Assessment of Knowledge Society Development in Uganda

June 2017

African Leadership in ICT (ALICT)

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Introduction

The Global E-Schools and Communities Initiative (Gesci), in collaboration with the African Union Commission (AUC) and other partners, developed an African Leaders in ICT (ALICT) capacity-building programme. The first phase of the programme ran from 2012-2013, focusing on leadership capacity-building in twelve countries (Botswana, Ethiopia, Kenya, Malawi, Mauritius, Mozambique, Namibia, Rwanda, South Africa, Tanzania, Uganda, and Zambia). A second phase of the programme ran between 2014 and 2016 and included four countries (Ghana, Ivory Coast, Morocco, and Senegal). ALICT has built the capacities of 487 mid and senior government leaders in 16 Anglophone and Francophone African countries, as well as officials from the AUC between 2012 to 2015. The Francophone version of the ALICT Programme is referred to as the Leadership Africain pour les TIC et le développement de la société du savoir (LATIC).

The course presented a multi-stakeholder approach for awareness-raising and capacity-building of African leaders around issues of Knowledge Society (KS), Information, Communication Technologies (ICT), Education, and Science Technology and Innovation (STI) in support of the AUC Action Plan and the EU-AU P8. Courses comprised of contextualized, modular content, founded upon country research and reflecting the identified needs of country governments.

The programme is currently under review to integrate leadership for sustainable development components in line with international frameworks and AU continental strategies for achieving 2030 sustainable development goals and objectives. The focus is on a continent-wide expansion of the programme through a wider access model.

Aims and Objectives of the study

To inform future development of the ALICT programme, it is important to understand where the participating countries are at in terms of developing a KS. Thus, Gesci commissioned Neil Butcher and Associates to prepare updates on the status of the KS in the 16 participating countries. Specifically, the focus was to update the situational and needs analysis of each country to keep abreast of developments since 2013 regarding the KS and its pillars of Education, STI, and ICT.

The specific objectives of the study were to:
- Update briefs of country KS pillars for the ALICT-LATIC Database.
- Update the ALICT KS country study database of the KS pillar status in each country, which involved:
  - Desk review of country KS documentation, identifying essential policies, strategies, plans, and papers on KS;
  - Review of KS pillar documentation sets related to Education, ICT, and STI; and
  - Identification of major actors, stakeholders, and partners and their role in KS pillar development.

Methodology

The report methodology involved a desk review of various government policy and strategy documents. Additionally, documents from development partners, research and academic papers, news articles, websites, and publications from various organizations were consulted. Further, data from the 2013 report were included where relevant. A framework for the country reports was
prepared, outlining what the various sections would cover. This was done to ensure uniformity in the
type of information collected. The major areas and themes covered included policies and plans in
ICT, Education, and STI. Additionally, socio-economic background information and indicators were
reviewed to obtain an understanding of the context of each country. After receiving approval from
Gesci for this framework, draft reports were prepared for each of the 16 countries. The reports were
sent to Gesci for review and, based on feedback received, the reports were then finalized.

Overview of theoretical model

Modern economies are transforming from agricultural and industrial economies to information and
knowledge-based economies. Such rapid transformation has had significant impact on social,
economic, political, and cultural development across the world. For such development and growth,
ICT is seen as both a driver and an enabler towards establishing and developing the various sectors
in an economy that contribute to stronger, more developed, and richer societies. Africa is on a
journey of transformation towards information and knowledge societies. During any such
transformational journey, the leaders of a society and policy makers are likely to undergo a
paradigm shift that involves developing their capacity and providing tools and direction for accepting
relevant changes in mindset.

Dahlman (2011) defines a KS as a society that values the creation, dissemination, and effective use of
knowledge, and has the institutions, infrastructure, norms, social interactions, and culture that
support this. UNESCO (2005) describes a KS as one that is nurtured by its diversity and its capacities.
It further argues that, in the increasingly knowledge-based world, it is critical to embrace knowledge
and innovation-related policies to spur competitiveness, growth, and improvements in welfare.

Gesci believes that ICT, education, and innovation are the critical pillars and key elements for
development towards a knowledge-based future. Butcher (2010) visually captured the inter-
relationship between the three pillars as follows:

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http://www.knowledgesocietyfoundation.com/images/Dahlman_C_2011_What_is_the_Knowledge_Economy_and_Societ y_-How_can_it_help_Jamaica_Jam KE_C_Conf_Ssn_1-2.pdf

The innovation pillar incorporates the fields of Science, Technology, and Innovation (STI) in a single pillar. The education and innovation pillars are presented as interrelated drivers for development. The ICT pillar is the enabler for Education and Innovation dynamics that will drive Development towards the Knowledge Society.  

ICT is regarded as an engine for growth and a tool for empowerment, which has profound implications for education change and socio-economic development. UNESCO (2007) defines ICT as **Forms of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means. This broad definition of ICT includes technologies such as radio, television, video, DVD, telephone (both fixed line and mobile phones), satellite systems, and computer and network hardware and software, as well as the equipment and services associated with these technologies, such as videoconferencing, e-mail and blogs.**

ICT is considered a critical tool in preparing students with the skills required for the global workplace. Thus, technology integration is becoming a key element in almost every plan for the restructuring and re-engineering of education systems. This enables continuous adaptation to a

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work world of continuous technological innovations and makes it easier for students to access knowledge.

Challenges of ICT within Africa often relate to lack of human and financial resources, which translate into inadequate and insufficient skills supply, irrelevant or incomplete regulatory frameworks, including policies and legislation, and inadequate infrastructure and communication platforms.⁷ To embrace a KS, Gesci believes that there is a requirement to ensure that leaders develop skills to make informed policy and investment decisions to support socio-economic development effectively. This encompasses building both leadership ICT skills and ICT management skills.

Lifelong learning is regarded as a requirement to keep pace with the constantly changing global job markets and technologies. Education contributes to all other sectors by providing required skills and knowledge for economic development. Thus, it is not limited to formal education in traditional structures, but encompasses the broader societal learning necessary for development. Preparation for lifelong learning involves an emphasis, in primary and secondary schools, on learning general skills and competencies (communication, mathematics and science skills, new literacy skills, problem-solving and interpersonal skills, and self-directed learning skills to learn other subjects) and at tertiary level on capacity-building in science and technology, discipline-specific skills, research, and development.⁸ Additionally, there is a need for postgraduate programmes to build specific research capacity to handle knowledge-innovation process development – to meet needs and demands for national and regional competitiveness and growth. Education plays critical roles in imparting learning skills.⁹

Innovation is described as a process of creation, exchange, evolution, and application of knowledge to produce new goods. It involves adapting, adopting, or using knowledge to produce new goods and services in local contexts or to advance society in general.¹⁰ The UN Economic Commission for Africa (UNECA) (2010) regards innovation and change as fundamental when developing a KS to drive economic growth and advancement. It has been argued that the basic ingredient for nurturing the innovation dynamic is setting up systems to enable cross-fertilization of ideas between the fields of Science, Engineering, Technology, and Innovation (SETI).¹¹

Overview of the ALICT-LATIC programme

The ALICT Programme is conceptualized to model a methodology and multi-stakeholder approach for capacity building and awareness raising of African leaders on the issues of the KS, ICT, Education, and STI.¹² The programme is based on the premise that investments in ICT, Education, and STI contribute to socio-economic development and a shift towards the development of a KS.

The programme’s focus is to build absorptive capacity of current and potential future African leaders to acquire, assimilate, transform, and exploit the benefits of knowledge. It aims to foster dynamic

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¹² ibid
organizational capability through knowledge sharing, collaboration, and exposure to technology. It is hoped that, through participation in the ALICT-LATIC course, future African leaders will demonstrate knowledge, skills, and attitudes that promote their role as change agents. These are expected to translate into positive benefits for their respective countries in pursuit of inclusive knowledge societies.

The core concepts of the programme are as follows:

- **Capacity Building:** The ALICT capacity-building model aims to build and enhance the knowledge, skills, and attitudes of future leaders to manage transformation and change, manage institutional pluralism, enhance coordination, foster communication, and ensure that data and information are shared and used in planning, resource mobilization, implementation, and evaluation processes.

- **Knowledge Society:** The ALICT model focuses on the role all facets of ICT play in building the absorptive capacities of current and potential future African leaders to acquire, assimilate, transform, and exploit the benefits of ICT and knowledge to produce a dynamic organizational capability through peer knowledge sharing and exposure to technology. The ALICT approach to KS development focuses on the interconnection between leadership, policy development, and future-proof planning and how they contribute to KS development through Education, STI, and ICT.

- **Leadership:** A prerequisite for leadership development for knowledge societies is policy coherence between the three pillars (ICT, Education, and STI) that form the basis of any KS. For future African leaders to be able to steer their countries towards that goal, it is essential for them to not only be well versed in management, leadership, project formulation and project management skills, but also to acquire comprehensive knowledge about the interrelationship of the three KS pillars (Education, STI and ICT) and then be able to apply that knowledge in the African context.

- **Policy Coherence:** Policy coherence is the development and implementation of conjointly supportive policy actions across all sectors of the economy and society and, more specifically across government departments and agencies. Policy coherence pursues the creation of synergies across policies that advance the achievement of shared and agreed objectives. Within national governments, policy coherence issues arise between different types of public policies, between different levels of government, between different stakeholders, and at an international level.

- **Futures Thinking:** Futures Thinking was first theorized by Jim Dator (Bezold, 2009). Among its many uses within complex and rapidly shifting economic and social systems is its relevance to policy development and implementation. Futures Thinking requires the revisitation of plans and policies at regular intervals to take into consideration any new signals that appear in the environment that may affect a sector or number of sectors.13

**Considering Sustainable Development Goals**

The 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development officially came into force in January 2016. These new goals apply to all countries when mobilizing efforts to end all forms of poverty, fight inequalities, and tackle climate change over the next 15 years.

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They recognize that ending poverty must go hand-in-hand with strategies that build economic growth and addresses a range of social needs including education, health, social protection, and job opportunities, while tackling climate change and environmental protection.\(^{14}\)

While the SDGs are not legally binding, governments are expected to take ownership of, and establish national frameworks to achieve, the 17 Goals: no poverty; zero hunger; quality education; gender equality; clean water and sanitation; affordable and clean energy; decent work and economic growth; industry, innovation and infrastructure; reduced inequalities; sustainable cities and communities; responsible consumption and production; climate action; life below water; life on land; peace, justice, and strong institutions; and partnerships for the goals.

Primary responsibility for follow-up and review of progress made in implementing the SDGs rests with countries. Implementation and success of the SDGs depends on countries’ own sustainable development policies, plans, and programmes. However, regional follow-up and review will be based on national-level analyses and contribute to follow-up and review at the global level.\(^{15}\)

Whilst implementation of SDGs is still in early phases, it provides an opportunity to frame the ALICT programme as a mechanism for countries to address SDGs, due to the programme’s cross-cutting nature. Specifically, KS development relies on the progress made in many of the SDGs.


\(^{15}\) Ibid
Knowledge Society Development in Uganda

1. Introduction

Uganda (from the Swahili “Buganda”), officially the Republic of Uganda, is a landlocked country in East Africa covering an area of about 241,550.7 square kilometres and lying on the equator. Uganda is bordered on the east by Kenya, on the north by South Sudan, on the west by the Democratic Republic of the Congo, on the southwest by Rwanda, and on the south by Tanzania. The southern part of the country includes a substantial portion of Lake Victoria, which is also shared by Kenya and Tanzania. The financial and administrative capital and largest city in Uganda is Kampala. Kampala was recently named the most liveable city in East Africa\textsuperscript{16} and is the 13\textsuperscript{th} fastest growing city in the world.\textsuperscript{17}

\textbf{Figure 2} Map of Uganda\textsuperscript{18}

Uganda had a population estimated at 39 million in 2015.\textsuperscript{19} English and Swahili are the main languages although Ganda or Luganda is also common. The country is divided into 112 administrative districts.

Uganda released its second National Development Plan (NDPII) in 2015 for the 2015/16 – 2019/20 period that seeks to implement the country’s vision of transforming itself from a peasant to a modern and prosperous country within 30 years.\textsuperscript{20}

The overall goal of the second development plan is to achieve middle income status by 2020 by increasing “sustainable production, productivity and value addition in key growth opportunities”.

developing “the stock and quality of strategic infrastructure to accelerate the country’s competitiveness”, enhancing human capital, and strengthening “mechanisms for quality, effective and efficient service delivery.”

