such strategy and interventions. The World Bank points out that for countries like Mozambique, the Digital Economy presents both opportunities and risks of being left behind (World Bank, 2019).

Increased digital connectivity will bring a stimulus to the economy and inclusive growth, provided it is combined with strong digital skills and literacy.

9. ICT ACTIVITIES AND INITIATIVES IN NON-FORMAL EDUCATION AND LIFELONG LEARNING IN MOZAMBIQUE

9.1. General Observations

As stated earlier, Mozambique is at early stages of digitalisation with less than 25% of the population having access to the Internet. Over the 2010-19 period, more than 50% of workers lived in poverty (AUC/OECD, 2021). Most of the population work in subsistence agriculture. 83% of the population are self-employed or work in family business. The speed of internet is slow, though it is increasing marginally. In addition to unequal access to communications infrastructure, the country must deal with issues of Internet speed. As a result, 36.5% of youth in Mozambique list the Internet speed as a major constraint to Internet usage (RIA, 2019b).

Given the potential of the Internet to contribute to economic growth and job creation, accelerated ICT-enabled employment and skills training for young people should be explored. For instance, the digital space has seen the growth of several digital platforms including eBay, Alibaba, Under, Clickworker that outsource microwork and provide supplementary income to global virtual workers. RIA reports that 72% of Africans do not have access or use the Internet and are therefore excluded from the digital economy and online work or microwork (RIA, 2019b). The 2017-18 RIA After Access Survey indicates that Mozambique, together with South Africa, have the largest per centage of microworkers among the economically active population of the continent, with 8% and 7% respectively.
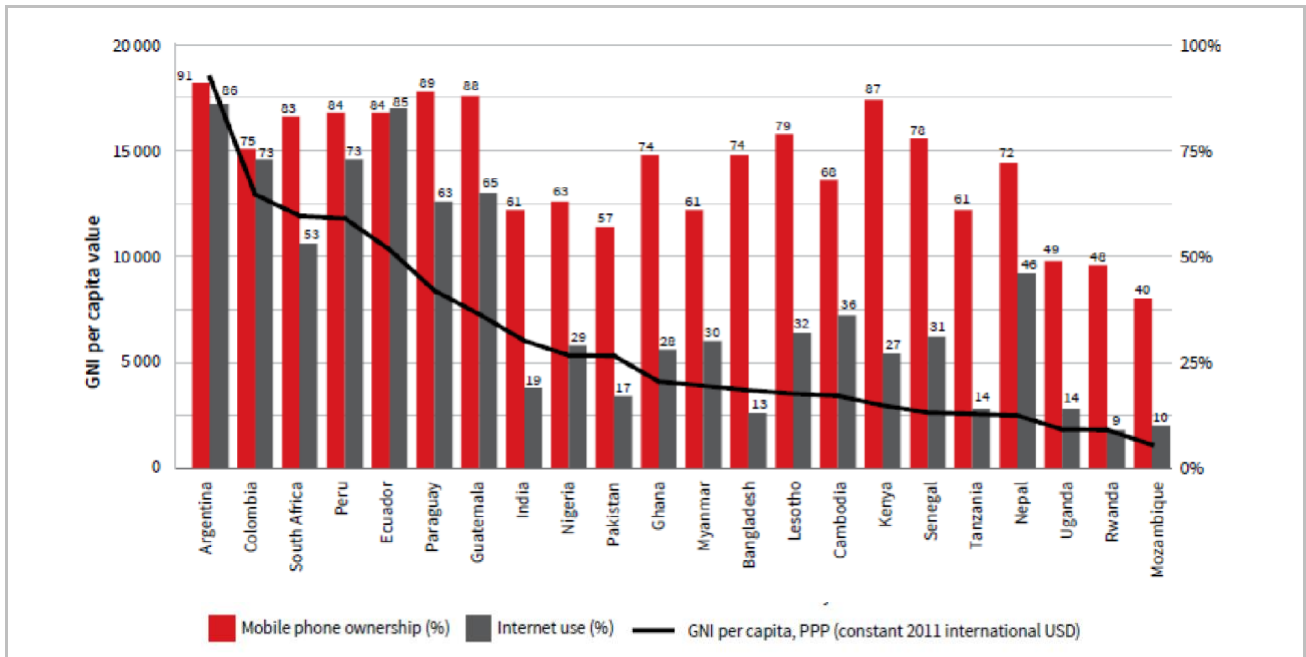
Figure 8: Mobile phone and internet penetration overlaid on GNI per capita

RIA, 2019b.

According to a study carried out in 2019 by the International Finance Corporation (IFC), a member of the World Bank Group and the largest global development institution focused on the private sector in emerging markets, by 2030 some level of digital skills will be required for 20-25% in Mozambique. The study anticipates that generic occupations are more likely to require digital skills rather than 'narrowly defined ICT professions,' as more enterprises across diverse sectors will adopt digital technologies (IFC, 2021). This has implications for non-formal education and lifelong learning in terms of digital skills development and upskilling.

The adoption of digital technologies could open access to learning for the large number of children and adolescents out of school, particularly girls who constitute two thirds of youth and children who are out of school. This large target group of female learners could benefit from some form of distance learning. While the Ministry of Education has focused on literacy programmes with equivalences to schooling, the education sector could consider expanding Adult Education by way of distance learning assuming that all forms of infrastructure are rolled out.
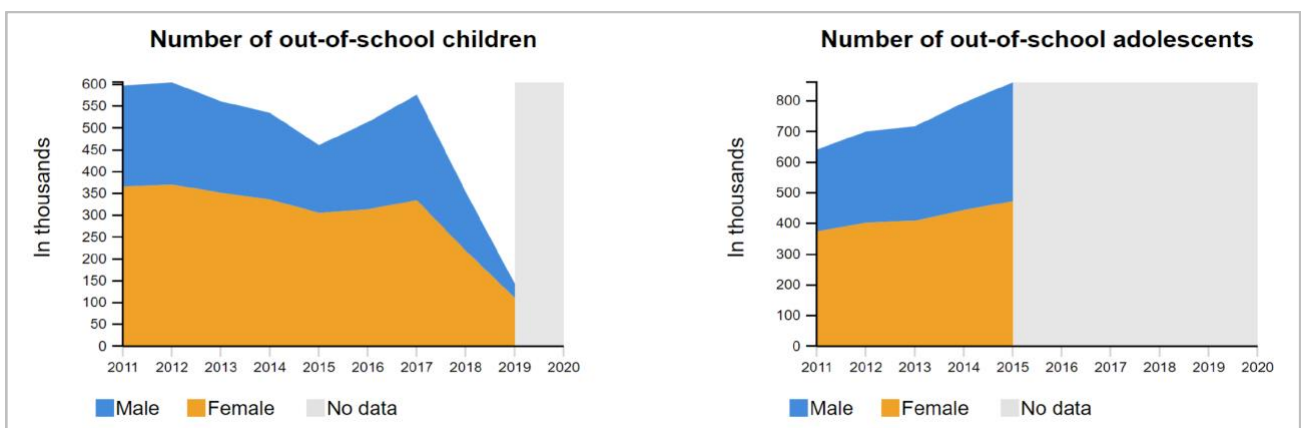
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Out-of-school children										
Total	597,664	604,749	561,413	534,910	461,026	513,572	576,566	353,839	143,339	52,869
Female	366,644	370,938	351,530	336,489	305,669	313,674	335,103	219,096	110,861	...
Male	231,020	233,811	209,883	198,421	155,357	199,898	241,463	134,743	32,478	...
Out-of-school adolescents										
Total	641,380	700,135	717,159	794,609	860,370	...	...	...	...	...
Female	374,521	402,427	409,517	443,888	473,006	...	...	...	...	...
Male	266,859	297,708	307,642	350,721	387,364	...	...	...	...	...

Figure 9: Out of school children and youth by gender

Source: Unesco UIS.
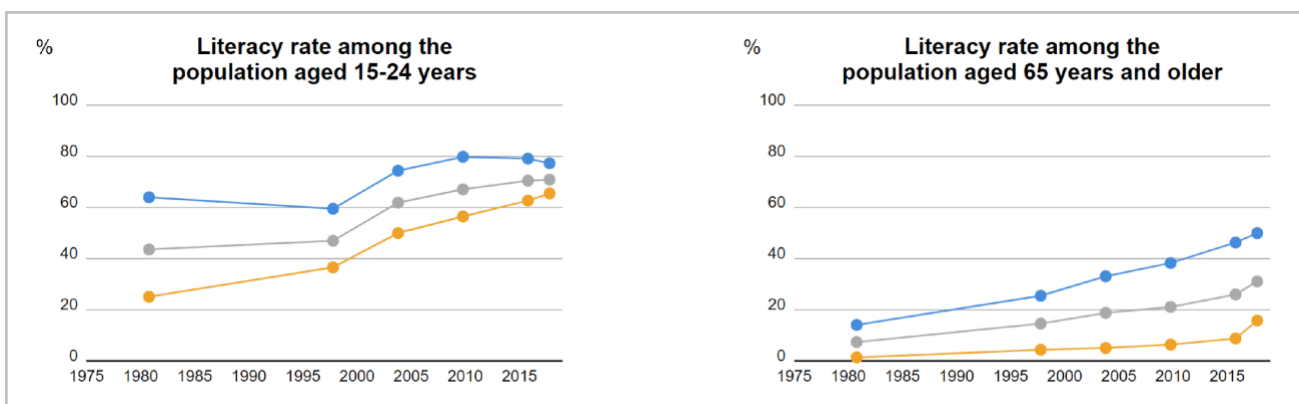
	TOTAL	MALE	FEMALE	
Literacy rate (%)				
15-24 years	70.9	77.3	65.5	(2017)
15 years and older	60.7	72.6	50.3	(2017)
65 years and older	31.1	50	15.8	(2017)

Figure 10: Literacy rates

Source: UNESCO, UIS.

While the youth literacy rates are at approximately 70%, the recent learning interruptions from COVID are bound to give rise to increased illiteracy rates, more especially among girls and women who, as the next section shows, were worst affected by school closures and other ongoing socio-environmental challenges. The situation of the girl child is problematic despite the increase in enrolments of learners in primary schooling increasing from 2,496,996 in 2000 to 6,938,434 in 2019 The Gender Parity Index is 0.91 for upper primary and lower secondary education. However, over 70% of children and adolescents do not complete basic education, with gross completion rates stagnating for the past 10 years. Over one-third of students drop out before reaching grade 3, with a higher dropout rate for girls, due to child marriage and early pregnancy. An estimated 140,000 children have missed out on learning and could be usefully targeted by distance learning modalities delivered through non-formal education.

10. ICT, COVID-19 AND EDUCATION IN MOZAMBIQUE

10.1. COVID-19 Lessons Learned

The pandemic affected 15,000 schools and universities which closed as from March 23, 2020, involving more than 8.5 million students[10]. While school closures were meant to save thousands of lives, the decision came at a heavy price. Global trends show that the longer children stay away from school, the less likely they are ever to return, increasing the risk that they fall into illiteracy. Pre-COVID-19, about one third of learners dropped out before Grade 3 and less than half completed primary school.

Prior to COVID-19, 10 million children of Mozambique were already living in some form of poverty. The pandemic worsened and prolonged poverty, as well as reduced access to basic services. As UNICEF points out[11]: the longer schools are closed, the greater the loss of learning time and the greater the risk that many, particularly girls, will not return when schools reopen.

Mozambique had its first confirmed COVID-19 case in March 2020 which led to the closure of schools on 23 March 2020. This occurred before the declaration of the state of emergency on 30 March. To mitigate the situation, the Ministry of Education and Human Development (MINEDH) provided guidelines to school management and teachers to ensure that students would continue to have access to some form of learning using alternative modes, including distance learning. These measures included the development of learning materials and their provision to students (mainly assignments) and teaching using on-line platforms, radio, and television. School directors, school councils and community leaders had to mobilise parents to support their children in completing their assignments at home and to ensure that they followed the available radio and television education programmes.

Several education systems adjusted the scope of the curriculum to be covered by reducing subjects and contents based on those that were to be evaluated for examinations during lockdowns or post-lockdown. Mozambique's Ministry of Education not only selected core subjects, but also prioritised remote learning programmes for grades 5, 7, 10, and 12, as students in those grades must sit for national examinations.

In terms of the evaluation of the response plan to COVID-19. Mozambique's Ministry of Education implemented a real-time monitoring system to track coverage, engagement, and learning through digital questionnaires and SMS (Short Message Service). Even though such monitoring efforts were important, it was just the first step to understand the effectiveness of remote learning. It was also critical to evaluate the effectiveness of distance learning programmes from the demand side, that is to track the level of student engagement and learning outcomes. Schools reopened in February 2021. In a study aimed to assess the impact of the suspension of face-to-face classes in universities, Martins et al (2021) explored the extent of the adoption of online learning. Their study showed that of a sample of 417 academics across Mozambiquan universities, 71% of them indicated that they were instructed to continue teaching during the lockdowns. Several platforms were used for this purpose. The most

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[10] Continuity of learning amid the coronavirus crisis in Mozambique, May 2022, https://blogs.worldbank.org/nasikiliza/continuity-learning-amid-coronavirus-crisis-mozambique

[11] UNICEF Mozambique (2020). The Impacts of COVID-19 on Children in Mozambique COVID-19 Policy Note

used was WhatsApp and email (49.2%). Respondents (67%) expressed that they encountered difficulty with the digital learning platforms. The authors of the study stated that the academic staff found the process challenging as they had to rely on several learning platforms and needed to adopt different teaching strategies.

In the context of the pandemic, and against the backdrop of the devastation of natural disasters that hit the country, attempts were therefore made to introduce remote learning but resources such as radios and televisions were scarce. The transition to distance learning remains challenging in a context of limited access to basic information channels and infrastructure:

- 74% of children live without electricity,
- 2% have access to the Internet,
- 35% have access to radio, and
- 22% have access to television.

Access to information is even more limited for rural children as Mozambique's educational system is already battling poor educational outcomes and limited use of the information technology in education and learning. Technology has the potential to solve many challenges related to access, cost and quality of education. EdTech solutions that use software and hardware to improve classroom education and enable remote education, have provided some relief to teachers, students and families struggling to cope with the new reality of COVID-19, and the existing education crisis in many Least Developed Countries (LDCs).

10.1.1. Multimodal delivery systems

In general, multimodal delivery systems were perceived as an effective strategy to increase coverage, provided education policy makers thoughtfully planned, implemented remote learning programmes, and considered contextual factors. In low-income countries, multimodal delivery systems were seen to be more effective in urban areas compared to rural areas. Education experts in most low-income countries perceived those combinations based on low-tech delivery systems (e.g., radio, TV, and printed material) as more effective. The effectiveness of the multimodal combinations depended on a variety of contextual factors such as access to devices needed for remote learning, internet connectivity, prior experience with the delivery system, teacher preparedness and capacity, and quality of contents that are interactive and locally relevant. The adjustment of the curriculum and content curation made the development process of the remote learning strategy more effective, as it allowed for cost savings and time efficiency. Such adjustments were needed to fulfil the main learning objectives of the curriculum, but also to acknowledge that replicating the face-to-face teaching–learning practices and the curriculum would not necessarily work in a remote learning environment. Investing time in analysing content that already existed and curating it around the curriculum's learning objectives was more effective than creating new content that was time and cost intensive.

A World Bank study that looked at remote learning during the global school lockdown, found that there was no single best combination; instead, it depends on many contextual factors such as access to the devices needed for remote learning and internet connectivity. For example, in Mozambique, low-tech solutions were the most effective delivery systems: the combination of national radio and community radios with printed material were considered effective, as the country had low mobile and internet penetration and almost 20 local languages that were spoken in primary schools (Barron Rodriguez et al, 2021).

10.1.2. Demand for digital skills

It is anticipated that by 2030, some level of digital skills will be required by 20-25% of jobs in Mozambique (IFC, 2021). Most demand for digital skills will be from occupations outside specialised ICT sectors and will be generated by enterprises adopting digital technologies. Seventy per cent of demand is expected to be for foundational skills, followed by 23% for non-ICT intermediate skills. A 2021 World Bank study finds a strong training market opportunity in several African countries including Mozambique, with training of the new workforce, and reskilling of existing workers to keep them relevant with digital skills that will be required for their jobs. Existing education providers should therefore align their programmes to respond to the demand. The training needs represent a significant business opportunity for private local, regional, and global training providers and will require partnerships across the education ecosystem to deliver. Models with affordability at their core will be required. By 2030, 25-35% of households are expected to be able to afford training programmes for foundational skills by spending 1-3% of their income, but that affordability would decrease with higher skill levels (Barron Rodriguez, M. et al., 2021).

10.2. Access and Inclusion

The 2019 GSMA Global Gender Gap Report indicated that the quantitative gap between female and male mobile phone owners in Mozambique is the third largest in the world. Even though mobile phone ownership and internet use have increased among Mozambican women over the last years, there are still persistent gender gaps in terms of digital skills as well as access to digital devices and the Internet. If these inequalities are not addressed, they are likely to become more deeply entrenched and to compound the risk of Mozambican girls and women being left behind in the digital transformation (GSMA, 2019). The 2020 GSMA Global Gender Gap Report indicates that literacy and digital skills remain the greatest collective barrier to mobile internet adoption across the countries surveyed including Mozambique, for both men and women.

Affordability is a critically important barrier to mobile internet access for men and women alike. While the perceived relevance of the internet — and a sense that there is insufficient content available in local languages — is still an important barrier in many countries, its importance as a top barrier has notably declined. This was clear for women in Mozambique. The decline of relevance as a barrier reflects growth in the use of apps to share video content particularly through platforms such as YouTube and TikTok, which have driven explosive growth in video consumption on mobile (GSMA, 2020).

Despite improvements in inclusive education, major challenges persist, including the lack of staff training and awareness among families of the importance of integrating children with special needs into schools, as well as the need to expand resources centres for children with special needs.

10.2.1. Universal Design for Learning (UDL)

Universal Design for Learning (UDL) is considered as a viable approach for the inclusion of learners with disabilities. However, it is also seen as a practice aimed at the inclusion of all learners, irrespective of the kind of barriers to learning that they face (McKenzie et al, 2021). UDL recognises that everyone learns differently and is an instructional strategy that can address systemic inequality

and discrimination, which may arise from an intersectionality of multiple forms of disadvantage (e.g., racial inequality, gender discrimination, poverty, disability stigma).

The Christian Blind Mission (CBM) commissioned the Including Disability in Education in Africa (IDEA) research unit at the University of Cape Town, South Africa, to review current UDL practices, training needs and relevant online resources in LMICs (Low to Middle Income Countries) in 2021, including Mozambique. The aim was to form recommendations for capacity-development resources and materials. It was found that capacity-building for teachers should include in-service and pre-service teachers and be mindful that not only are the needs of teachers diverse, but there are also pressing material needs in LMICs that affect the way diversity, disability and difference are understood. Teachers who have digital literacy and online skills will be able to develop their learners' digital literacy (McKenzie et al, 2021).

Implementing educational delivery systems following a Universal Design for Learning (UDL) approach can allow to effectively reach diverse learners with diverse needs. This could include TV learning sessions that are supported with sign language, adapting the web for students with special needs, and delivering radio in local languages. Mozambique adopted an approach that consisted of TV programmes that were supported with sign language, self-study materials distributed to reach vulnerable children, and radio learning programmes that had content both in Portuguese and other local languages. As responses to closure of schools due to COVID-19, UNICEF enabled the government to create the conditions to continue working by providing communication tools, computers, internet, conference call devices and internet credit for MINEDH and DPEDH. While schools were closed, distance learning programmes were put in place. The distance learning programmes were transmitted on television, radio, and internet. For television (TeleEscola) included sign language for children with auditive disabilities. The radio programmes were also transmitted in local languages by community radios with agreements with Instituto de Comunicação Social (ICS) in the framework of the partnership with MINEDH (UNICEF, 2020). In Mozambique, the combination of national radio and community radios with printed material are considered effective, as the country had low mobile and internet penetration and almost 20 local languages that were spoken in primary schools.

11. FACTORS ENABLING AND CONSTRAINING ICT USE IN EDUCATION

11.1. The impact of multiple threats on the education system in Mozambique

Mozambique faces a triple crisis of climate change, escalating armed conflict and the COVID-19 pandemic. The Global Climate Risk Index scores Mozambique first among the countries most affected by natural disasters in 2019 and fifth over the period 2000–2019, making it one of the most vulnerable countries to climate change in Africa[12]. The COVID-19 pandemic has caused severe socioeconomic shocks. The economy contracted by 3.1% in 2020 and by a further 0.6% in 2021. Budget allocations for education remain high (19.2% in 2020) but are still insufficient.

The aim to improve competences in reading and numeracy, respectively was starting to show dividends before the pandemic. However, because of the distance to school, children only attended

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[12] World Food Programme, "Food Security and Climate Change, the Pressing Reality of Mozambique", July 2021.

74 of the 190 required school days. A mere 3.5% of children aged 3–5 years were enrolled in pre-school or early learning services in 2019, with significant rural/urban disparities. The impact of the COVID-19 pandemic has exacerbated the situation and recovery will be a challenge (UNICEF, 2022). Student and teacher absenteeism rates remain high.

The shortcomings in the delivery and access to learning and therefore, in the quality of the basic education system, affect the other sub-sectors of education, including Higher Education and TVET, with programmes and courses insufficiently geared to the labour market and lacking relevance. Mozambique has a high reliance on external partners whereas the private sector is weakly integrated in implementation of education programmes. Key lessons learned call for a realistic scope and ambition regarding the integration of ICT in the education sector. Low-cost ICT does not seem to have been deployed sufficiently and effectively to scale to the benefit of quality training in any of the sub-sectors.