Economically, Uganda is reported to have substantial natural resources, including fertile soils, regular rainfall, deposits of copper, gold and other minerals and recently discovered oil. Agriculture remains the backbone of the economy. Thirty-four percent of the country is arable with 72% of this under agriculture. The sector employs approximately 72% of the workforce, followed by industry at 7% and services at 21%.

Uganda’s GDP in 2015 was US$27.5 billion (US$76.9 billion PPP) representing a per capita GDP of just over US$705 (US$2,023 PPP). After experiencing strong economic growth between 1995 and 2011, growth slowed to just 1.7% in 2015. Export earnings are just under 18% of GNP and coffee accounts for the bulk of export revenue. Export earnings rose sharply (by 36%) during 2016. The discovery of commercially viable oil deposits has prompted hopes that Uganda will soon become a net oil exporter.

Inflation in Uganda is well down from its recent peak of 24% in 2012 to around 6% at the start of 2017 indicating that fiscal policy, despite the recent drought affecting food prices, is creating a more stable economic environment. The country’s Gini Coefficient Index (which measures inequality in the level of income) was recorded at 41 in 2012, down from 44 in 1989, illustrative of some disparities in resource allocations among citizens. Uganda received just under US$1.1 billion of foreign direct investment during 2015 a figure almost double the 2011 figure but still only 2.6% of Foreign Direct Investment (FDI) received by Sub-Saharan Africa.

In 2015, Uganda ranked 19 out of 54 African countries on the Mo Ibrahim Index which offers a comprehensive assessment of governance that informs and empowers citizens, civil society, parliaments and governments as a tool of measuring progress in governance. Currently, Uganda enjoys a positive trend in this measure.

The Global Competitiveness Index (GCI, 2016-17) which assesses the ability of countries to provide high levels of prosperity to their citizens through measuring the set of institutions, policies, and factors that set the sustainable current and medium-term levels of economic prosperity ranks Uganda 113 out of 138 countries with a score of 3.7. The recent trend is slightly positive but the

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21 Ibid
23 International Labour Organisation. (2016). ILO Stats. Retrieved February 11, 2017 from http://www.ilo.org/iostat/faces/oracle/webcenter/pagehierarchy/Page21.jspx?_afrLoop=896420607124838&_afrWindowMode=0&_afrWindowId=6dj1ns8t9_1#!%40%40%3F_afrWindowId=6dj1ns8t9_1%40%40%3F_afrWindowMode%3D0%26_adf.ctrl-state%3D6dj1ns8t9_50
index points to corruption, inflation and high tax rates as primary limiting factors. Significantly, policy and government stability are also noted among the top limiting factors.

The World Economic Forum’s Inclusive Development Index is an index that provides a multidimensional assessment of living standards and inclusive growth. In 2017, Uganda was ranked 64th out of 109 countries overall with a score of 3.28. Uganda’s five-year overall trend, however, is negative, mainly due to a very negative trend of -14.89% for inclusion. Having said this, Uganda is doing slightly better than some of its East African neighbours.

The World Bank’s “Ease of doing business” index, a measure of the relative ease for starting a running a local business, for 2016 ranks Uganda as 115 out of 190 countries up from 116 in 2015 and 132 out of 189 countries in 2013. Thus, the trend is certainly positive but the ease of starting a business and obtaining electricity are still major constraints.

According to the Heritage Foundation report, Uganda’s economic freedom score is 59.3 (its lowest since 2012) making it the 102nd freest economy out of the 178 ranked countries and rated as “mostly unfree”. Its score is 0.4 points lower than the previous year, a trend which has persisted since 2012 (down 2.6 points). Uganda is ranked 13th out of 46 countries in the Sub-Saharan Africa region, and its overall score is below the world average of 60.7. According to the Heritage Foundation, there is a serious need for greater institutional reforms to improve the combating of corruption and the rule of law generally. Widespread corruption erodes entrepreneurial incentives, and political influence undermines the independence and integrity of judicial and regulatory systems. A rigid labour market forces most Ugandans to work in the informal sector. 

According to the International Telecommunication Union (ITI), Uganda’s (IDI) score for 2016 was 1.94, placing it 157 out of 175 countries. This is down from 155th place and a score of 1.89 in 2015. So, while Uganda’s score improved slightly, the pace of development lagged its competitors and Uganda is only ranked 23rd in the region.

Furthermore, the World Economic Forum’s Networked Readiness Index for 2016 ranked Uganda 121 out of 139 countries with a score of 3.1. This is a marginal drop from its 2012 (3.25) and a concomitant fall in the overall rankings. Together, these data suggest that Uganda is doing quite poorly globally in terms of ICT readiness and the Knowledge Society especially in relation to its economic competitors. Particularly revealing in this regard is a relative stagnation or decline in the four sub-indicators of the 10th Pillar: Social Impacts, which includes the impact of ICTs on access to basic services (3.5 and down from 3.67 in 2012), internet access in schools (3.2 and up from 2.9 in 2012), ICT use and government efficiency (4.0 down from 4.21 in 2012) and the e-participation index (0.1 up from 0.08 in 2012).

In 2016, almost 50% of Uganda’s population was between the ages of 15 and 64 with 21% between the ages of 15 and 24. This is up from an estimated 19.3% in 2012. Thus, Uganda’s youth population continues to grow rapidly and the country has one of the highest fertility rates of 5.8

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children per woman. Concomitantly, youth unemployment and underemployment remains an issue with causes including poor skill/market matches and inadequate investment in job creation. While Uganda’s measured overall unemployment rate (3.8% in 2014) and youth unemployment rate (13% in 2014) are relatively low, these figures mask high numbers of discouraged young job seekers and young no wage / family agricultural workers.

According to the African Economic Report of 2012, only 14% of Uganda’s working age youth are in wage employment, while 20.9% and 63.6% are self-employed or contribute to family work. These latter two categories thus account for almost 85% of youth employment in the country. When one factors in such measures of underemployment and vulnerable employment in Uganda, it suggests that many youth are engaged in employment characterised by low pay, job insecurity, and an underutilisation of their time and skills.

Figure 3 Employment rates in various African countries

To address these issues, the government has placed an emphasis on self-employment through microfinance schemes dating back to the Youth Entrepreneurial Scheme of the late 1990’s through to the present Youth Venture Capital Fund supporting entrepreneurial bankable ideas and initiatives, the Graduate Venture Fund and the Youth Livelihood Programme. Recent evaluations point to these initiatives being heavily biased towards urban youth and thus unlikely to solve the major issue of bringing youth out of subsistence agricultural activities.

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41 Ibid
In addition, there has been a focus on curriculum review at all levels with regard to Business, Technical and Vocational Education and Training (BTVET). However, many facilities are underutilised, underfunded and focus on low-cost skills training mismatched with labour market demands.


Uganda recognises the potential negative impact of climate change on its ability to meet its Vision 2040 as demonstrated by the affect this is already having on the length and severity of regional droughts. Thus, Uganda is a signatory to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol (KP) and has committing itself to the adoption and implementation of mitigation and adaptation policies and measures. Uganda has also committed itself to the implementation of the East Africa Community Climate Change Policy also requiring member states to initiate and develop consistent and harmonized policies and plans to address climate change.

In response to these commitments, Uganda has a National Climate Change Policy intended to direct to key sectors as to the potential effects of climate change as well as to facilitate adaptation and mitigation strategies.

In 2013, Uganda’s CO$_2$ emissions stood at 0.134 metric tons per capita, up from 0.061 metric tons per capita a decade earlier\footnote{World Bank. (2013). CO$_2$ emissions (metric tons per capita). Retrieved February 12, 2017 from http://data.worldbank.org/indicator/EN.ATM.CO2E.PC?locations=UG}, with total greenhouse emissions at 81,000 kilotons – 0.15% of global emissions. Thus it is clear that Uganda is by no means a major polluter but stands to be disproportionately affected by the pollution of other countries, making the need for adaptation rather than emission control strategies of primary importance.

However, according to the NDPII, Uganda has still committed itself to pursuing a low-carbon development path given that these paths are increasingly aligned with job creation, poverty reduction and economic competitiveness. Uganda’s current share of renewable energy consumption stands at over 90% of its total energy production (although this has been falling steadily over the past 20 years). However, the country’s total energy production remains small by global standards (133\textsuperscript{rd} in terms of electricity production) so this high proportion of renewable energy usage is a proportion of only a relatively small total energy production.

Uganda’s current Head of State and Government is President Yoweri Kaguta Museveni who seized power in 1986 and has subsequently been returned to power several times since then (the last in February 2016 with 60% of the vote). There are no term limits on the office after Museveni amended the constitution in 2005.

Uganda is currently engaged in several armed conflicts with various hostile groups and militia, most notably the Lord’s Resistance Army (LRA). In 2016, Uganda hosted roughly 1 million refugees, mainly from South Sudan and the Democratic Republic of the Congo.
2. Information and Communication Technology (ICT)

2.1 ICT Policy Frameworks

The ICT sector in Uganda is organised along three key functions namely: policy, regulation and implementation/service provision. The Ministry of Information and Communication Technologies provides the policy framework. The Uganda Communications Commission (UCC) and the National Information Technology Authority Uganda (NITA-U) are the main regulatory bodies. Services are provided by local governments, development agencies, academia and the private sector.

The development of the Knowledge Society in Uganda continues to be grounded in Uganda Vision 2040. The Vision notes that ICT and ICT enabled services industries hold great promise for job creation, accelerated economic growth and increased productivity for both the public and private sectors. The document cites figures from the UN New Economy Skills for Africa – Information and Communication Technologies and Education project that estimate that, of the current global potential for ICT outsourcing of USD500 billion, only USD100 billion is being realised with the global total potential market rising to USD1.6 trillion by 2020.44 Vision 2040 goes on to note the potential multiplier effects associated and related with secondary and tertiary industries.

Human capacity and infrastructure development are identified as key enablers of this future as is the development of a “hi-tech city” to foster and support both local and international research and development and capital formation.

At a high level this vision is given more defined expression in the second National Development Plan (NDPII) published in 2015. It targets an increase in employment in the ICT sector from 1 million to 3 million by 2020 and lists the following key objectives:

1) Increase access to ICT infrastructure to facilitate exploitation of the development priorities;
2) Enhance the usage and application of ICT services in business and service delivery;
3) Increase job creation through ICT research and development;
4) Increase the stock of ICT skilled and industry ready workforce;
5) Improve the information security system to be secure, reliable, resilient and capable of responding to cyber security threats; and
6) Improve the legal and regulatory frameworks to respond to the industry needs.45

To achieve these objectives certain key initiatives have been identified and defined namely:

1) Extending the National Backbone Infrastructure and enhance its connection to international submarine cables;
2) Completing the deployment of Digital Terrestrial Television broadcasting so as to fully realise of the “digital dividend”;
3) Promoting the production of low-cost, locally assembled computing devises;
4) Establishing ICT parks and regional incubation centres;
5) Developing and implementing a Business Process Outsourcing strategy; and
6) Reviewing and improving the national ICT training curriculum at all levels including teacher ICT pedagogy capacity.46

Specific policy guidance for these and other initiatives are provided by the following pieces of legislation.