11.2. SWOC Analysis

INFRASTRUCTURE	
Strengths	**Opportunities**
- The Information Society Policy is a 10-year policy that aims to provide the vision, mission, objectives, and framework for ICT to become an economic and social vehicle for Mozambicans to improve their livelihoods. It has three principal areas of action: Industry, Trade and Services, that are paramount to promote the growth of the ICT industry. - The National Youth Policy (2014-2023) advocates for the government to adopt measures that encourage the initiatives of young people, towards the eradication of poverty. - Existence of an Education Sector Technological Plan for the integration of ICT in the education sector. - Long term support of technical partners and donors.	- Internet data tariffs are trending down, due to Mozambique's connection to two undersea international links and increased competition in the market, increasing affordability. - While fixed broadband penetration is very low, mobile broadband has become the most common way to access the Internet and is likely to continue to drive access. - Internet and data services can be provided via lower-cost wireless infrastructure to expand access in rural areas. All three operators have deployed 3G technologies, and Vodacom has also launched a 4G network (although only in major cities presently). - The government has made efforts to expand ICT services through a Universal Access Service Fund (USAF) since 2007. Reform and operationalisation of the USAF can accelerate the expansion of ICT services to low-income rural areas. Communal access to broadband is expanded by constructing community access centres (Community Multimedia

	Centres Programme under the MCTEST) or digital plazas (funded by the USAF).
Challenges	**Weaknesses**
• Risks that ICT investments do not benefit the bottom of the pyramid run high. Without interventions targeting women and the marginalised, the benefits of infrastructure deployment could further entrench inequalities. • Young women suffer from highest level of unemployment, reinforced by their underrepresentation in socioeconomic and political structures. In addition, according to the Mozambique 2017 census, the per centages of women with access to a computer or mobile phone have fallen since 2007. • Size working age population continues to grow (each year 300,000 new young job seekers enter the labour market). However, the economy is unable to absorb them within formal employment. • The young age structure of the Mozambican population can either exacerbate poverty and inequality or enhance prosperity. In the last decade alone, Mozambique's population increased by 41% (or 4% a year) from 20 to 29 million people. Hence, despite decreasing poverty rates, the total number of poor has been growing.	• Broadband penetration remains low, at 17.5% in 2017, and is lower than average for the Southern Africa region (29.1%) and Sub-Saharan Africa (SSA) (19.9%). • Mozambique is a low-income country, where low purchasing power and low electrification rates are binding constraints to most of the population. Prices of internet-enabled devices are not affordable to most Mozambicans, resulting in extremely low smartphone and desktop penetration levels (at 7% and 2%, respectively). The lack of electricity to charge devices is also a major constraint, as only 24% of the population has access to electricity. • Broadband coverage is limited to provincial capitals and major cities, as well as main centres of development, while rural areas, where most of Mozambique's inhabitants live (up to 70%), are un- or under-served. • Informality remains very much prevalent in Mozambique. About 80% of the Mozambican labour force works in the informal sector, mostly in agriculture and informal self-employment. • Limited availability of resources.

EDUCATION	
Strengths	**Opportunities**
• Entrepreneurship education is increasingly prevalent in Mozambique's higher education institutions and calls for digital skills to remain competitive.	• In Mozambique 45% of the population is under the age of 15, and 65% is under 25. Youth play a key role in harnessing the country's demographic dividend, provided social and economic constraints

- Young people are a powerful force for improving prosperity, for innovation and for socio-economic development. TVET and HEIs combined have 300,000 students, graduating approximately 25,000 students on the average per year.
- Combination of national radio and community radios with printed material were considered effective, as the country had low mobile and internet penetration and almost 20 local languages are spoken in primary schools.

are addressed, as well as the quality and equitable access to education. By 2030, there will be a huge contingent of more than 7 million youths, with few years of education and unskilled, unprepared to pick job opportunities that will require basic digital skills.

- Even though the implementation of the education technological plan in secondary schools lags, there is a regulatory framework and a clear vision, expressed in the ICT policy.
- Digital skills, literacy, and socio-behaviour skills, according to a recent survey to Mozambican companies, appear among the highly required skills for the future workplace.

Challenges	Weaknesses

- There are few existing initiatives designed to tap into the entrepreneurship potential of Mozambique's noticeably young population. The Ministry of Youth and Sports, the Ministry of Education or the Ministry of Science and Technology do not provide impetus for entrepreneurship. Policies mention entrepreneurship but they are seen as belonging to their respective ministries and do not have a broad interdisciplinary engagement across the economy.
- Digital connectivity will bring a stimulus to the economy, decent work and employability of young people, and inclusive growth provided it is combined with strong digital skills and literacy.

- Over 50% of Mozambicans children do not complete primary education. The overall illiteracy rate is still high 39%, among the highest in the region, and it hits particularly, the rural population at 50% and women in rural areas, 62.4% (INE, 2017). Ninety per cent of those applying for their first job have not finished basic education. Among them the majority (62%) has no work experience or qualifications.
- While secondary education (800.000 students), TVET (90.000 students) and higher education (200.000 students) will continue to expand, the rate of expansion is too slow, due to high wastage. The net enrolment of upper secondary education is about 22%; in TVET, it is less than 6% and in tertiary education, it is 7%, well below many countries in the region. While expanding school and university access is required, it is necessary to think of what can be done to accelerate access for those who are out of the

	system and those who are in the system, but learning is critically low.
	• Assessments of the reading competencies of Grade3 pupils, conducted in 2013 and 2016, revealed that only 6.3% and 4.9% of the pupils, respectively, could read. Despite progress, learning is critically low, unequal, and below other countries in the region.

12. ICT IN EDUCATION IN MOZAMBIQUE: A WAY FORWARD

12.1. Current ICT Initiatives and education projects

Overall responsibility for the ICT sector straddles the Ministry of Transport and Communications (MTC) and the Ministry of Science and Technology, Higher and Technical Vocational Education (MCTESTP). The MCTESTP has the overall role of promoting and overseeing implementation of the ICT policy and the e-Government strategy, supported by the National Institute of Information and Communications Technologies (INTIC), the ICT regulator. The distribution of roles and responsibilities across several government agencies creates overlaps and inefficiencies (World Bank, 2019).

12.2. Overview of the ICT4E Partner Mapping and Intervention

The '**ICT Transforming Education in Africa**' is part of the **UNESCO-Korea Funds-in-Trust cooperation**, has a budget of $6 million, and takes place in three countries in Africa: Mozambique, Rwanda, and Zimbabwe. It is a 4-year project launched in 2015 to foster development using information and communication technology and mobile learning. The Mozambique project aims to establish an e-school model to align learners' competencies with the new national curriculum; to make information for management administration easily accessible on-line and enhance communication between schools and their communities; to transform online distance learning from a paper-based model to blended learning models; and to create an ICT Education policy with the Ministry of Education. Updates from the January-March 2019 report on the project include the following achievements: twenty-four 'champion teachers' created 45 lesson plans in eight subject areas for the establishment of 22 e-schools; 400 teachers received training on the pedagogical use of ICT In 16 provinces; and a five-day seminar on 'Empowering the next generation' was held in February 2019 at the Maluna Science and Technology Park, attended by 200 students, 60% of whom were girls (e-Learning Africa, 2019).

In 2003, **Project Pensas - Assisted Learning Platform**, a joint effort between the Ministry of Education and the University of Aveiro, funded by Portuguese Cooperation, was launched. The key objectives were to allow students to learn Mathematics through ICT; strengthen the use of the Portuguese language; increase the use of computers, Internet, and science communication. The Portuguese Cooperation jointly with the Education Minister of Mozambique created a schools Network with at least one major school in each Mozambican province. The project was based on the "dynamic

school" concept which had a laboratory with up to 20 computers. The devices were connected permanently to the Internet and worked as a gateway to the neighbour schools – so called "satellite schools." While Pensas ended in 2013, the Ministry of Education and Human Development of Mozambique (MINEDH) and the Ministry of Science and Technology, Higher Education and Professional Technician (MCTESTP), approached the Pensas team, to bring EquaMat@Moz back. The competition is hosted on a simpler, more intuitive platform, and maintains its initial objectives: use of ICT to create wider learning networks and create strategies to increase students' interest in Mathematics (IST-Africa, 2018).

The **World Bank-Global Partnership for Education** support to basic education has been channelled through the Education Sector Support Fund (FASE). The other FASE donors are Germany, Finland, Ireland, Italy, UNICEF, and Portugal. The World Bank Education Sector Support Project (ESSP P125127) which closed in December 2019, was implemented over seven years. The World Bank will support the implementation of the next ESP, which outlines the priorities for the sector over the next decade and operationalises the implementation of the new Education Law. Support will be through the 'Ending Learning Poverty in Mozambique' project. The project will also introduce the use of innovative technology in several activities, aiming at improving the effectiveness of the interventions and ensuring conditions are given (or created) for technology to be used as expected. The use of ICT will be considered for the package of interventions to improve learning in early grades, including providing tablets or smartphones to coaches and supervisors, using videos and digital materials for teacher training, and phones and text messages to facilitate the interaction between teachers and coaches and among peer teachers. ICT will also be considered to improve reporting and monitoring mechanisms, and to strengthen the sector's statistics. Finally, ICT will be used to expand and strengthen distance learning for secondary education. Successful distance learning (DL) experiences in Brazil using ICT will be analysed to potentially be adapted for the context in Mozambique (World Bank, 2020b).

To address the bottlenecks that are pre-empting the digital economy to fully develop in Africa, the **World Bank Group and the African Union** have partnered under the Digital Economy for Africa (DE4A) Initiative. The DE4A Initiative forms part of the World Bank Group's support for the African Union's Digital Moonshot for Africa, which wants to see every African individual, business, and government to be digitally enabled by 2030.

In 2020, the **World Bank** approved a USD104 million grant from the International Development Association (IDA) in support of skills development programmes for Mozambican youth. The project will target Technical Vocational Education and Training (TVET) and Higher Education (HE) subsystems to improve access and quality of educational curriculums and skills development training in response to the country's priorities and economic sectors. The project will help address current shortages of specialised technical skills including in ICT. It will promote the development of digital literacy and related skills and entrepreneurship.

The World Bank Mozambique Digital Acceleration Project (P176459) will support the country to increase broadband internet access, promote increased digital inclusion, and accelerate country-wide digital transformation, focusing on critical digital foundations and enablers (World Bank, 2022). A subcomponent of the project will "support digital transformation of the national education and higher education systems." The objective is to improve the efficiency and efficacy of education delivery through ICT, while ensuring learning continuity through distance learning in case of shocks. The project will improve the digital competencies of students to prepare them for employment through

provision of broadband connectivity for secondary schools, technical and vocational training institutions, and higher education institutions. There is also planning to provide financing schemes to support affordable access to internet connected devices for teachers and higher education students, updates to the curriculum to better reflect digital competencies and to utilise digital tools for learning, teacher training and support for access to digitised educational content (World Bank, 2022).

Another major partner is **UNICEF**. During school closures due to COVID-19, the UN agency supported nearly 100,000 children with distance/home-based learning. Additionally, more than 1.5 million primary and secondary school children were reached indirectly through UNICEF's support to the Institute for Social Communication for their production of community radio and educational television learning programmes (UNICEF, 2021b).

The **Japan International Cooperation Agency (JICA)** has been supporting the capacity building of teachers in Mozambique since 2006 from both physical and technical aspects through technical cooperation projects such as the Strengthening of Primary Education in Gaza Province in Mozambique. In the Project for Expansion of New Curriculum of Teacher Training Institute (IFP) in Mozambique (hereinafter referred to as "PENCIFOP"), implemented from 2016 to 2020, JICA supported the development of teaching materials for mathematics and natural science for IFPs, which greatly contributed to the improvement of teaching skills of the IFP pupils and instructors.