46 Ibid
The National Information Technology Policy for Uganda (2012) is a far-reaching policy document that articulates national policy principles and objectives as well as implementation strategies as these relate to ICTs in the telecommunications, broadcasting, postal, ICT services, education, health, agricultural and science sectors of the economy. It has the promotion of the “efficient utilisation of Information Technology in transforming Uganda’s economy” as a mission and seeks to guide the expansion of ICT infrastructure, deepen the utilisation of ICTs, enhance education, research and innovation and improve governance.47

The National E-Government Framework (2013) is another example of significant ICT policy and drives much of the activity around e-government initiatives. The Framework which lists the following seven objectives:

1. To continuously improve the efficiency of, and access to government information and services to meet citizen’s expectations;
2. To use the successful development of the e-Government initiative to promote Uganda, as an Information Technology centre for excellence in Africa;
3. To establish leadership and partnerships that advance e-Government services;
4. To develop and maintain a secure seamless and comprehensive e-Government interface (one-stop centre integrated service delivery mechanisms);
5. To manage the cost of e-Government implementation through effective use of technology;
6. To institutionalize the use of e-Government information and services through the adoption of appropriate organizational models;
7. To encourage the use of open source software in order to reduce the amount of money spent by Government on licensing proprietary software and encourage innovation in enterprise platform software development.48

The Uganda Communications Act (2013) legislates the licensing and control of radio, television, postal and other telecommunications entities through the establishment of a single regulatory body, the Uganda Communications Commission. It also seeks to enhance the national coverage and quality of such services by expanding the variety of services available through encouraging private sector investment and competition and administering a fund to supplement rural access investments.49

The NITA-U Act (2009) established the National Information Technology Agency, Uganda (NITA-U) as a statutory body with the objective of providing high quality ICT services to government, promoting standardisation of ICT planning, procurement and implementation in Uganda, providing national guidance to the sector, and promoting cooperation and rationalisation among the various sector role players.50

The Electronic Signatures Act (2010) provides the legal framework for the use of electronic or digital signatures and outlines how such signatures are to be created and secured and what the

requirements for a compliant electronic signature are. This act operates in tandem with the Electronic Transactions Act of 2011.\textsuperscript{51}

The Electronic Transactions Act (2011) was passed to provide the regulatory framework to enable and facilitate safe, secure and effective electronic transactions and thus to provide the legal certainty and public confidence in the use of such transactions. It also aims to promote e-Government services through electronic transactions as well as to encourage investment and innovation in the space.\textsuperscript{52}


The Computer Misuse Act (2011) makes provision for the safety and security of electronic transactions and information systems by legislating against unlawful access, abuse or misuse of information systems including computers (and electronic devices like mobile phones) and making provision for securing the conduct of electronic transactions in a trustworthy environment.\textsuperscript{53}

The Digital Migration Policy for Television Broadcasting in Uganda (2011) was drafted to provide the legal and implementation framework for the migration of analogue terrestrial broadcasts to digital terrestrial broadcasts in line with International Telecommunications Union’s Geneva 2006 Agreement. The policy also focused on ensuring equitable access to digital broadcast services, efficient use of the applicable radio spectrum and utilisation of the resulting “digital dividend”, protection of the public against unfair practices during the migration process, and the promotion of local content.\textsuperscript{54}

The E-Waste Management Policy (2012) was drafted to “guide, promote and ensure the safe management of E-waste in Uganda and contribute to reduction of environmental degradation by mitigating pollution arising from the use of electric and electronic equipment.” The policy outlines the following objectives:

1. To provide for establishment of e-waste facilities in the country;
2. To mobilize and sensitize the Government, private sector and the communities on the proper management and handling of e-waste on a sustainable basis;
3. To provide for the putting in place of specific E-waste standards, regulations and guidelines for the acquisition, handling and disposal processes;
4. To develop a critical human resource base knowledgeable in E-waste management;
5. To provide for resource mobilization for efficient management and disposal of e-waste; and
6. To establish incentives for encouraging both local and foreign investors to establish e-waste facilities in Uganda.\textsuperscript{55}

The Second Rural Communication Development Fund (RCDF) Policy (2010/11-2014/15) is designed to “enable equitable access to and effective utilisation of innovative communication-enabled


services that support the attainment of Uganda’s development goals (for all people, especially those in rural and other underserved areas, both male and female). Key objectives of the policy include ensuring that all institutions of learning and health have broadband internet access, ensuring there is an increase in the awareness and quality of ICT literacy among all Ugandans, encouraging local innovation in the deployment and use of ICTs in rural settings and ensuring that underserved groups, including women, children, youth and the elderly, are catered for.

The focus of much of this legislation has been to harness the vast information resources available to facilitate improved services delivery provision and ease of access to information by the citizenry. The Electronic Transactions Regulations (Statutory Instrument no. 42 of 2013) and the Electronic Signatures Regulations (Statutory Instrument no. 43 of 2013), for example, demonstrate the country’s recognition that issues involving computer and internet use require legislation.

2.2 ICT Infrastructure

A centrepiece of Uganda’s current ICT infrastructure policy landscape is the National Broadband Strategy for Uganda (2016 – 2020). This is the latest in a relatively long line of policies and strategies aimed at developing and harnessing Uganda’s ICT infrastructure. These have largely centred on promoting faster development of ICT infrastructure, enabling greater access to affordable and high quality communications, broadcasting and ICT services and realising the potential of reliable and transparent e-government service delivery.

The National Broadband Strategy recognises the centrality of broadband internet connectivity to the realisation of any ICT for development strategy and its fundamental necessity for economic growth, job creation, investment and service delivery. The overall objective of the strategy is to “facilitate uptake of broadband for socio-economic transformation of the country.”

The strategy encompasses five key areas:
1) Infrastructure, Connectivity and Devices;
2) Content, Applications and Innovation;
3) Capacity Building and Awareness Creation;
4) Policy, Legal and Regulatory Environment; and
5) Finance and Investment.

Key targets are articulated as follows:
1) Minimum broadband speeds of 3Mbps by 2020;
2) Broadband access penetration of 50% and 100% for rural and urban areas respectively by 2020;
3) 100% of district and sub-county headquarters, health centre IVs, tertiary institutions and secondary schools with broadband connectivity by 2020;
4) 50% of primary schools with broadband connectivity by 2020;
5) Cost per Mbps of broadband in relation to average income reduced to 10% by 2020;
6) One national virtual submarine landing station in Kampala by 2020;
7) 70% of MDAs and LGs with interactive e-services by 2020;
8) 50% of registered Ugandan businesses online by 2020; and

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9) 40% of the population digitally literate by 2020.\(^58\)

The USD100 million National Broadband Infrastructure/E-Government Infrastructure (NBI/EGI) project is a central feature of the strategy and was established with the aim of connecting all major towns to a national optic fibre network. It is being implemented by the NITA-U. The NBI portion is intended to ensure that a high bandwidth data connection is available in all major towns of Uganda at reasonable rates, while the EGI is designed to reduce the cost of doing business in government, improving communication between government agencies and reducing the need for officials to commute for meetings and thus increasing efficiency.\(^59\)

By 2015, Phase 1 and 2 of the project had been completed with the following achieved:
1) Laying of 1536.39Km of Optical Fibre Cable to create the National Data Transmission Backbone.
2) Connection of this backbone to other regional backbone infrastructure at the borders of Southern Sudan (Elegu) and Kenya (Malaba and Busia).
3) Expansion of the Government Metropolitan Area Network into a Wide Area Network covering the towns of Kampala, Entebbe, Bombo, Mukono, Jinja, Busia, Tororo, Malaba, Kumi, Mbale, Soroti, Lira, Gulu, Masindi, Nakasongola, Luwero, Mbarara, Kasese, Fort Portal and Kyenjojo.
4) Connection of a total of 45 sites with Kampala and Entebbe.
5) Seven public universities have also been connected to the national backbone.
6) Distribution infrastructure for digital TV Broadcasting was installed for the greater Kampala area.

Phase 3 of the project aims to connect Kabale, Katuna, Malaba, Masaka and Mutukula and, crucially, provide an alternative route to the undersea cables at Mutukula through mainland Tanzania to the East African Submarine cables. All other districts will be reached using the last-mile connectivity technologies such as WiMax.

To date, over 5,000km of optic fiber has been laid as a result of public and private (Airtel, MTN, UTL, Africell, Roke Telecom, Infocom, and Google) efforts with the private sector mostly responsible for cross-border connectivity.\(^60\)

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\(^{58}\) Ibid


As a result of these efforts, bandwidth availability in Uganda is trending positively. The following graph from the UCC, illustrates absolute bandwidth growth from 2010 to 2014 but also that this growth is simply keeping pace with population growth rather than increasing the amount of bandwidth available to each person.

KEY: Phase I (Yellow) Phase II (Blue) Phase III (Green).

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However, when one views this in terms of the estimated total number of internet users and internet subscriptions over the same period, one can see that, in real terms, bandwidth availability per user may actually have fallen.

Figures from the July – September 2015 UCC Post, Broadcasting and Telecommunications Market and Industry Report indicate that this relative stagnation continued with reported growth in

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63 Ibid
bandwidth per million inhabitants of 0.07% to 958 mbps/person while the total number of internet users grew in September 2015 to just over 13 million, growth of over 50% in 5 quarters.\textsuperscript{64}

What is driving the bulk of the growth in the number of internet users is an increase in mobile users indicating that fixed line broadband services are still relatively under-subscribed. In fact, fixed line subscriptions (often required for basic fixed line internet access) declined in the July – September 2015 period by 0.13%.

A second notable driver of increased internet users is reducing costs. The problems associated with reliance on satellite technology such as slow connectivity and high cost have been addressed by the high-speed fibre-optic cable allowing faster data transfer and enabling an increasing number of Ugandans to take advantage of the internet. The East African Marine System (TEAM) and the East African Submarine Cable Systems (EASSYs) have provided such international connectivity. This has led to faster connectivity and lower internet tariffs Therefore, as more and more traffic (especially international traffic) is carried over optical fibre networks, so the reliance of costly satellite systems is reduced.

The rapid rise in mobile internet subscriptions indicates that there are more Ugandans that can now afford internet services. It can be argued that it is because of the availability of more affordable bandwidth than before. The National Broadband Strategy notes that average data costs for 500Mb are UGX24,000 or USD6.69 while a 10Mb uncapped broadband connection is currently approximately USD67/month on par with many other African and other developing countries.\textsuperscript{65}

However, while internet users (per 100 people) have increased by more than 1,000% in the past decade to 19.22 in 2015, this is still far below international (43.99) or even regional measures. The percentage of individuals using the internet in Uganda in 2015 was 19.22% compared to 45.62% in neighbouring country, Kenya.\textsuperscript{66}

In terms of telephony, and especially mobile telephony, Uganda continues to make useful gains. In between July and September 2015, the country saw an increase of 3.1% (687,265 subscribers) over the previous quarter. Currently, Uganda has a mobile phone penetration of just over 50%. As noted above, mobile phone subscription growth is far less steady and current penetration is down to 2009 levels. The vast majority of the increase in mobile phone subscriptions are pre-paid subscriptions.

Voice traffic shows a steady increase, particularly On Net Traffic (calls made to numbers on the same mobile network), which registered a 0.13% increase in the quarter. Off Net and international traffic volumes remained largely unchanged.\textsuperscript{67}

\textbf{2.3 ICT4D Initiatives}

As noted above, the National Backbone Infrastructure/E-Government Infrastructure (NBI/EGI) project is a central feature of the National Broadband Strategy. The EGI component consists of


\textsuperscript{65} Numbeo. (2017). Prices by Country of Internet (10 Mbps, Unlimited Data, Cable/ADSL) (Utilities (Monthly)). Retrieved February 13, 2017 from https://www.numbeo.com/cost-of-living/prices_by_country.jsp?itemId=33


specific productivity and accountability enhancing infrastructure installed in 27 main line Government Ministries, Departments and Agencies (MDAs) as well as the establishment of a Primary Data Centre. Specific initiatives include the Integrated Financial Management System (IFMS), Video Conferencing Services, Voice over Internet Protocol (VoIP) and the Secure Messaging and Collaboration Platform (SMCS).

To date, the SMCS platform has been successfully piloted in three sites - State House, Ministry of ICT and the National Information Technology Agency – Uganda (NITA - U). Delivery and installation of communication (and backup) equipment to the 27 targeted Ministries and Departments including the deployment of video conferencing services has also been completed and VoIP services are currently under test at three pilot sites; NITA-U, Ministry of Foreign Affair and Ministry of Internal Affairs.

Under the direction of the National Electronic Government Framework, an Information Access Centre has been set up in conjunction with the Government of Korea to enhance citizen participation and engagement in public policy and governance. In addition, a Government Citizen Interaction Centre (GCIC) was established to facilitate seamless access to over 20 e-Government services.

Other e-Government initiatives either completed or in progress include:
1) Voter Registration – This project was supported by USAID to improve the transparency of the voter registration and election management process.
2) National Security Information System (NSIS) project (National ID Cards) – This project focused on the implementation of a national biometric and identity system.