In the process of implementing these projects, the MINEDH and JICA agreed on the need for further comprehensive efforts including the improvement of the national curriculum and textbooks, the educational evaluation system and teacher education in order to enhance pupil learning in primary mathematics and natural science. It is against this background that the MINEDH and JICA jointly launched the Project for Expansion of New Curriculum in Mozambique for the revision of mathematics and science curricula and textbooks and strengthening of pre- and in-service teacher training and the educational assessment system, aiming to improve the academic performance of Mozambican pupils. The capacity of primary school teachers to teach mathematics and natural science will be improved through self-learning and self-training using ICT. The project which will run from 2021 to 2027 will cover all 38 IFPs and all primary schools.

The **European Union (EU)** Multi-annual Indicative Programme (MIP) includes support to 'Growing Youth Mozambique' and runs from 2021-2027. It takes into account the country's young age structure. Youth (aged 10–35) accounts for almost half of the total population. The EU will therefore support efforts that ensure adequate nutrition and food security, more and better investment in inclusive quality education, the creation of more employment opportunities by integrating green and digital skills into education and training. The project will be implemented through the Ministry of Education and Human Development (MINEDH), National Institute for Development of Education (INDE), Institute of Open and Distance Education (IEDA), and National Institute of Exams, Certification and Equivalences (INECE) (European Union; 2021).

UNESCO provides tablets and technical support for adult literacy. The project ended before the onset of Covid.

GIZ, UNICEF and Associação Progresso provide funding for the teacher training programme, equipment, operation and connectivity.

12.3. Recommendations: Moving Forward on Implementation of ICT in Education

Given the lack of infrastructure and major challenges for ICT integration in the education sector, Mozambique requires a solid ICT in education vision and therefore an ICT in education policy that is also linked to other policies, including those outside the education sector. The government would need to work out a financing mechanism for scaling and sustainability, but in a first phase, infrastructure challenges need to be addressed including ensuring adequate power, providing sufficient equipment and networking infrastructure, enabling sufficient technical support and maintenance. Key partnerships including with the private sector could assist in the ICT in education Strategy. The government should take adequate measures to provide ICT-related technical and pedagogical training for teachers.

It should also be noted, from a policy perspective, that connectivity will not address digital inequality as inequality remains between the connected and unconnected, between those who have the skills and financial resources to use the Internet optimally and those that have no access to the Internet (RIA, 2017). The 2017 After Access Survey data found that "education, income and locational inequalities are simply being mirrored online – and arguably amplified, as the economic and social value of being digitally networked increases exponentially".

The Digital Economy for Africa (DE4A) Moonshot initiative is underpinned by the five pillars shown in the figure below.

DIGITAL INFRASTRUCTURE: Digital infrastructure provides the way for people, businesses, and governments to get online, and link with local and global digital services, thus connecting them to the global digital economy.

DIGITAL PLATFORMS: Digital platforms offer products and services, accessible through digital channels, such as mobile devices, computers, and internet, for all aspects of life. Digital platforms enable producers and users to create value by interacting with each other.

DIGITAL FINANCIAL SERVICES: Digital financial services enable individuals and businesses to conduct transactions electronically or online and open a pathway to a range of digital financial services in addition to digital payments, including credit, savings, and insurance.

DIGITAL ENTREPRENEURSHIP: Digital entrepreneurship and innovation create an ecosystem to bring the digital economy to life, with new, growth-oriented ventures, and transformation of existing businesses, contributing to net employment growth and helping enhance competitiveness and productivity of an economy.

DIGITAL SKILLS: Economies require a digitally savvy workforce in order to build robust digital economies and competitive markets. Digital skills constitute technology skills, together with business skills for building or running a start-up or enterprise. Greater digital literacy further enhances adoption and use of digital products and services amongst the larger population.
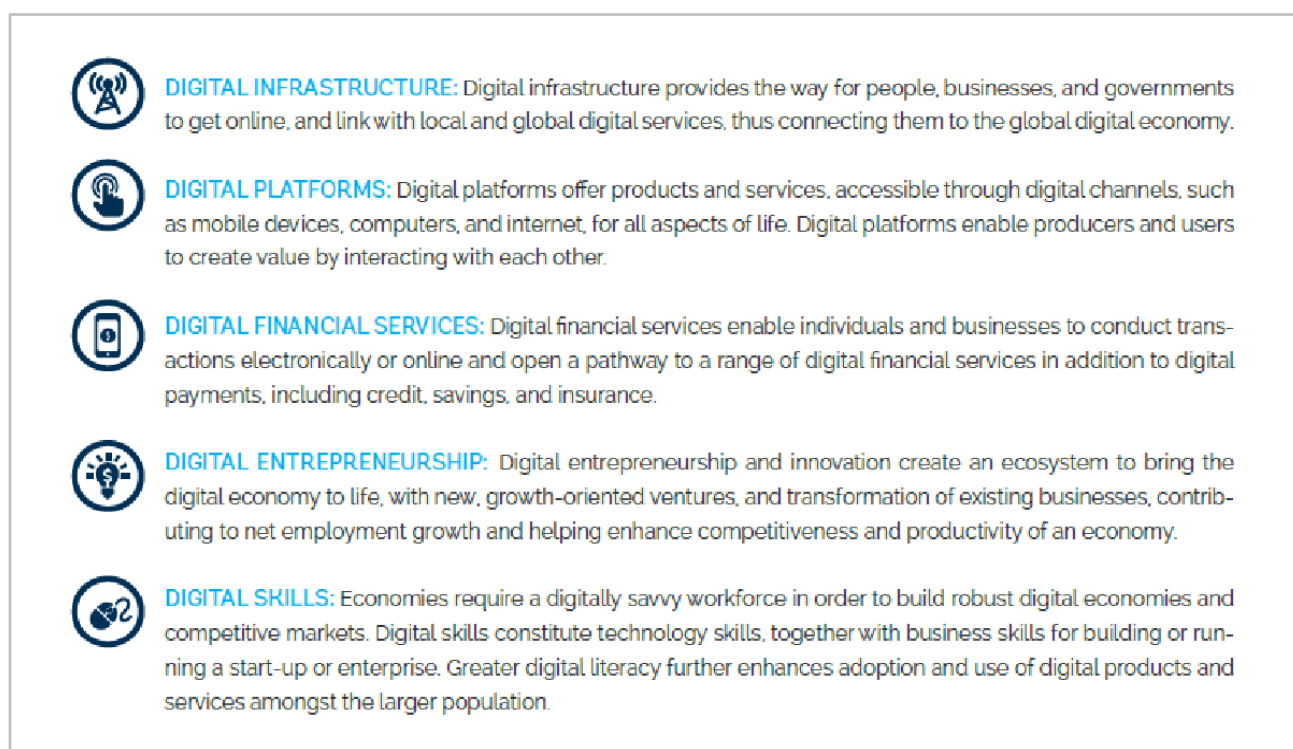
Figure 11: Five Pillars

The high priority recommendations formulated for Mozambique by an assessment team of the Digital Moonshot for Africa project and that relate to the education sector, are as follows:

- Task force to develop a digital skills development strategy and facilitate coordination with institutional coordination conducted by MCTESTP, MINEDH, Institute for Vocational Training and Labour Studies (IFEPLAC) and ANEP.

- Build core capacity on Internet-era skills with coordination by the National Institute of Electronic Governance (INAGE).

- National Entrepreneurship Strategy with a clear definition of roles, resources, and objectives MCTESTP, the Ministry of Industry and Commerce (MIC), Ministry of Youth and Sports (MYS).

- Stimulating demand by supporting MoRENet in providing connectivity and improved digital content MCTESTP, HEIs, ANEP, FIs

- Evaluate and revise current training programmes offered by HEIs according to international standards MCTESTP, National Council for Quality Evaluation of Higher Education (CNAQ), HEIs, ANEP with support from industry.

The right channel to promote the above-mentioned digital skills, with an impact and lasting effect into the forthcoming digital economy, is through responsive national education and training systems. Digital skills development at the primary, a secondary and tertiary levels, as well as for technical and vocational education and training (TVET) programmes should be clearly defined and implemented. Capacity-building and TVET for vulnerable populations in areas and professions where there will be high demand, should be promoted, linking education to specific skills needs and training and to the labour market.

Taking advantage of the existing strengths of the national educational policy, Mozambique can develop additional frameworks and resources are required to reach the non-formal education on TVET, including for the development of alternative and non-formal education models for digital training. Training programmes should be adapted to the various needs of workers of different socioeconomic backgrounds and skills levels, as well as to out-of-school youth and adults.

Ensuring access to high-speed internet and quality content services to research and academic communities, as well as TVETs (Technical and Vocational Education and Training) (Technical and Vocational Education and Training), is essential for the development of a vibrant digital economy in Mozambique. Increasing learning opportunities for students and teachers through the Internet can also spur demand for broadband and digital content within surrounding communities.

Taking in consideration the rapid advancements in ICT and related technologies, and the vast number of people required with advanced digital skills, for Mozambique to cope with the Fourth Revolution, there is a need to evaluate current training programmes offered by HEIs and revise them by critically looking at past and current experience, inspired by best regional practices and according to international standards.

The World Bank PID points out that Mozambique has the lowest mobile internet cost in sub-Saharan Africa (US$1.97 per gigabyte), and mobile phone penetration stands at 46% of the population. Improvements in foundational digital transformation elements, combined with support to start-ups and existing businesses, can help the Mozambican economy harness digital data and modern technologies, generate new content, link individuals with markets and with government services, and address the challenges the country is facing on public service delivery and job creation.

Digital transformation can support social protection programmes that target households in need. The domestic digital economy would also be key to generating opportunities for the youth population, while also providing cost-effective technological solutions, adapted to the local market and needs. Noting however that ICT infrastructure development and coverage do not necessarily ensure digital beneficiation, but demand-side factors such as digital skills, education and affordability are equally critical elements to ensure a sustainable ICT sector that would in turn support further education, skills, and human resource development (World Bank, 2020). If the human capital has limited education levels and poor ability and capacity to adopt, manage and operate technologies, it is unlikely that any ICT infrastructure will be optimised. Human resource capacity is crucial and warrants relevant curriculum and an education system that is responsive to emerging needs and labour market demand.

FINDINGS AND RECOMMENDATIONS FROM PRIMARY RESEARCH

13. INTRODUCTION

This second part of the report, as a sequel to the literature review presented in Part 1, presents the findings and interpretations deduced from the primary research conducted as a component of the investigation into the integration of ICT in education. As mentioned in Part 1 of this study, this ADEA study is conducted as part of the larger study of 30 African countries (all of which are members of the Islamic Development Bank and the African Development Bank). This large-scale country study seeks to explore the use of ICT in education during a crisis with a view to providing actionable recommendations for the needed investment in digital infrastructure and curriculum development.

The specific objectives of the large-scale African study are to:

1) Gather information that will support the design of ICT-oriented education policies and strategies in the member countries.
2) Identify opportunities and challenges in the target country and its ability to harness and support the use of ICT across basic education (from pre-school to secondary school), and in the post-school sector including TVET and higher education.
3) Identify the curricula changes required for the adoption of ICT in the education levels mentioned above.
4) Enhance regional cooperation in digital education to improve economic competitiveness of Africa.

The Secondary and Primary data collection focused on the following aspects for all the education levels (basic education, TVET and higher education) in all the countries studied:

- Existence and level of ICT infrastructure.
- Existence and breadth of ICT policies and strategies.
- Level of digital competence of the workforce.
- Existence of cross-country e-education programs and challenges related to implementing e-education.
- The utilization level of ICT infrastructure in learning facilities.
- Challenges experienced in ICT implementation.
- Availability of ICT for learning.
- The ICT abilities and training needs of the workforce and the students.
- Partners currently engaged in supporting the use of digital technology in education and the areas of support in which they are engaged.
- SWOT analysis of the use of ICT in education.
- To gather experiences of good and challenging practices in the use of ICT in education.
- To identify critical needs and gaps in using digital technologies in terms of ICT and other infrastructure and pedagogic requirements.
- Prioritising needs for improving ICT in education.