Uganda is also making impressive gains towards realising the digital dividend of migrating to digital terrestrial broadcast. The UCC fulfilled the international switch-off of Analogue TV Transmission on the 17 June 2015 with digital cover in place for the preceding 18 months in the greater Kampala are. A phased switch-off of the analogue signal was undertaken in other areas during July and August 2015.

There are several initiatives promoting ICT for socio-economic development.
- I-network Uganda: This is a national network of individuals and organizations for sharing knowledge and information on applying ICTs. (http://www.i-network.or.ug/)
- U-connect: This non-profit NGO advances public education using ICT to improve the quality and efficiency of communications. U-connect focuses on providing computer connectivity and training for schools and providing ICT training. (http://www.uconnect.org/)
- Research and Education Network Uganda (RENU): Hosted by Makerere University faculty of computing and Information Technology, this network was established in 2006 as a not-for-profit limited company licensed to operate a private communications network for member organisations and between the network and similar networks in the region and around the world. During 2015, RENU was connected to transcontinental research network

There are also several other initiatives to reach out to communities and support government in integrating ICT provisions of government services such as e-health and e-business.

Uganda developed a national e-health policy in 2013. In terms of e-health, the country’s e-health strategic plan (2012/2013 – 2014/2015) lists the following key objectives:

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1) To harness eHealth to facilitate the transformation of the Uganda health system and improve health outcomes;
2) To make patient care safer and more effective by making available the right information in the right place at the right time;
3) To ensure equitable access to quality health services for all, with emphasis on improving access to underserved communities and vulnerable populations;
4) To contribute to ‘health literacy’ of all citizens for the necessary skills, knowledge and confidence to manage their own health;
5) To safeguard confidentiality, privacy, security and integrity of patient information;
6) To enable more efficient use of healthcare resources through replacing paper intensive processes and providing better management of information; and
7) To promote eHealth research and development including research on the social determinants of health and the impact on the health of the Ugandan population.º

As part of efforts to realize these objectives, has been the migration of the country’s Health Management and Information System (HMIS) to a fully web-based system accessible to all districts. Poor connectivity and power supply at many facilities has hindered operationalization and usage. ²

The Ministry of Health has also invested in implementing m-Trac, an initiative to improve healthcare delivery by enabling real-time data collection, verification, accountability and analysis of aggregate data.³

In terms of e-business, the NDPII notes government plans to continue to invest in creating enabling environments of the development of e-business in the country, most especially in terms of Business Processes Outsourcing (BPO). These include investments in ICT incubation hubs and ICT parks as well as continued investments in the government’s BPO incubation centre located in Kampala.⁴

2.4 Key Actors and Players

<table>
<thead>
<tr>
<th>Actor/Player</th>
<th>Role and Area of Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of ICT and National Guidance</td>
<td>Overall policy direction</td>
</tr>
<tr>
<td>Uganda Communications Commission</td>
<td>Development of modern telecommunications and related infrastructure</td>
</tr>
<tr>
<td>National Information Technology Authority Uganda</td>
<td>Coordinate, promote and monitor Information Technology developments in Uganda within the context of National Social and Economic development.</td>
</tr>
</tbody>
</table>
| Mobile Network Operators | • MTN Uganda.  
• Airtel Uganda.  
• Uganda Telecom  
• Africell Uganda  
• Smile Telecom |


2.5 Challenges in ICT Development

There are numerous positive developments in Uganda’s ICT sector and it continues to record increases in tele-density (63.9 in 2014).\(^73\) However, this is still among the lowest in the region, with Rwanda, Kenya and Tanzania all registering higher tele-densities.

Uganda currently faces three primary challenges regarding the development of ICTs. The first of these is bandwidth availability. While the number of internet users continues to increase the amount of bandwidth available to each user is declining. A 15.7% increase in bandwidth between 2014 and 2015 was positive but not enough to keep up with the 52% increase in internet users over the same period.\(^74\) As a landlocked country, Uganda does not have direct access to any of the continents sub-marine cable systems and access to these needs to be provided by overland linkages. Several connections to are already in place to many of its neighbours but Uganda will need to continue to invest in providing more international bandwidth to the country.

Related to this is the extent and quality of the country’s internal internet backbone. The National Backbone Infrastructure Project is well placed to continue to improve the network but focus is required on providing last mile access and access to the more rural parts of the country. Some private sector investment is occurring on the back of increasing mobile subscriber numbers through wireless connections, but the number of fixed line users remains low.

Secondly, the cost of international internet bandwidth remains relatively high in Uganda\(^75\) compared to international norms and is often cited as a key restraint to continued ICT developments in the country.\(^76\) One reason for this is the relatively high bandwidth costs charged by the international submarine cable consortium, but another large reason is the cost of maintenance of the various overland links to this system, especially given issues of infrastructure damage and vandalism.\(^77\)

Thirdly, the NDPII also mentions a lack of local content and locally developed e-services as constraints on further development of the sector. These deficiencies, is notes, are largely the result of a general lack of suitable skills.\(^78\)

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74 Ibid
75 Numbeo. (2017). Prices by Country of Internet (10 Mbps, Unlimited Data, Cable/ADSL) (Utilities (Monthly)). Op cit
78 Ibid
3 Education

The formal education system in Uganda is managed and directed by the Ministry of Education and Sports and follows a 7 – 4 – 2 structure with seven years of primary education followed by four years of lower secondary education and two years of upper secondary education. Primary education is free and compulsory and learners exit Grade seven by writing the Primary Leaving Certificate Examination (P7). The Uganda Certificate of Education is written at the end of grade eleven (S4), and the Uganda Advanced Certificate of Education at the end of grade 13 (S6).

Learners obtaining university entrance at the end of grade 13 can continue onto two, three or more years of tertiary education. Starting immediately after primary education and partially running in parallel with secondary education is the Business, Technical, Vocational Education and Training (BTVET) track that includes craftsmen level training, technician level training and graduate level training (administered by universities).

This structure is mirrored by the Ministry’s internal structure with departments for Pre-primary and Primary, Secondary, Higher and BTVET.

Pre-primary and primary education is provided by 5,763 and 22,600 institutions respectively (although only 18,889 primary schools responded to the 2015 Education Management Information System -EMIS census) while there are 2,695 secondary schools of which 1,023 are completely government funded. Post-primary BTVET education is provided by 167 institutions.\(^79\)

Access to basic education has seen dramatic improvements since 1997 and the adoption of Universal Primary Education (UPE). At that point, total enrolment was 3,068,625 (54% male). Subsequently, enrolment has risen to 8,264,317 with close to gender parity. Uganda is currently also pursuing Universal Secondary Education (USE) for grades 8 – 11 as well as Universal Post O-Level Education and Training Programme (UPLOET).\(^80\)

Enrolment in the education sector in 2015 is summarised in the table.

**Figure 7** Summary of enrolment information for 2015\(^81\)

<table>
<thead>
<tr>
<th>Section</th>
<th>Total Enrolment</th>
<th>Total Girls</th>
<th>Total Boys</th>
<th>Total Teachers</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Primary</td>
<td>477,123</td>
<td>240,839</td>
<td>236,284</td>
<td>16,741</td>
<td>29:1</td>
</tr>
<tr>
<td>Primary</td>
<td>8,264,317</td>
<td>4,141,654</td>
<td>4,122,663</td>
<td>192,566</td>
<td>43:1</td>
</tr>
<tr>
<td>Secondary</td>
<td>1,284,008</td>
<td>608,845</td>
<td>675,163</td>
<td>58,051</td>
<td>27:1</td>
</tr>
<tr>
<td>BTEVT</td>
<td>36,927</td>
<td>14,662</td>
<td>22,265</td>
<td>3,152</td>
<td>12:1</td>
</tr>
<tr>
<td>Tertiary</td>
<td>249,049</td>
<td>109,957</td>
<td>139,092</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Private secondary education plays an important role in the sector with more than half of all enrolled learners attending private institutions. Many of these institutions (669 out of 1,023) receive government grants. This number has been declining in the past few years after the president, in 2014, directed the ministry to stop all funding to private institutions.\(^82\)

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\(^{80}\) Ibid

\(^{81}\) Ibid

\(^{82}\) Ibid
While enrolment shows healthy gains, Uganda still has room for improvement. According to the Millennium Development Goals Report for Uganda 2015, it failed to achieve goal 2 and 3.

1) Goal 2: Achieve universal primary education - Target 2.A: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.

2) Goal 3: Promote gender equality and empower women - Target 3.A: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015.\textsuperscript{83}

Other key metrics according to the Ministry of Education and Sport (MoES) 2015 Statistical Abstract include a primary (P7) completion rate of 61.6\% and a transition rate to secondary education of 63.2\%. Uganda has a relatively high primary repetition rate of 7.2\% with the highest rate of 9.1\% in grade four and grade six.\textsuperscript{84}

The lower secondary completion rate is only 36.2\%. Of those completing upper secondary school, 83\% are eligible for university entrance. Overall quality is therefore considered low. Indications of this, according to the MoES 2015 EMIS data are that only 51.9\% of grade six students attain grade appropriate literacy levels, and only 41.8\% of grade nine learners attain grade appropriate Mathematical proficiency.

These figures illustrate why the NDPII has identified the following targets and goals in relation to education.

1) An increase in the P7 completion rate to 85\% by 2019/20;
2) An increase in the S1 (first year of secondary school) transition rate to 83 \% by 2019/20;
3) An increase in lower secondary completions to 50\% by 2019/20;
4) A focus on increasing access to and improving the quality of ECD programmes; and
5) Develop and implement a variety of programmes to improve the quality of education at all levels and the rates of skill acquisition by all learners.\textsuperscript{85}

The BTWET sub-sector is focused on developing business, technical and ICT skills. The BTWET Strategic Plan 2011-2020 envisages the emergence of a comprehensive system of skills development for employment, enhanced productivity and growth. The main purpose will be to create employable skills and competencies relevant in the labour market instead of educational certificates. It will embrace all Ugandans in need of skills, including but not confined to, only primary and secondary school leavers.\textsuperscript{86}

The NDPII notes, however, that several challenges currently face the system including

1. An inadequate skills mix to support increased production and expansion;


2. Poor work readiness of many young people leaving formal secondary and tertiary education and entering the labour market for the first time;
3. Inadequate linkages between institutional (employers) and workplace learning;
4. Lack of basic numeracy, literacy, and entry-level skills and work-based training;
5. Continuing skills shortages in the artisanal, technical and professional fields that are fundamental to the development and growth of our economy;
6. Lack of synergy between the various post-school sub-systems;
7. Lack of clarity in relation to the role expected of the various parts of the skills development system;
8. Inefficiency and waste;
9. The silo mentality which prevents the partnerships and alignments needed to improve effectiveness; and
10. The absence of coherent strategies within economic and industrial sectors, compounded by the lack of systematic skills development to support and sustain growth and development.\(^{87}\)

According to the Global Innovation Index (2015), tertiary education in Uganda comprises 198 tertiary institutions (universities, teacher training colleges, colleges of commerce and technology and other institutions) or which 115 (72%) are privately owned.\(^{88}\) There are 40 universities, 8 of which are public universities and a total of 9 other degree awarding institutions. Seventy-four percent of all higher education institutions are private and account for 51% of all enrolments.\(^{89}\)

The sector is managed by the National Council for Higher Education (NCHE) that sets standards for all public and private institutions with the aim of creating and sustaining a tertiary sector that provides quality and relevant higher education to meet local, national and global demands.

\(\text{Figure 8} \quad \text{Enrolment in Ugandan Tertiary Institutions 2011 - 12}^{90}\)

Degree programmes are offered by universities on successful completion of three to five year programmes and Diplomas are offered for programmes lasting two or three years. There are seven public universities or degree awarding institutions along with and 34 private universities or degree awarding institutions.

Tertiary enrolments have increased since the advent of UPE and this has been supported by a highly competitive government sponsorship programme based on A-level examination results. However, quality at most institutions remains an issue with over-crowding, lack of suitable infrastructure and resources, inadequate governance structures and capabilities and poor quality teaching staff cited as the major concerns.91

Total enrolment increased by 18 percent from 169,476 in 2009 to 201,376 in 2013 with significant increases in female enrolment. Female enrolment in 2014 stood at 44% of all enrolments.92 Universities continue to enrol most the post-secondary students with universities accounting for 71% university of student enrolment followed by 26% for other tertiary institutions (and 2.6% for other degree awarding institutions).93

Most university enrolments (56%) are arts and humanities students with 44% of enrolment in science disciplines. The proportion of science students decreases to 38% in other tertiary institutions.94

University graduation was at 94% in 2014 (92% from other institutions) and 78% of graduates acknowledged that their degrees enabled them to get jobs (mostly in agriculture, health, trade, banking and finance).95 A 2015 tracer study of 2012 graduates indicated that 18% of this cohort were unemployed, the balance either in employment or self-employed.96

Despite increases in enrolment and good through-put rates, the majority of graduates from universities and other higher institutions of learning do not have the practical skills required in the job market. This is largely attributed to inappropriate curricula in these institutions and lack of linkage between the training institutions and potential employers.97

Besides the NDPII, The Revised Education Sector Strategic Plan 2007 – 2015 (RESSP) is currently the most up-to-date published overarching policy framework available. It places a strong emphasis on achieving the Education for All goals and the revised strategic plan introduced the following additional key policy objectives:

1) Bringing the ESSP into full conformance with EFA FTI goals (the ESSP 2004- 2015 had been designed to fit within financial constraints).
2) Improving the quality of primary education through introduction of local language instruction and a simplified thematic curriculum.
3) Ensuring that all pupils successfully completing P7 have access to either academic secondary education or BTVE.
4) Strengthening science and technology education by providing science laboratories, ICT laboratory rooms, and well-stocked libraries to secondary schools.

93 Ibid
94 Ibid
95 Ibid
5) Increasing participation in tertiary education in order to ensure that Uganda meets its needs for high-level work force.

6) Increasing the attractiveness of the teaching profession through the introduction of a scheme of service that creates a career ladder for teachers and school administrators and differentiates salaries in recognition of career status.

Many of these policy objectives have yet to be fully realised. While there are plans and strategies in place, it is the full implementation of these that is lacking. Primary reasons for this appear to be budgetary constraints, weak institutional capacity and strategic alignment, poor coordination and accountability systems and practices and misaligned social and cultural practices. Thankfully, the historical prevalence of HIV/AIDS appears to be less of a constraint. Children (0 – 14) living with HIV has fallen to 96,000 and overall prevalence of HIV (15 – 49) appears to be stable at 7%.

Finally, the following figure provides an overall picture of the skills base in Uganda.

\textit{Figure 9} \hspace{1em} Education and skills status of the total working population, 2013

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{skills_base.png}
\caption{Skills base of the total working population, 2013}
\end{figure}

\subsection*{3.1 ICT in Education}

The UNESCO report (2011) on \textit{ICT Competency for Teachers} notes that teacher competencies, learning materials, electricity supply, ICT equipment, student and teacher motivations as well as the linkages to other areas of national policy and social economic development are all vital for effective ICT in education integration. The report further explains that adopting a cross-sectoral approach through an ICT in education can help countries to successfully address relevant dimensions. Efforts are being made to integrate ICT in the education curriculum in Uganda.


Vision 2040 has lofty goals with regard to ICT in the development of its human capital base and states that Uganda will develop and improve mechanisms to build ICT talent. It further states that both curricula and learning content across the education system will be regularly reviewed and developed to align what students are taught and what the economy requires and that ICT-enabled learning methods and pedagogies will be employed to prepare future generations of ICT-savvy workers, and ensure their effective utilization.\(^\text{103}\)

The National Broadband Strategy (NBS) and National ICT Policy also note the importance of ICTs to delivering high quality education and skills for economic development and the need for Uganda to embrace “lifelong education for all”. However, the NBS also notes that in the current discourse, literacy is largely viewed as traditional literacy with “small ICT components limited to schools at which civil society efforts have made ICT applications available for education and training”.\(^\text{104}\) It further notes that while most tertiary institutions do offer some ICT skills development, most ICT skills development in Uganda is carried out by computer vendors and private computer training institutions, who often provide poor quality training. There is very little systemic integration of ICT into the education system as a whole for administration or teaching and learning purposes. This is despite pronouncements in the Revised Education Sector Strategic Plan of the country embracing the use of ICTs in schools.

Despite such implementation issues, Uganda is still one of the relatively few African countries that, in 2014, had both a national ICT policy and a ICT in education policy.\(^\text{105}\) Furthermore, according to research conducted by the UNESCO Institute for Statistics and published in Information Paper 25 of August 2015, Uganda was one of only seven sub-Saharan African countries that had primary school curricula that contained recommendations and/or objectives or specific courses on basic computer skills.\(^\text{106}\) This is in contrast to a more developed country like South Africa where only the upper secondary curriculum contained such objectives or courses. The UNESCO paper goes on to state that “the early integration of ICT into primary and secondary curricula through formal recommendations is an important lever to ensure children and adults will develop digital literacy, not only for general life and work skills but also to empower youth in their ongoing education throughout secondary, post-secondary and tertiary education levels.”\(^\text{107}\)

Despite, these impressive policy goals and curriculum objectives, actual implementation remains slow and patchy.

The UNESCO paper also cites a 2013 survey of sub-Saharan African school access to electricity, which shows Ugandan schools at the bottom of the table. It was reported that only 2% of primary schools had reliable and regular access to electricity. Data for lower and upper secondary schools were not available. In fact, the only indication given in the MoES 2015 Statistical Abstract to the number of schools with a reliable electricity supply (and hence the basic required infrastructure for ICT integration) is to note that only 4% of pre-primary institutions use electricity as their major energy supply as opposed to 81% which use fire wood.

\(^{106}\) Ibid
\(^{107}\) Ibid
According to the MoES 2015 Statistical Abstract, there are 1,513 computer laboratories in primary schools (78 not in use).\(^{109}\) No indication is given of how these laboratories are distributed among schools, but assuming a distribution of one laboratory per school, this figure indicates that 8% of primary schools have access to a computer laboratory. This figure does not entirely agree with reported rates of electricity supply to primary schools which could indicate either a strong bias in the distribution of computer facilities to those schools with reliable electricity supplies or some over-reporting in the presence of computer facilities.

The figures for computer laboratories in secondary schools are slightly better. The MoES 2015 Statistical Abstract indicates the presence of 1,455 in-use computer laboratories with another 125 under development.\(^{110}\) A further 27 laboratories are reported as not-in-use. Taken together, this means that, given a distribution of one laboratory per school, almost 54% of schools have access to a computer laboratory, although the 2015 Statistical Abstract does note a requirement for 2,054 such facilities suggesting that only 24% of secondary schools have access to computer laboratories.

Therefore, despite some notable policy and strategy pronouncements, and given the data regarding institutional electricity supply, it is unclear how Uganda hopes to integrate ICT into basic education.

\(^{108}\) Ibid
\(^{110}\) Ibid
This is worrying at the secondary level as well, where, although the MoES has a policy goal of providing ICT laboratories to secondary schools, there is no accompanying implementation plan for the policy.

Having said this, however, qualitative case study research conducted by Newby et.al. (2013) suggests that at the school level there are investments in ICT. In a sample of 11 schools in the Mukono area they found good usage of limited ICT resources, and that ICTs were used for administrative (86%), entertainment (45%) and pedagogical (45%) functions.\textsuperscript{111}

Further, there are a number of notable ICT in education projects in the country both past and present. The following section presents an overview of some of the more recent ICT4E programmes and initiatives that have emerged in the last decade.

Uganda was the first country in Africa to develop curriculum aligned digital content through the use Microsoft Partners in Learning programme. To date, Uganda has developed content for mathematics, biology, chemistry, geography and some primary subjects.

Since 2003, Nakaseke community radio has served as a provider of knowledge for Nakaseke district in central Uganda. Nakaseke has, more recently been part of a series of Multipurpose Community Tele-centre pilots in the country. Providing educational information is one of the station’s main activities and, along with teachers from the 95 government and private schools in the area, started a programme in 2011 called The Radio Quiz Competition. The aim of the programme is to motivate the approximately 13,400 enrolled learners to improve their performance and raise literacy levels.

According to an evaluation carried out by the district education authorities and the District Teachers’ Association (DTA) and reported by James Ssenabulya in 2012, the competition has helped to:

1. Promote confidence among learners;
2. Raise the academic standards in the Nakaseke district;
3. Enable teachers from different schools to share views and ideas on teaching;
4. Enable teachers to evaluate their teaching;
5. Promote competition amongst the students, providing them motivation to succeed;
6. Expose the pupils to an educational environment beyond the classroom; and
7. Provide free computer trainings every year for pupils at the tele-centre.\textsuperscript{112}

In 2012, the MobiLiteracy Uganda project was launched to develop and test an early literacy product whereby parents would be encouraged and enabled to support their primary school aged children in building literacy skills outside of formal school hours. Multimedia (text and audio) Luganda content was sent to caregivers’ phones daily for 91 days. Control groups of parents receiving these instructions on paper and those receiving only a single verbal instruction at the start of the programme were established. The end-line evaluation report of the project, conducted by Research Triangle Institute (RTI), indicates the effects of the programme were small but relatively consistent and indicate greater gains made by children whose parents received regular mobile or paper instructions.\textsuperscript{113}

In 2013, the Department of Secondary Schools within the MoES reported progress on the Digital Science project to provide teacher development and resources for the implementation of ICT enabled Science teaching. The initial target of 100 schools was subsequently expanded to 300 schools with each school receiving six computers and a wide screen television set and teachers receiving both initial and ongoing professional development support.\(^{114}\)

The department reported a total of 100 head teachers and 1,650 science and mathematics teachers had been trained in the utilization of digital science methodologies and that over 3,000 students had received hands on computer skill training. The project was reported to be in its second phase where regional centres of excellence were being created.

In the same report, the Department also reported on efforts to retrain teachers and Head teachers in ICT skills and noted that 516 teachers and 120 head teachers had received training in using ICT to improve the teaching and management in secondary schools.\(^ {115}\)

Other smaller ICT in education projects include the “Improving Learning Outcomes through ICT” project which ran from December 2011 to 31 December 2014. It is focused on improving learning outcomes for 100 girls in particular in primary schools in the Apac District of Uganda through access to ICT by training 40 teachers and school administrators in learner centred teaching and learning methodologies. It also facilitated access to supporting teaching and learning materials and networking opportunities between schools.

The International Institute for Communication and Development (IICD) ran the “ITELE for ICT” project from December 2011 to 31 December 2014. It was focused on improving literacy and numeracy in primary education in the Serere District in Eastern Uganda through the integration of ICT with teaching and learning processes. The project aimed to train 20 teachers in eight targeted primary schools and then ten teachers per school by 2014 to develop ICT based teaching and learning content.\(^ {116}\)

SchoolNet Uganda, active since 1997, has a relatively long history in the country and runs several ICT in Education projects. The organisation’s objectives include, among others:
1) Advising schools on different ICT and Internet connectivity options;
2) Providing affordable refurbished computers to schools and individual teachers at a price agreed on with the Ministry of Education and Sports and conforming to agreed-on minimum specifications;
3) Setting up school computer labs and Local Area Networks;
4) Providing technical training for school IT coordinators and student technical support teams;
5) Providing basic ICT skills training;
6) Providing pedagogical training and on-going pedagogical support to teachers on how to use ICT to enhance teaching and learning in different subjects;
7) Carrying out research studies on the impact of ICT on education in Uganda; and
8) Training teachers in digital multimedia content production.\(^ {117}\)

U-Connect works to raise awareness of the benefits derived from ICT-enhanced primary and secondary school education and supports the provision of school computer labs and affordable high


\(^{115}\) Ibid


bandwidth connections to the internet. The distribution of RACHEL (Remote Area Community Hotspot for Education and Learning) e-learning repositories is a key initiative of U-Connect as part of its aim to introduce widespread use of ICTs tools in both primary and secondary schools in Uganda with an emphasis on rural areas.118

Ericsson’s “Connect to Learn” Initiative (see http://connecttolearn.org/) has had a presence in Uganda including delivering teacher professional development for ICT integration. More broadly, the initiative uses technology with three primary aims of: implementing low-cost and easy-to-use ICT for schools through mobile broadband and cloud computing; enabling access for students and teachers to information and educational resources, and connecting schools to others around the world in order to foster collaborative learning, cross-cultural understanding and global awareness.119

The Curriculum Net initiative was established by National Curriculum Development Centre (NCDC) in conjunction with the International Development Research Centre (IDRC) to develop, test and implement digital curriculum materials and delivery for primary Mathematics and Geography and secondary Mathematics and Science in Uganda.120 Although notable strides were made, connectivity, ICT resources and teacher ICT competence were all reported as significant barriers to success.