14. METHODOLOGICAL APPROACH

This primary research component followed a mixed-methods research approach, which is often considered to be a "value-add approach" since it relies on the "mixing" of both quantitative and qualitative methods, as well as secondary and primary data with the merged sources of data better able to respond to the research questions of a study.

The study utilised a mixed-methods approach conducted in two phases.

The first phase undertook a desk review and analysis of the relevant literature from government and institutional websites. The desk study also considered national and international studies that reviewed changes in the post-schooling sector after the onset of the pandemic.

The second phase entailed a questionnaire which comprised open ended questions in order to obtain a more nuanced understanding of the integration of ICT into the education sector in the target country, and to better understand the impact of the pandemic.

Mixed-methods research entails the gathering and merging of data from various sources and draws on the complementary strengths of the data sources to gain an enriched understanding. The approach used here relies on collecting and mixing data sources against the backdrop of the broad literature review conducted for Part 1 of this study.

This methodological choice is especially relevant to understanding and identifying both weaknesses (needs) and best practices, describing and explaining the interaction between contextual conditions, actions and education policy in order to understand the use of ICT in education before, during, and after the COVID-19 pandemic period, and to provide recommendations for the proposed investment in digital infrastructure, policy change and curriculum development.

14.1. Research design for primary data gathering

The previous section of this report entailed the collection of secondary data drawn from relevant literary sources. This review was conducted with the intention of providing a frame of reference for understanding the key issues, the countries' priorities, challenges and experiences regarding ICT and remote learning based on the Covid-19 experience. The literature review also assisted in identifying research questions and informed the design of the data collection tools whilst providing a backdrop for the interpretation of the findings.

This latter section of the report refers to the gathering of primary data sources in pursuit of understanding their use of ICT across the education subsectors before, during, and after the COVID-19 pandemic.

14.2. Country focal points

ADEAs appointment of country focal points in each of the countries played a critical role in enabling access to the Ministries and to the various subsectors, to source relevant literature and administer the surveys and interviews in line with the three instruments developed for this study.

Following a start-up team meeting the country focal person was responsible for identifying the sample and then sending the Google link to the questionnaire and the KII form to the identified sample in terms of the sampling stratification protocol. The focal person was also responsible for facilitating the focus group discussions.

Focus Group Discussions typically brought together a group of up to 12 targeted participants. The process in this case comprised semi-structured questions developed for the respondent group and presented and captured on the FGD Google form. FGDs are used to understand multiple viewpoints and different perceptions and perspectives on the topic, as understood through the group's collective voice. The country focal persons facilitated the group discussion, ensuring that all participants had an opportunity to engage, and steered the discussion in the direction required to ensure the questions were answered. The country focal person facilitated and then compiled the FGDs responses onto the Google form for ease of administering and analysing.

14.3. Sampling for the KIIs and FDGs

Multistage sampling was applied, and for the participants of KIIs and FDGs a snowball and purposive sampling was conducted, with guidance from the Ministry of Education, to ensure a practical level of coverage to capture the needs and aspirations of the various levels. Moreover, ADEA utilised its existing networks with the country focal points facilitating access to relevant government institutions.

The following respondent nomenclature was defined to ensure sufficiency of the sample:

- International and regional development partners.
- Relevant Government line ministries and heads of institutions and training facilities.
- Policymakers, Technical leads and Implementers, faculty, chairpersons (curriculum developers, statistics, planning, financing, ICT).
- Decentralized education authorities (officials).
- Heads or designated officials of teacher unions, teacher associations, and parent teacher associations.
- Head teachers and teachers/trainers from primary and secondary public and private schools, TVET and higher education institutions.
- Learners from the above identified schools/institutions and their parents.
- ICT development partners, private sector, telecoms, and civil society organizations who have an interest in ICT in education.

The focus groups aimed to explore both the existing and aspirational infrastructure, and the following possible advocacy for various stages of readiness:

- Pre-integration and baseline contexts and advocacy needed
- Transitional arrangements and related advocacy
- Development of implementation, skills and abilities
- Expansion of usage
- Scaling up for system-wide integration.

Note on the sample: This study does not claim that the findings are representative of, or generalizable to, the general population, however, the qualitative responses elicit many insights and experience trends that can enrich considerations for implementation. The findings represent "voices" of the various subsectors in education, from government officials, educators and learners, and are

used interpretively against the backdrop of the previous literature review. The following subsections refer to the findings from both the questionnaire and the interviews. The literature review and the various modes of interviews explored the ICT ecosystems as is discussed below.

14.4. Limitations of the study

With the time and resource constraints of any research study, the sample for this study was not sufficiently large enough for the findings to be generalizable. However, from the findings obtained it may be claimed that the study met the criteria for adequacy of information, despite the sample sizes being smaller than anticipated, as it was sufficient for saturation to be reached.

As with all studies, the limitations need to be articulated. They pertain to:

- Country contextual incidences such as strikes, holidays and also survey fatigue amongst officials.
- Cost estimation of digital learning systems in an African context.
- COVID-19 protocol causing limited travel and physical interactions.
- The lack of accurate and updated data.
- Government bureaucracies in terms of tedious procedures to conduct interviews or receive official documents for review.
- The limited size of samples.

14.5. Ethical considerations

At the start of each KII or FGD, an oral or written explanation was communicated to the participants to explain the research, assure the participants of confidentiality, and seek informed consent. Participants were aware that of the voluntary nature of the study and that they could withdraw or withhold a response if they so wished. Lastly, respondents were assured of the security of data collected and data protection.
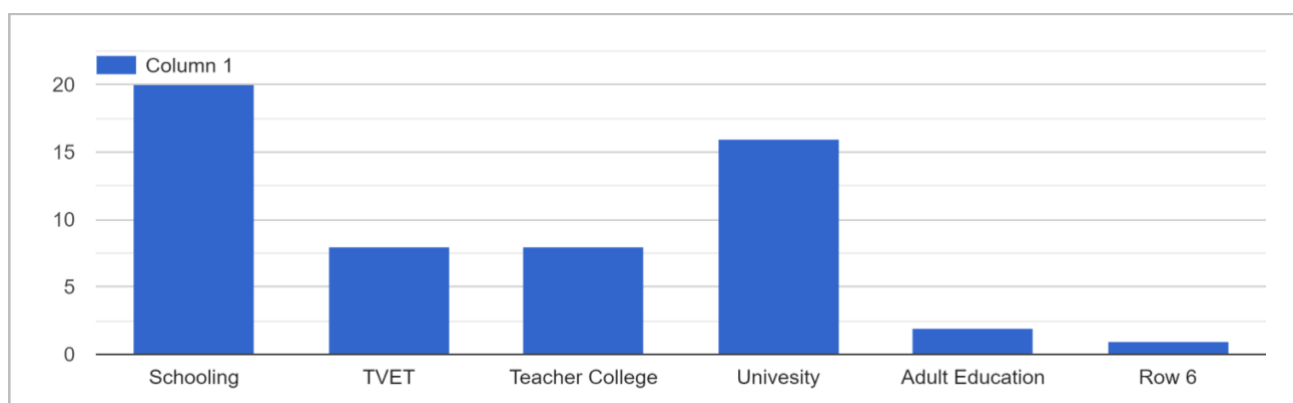
15. THE SAMPLE

Figure 12: Sector representation of participants

16. THE EXTENT TO WHICH COUNTRIES USED ICT BEFORE AND AFTER THE ONSET OF THE COVID-19 PANDEMIC

16.1. ICT trend in the various subsectors prior to the onset of the COVID-19 pandemic

Participants in the focus groups indicated that ICT was not a dominant mode for teaching, prior to COVID-19 and that there had been minimal investment in ensuring using ICT as a learning tool in classroom teaching. However, it was pointed out that it was used for the production of texts and support handouts, and that the use of WhatsApp had previously been used as a mechanism for sharing study materials. Data projectors were used for to project learning content and for power point presentations. Some thematic content for secondary education learners was broadcast via public television (TVM), in accordance with the needs and characteristics of each sub-sector, as described below:

16.1.1. The use of ICT in Adult Literacy and Basic Education prior to the onset of Covid-19

The "Escola na Caixa" programme, for adult learners was funded by UNESCO and the funding was intended to buy tablets and overhead projectors for teaching and learning in some literacy centres located in urban areas where they started using ICTs. The initiative was not extended to centres in rural areas due to the partners' inability to pay for additional resources.

16.1.2. The use of ICT in schooling prior to the onset of COVID-19

Pre-school education was operating as a pilot intervention with no significant use of ICTs. The pre-school teachers used mobile phones for communication and computers to produce documentation and organise the pedagogical-administrative work in kindergartens.

Primary and Secondary Education have had some initiatives such as Telescola.

For the 11 and 12 grade was the Secondary Education Distance Learning Programme (PESD), which is offered entirely via online to a number of just over 16,000 students in all provinces.

The computer rooms installed, with support from partners, in some schools include interactive frameworks, which were used for teacher training where this was possible.

However, it was indicated that there was a lack of resources to ensure the maintenance of equipment, venues or to provide ongoing connectivity, In addition, there was no funding for employing trained staff to provide for technical assistance. The participants pointed out that the situation had worsened and currently many of these venues are inoperative.

16.1.3. The use of ICT in Technical and Vocational Education prior to the onset of COVID-19

Participants indicated that the situation regarding the use of ICT for learning in technical and vocational education is identical with the other education sub-systems. From a legislative and strategic point of view, the government is "betting a lot on technical education". But in practical terms there is very little progress towards ICT and/or distance learning. Participants indicated that there are

TVET teachers who were trained abroad to teach technical education, but there are challenges in strengthening the sub-sector when it comes to the use of ICT-based learning, due to lack of related equipment and training of the workforce.

16.1.4. The use of ICT in higher education prior to the onset of COVID-19

In general, the situation regarding the use of ICT for learning before the pandemic is not different from the other subsectors, as far as in-person courses are concerned. "In this subsector there are distance learning courses using ICTs and there are experiences of some private institutions that, at the moment of enrolment, provide students with learning devices." Participants referred to an experiment that was piloted by a private university before the pandemic started – the institution used a Moodle platform for learning. The institution has well-equipped computer rooms, a functional internet and access points and all classrooms that are fully equipped with computer equipment for online learning.

16.1.5. Other Relevant Aspects pertaining to prior to the pandemic

National Institute of Information and Communication Technologies (INTIC), a state institution with regulatory powers regarding the use of ICT, has been involved in policy making and is now focused on monitoring and collecting the activities and targets entered by the Education Sector. INTIC has also introduced an ICT training programme for the workforce, especially for students, through a mobile unit, previously equipped for this specific purpose.

As part of the social responsibility of MOVITEL, a mobile phone network, provided the installation of a package for free Internet access, with Wi-Fi for students and teachers, but this initiative was short-lived.

The Ministry of Education and Human Development has established for a sectoral Technological Plan for Education which aims at: (i) equipping classrooms, providing a virtual library, (ii) developing learning programmes for I and II cycle of secondary education, (iii) offering human resources training, including the training of teachers in digital literacy, thinking of the student as the main beneficiary as well as (iv) connectivity.

This Technological Plan was designed to operationalise the strategy of ICT use, developed by the Ministry of Science and Technology. But the MINEDH is facing problems to ensure its expansion and execution, due to discontinuities in related funding and lack of resources for most students and teachers, especially in rural areas.

This situation is the result of regional asymmetries, due to the great disproportionality of the country's development, which prevail in the:

- Weak electrification in most rural areas, where primary and some secondary schools are located;
- Lack of capacity on the part of students and parents, as well as some teachers to acquire android mobile phones;
- Disproportionality distribution of mobile phone signals in the country, with rural areas suffering the most;
- Lack of computer equipment;
- Poor ICT skills among students and teachers, especially in rural areas;

- Lack of specialised ICT training;
- Lack of regular and permanent maintenance.

16.2. ICT use after the COVID-19 pandemic outbreak

The pandemic imposed the use of ICTs on the sector as a whole, "which consolidated and expanded the experiments that had been carried out in a 'timid way'". All the education subsystems, with the exception of pre-school, started to provide activities (worksheets and thematic content) to their students as a way of keeping them learning during the pandemic, but these learning resources were not made available in a uniform and comprehensive way, for several reasons such as lack of access to connectivity or appropriate devices etc.

16.2.1. Adult Literacy and Education after the onset of COVID-19

In this sub-sector, the interviewees reported that they shared learning material electronically, and that they broadcast lessons via TV and Radio with the emphasis on Community Radios, in places where this is possible based on a schedule previously shared with literacy learners and students.

16.2.2. Schooling after the onset of COVID-19

The first intervention of the Sector, through the Department of Technologies and Information of the MINEDH - DTIC, was initiated after the outbreak of the pandemic and by force of presidential decrees. The aim was to redouble efforts to expand the use of ICTs in the country, in alignment with the Sector's Technological Plan.

In its turn, the Institute of Education Development, as the body responsible for curriculum development in the country, firstly, proceeded to the adapt the in-person teaching programmes for a virtual teaching; secondly, it interacted with the universities, in order to align the learning contents for the purposes of the pre-employment examinations for students to higher education.

There is also an ongoing negotiation with the media in order to disseminate the learning contents for the domain of the interested people.

The site of the Institute of Open and Distance Education - IEDA, an organic unit of the Ministry of Education and Human Development - MINEDH, which hosted learning contents, became operational. Before the pandemic the IEDA was only used by students enrolled in the Distance Secondary Education Programme (PESD) and subsequent to the onset of the pandemic is now used by all students in the national education system.

The learning contents are offered via the MOODLE platform to 16,000 students enrolled in PESD for the Second Cycle.

In some situations, ZOOM and GOOGLE MEET are used for meetings and some training of teachers and managers. A small number of schools use these platforms for intermediate assessments.

At the level of some secondary schools in urban areas there were isolated experiences of the assembly of some net-boxes, from a project "Mova Aprender", which was discontinued due to lack of resources.

A hybrid learning model was adopted but could not be consolidated due to barriers such as weak outreach and advocacy. However, there was some innovation on balance. Video lessons produced in an amateur way by the teachers were also introduced, but they contributed to make the learning process more creative. Also, during this period, all subsectors of primary education were broadcasting the lessons, through the programme Telescola, from TVM. A primary school programme was introduced on Canal Aberto, in partnership with the Institute of Social Communication, where they made available learning instructions and worksheets.

The Telescola programme had UNICEF funding which included the production of flyers. Now that the pandemic situation is normalised and with no more funding, everything has stopped.

16.2.3. Technical and Vocational Education

Just as in other subsectors, in Technical and Vocational Education there was an increase in the use of ICTs after the pandemic outbreak. Institutions began to use radio broadcasting and mobile phones, WhatsApp and other platforms as vehicles of communication and interaction between trainers and trainees of the Teacher Training Institutes (IFP), teachers and students in technical education, as part of the guidance of the learning process.

16.2.4. Higher Education

After the outbreak of the pandemic, public universities invested in the use of ICT to share academic work and classes online, without however covering all students and consequently compromising the academic year for the following reasons:

- Significant number of students unable to afford an android device;
- Teachers unprepared for migration to online learning;
- Lack of connectivity due to network overload;
- High internet costs;
- Use of several platforms, some of which are unsuitable for online learning.

There are in the sector experiences in a university with ICT resources, ensured the teaching and learning process, including the administration of assessments throughout the year and completed the curriculum according to the academic calendar.

17. THE WAY FORWARD POST-COVID-19

Respondents stated that "they will continue to use ICTs because they are here to stay and because there is a need to capitalise on the practical gains already made in using ICTs for learning during the pandemic".

However, they acknowledge there are major weaknesses, in the provision of technological resources, connectivity and in the training, especially for literacy learners, literacy teachers, pre-school

educators, teachers and staff. With the normal resumption of the activities of kindergartens, ICT will continue to be a bet because it will help in the pedagogical work of the nursery teachers through the realisation of learning dynamics, such as letter and colour games, among others, using computers suitable for early childhood. It is also the responsibility of this sub-sector to train primary school teachers, who should be given the pedagogical tools to ensure the use of ICTs from the early grades onwards. However, there are weaknesses in the provision of necessary and appropriate resources for people with disabilities, which negatively impacts on children's development.

The policies are clear, but in practice there is no provision of resources to ensure inclusion and efficiency in the education system, as well as for teacher education and training, especially in the IFPs as agents of socialisation (school, family and community). The Literacy and Youth and Adult Education sector, will continue to broadcast classes via radio which presents life skills courses on health and nutrition. The MINEDH, through the Department of ICT, distributed 7,900 tablets to support disadvantaged students in the 2nd cycle. This has contributed to an exponential increase in the number of enrolments. The return of the tablets aims to ensure that more students can benefit from them in subsequent years, and this will contribute to the sustainability of the Distance Secondary Education Programme (ESDP).

18. THE AVAILABILITY OF E-LEARNING MATERIALS, THE USE OF RADIO, TV, COMPUTERS

18.1. General Education

The Sector already has learning content from general education are available on the education website, but not in the appropriate format for learning, in EAD. However, there is a Moodle platform, with content that is only for PESD learners.

Therefore, it is still a challenge to digitise the activities and assessments to allow students to complete them without having to travel. That is why teachers are use different platforms such as email to provide worksheets to their students for formative assessment. Given the advantages that Telegram offers, in relation to the possibility of having a greater number of students in relation to WhatsApp, teachers were guided to use it to communicate with students.

They also used SMS, usually to alert the parents of the pupils, mainly those in primary education, to monitoring the work sent to their pupils, as well as for listening to the class sessions, via public Radio and TV. Some schools have created WhatsApp groups in their classes for content sharing and interaction among students and between students and their tutors and teachers.

In the online class sessions, we faced the difficulty characterised by a very lower socio-economic learners who lack android devices and Internet availability, which forced the teachers to repeat the lessons when the in-person classes were resumed.

18.2. Technical Education and Vocational Education

This sub-sector had similar experiences to general education, except with regard to the use of community radios to broadcast learning content, where possible, for teacher training. It should be

noted that schools and technical institutes were more limited by lack of technological capacity and specialized training to adopt and/or produce multimedia content specific to the subjects taught in technical education.

18.3. Higher Education

There are disparities in the way ICTs have been used, arising from a lack of approach among teachers and students about the types of platforms to be used. But on the whole the provision of learning content was ensured through the use of various platforms.

Meanwhile some private institutions have a successful experience in providing learning resources via a Moodle platform. But the lack of ICT literacy on the part of some teachers, especially among the older ones, was evident.

19. CONDUCTING ASSESSMENTS

Regarding to ICT-based assessments during the pandemic, the Sector only carried out intermediate assessments using WhatsApp, ZOOM, and Google Meet for formative and intermediate assessments throughout the study process. Final exams were conducted in-person, in accordance with the law in force on the matter, and in preparing students for the exam, other platforms were used, including in-person sessions in accordance with the health protocol. Some private sector schools using Cambridge curriculum had online exams.

The Literacy and Adult Education subsector carried out formative mid-term evaluations using ICTs, but it is not a comprehensive experience. The MINEDH as the central sector carries out online supervisions.

20. THE DIGITAL DIVIDE AND ITS IMPACT ON TEACHING AND LEARNING

There is a digital divide in the country and the way it influences the learning process is similar in all subsectors of education, since the majority of the school population tends to be low income. For a large part of the population does not have access to ICT as was desirable, for various reasons, the following being the main motivations, among others:

- Poverty that makes it impossible to acquire modern technological resources;
- Regional asymmetries (electrification, connectivity);
- Resistance to change;
- The lack of digital literacy; and
- Illiteracy.

The lack of resources to acquire android mobile phones and the poor digital literacy of a considerable part of teachers and students, the lack of equipment maintenance constitutes, among others, barriers to access learning contents, as well as to exercise, as they are dependent on PCs installed in places of possible access. This includes the situation of parents and who cannot monitor the learning of their

children also due to lack of ICT resources, especially those living in suburban and rural areas due to the high poverty rate and regional asymmetries.

This situation creates a huge gap between those who can and those who cannot have technological resources for learning. Therefore, the compliance of study plans by educational institutions, especially public ones, was not properly fulfilled and teachers were forced to review in the classroom, all syllabus contents that had already been covered during the critical period of the pandemic.

21. WORKFORCES' DIGITAL COMPETENCE: INTERVENTIONS FOR PRE- AND IN-SERVICE TRAINING

In general, the level of digital competence of the workforce of all Education sub-sectors (literacy trainers, kindergarten teachers and teachers) is very low, with the majority of those who are proficient only using MS Word to type texts, use WhatsApp to share content and search for scientific content on various websites, but without the knowledge to explore the potential of computer equipment and the internet. However, the vision is to address the problem in the sense of improvement, in line with the education sector's ICT strategy.

In this context, government policy is to promote the massive use of ICTs, but there are constraints to their practical implementation, due to limited resources. At the Sector level, kindergarten educators, literacy and primary school teachers are the weakest in digital literacy. And those in secondary education use computers with difficulty, while in higher education the digital skills of the workforce is considerably better. Resistance to change by older staff and teachers does not help the system in developing ICT skills.

However, there is a package called ICT in Pedagogy as a strategic Sector for training the workforce, which will help prepare future primary school teachers in the use of ICT to then replicate the knowledge in the classroom. There is an ICT subject in the curriculum of teacher training courses, but the format used does not give future teachers sufficient knowledge either as users, let alone to deliver it to students. A study done in schools recently on the ICT use in education and related reflections reveals great weaknesses in the use of ICT, especially for children, leading teachers to opt for printed sheets with learning support material.

According to the study it was concluded that:

- 15% have no devices (mobile phone, tablet, computer and others);
- 43.9% access the internet based on their own resources;
- 94% of primary school teachers
- 64% of secondary schools do not have laboratories.

22. AFFORDABILITY OF INTERNET CONNECTIVITY

With the pandemic, there was great pressure on the actions already designed within the sector strategy for the use of ICTs, a fact that created problems in connectivity, availability of digitalised

learning content, as well as digital literacy on the part of most users (students, teachers, teacher trainers, school managers) and others.