In 2010, IICD launched the "Helping teachers use ICT for teaching" project. It focused on training 400 teachers and administration staff in 13 schools in Western Uganda on the importance of using ICT for Education and for school management.121

To date, the One Laptop Per Child initiative, launched by the Massachusetts Institute of Technology Media Lab in 2005, has provided 1,200 laptops to Uganda.122

The British Council’s Connecting Classrooms programme has, since 2002, connected almost 500 Ugandan and other African classrooms to classrooms in the UK with the aim of co-coordinating ICT, science, vocational skills, global citizenship and cultural science in the connected schools.123 Further, 263 Ugandan teachers took part in British Council sponsored ICT and Global Citizenship training in 2012 and, by 2013, 300 Ugandan schools had received funding to form international partnerships.

The International Institute for Communication and Development’s (IICD) JOBoYo project created an IT based career guidance tool for youth aged 12 – 18. The focus was especially on primary school leavers who were unlikely to find a place in the formal post primary system. It improved their chances of entering the world of work by assisting them in developing occupational profiles, micro-scale start-ups ad outlining various vocational training opportunities.124

Between 2012 and 2014, the World Bank helped fund the Post Primary Education and Training Program to, among other aims:

1) increase access to lower secondary education through the development of school infrastructure like classrooms, libraries and multi-purpose science and technology rooms; and

2) Improve the quality of lower secondary education through curriculum and assessment reform, teacher development, and the provision of high quality instructional materials.

The Support to Higher Education, Science and Technology (HEST) Project,\textsuperscript{126} funded by the African Development Fund is a large scale, wide reaching and multi-year project (2012 – 2019) designed to create strong links between higher education institutions (HEIs) and the employment sectors so that HEI programs more directly address actual labour market needs by expanding and improving university and tertiary education to make it more responsive to the economy’s demand for more focused high-level skills. The project has 4 key components, 3 of which pertain directly to the development of the higher education sector and developing its science and technology capacity in six public universities\textsuperscript{127} and two other strategic tertiary education institutions.\textsuperscript{128}

1) Component 1 will improve and expand access to science and technology in six public universities and two other degree awarding institutions through
   a) Rehabilitation and expansion of Science, Technology and Innovation (STI) learning facilities including laboratories, lecture spaces, technology workshops, e-learning centres, virtualized libraries, faculty offices and business incubator/production units;
   b) Equipping these facilities with improved ICT connectivity and equipment;
   c) Supporting ICT broadband backbone and networks together with relevant equipment to widen access and improve quality through learning methods through e-learning options;
   d) Supporting the creation of utility networks and their storage, such as power supply and the stabilization/alternatives needed to attain stable learning;
   e) Designing and constructing facilities to ensure access for women and people with disabilities; and
   f) Providing 475 scholarship years of UGX 10.0 million each for students (40% female) to participate in strategic areas of STI at the undergraduate (80%) or postgraduate (20%) level.

2) Component 2 will build management capacity in public institutions through
   a) Providing postgraduate training and specialized science and technology skills development of faculty staff;
   b) Providing institutional management, entrepreneurship, governance, public-private partnership development, maintenance and sustainability training at local and regional levels; and
   c) Supporting capacity development of the Ministry of Education’s Higher Education Department and the NCHE to handle tertiary education data and tracer studies of graduates.

3) Component 3 will improve the quality and relevance of STI in public institutions by
   a) Strengthening applied research and innovation in STI and improving the relevance of science and technology;
   b) Financing the initiation of at least five new STI programs with one being entrepreneurship;
   c) Reviewing the current Higher Education Strategic Plan (HESP) 2003–2015 to develop the HESP 2015–2020 with a particular focus on the strategic role of e-learning and how it can be used to harness higher efficiency in the sector;

\textsuperscript{127} Target institutions (Public universities) - Makerere University, Kyambogo University, Mbarara University of Science and Technology, Gulu University, Busitema University, Muni University
\textsuperscript{128} Target institutions (other) - Uganda Management Institute, Makerere University Business School
d) Establishing relevant networks and partnerships with the productive sector and other worldwide institutions of excellence in their fields to enhance production/business incubation centre emerging from research and technology innovations;

e) Establishing eight entrepreneurship incubator centres;

f) Supporting interuniversity links and links with centres of excellence in applied research to enable the institutions to carry out research on tropical agriculture beyond the normal learning process and to multiply research outputs in industry; and

g) Support practical training/supervision of students in industry through a well-designed internship program for at least five STI programs.129

The "Building a Sustainable ICT Training Capacity in the Public Universities in Uganda" project implemented between 2003 and 2008 was very successful in improving the ICT capacity of staff and students in the, then, four public universities in Uganda by supporting curriculum development and implementation, the development of research capacity and advising on the establishment of a Centre of Excellence for ICT Training and Research at Makerere University. It also supported the development of ICT infrastructure.130

A further key development in the ICT in education space has been the establishment of the Virtual University of Uganda (in 2011), a private Ugandan university licenced by the NCHE and utilising cloud-based technologies to deliver post-graduate programmes in International Development, Public Health, Business Administration, and ICT for Development. The Virtual University of Uganda is the first fully online university in East Africa.131

3.2 Curriculum

The education curriculum is developed by The National Curriculum Development Centre (NCDC) that was established by the NCDC Act in 1973 and revised in 2000. It is situated under the Ministry of Education and Sports (MoES) and is mandated to be responsible for the development of curricula and related materials for the various levels of education (Pre-Primary, Primary, Secondary and Tertiary), and organising capacity building courses for stakeholders on curricula and matters related to curriculum.

The Early Childhood Development Policy in the Education Sector (approved in 2007) stresses the importance of Early Childhood Education (ECD) and, in response, the NCDC has produced both a Learning Framework for Early Childhood and companion Caregivers Guide to the Framework. The framework is outcomes and competence based and focuses on results by emphasizing observable and measurable skills, competences and values to be acquired by the children. It has been designed to allow every Ugandan child to enjoy the right to development, whether at home, in a formal or a semi–formal pre-school setting and is available in Kiswahili and 16 other local languages.

The Caregivers guide provides guidance on how to assess and record progress, and report to those who need the progress reports on the child. This allows for regular monitoring of individual learners’ progress, diagnosis of learning difficulties and the provision of necessary assistance. The guide also provides information on the teaching and learning experiences that enhance the holistic development of a child. Emphasis is on learner-centredness, and provides for increased learner-teacher contact time, different ability groups and use of familiar language for initial literacy.

The Primary School Curriculum aims to enable learners to develop competences and life skills for lifelong learning and so emphasises the importance of literacy, numeracy, language development, values, attitudes and other cross-cutting skills. The curriculum advocates for the use of child-centred pedagogies to help learners acquire self-confidence.\textsuperscript{132}

The primary phase is divided into 3 phases:
1) Lower Primary (grade 1 – 3)
2) Transition (grade 4)
3) Upper Primary (Grade 5 – 7)

Each phase, has its own curriculum policy document to cater for different age interests and abilities. Detailed curriculum documents are available on the NCDC website.

Secondary school is divided into four years of lower secondary culminating in the Uganda Certificate of Education (UCE) and 2 years of upper secondary culminating in the Uganda Advanced Certificate of Education (UACE). The objectives of secondary education are listed as follows:

1) Instilling and promoting national unity and an understanding of social and civic responsibilities; strong love and care for others and respect for public property, as well as an appreciation of international relations and beneficial international co-operation.
2) Promoting an appreciation and understanding of the cultural heritage of Uganda including its languages.
3) Imparting and promoting a sense of self-discipline, ethical and spiritual values, personal and collective responsibility and initiative.
4) Enabling individuals to acquire and develop knowledge and an understanding of emerging needs of society and the economy.
5) Providing up-to-date and comprehensive knowledge in theoretical and practical aspects of innovative production, modern management methods in the field of commerce and industry and their application in the context of socio-economic development of Uganda.
6) Enabling individuals to develop basic scientific, technological, technical, agricultural and commercial skills required for self-employment.
7) Enabling individuals to develop personal skills of problem-solving, information gathering and interpretation, independent reading and writing, self-improvement through learning and development of social, physical and leadership skills such as are obtained through games, sports, societies and clubs.
8) Laying the foundation for further education.
9) Enabling the individual to apply acquired skills in solving problems of the community and to develop in him/her a strong sense of constructive and beneficial belonging to that community.
10) Instilling positive attitudes towards productive work and strong respect for the dignity of labour and those who engage in productive labour activities.\textsuperscript{133}

Computer Studies (CS) is taught as a separate subject in secondary schools and, at the end of the 4 years of lower secondary, is externally examined by the Uganda National Examinations Board (UNEB). CS aims is to equip learners with computer and ICT skills in order to develop their problem-


solving skills (including analysis, interpretation and information processing and dissemination skills) and increase work efficiency by teaching them to apply these skills to other subjects. 134

Ultimately the CS curriculum aims to reach learners how to live and thrive in a technological society while also displaying ethical behaviour in the use of ICTs.

To support curriculum efforts to integrate ICTs, the CurriculumNet project developed, tested, and integrated ICT-based instructional materials and teaching into the existing Ugandan curriculum. In addition, the project has explored the viability of using ICTs in education by evaluating their potential for a positive impact on teaching and learning, and testing the economic, technical and operational feasibility of the delivery process. The project was undertaken as a participatory effort, wherein curriculum experts and teachers were trained and supported in the collaborative development of ICT-based curriculum, and in delivering the curriculum electronically in their local classrooms.135

The post-primary education (BTVET) curriculum outlines both certificate courses (National Certificates – 2 years, National Junior Vocational Certificates – 3 years and Competency National Certificates – 3 months to 7 years) and diploma programmes (National Diploma – 2 years and Higher Diploma – 2 years).

Possibly the most significant curriculum reform initiative undertaken recently was the Lower Secondary Curriculum Reform with reform efforts starting in 2012. The major objectives of the reform are:

1) To promote effective learning and acquisition of skills;
2) To address the needs of all students and lay the foundation for improved pedagogy and assessment procedures which allow learners to more effectively realise their full potential and demonstrate their achievements;
3) To address the social and economic needs of the country by meeting the educational needs of learners who will take jobs in the world of work, become self-employed people or pursue academic studies beyond senior four;
4) To allow flexibility to absorb emerging fields of knowledge in a rapidly-changing world; and
5) To reduce content overload by specifying a realistic set of expected learning outcomes with a range of essential generic skills at the heart of the curriculum.

Aligned to the NCDC is the Bfor Higher Education which manages the tertiary education sector including ensuring minimum standards for degree, post-graduate, diploma and certificate courses of study awarded by public and private institutions and to set and coordinate national standards of admission.

The Uganda National Examinations Board manages all basic education examination process in the country including conducting primary, secondary and other examinations and moderation and awarding of certificates.

Several individual sector Examination boards have been established including the Uganda Business and Technical Examinations Board (UBTEB), Uganda Allied Health Examinations Board (UAHEB) and the Uganda Nurses and Midwives Examinations Board (UNMEB). This regime has created an enabling

environment for the provision of uniform assessment tools and other manuals necessary for the enhancement of skills development and to ensure standardization of qualifications in the various fields of vocational education and training following the principles of Competence Based Education and Training.

### 3.3 Professional Development

Teacher development is within the purview of the Directorate of Higher, Technical and Vocational Training (HTVET) within the MoES and is managed by the Department of Teacher/Tutor, Instructor Education and Training Department which is responsible for:

1. Teachers of primary and secondary schools;
2. Tutors of Primary Teachers' Colleges and Health training institutions;
3. Instructors of Technical Training institutions; and
4. Lectures for specialized training institutions including National Teachers' Colleges, Colleges of Commerce and Technical Colleges among others.

Most teacher training occurs via a network of five National Teachers Colleges and 23 Core Primary Teachers' Colleges.

With funding from the Global Partnership for Education, the MoES is currently implementing a project to improve the quality of Universal Primary Education in the country by improving pre-service teacher education in, particularly, the 23 core Primary Teachers’ Colleges. The project has the following aims and objectives:

1. To train teachers in active teaching and learning methodologies and to develop the critical thinking capacities of teachers and learners;
2. To provide academic staff with modern IT tools and software to better prepare, illustrate and deliver lively and inspiring lessons.
3. To encourage education managers to better administer their colleges using ICT as an enabler and efficiency driver in the areas of HR, student support, maintenance, financial accountability and efficiency.
4. To improve the physical conditions for teaching and learning at the colleges and to provide enhanced laboratories, workshops, user-friendly libraries and staff rooms.\(^{136}\)

The three year, US$100 million Global Partnership for Education funded Uganda Teacher and School Effectiveness Project is possibly the largest current national education project. Implementation is supervised by the World Bank. The project has three components although none of them have any direct ICT component, improvements in the quality of basic education are still likely to support and foster the development of a knowledge society. The three components are:

2. Component 2 (Effective Schools): Improving the school environment in the form of enhanced school management, accountability, and learning conditions including school facilities (classrooms, offices, water and sanitation facilities, teacher housing).
3. Component 3 (Technical Assistance and Capacity Building): Financing advisory, technical, monitoring and evaluation, implementation, and capacity-building support on the level of the education system.\(^{137}\)


\(^{137}\)
The ICT for Schools project in Uganda was implemented by Close the Gap (an organising specialising in making refurbished computers available to developing countries) in 2013 and aimed to train teachers, head teachers, deputy head teachers and the director of studies on the use of ICT to improve the quality of teaching and learning. Computers for Schools Uganda was the local implementing partner and identified partner schools able to join the IT programme. It also distributed Close the Gap computers to the recipient institutions and set up a maintenance programme to ensure that the ICT labs were correctly set-up and maintained in the schools. A partnership between IICD and Schoolnet Uganda additionally ensured that the IT equipment was used effectively and that the teaching staff was in a position to make full use of the benefits of ICT for educational purposes.

Secondary Science and Mathematics Teachers’ Programme (SESEMAT) was initially a Japan International Cooperation Agency (JICA) funded project designed to improve the teaching of Mathematics and Science. After a successful pilot implementation, starting in 2005, the MoES institutionalized the project as an in-service training programme to strengthen science and mathematics education in 37 districts with the aim of disseminating the effect of the pilot project to other districts. Thus, SESEMAT was firmly established as a national programme through the pilot project and its subsequent expansion. An evaluation conducted on the programme during the period 2009 – 2013 found that it had the greatest impact on improving teachers and student’s attitudes towards science and mathematics as well as improving the performance of students in the national examinations. It also had a positive effect on developing practical teaching methodologies.

The African Network of Scientific and Technological Institutions (ANSTI) is a UNESCO project that supports staff development in science and technology at several universities in Uganda, through the award of post graduate training fellowship and conference grants. It deliberates on issues affecting the research, development and deployment for sustainable development of the country.

The World Bank is also involved in skills development in Uganda in the tertiary sector. The Skills Development Project, to be implemented between 2016 and 2020, aims to “enhance the capacity of institutions to deliver high quality, demand-driven training programs in target sectors.” The project consists of three main components.

Component One seeks to institutionalise systemic reforms in skills development and aims to support the reform task force (RTF) to oversee the implementation of critical reforms necessary for the effective functioning of the skills development system as well as supporting the establishment of the skills development authority (SDA) in the medium term. The establishment of sector skills councils (SSCs) are also part of this component and will carry out the following functions:

1) Identifying and analyzing of skill requirements in the economic sector;
2) Development of industry skills strategies and training plans to achieve priority goals;
3) Establishing occupational and competency standards and qualifications as part of the Uganda Vocational Qualifications Framework (UVQF);

4) Evaluating performance in skills development;
5) Putting in place regulation of public and private sector training providers; and
6) Promoting enterprise based training in the sector.  

Component Two aims at improving the quality and relevance of skills development and seeks to develop 4 colleges to eventually become Centers of Excellence (CoE). These CoE will be capacitated in terms of institutional governance, curriculum design and assessment processes, staff development, instructional materials development and suitable physical and ICT infrastructure. 

Component Three will be implemented through a Grant Facility mechanism that will be co-financed by the private sector through a matching grant contribution. It will support training activities that lead to improved productivity and competitiveness in the formal and informal sectors. Grants will be made available through 4 windows:
1) Window 1 will be addressing skills shortages in the formal sector;
2) Window 2 will assist self-employed and workers in the informal (jua khalii) sector, micro and small enterprises, master crafts-people and members of cooperatives to improve their practical, technical, business and foundational skills in order to enhance their competitiveness.;
3) Window 3 will support innovative skills training programmes; and
4) Window 4 will fund initiatives by private sector/industry organizations interested in participating in the development of a system for certification of skills and competencies acquired through informal and non-formal means. 

UNESCO-China Funds-in-Trust Project (UNESCO CFIT) “Harnessing Technology for Quality Teacher Training in Africa” operates in Uganda. The project was launched in 2012 with the support of the Chinese government who donated a budget of $8 million for a duration of four years. The project was conducted in Uganda between (2013 – 2016). The CFIT project is one of the initiatives of UNESCO to accelerate progress towards the attainment of Education for all goals, (in particular Goal 6 aiming at improving the quality of education) and the education-related Millennium Development Goals (MDGs) (in particular Goal 2 to achieve universal primary education). Several workshops were conducted. For example, there was a workshop focusing on open educational resources (OER), their selection and use by teacher educators. Another workshop focused on the UNESCO ICT competency framework for teachers and how it will work in Uganda. Yet another workshop (facilitated by GECSI) focused on the link between active teaching and learning methodology and ICT integration, recognizing that ICT integration is about pedagogy as much as technology and that it is more likely to be effective if students are active participants in their learning. 

### 3.4 Key Actors and Players

<table>
<thead>
<tr>
<th>Actor/Player</th>
<th>Role and Area of Development</th>
</tr>
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<tbody>
<tr>
<td>Ministry of Education and Sports</td>
<td>The Ministry is responsible for all aspects of education in Uganda from early childhood development to tertiary education.</td>
</tr>
<tr>
<td>National Curriculum Development Centre</td>
<td>The NCDC is responsible for the development and maintenance f the Primary, Secondary and Post-primary (BTVET) curricula.</td>
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</tbody>
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142 Ibid
143 Ibid
144 Ibid
The Uganda National Council for Higher Education manages the tertiary education sector including ensuring minimum standards for degree, post-graduate, diploma and certificate courses of study awarded by public and private institutions and to set and coordinate national standards of admission.

The UNEB is responsible for administering Primary and Secondary examinations and certification.

Multilateral donor organisation funding education projects in Uganda

Japanese aid agency funding education projects in Uganda

### 3.5 Challenges facing the education sector

Despite enormous gains made by the education system in Uganda in recent years with the advent of universal primary and secondary education, several challenges remain. The first of these is the lack of an effective and universally implemented Early Childhood Development (ECD) programme. While there is some policy direction, this needs to be stronger with a suitable allocation of financial resources and public awareness.

Ugandan basic education also still suffers from low quality of education at all levels. This is coupled with low completion rates at primary and high dropout rates, especially among girls at secondary. The result is a lack of basic numeracy, literacy, and entry-level skills and work readiness skills.

The implementation of ICT tools to improve both the quality, accessibility and cost-efficiency of basic education is generally poor with several small and uncoordinated projects occurring from time to time. Stronger and more defined policy direction would help to coordinate the role players (donors, implementers and education departments) in designing projects to achieve specifically mandated ICT in Education goals.

While progress is being made in post-secondary skills development with the demand for skills development increasing and an expansion in service provision, courses and enrolments, challenges remain in the BTWET and HE sectors. The NDPII lists some of these as:

1. An inadequate skills mix to support increased production and expansion;
2. Poor work readiness of many young people leaving formal secondary and tertiary education and entering the labour market for the first time;
3. Inadequate linkages between institutional and workplace learning;
4. Continuing challenges providing sufficient skills in the artisanal, technical and professional fields; and
5. A lack of synergy between the various post-school sub-systems and a lack of clarity is each sub-system’s role.\(^{147}\)

This last issue, in particular, is a manifestation of a more general problem where there is a lack of clarity in relation to the role expected of the various parts of the skills development system with what the NDPII terms a ‘silo mentality’ preventing effective partnerships and alignments between role players to boost effectiveness and efficiency.

The Higher Education Strategic Plan for 2003 – 2015 envisaged a student computer of 1:10 by 2010 (1:5 by 2015). By 2012, only Makerere University came close to attaining this requirement with a

ratio of computers to students of 1:7. At Mbarara University of Science and Technology and Gulu University, for example, it was 1:23 and 1:34 respectively.\textsuperscript{148}

The rapid growth in student enrolment in university has not been matched with improvements in infrastructure, equipment or staffing. The government funding to HE has been averaging 10\%–12\% of the education budget over the last five years, against requests of at least 20\%.\textsuperscript{149} However, given inflation rates and population increases, this expenditure can be considered stagnant.

4 Science, Technology, and Innovation (STI)

The Government of Uganda recognizes that science, technology and innovation (STI) are critical to Uganda’s socio-economic growth and transformation. The Government also recognizes the key role that STI and the accelerated use of applied technology, research and innovation plays in fostering research and development and in building the human capital that Uganda requires for the future knowledge-based economy (National STI Policy, 2009). Currently, Research and Development (R&D) is mainly confined to institutions such as universities, colleges, vocational institutes and Government research centres with limited applicability to production and delivery of services.

Uganda currently has only about one researcher per 1,000 people in the workforce (up from 0.5 in 2009) compared to over five researchers per 1,000 in the developed world. According to the World Bank, in 2010 Uganda had 38 researchers in R&D per million people, compared to a world average of over 1,200.\textsuperscript{150} In addition, in 2010 the country had only 13 technicians in R&D per million people\textsuperscript{151} and spending on R&D as a percentage of GDP was only 0.476\% in 2010\textsuperscript{152} where the African Union target is 1\%.

In recognition of the strategic role STI plays in national development, the Government of Uganda (GoU) has initiated efforts to promote a suitable environment for STI to thrive. These efforts have taken the form of legal, institutional and administrative reforms to facilitate R&D, technology transfer and human capital development.

The overall policy framework for Science, Technology and Innovation (STI) is provided by the National Science, Technology and Innovation Policy of 2009. This policy was the culmination of consultations that began in 1994 and outlines the positive contribution that STI can have towards economic growth, employment creation, technological progress and export promotion, human capital development, conservation, tourism and rural development.

Flowing from this is the National Science, Technology and Innovation Plan (NSTP) 2012/13-2017/18 developed by the Ministry of Finance, Planning and Economic Development (MFPED) developed in 2011.

Another initiative is the creation of Ministry of Science, Technology and Innovation – the latest cabinet level government ministry, formed in June 2016. Many of the ministry’s responsibilities used to reside in the Ministry of Education and Sport (previously the Ministry of Education, Science,
Technology and Sport) but were moved to the new ministry in an effort to accelerate the pace and depth of science and technology innovation.

The Uganda National Council for Science and Technology (UNCST) is the primary implementation agency and has strong links with other sectors through its specialized technical committees that include; agricultural sciences, industrial sciences, engineering and technology, natural sciences, physical sciences, health sciences, information sciences, and social sciences and humanities.  

This is supported by a network of public and private universities. Chief among these is Makerere University. An important role of the university is exercised through its School of Computing and Informatics Technology which builds links between academia, R&D organisations and the Uganda ICT industry that encourages the development synergies.

The private sector applies science, technology, engineering and innovation into their business processes and provides necessary feedback to guide research and innovations while academia provides the necessary training for practitioners and carries out research alongside other research institutions. Importantly, Civil Society Organisations (CSOs) undertake advocacy for development and application of safe and environmentally friendly technologies whereas the development partners support technology transfer and sharing, as well as provide financial and technical support. Furthermore, Uganda is party to a number of regional and international agreements on STI, especially under the UN, the Commonwealth, NEPAD, and EAC programme and initiatives. These are premised on creating a sound STI policy environment among partner countries.