22.1. In General Education

This Subsector has the highest number of schools, between primary, secondary including resettlement centres for children in vulnerable situations due to terrorism and natural disasters, but with improvised spaces for classes. Most of these schools are located in rural areas, which often lack basic conditions for connectivity (power, mobile phones, broadband and low family income). There are three mobile operators in the country that provide Internet that cover a considerable part of the population, although with some many limitations in rural areas and even in urban areas. But it is not accessible to all due to high prices and in many cases, connectivity is of poor quality.

Students, whose parents are deprived of a fixed income, are the most penalised because of their lack of capacity to resort to alternative means.

As a way of minimising the problem, the INTIC (National Institute of Information and Communication Technologies), the state regulatory body, has created a mechanism for Internet provision, installing squares or digital access terminals in the provincial capitals and district headquarters, but it does not satisfy the majority of the target population who are the students and teachers, nor does it satisfy the majority of the population.

23. VULNERABLE GROUPS AT RISK OF MARGINALIZATION

The groups most at risk of further marginalisation and exclusion are the elderly, people with disabilities, young people and children in vulnerable situations in the education sector and those living in areas with low levels of development.

Most of the computer equipment available in the internal market does not have applications that help people with disabilities to use these tools comfortably.

23.1. Girls and their access to ICT

The Education Sector is committed to the struggle for gender equity and the situation has improved a lot in recent years. There are, however, challenges regarding parity and this is reflected in the Internet access, because in countryside or low-income families, the boys are the most privileged in access to mobile phones and mobile data compared to the girl, partly due to socio-cultural motivations. Meanwhile, in urban centres it is much better, and, in many cases, girls are the most benefited.

23.2. Learners with disabilities

The law provides for a study plan for the training of teachers prepared to attend to students with disabilities and there is already a set of actions aimed at responding to this type of situation, such as the curriculum review by INDE - Institute for the Development of Education, as well as the acquisition by the Institute of Open and Distance Education of a Braille machine to adapt learning materials for distance education.

But there is also weak technical capacity in the sector to explore the potential that ICTs can offer to help people with disabilities, as well as the absence of legislation that obliges economic agents to import inclusive ICT equipment that safeguards the needs of people with disabilities.

24. BROADBAND ADHERENCE

The three mobile phone operators make Internet available with some coverage, but they do not cover the whole country. In the areas where these operators have the greatest impact adherence is high, especially in institutions that benefit from help from partners who subsidise Internet costs.

However, at the time of the pandemic there was some increase in terms of adherence, with the use of WhatsApp in rural areas and Zoom, Google Meet in urban and peri-urban areas for sharing learning content, overloading the installed capacity for broadband connectivity.

The distribution of tablets to middle level students has spurred more students to the learning process, putting more pressure on the available bandwidth, which is not prepared for an ever-increasing demand. The take-up level of mobile phone services is good in areas where these services are available.

It is a problem because the electrification grid does not cover rural areas with many schools unable to access electrical power. Moreover, the cost of energy is very high and is not always of the desired quality, especially in peri-urban and rural areas.

25. CHALLENGES IMPACTING ON ICT IN EDUCATION

The other challenges that are faced in implementing ICT in education has to do with the lack of skilled personnel to explore the more complex functionalities that ICT offers and not just what is being done so far.

25.1. Adult Literacy and Education

- Training of literacy teachers in ICT for learning;
- Availability of technological resources with appropriate software for learning.

25.2. Schooling

a) Introducing digital literacy at the pre-school stage;
b) Computerisation of secondary schools;
c) Specialise technicians in multimedia contents for the production of digital learning resources;
d) Purchase of inclusive and good quality computers and other equipment;
e) Awareness raising of the workforce to change their mindset and embrace ICT;
f) Changing teaching and learning approaches with ICT resources;
g) Establishing partnerships and exchanging experiences with organisations with a higher profile in the use of ICT for education;
h) Creation of facilities for subsidised internet purchases.

25.3. Vocational Technical Education

The challenges of this sub-sector are similar to those of general education, but with the particularity that it is a challenge to specialise teachers and trainers in ICT, aimed at exploiting software for the dynamics of technical learning in each course in schools and agricultural, industrial, commercial and primary teacher training institutes.

25.4. Higher Education

Teacher training on ICT in pedagogy. Training of specialists in open and distance learning.
Use of platforms with appropriate functionality for students to study at a distance. Provision of quality internet to higher education institutions. Equipping institutions with computer equipment that meets the institutional challenges.

26. LEGISLATIVE OVERVIEW

26.1. Policies

The ICT policies in place in the country are:

- Information Society Policy – Ministry of Science, Technology and Higher Education Strategic Plan for the Information Society 2019 -2028 - Ministry of Science, Technology and Higher Education;
- Cyber Security and Safety Policy and Strategy for its Implementation – Ministry of Science, Technology and Higher Education;
- Information and Communication Technologies in Education Policy – Ministry of Education and Human Development;
- Education Technology Plan 2019 – Ministry of Education and Human Development.

Are there new strategies or interventions being considered/proposed/changed for ICT in education? If so, in which ministries?

- The country already has policies and strategies in place for the use of ICTs for education. With the outbreak of the pandemic and under the health protocol of the ministry of health, each sector had to adjust its sectoral strategies to face the COVID-19.

- Some of the managers interviewed consider that all the decrees were issued depending on the situation the country is experiencing. Therefore, there was no need to design new strategies, but rather to adjust them to meet the current challenges. However, other managers believe there is a need to review the legislative package to safeguard the interests of people with disabilities in relation to digital access, assistive technologies and improved connectivity, and to review strategies to massify the use of ICT for learning.

Strategy to deal with the impact of COVID-19:

- The Sector's strategy already provides for distance learning programmes for general, technical, professional and higher education.

27. OPPORTUNITIES AND CHALLENGES TO HARNESS AND SUPPORT THE USE OF ICT

COVID-19 was an opportunity for (i) new learning system, (ii) attracting funding, (an opportunity for more outreach to distant people through web meetings) and generated a lot of learning and enthusiastic young people to pursue the use of ICT for learning.

27.1. Adult Literacy and Education

Opportunities:

- Favourable country legislation;
- Growing affluence of literacy learners and students in literacy centres motivated in using ICT for learning;
- Prevalence of a considerable illiteracy rate;
- Enhance the mechanisms to provide literacy learners with content for life skills Challenges;
- Technological resources with appropriate software for this sub-sector;
- Workforce training;
- Electrification and connectivity.

27.2. General Education

Opportunities:

- Favourable country legislation;
- Window of opportunity to increase the supply of free schooling and beyond;
- Students and teachers motivated in the use of ICT for learning;
- Opportunity to reduce the student teacher to class ratio.

Challenges:

- Technological resources;
- Training the workforce;
- Connectivity.

27.3. Vocational Technical Education

Opportunities:

- Favourable country legislation;
- Window of opportunity to increase the supply of technical training and life skills;
- Students and teachers motivated in using ICT for learning.

Challenges:

- Technological resources including appropriate Software for technical and vocational education;
- Training the ICT workforce;
- Connectivity.

27.4. Higher Education

Opportunities:

- Favourable country legislation;
- A window of opportunity to increase the supply of higher education;
- Students and teachers committed to use ICT for learning.

Challenges:

- Modern technological resources;
- Training the ICT workforce;
- Connectivity.

28. SUCCESSES, WEAKNESSES, OPPORTUNITIES, AND THREATS / CHALLENGES (SWOT)

Positive case study

The use of ICT helped ensure that schools with connectivity conditions were not closed altogether and made it possible for students to access study materials, providing them with visualisations of images and objects representative of the subject content for the learning context. Without the use of ICT it would have been almost impossible to achieve these results and to take students to make in-person exams successfully.

There is one private university that during the pandemic managed to maintain its full operation, through digital platforms without compromising the fulfilment of study plans, assessments and the academic calendar in a timely manner.

What weaknesses have been noted in the implementation of ICT in Education?

The biggest weakness boils down to the sector's lack of capacity to embrace ICT in a comprehensive, sustainable, integrated and inclusive manner. The policies of the country and the Education Sector on ICTs are clear, but there is a weakness in relation to their effective implementation. The school curriculum has not been designed taking into account the particularities of distance education, especially regarding to assessment and certification processes.

According to the Forum of Associations for People with Disabilities in Mozambique, the country is a signatory to conventions on safeguarding the situation of people with disabilities, but the 2021 study shows that it still has incomplete policies in relation to access with the same quality of accessibility. In other words, for people with disabilities, accessibility to physical spaces of services is guaranteed, but there are problems in terms of digital approach, as follows:

- Lack of compliance with standards on inclusive digital accessibility;
- Official government websites, including that of the MINEDH and universities, is not suitable for people with disabilities;

- The procurement law does not make room to safeguard the situation of people with disabilities in the procurement of IT equipment;
- The law of the country does not regulate the import of IT equipment, taking into account assistive technologies, even assuming that the state is the largest buyer of IT equipment at national level. Therefore, sending people with disabilities to distance learning ends up looking like a way to worsen the situation of this class;
- Connectivity is limited due to high costs and signal fluctuations.

Opportunities for improving implementation of ICT in Education:

- Increase the supply of schooling and technical training programmes;
- Existence of motivated pupils in the use of ICT;
- Existence of teachers trained to provide online learning tutoring at grade 10 and 11 via the Moodle platform;
- Encouraging results from students in Distance Learning Secondary Education via online;
- There are many people learning ICTs outside the formal education system, which should be exploited to boost the use of ICTs in the country through the Education Sector;
- There are some investment programmes underway, particularly in Technical and Vocational Education and Higher Education that cannot be wasted;
- Existence of favourable policies for the use and massification of ICTs in learning;
- Implementation of electrification projects in rural areas by the government;
- Existence of mobile telephony and Internet provision companies.

Threats or challenges for the implementation of ICT in Education?

ICT access faces the following threats:

- There are many schools without conditions to install electricity or to assemble equipment;
- Vandalization of electricity grid and mobile phone infrastructure, particularly in rural areas;
- Control possible cyber theft;
- Ensure that ICTs are not used for extraneous purposes;
- Resistance to change;
- High levels of poverty and regional asymmetries;
- Huge distances between service providers and users (schools) due to the vastness of the national territory;
- Vandalization of facilities and theft of equipment;
- Use of ICT for other purposes.

Challenges:

- Strengthen infrastructures in order to guarantee the connectivity of mobile telephony and provide broadband to meet the needs of the Education Sector;
- Developing ICT workforce capacity;
- Introducing ICT literacy from pre-school onwards;
- Adopt a learning platform for the whole country, according to the conditions and purposes of each education sub-sector;
- Massify the creation of digital squares even in rural areas;

- Introduce in Technical and Vocational Education software that allows simulations of practical activities to be carried out at a distance;
- Electrify schools;
- Increase broadband;
- Ensure the purchase and maintenance of equipment;
- Create policies to ease access to computing devices;
- There are infrastructure problems in the country capable of ensuring real-time connectivity between the transmission
- and reception of voice data in videoconference sessions;
- The existing operators do not cover the entire national territory;
- Design e-learning strategies taking into account poverty and regional asymmetries in the country, as well as phobias when talking about ICT use.

29. RECOMMENDATIONS BASED ON A NEEDS AND PRIORITIES ANALYSIS
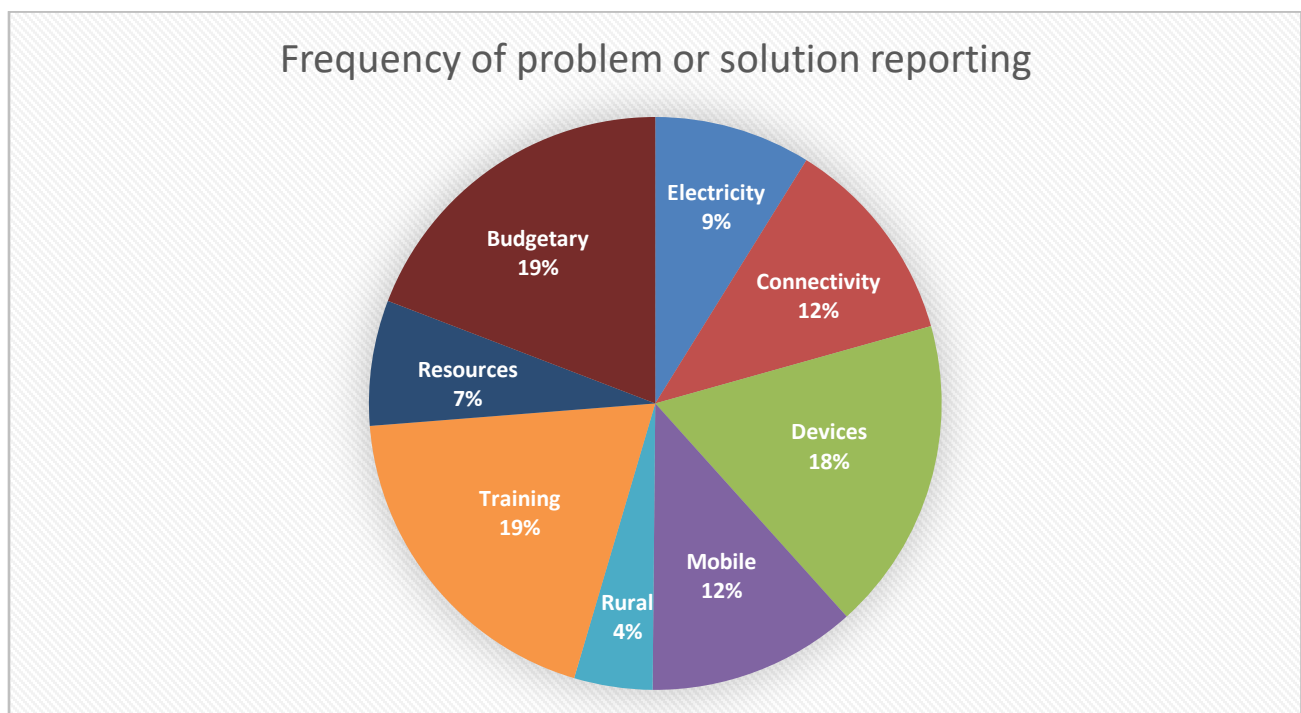
Figure 13: Frequency of challenges reported as impacting on ICT

Training and workforce capacity was most frequently mentioned as a challenge and a solutions. This was followed by reports on low access to connectivity, restricted budgets, lack of connectivity, electricity and lack of mobile Smart phones and mobile data. The participants proposed the following recommendations which can be considered more compositely considering the recommendations of the first part of this report.

Short term recommendations:

a) Raising awareness among people at all levels about the importance of using ICTs;
b) Create and secure funding sources for equipment acquisition, maintenance and connectivity;
c) Create subsidised facilities for access to computing devices and connectivity;

d) Make computing devices available to students;
e) Train teachers in ICT for learning;
f) Investing in the acquisition and use of ICT platforms as a learning resource.

Medium Term recommendations:

a) Set up computer rooms in schools;
b) Produce and make available multimedia learning content;
c) Create digital libraries in educational establishments;
d) Introduce in Professional Technical Education software that allows learning practical lessons at a distance;
e) Improving learning conditions for people with disabilities.

Long-term recommendations:

a) That the use of ICT be the day-to-day of the learning processes;
b) Making multimedia learning content available;
c) Conducting assessments and examinations via online.

30. CONCLUSION

It is recommended that Mozambique be considered as a country in need of investment. Digital transformation can improve the quality of learning outcomes and enable better access, inclusivity and participation. The digital divide in the country is vast and targeted investment will be needed to make ICT available especially for vulnerable groups. Digital devices, and connectivity are mentioned as significant barriers.

As the focus group participants point out, budgetary and capacity is needed simultaneously. Capacity here refers to the educators, administrators and also to technical support. They rightly point out that if human capital is limited by poor education levels and poor ability and capacity to adopt, manage and operate technologies, it is unlikely that any ICT infrastructure will be optimised. Human resource capacity is crucial and warrants relevant curriculum and an education system that is responsive to emerging needs and labour market demand.

Given the high poverty levels, ICT offers opportunities expanding education opportunities, particularly for the youth, while also providing cost-effective technological solutions, adapted to the local market and needs.

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Digital Development Dashboard^BETA

An overview of the state of digital development around the world based on ITU data

Mozambique

INFRASTRUCTURE & ACCESS

Network coverage

Population covered by a mobile-cellular network (2019) — **85%**

Population covered by at least a 3G mobile network (2019) — **82%**

Population covered by at least a 4G mobile network (2019) — **40%**

Mobile phone ownership

Individuals owning a mobile phone (2017) — **31%**

Female mobile phone ownership as a % of total female population (2017) — **26%**

Male mobile phone ownership as a % of total male population (2017) — **37%**

ICT access at home

Households with Internet access at home (2017) — **2%**

Households with Internet access at home, rural (2017) — **1%**

Households with a computer at home (2018) — **7%**

Households with Internet access at home, urban (2017) — **6%**

Mobile and fixed telephone subscriptions

Mobile-cellular subscriptions per 100 inhabitants (2019) — **49**

Fixed-telephone subscriptions per 100 inhabitants (2019) — **0**

Mobile and fixed broadband subscriptions

Active mobile-broadband subscriptions per 100 inhabitants (2019) — **18**

Fixed broadband (% of total): 256kbit/s - <2Mbit/s (2019) — **10%**

Fixed broadband subscriptions per 100 inhabitants (2019) — **0**

Fixed broadband (% of total): 2 to 10 Mbit/s (2019) — **54%**

Fixed broadband (% of total): >10 Mbit/s (2019) — **34%**

Fixed broadband (% of total): Unspecified speed tier — **NA**

International bandwidth per Internet user (kbit/s) (2019) — **17**

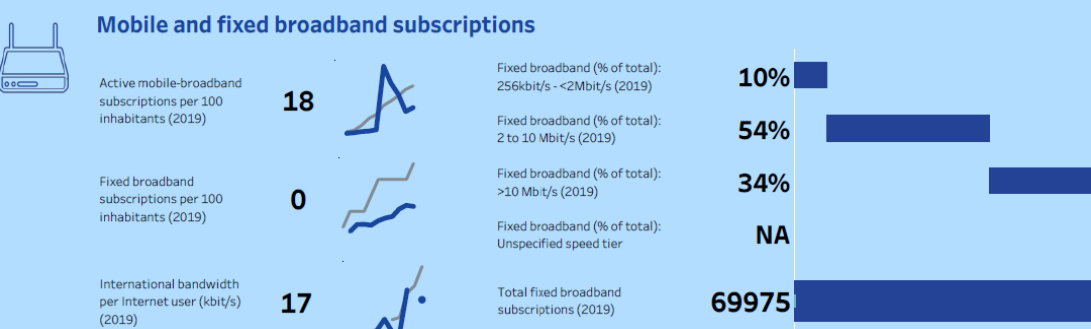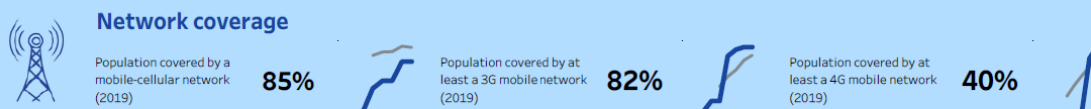Total fixed broadband subscriptions (2019) — **69975**

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Mozambique

INTERNET USE

Percentage of population using the Internet

Individuals using the Internet, total (2017)	**8%**	< 15 years as a % of all < 15 years (2017)	**1%**	
Female Internet use as a % of total female population (2017)	**6%**	15-24 years as a % of all 15-24 years (2017)	**12%**	
Male Internet use as a % of total male population (2017)	**10%**	25-74 years as a % of all 25-74 years (2017)	**10%**	
		75+ years as a % of all 75+ years (2017)	**2%**	

Broadband traffic

Average monthly fixed broadband Internet traffic per fixed broadband subscription (MB) (2018)	**12837**
Average monthly mobile broadband Internet traffic per mobile broadband subscription (MB) (2019)	**0**

ENABLERS & BARRIERS

ICT prices

Fixed broadband basket as a % of GNI p.c. (2020)	**36.0%**
Mobile data and voice basket (high consumption) as a % of GNI p.c. (2020)	**20.0%**
Mobile cellular basket as a % of GNI p.c. (2020)	**19.9%**
Mobile data and voice basket (low consumption) as a % of GNI p.c. (2020)	**16.0%**
Mobile broadband basket as a % of GNI p.c. (2020)	**8.0%**

ICT skills

Individuals with basic skills	**NA**
Individuals with standard skills	**NA**
Individuals with advanced skills	**NA**

About this dashboard

The Digital Development Dashboard reports the latest values for selected indicators drawn from three ITU data sets:
· **Telecommunication/ICT infrastructure and access data,** collected annually through one short and one long questionnaire. These indicators are defined in the ITU Handbook for the Collection of Administrative Data on Telecommunications/ICT.
· **Price data,** collected through an annual questionnaire. Price indicators are also defined in the ITU Handbook for the Collection of Administrative Data on Telecommunications/ICT.
· **Data on access to and use of ICTs by households and individuals,** collected annually through one short and one long questionnaire. These indicators are defined in the Manual for Measuring ICT Access and Use by Households and Individuals. This version of the Dashboard uses data collected up to November 2020.
When a value is not available, NA is reported. In some cases, it is possible that the value reported for disaggregated indicators is for a different period than the main indicator.

ICT skills
· **Basic skills:** the highest value among the following four computer-based activities: copying or moving a file or folder; using copy and paste tools to duplicate or move information within a document; sending e-mails with attached files; and transferring files between a computer and other devices.
· **Standard skills:** the highest value among the following four computer-based activities: using basic arithmetic formula in a spreadsheet; connecting and installing new devices; creating electronic presentations with presentation software; and finding, downloading, installing and configuring software.
· **Advanced skills:** the value for writing a computer programme using a specialized programming language. This version of the Dashboard uses data collected up to November 2020. When a value is not available, NA is reported. In some cases, it is possible that the value reported for disaggregated indicators is for a different period than the main indicator. For most indicators, values are rounded to the nearest integer. As a result, it is possible that the sum of

the values of disaggregated indicators does not add up to 100%. A print-friendly, two-page version of the Dashboard for the selected economy is available by clicking the PDF icon, next to the map.
Questions and comments: indicators@itu.int.

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Ushirika wa Maendeleo ya Elimu Barani Afrika

الرابطة لأجل تطوير التربية في إفريقيا

Association for the Development of Education in Africa

Association pour le développement de l'éducation en Afrique

Associação para o Desenvolvimento da Educação em África

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