The continued funding of R&D sectors by the government further emphasizes the opportunities present. The GoU recognises that investment in R&D will act as an optimal strategy through which future development can be realised in the diverse sectors of the economy. Some major challenges that remain to be resolved are the attitude towards science subjects in schools and universities. For example, there persists a low ratio of Science to Arts graduates with only six institutions of higher learning offering science-oriented courses. This has led to slow adoption of new technologies and innovations and a country with very few full-time researchers in the STI field.

### 4.1 STI Policies and Objectives

As noted, the National Science, Technology and Innovation Policy forms the overarching framework for policy and strategy in the area of STI. It defines the roles of various necessary stakeholders in the sector including government, Science, Engineering and Technology institutions, the private sector, NGOs, local and international communities.

The primary goals of the policy are to:

1) Create an enabling policy environment to foster STI and augment their contribution to national development.

2) Build STI sector capacity to generate and transfer technology.

3) Establish and strengthen the legal and regulatory framework to ensure ethics and safety in STI development and application.

4) Strengthen the STI coordination framework to enhance sector performance.

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The policy also outlines various strategies to achieve 16 policy statements covering:
1) Technology Forecasting, Assessment and Transfer;
2) Industrial Development;
3) Intellectual Property Management;
4) Traditional, Conventional and Emerging Technologies;
5) Gender and Equity;
6) Sector Financing and Investment;
7) Human Capital Development and Retention;
8) STI Infrastructure;
9) Research;
10) Technology Incubation;
11) STI Safety Regulations;
12) Ethics in STI;
13) Standards and Quality Assurance in STI;
14) Public Awareness and Appreciation of STI;
15) Information Management System; and
16) Sector Coordination and Partnerships.  

In addition, the government launched the National Science, Technology and Innovation Plan (NSTP) 2012/2013-2017/2018. The plan notes that aim of building “A prosperous Science and Technology led Ugandan Society”. The NSTP provides some detailed policy actions, for example, providing short, medium and long term priorities and targets for the sector in tandem with the goals and objectives of the Second National Development Plan (NDPII). It provides a broad framework for development of STI and is regularly reviewed to incorporate new developments in the sector. The NSTP has four goals:
1) Create an enabling policy environment to foster STI and augment their contribution to national development.
2) Build the STI sector capacity to generate and transfer technology.
3) Establish and strengthen the legal and regulatory framework to ensure ethics and safety in STI development and application.
4) Strengthen the STI coordination framework to enhance the sector’s performance and contribution to national development (GoU, MFPED NSTP 2011).

The NDPII notes the importance of raising Uganda’s Technology Achievement Index from 0.15 to 0.21, thus placing the country in the dynamic adopters group. It also aims to increases Uganda’s R&D spend to 1% of GDP, in line with African Union benchmarks. It articulates four major strategic objectives for the sector:

1) Enhance the integration of science and technology into the national development process by developing an STI management system that facilitates coordination and partnerships between organisations as well as protecting intellectual property rights;
2) Increase the transfer and adoption of technologies by developing bilateral and multilateral STI agreements and other partnerships;

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155 Ibid
157 The Technology Achievement Index it is used by the UNDP (United Nations Development Programme) to measure how well a country is creating and diffusing technology and building a human skill base, reflecting capacity to participate in the technological innovations of the network age. The TAI focuses on four dimensions of technological capacity: creation of technology, diffusion of recent innovations, diffusion of old innovations, human skills.
3) Enhance R&D in Uganda by supporting more basic research and promoting the design, development and commercialization of Ugandan products and services; and
4) Improve the STI legal and regulatory framework.\textsuperscript{158}

Other key STI related policies include the National Information and Communication Technology (NICT) Policy (2003) and the National Biotechnology and Bio-safety Policy (2008).

4.2 Research and Innovation

There has been some overall progress in the country's science and technology status in terms of diffusion of old innovation and human skills development, however the development of new technologies and diffusion of recent innovations is still very low owing to the low levels of research and development. In 2014, the percentage of expenditure to research related activities by Ugandan universities was 0.75\% and 0.84\% for public and private universities respectively.\textsuperscript{159}

The bulk of the R&D funding in Uganda is directed towards applied research (UGX44.8 billion) with almost five times less funding directed at basic research. Most of the funds for applied research finance agricultural sciences at the National Agricultural Research Organisation (NARO) and engineering and technology research at the Uganda Industrial Research Institute (UIRI). According to the NDPII, only 2.3\% of funding is directed towards medical sciences. Additionally, there is slow technology adoption and diffusion in the country coupled with a weak legal framework that supports innovation.\textsuperscript{160}

R&D products to have been developed include banana value chain management,\textsuperscript{161} crop breeding and disease control, malaria and livestock diseases control and ICT.

In 2011, the College of Computing and Information Science at Makerere University was re-launched by the United Nations Industrial Development Organization (UNIDO) and Microsoft as the first Microsoft Innovation Centre in Uganda. It was initially funded for two years by the Rockefeller Foundation. The Centre is an extension of the global Microsoft Innovation network and is designed to promote the development of innovation and growth in the Ugandan software economy. The Innovation Centre provides access to PCs, software, desk space and mentoring, and supports both final year students, recent graduates, staff and external entrepreneurs. The facility focuses on skills development and aims to educate local students to help improve their professional IT knowledge and allow them to gain real project experience before graduating.\textsuperscript{162}

In collaboration with the Ugandan Government, National Information Technology Authority Uganda (NITA-U) and Makerere University, the Centre also helps developers and IT professionals learn about the latest technologies, stimulate technology innovation and drive the local software economy to boost national competitiveness. It provides assistance and resources to small and medium sized enterprises to create new and innovative products and services, bring those products to the market and increase their business competitiveness.\textsuperscript{163}

\textsuperscript{163} Ibid
Other public and private research and STI development organisations include:
1) The Joint Clinical Research Centre conducts scientific and social research into vaccine development, HIV care, Prevention of Mother to Child Transmission (PMTCT), HIV/AIDS Treatment and Paediatrics.\textsuperscript{164}

2) The MRC/UVRI Uganda Research Unit on AIDS is an internationally recognized centre of excellence in HIV infection and related diseases. Its mission is three-fold:
   a. To conduct research to improve the control of HIV epidemic through prevention and Care both in Uganda and elsewhere in Africa.
   b. To contribute to the translation of research findings into policy and practice both locally and internationally.
   c. To support capacity building for research in Africa.\textsuperscript{165}

3) The Uganda Virus Research Institute is a government research facility that conducts scientific research into viral and other communicable diseases in order to contribute to knowledge, policy, practice and to build research capacity.\textsuperscript{166}

4) The Epicentre in Uganda is part of an international clinical research organisation targeting malaria, tuberculosis, and central nervous system infections. The centre is based in the Mbarara University.

5) The ResilientAfrica Network is funded by USAID and is based at Makerere University. It is a partnership between 18 African universities in 16 countries and the George Washington University’s Disaster Resilience Leadership Academy ad the Stanford University Centre for Strategic and International Studies. The network aims to strengthen the resilience of communities by nurturing and scaling innovations from the different universities. It applies science and technology to strengthen the resilience of African communities against natural and man-made stresses.\textsuperscript{167}

The Presidential Support to Scientists, with an annual allocation of UGX8 billion provides support to scientists in the development and commercialization of local innovations and the establishment and nurturing of a number of S&T institutions and enterprises. One significant positive result of this initiative was the development of Uganda’s first electric vehicle called the Kiira EV. Although the technical design and development of the vehicle is important, it was the integration of informal sector artisans, under non-disclosure agreements, in its construction that is particularly promising for future STI efforts. The Kiira EV is expected to go into production in 2018 with a model that will continue to involve informal sector workers.

**4.3 Human Resource Development**

While some progress has been made towards skilling the Ugandan labour force, the economy still faces substantial skills gaps in key sectors. Over the last five years, progress has been made in some areas of Business, Technical, Vocational Education and Training (BTVET) which has registered a 73% increase in enrolment from 24,598 in 2009 to 42,674 in 2013, of which 28,024 (66%) where males and 14,650 (34%) females. However, the number of places available in BTVET institutions compared to demand from primary and S1- S4 leavers still falls short by 60%. With regards to the informal sector, which from anecdotal evidence provides the biggest number of people at the lower skills level, not much progress has been registered in terms of standardization, quality and certification.


According to the Global Innovation Index 2016, Uganda’s Full Time Equivalent (FTE) researchers per million stood at 38.1, low by international standards. This is because the current education system emphasizes theoretical academic work (teaching) with little depth of applied science, engineering and technical skills which are central to technological innovation (research). It is also due to the fact that enrolments in Science Technology Engineering and Mathematics (STEM) programmes are currently still under 25%.

Apart from Makerere University, which was ranked 54th in Africa in 2007, the overall ranking of other Ugandan Universities and specialized STI institutions is still extremely low compared to other universities in the developing world. However, Ugandan universities have continued to climb up the scale of world universities in recent years. Makerere is among the best ranked in sub-Saharan Africa and was placed in 11th in the continent in the latest rankings.

The Uganda NCST supports various universities and research institutions in training scientists and engineers to develop research capacities and undertake cutting edge research. This has led to a modest increase in STI human resources capacity with the R&D personnel capacity increasing by 6.7 percent between 2010 and 2012. The NCST also offers various grants, awards and fellowships like the National Science, Technology and Innovation Programme to encourage study in STI related fields.

For example, in 2012, Makerere University launched a Master of Science Programme in Technology Innovation and Industrial Development (TIID) at its College of Engineering, Design, Art and Technology. The programme builds on many years of collaboration with the Norwegian University of Science and Technology and it is expected that the TIID will be instrumental in locally training the next generation of STI experts. TIID has deep links with several key partners such as the Uganda Institution of Professional Engineers, the Uganda Association of Architects, the Uganda National Association of Building and Civil Engineering Contractors, the Uganda Manufacturers Association, and the Uganda Small Scale Industries Association.

Makerera University is also partnering with the Embassy of Sweden in Kampala on the Research Capacity Building Programme. The partnership is managed by the Directorate for Research and Graduate Training at Makerere University. The overall aim of the programme is to “increase the capacity of Makerere and partner public Universities to generate knowledge and promote research uptake for national and regional development.”

Specific objectives include:

1) **Improve the institutional and research infrastructure to support a robust environment for research and innovations at Makerere University by 2020**;
2) **Strengthen local PhD training in public universities in Uganda by 2020**;
3) **Increase the generation and dissemination of knowledge and research outputs by 2020**;
4) **Increase capacity for knowledge translation and innovations by 2020**;
5) **Increase partnerships and regional synergies for knowledge generation and sharing by 2020**;
6) **Improve the coordination and management of research and knowledge uptake by 2020**; and

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7) Increase cooperation with and strengthen capacity of partner public universities by 2020.\textsuperscript{171}

Key outputs of the programme are listed as:
1) 200 PhD graduates; 50 of whom are from partner public university (at least 30% will be female)
2) 150 masters students supported; with 100 from partner public universities (at least 30% are females)
3) 30 postdoctoral projects supported; with 5 from partner public universities (at least 30% headed by females)
4) 200 Publications
5) At least five patents held by Makerere University
6) At least 20 Innovations and Technologies developed\textsuperscript{172}

From 2007 to 2011, the University of Groningen in the Netherlands partnered with the Makerere University Faculty of Computing and IT, the Mbarara University of Science and Technology, Kyambogo University and Gulu University on the Strengthening ICT Training and Research Capacity in the Four Public Universities in Uganda project. The objectives of the project were to:
1) Build sustainable ICT human resource capacity at all the four Public Universities;
2) Strengthen ICT educational programmes at the four public universities;
3) Strengthen a joint research programme;
4) Improve the ICT and Teaching Infrastructure at the four Public Universities;
5) Strengthen the Centre of Excellence in Computing and ICT at Makerere University;
6) Promote gender-balance in both the number of academic staff as in the number of students and to contribute to the Uganda government's plans to increase the number of women participating in ICT/ Science and Technology; and
7) Strengthen relations and collaboration among the Universities, ICT Industry and the government.\textsuperscript{173}

The Millennium Science Initiative (2006 – 2013), funded by the World Bank, aimed to support “Ugandan universities and research institutes to produce more and better qualified science and engineering graduates, and higher quality and more relevant research, and for firms to utilize these outputs to improve productivity for the sake of enhancing Science and Technology-led (S&T) growth.”\textsuperscript{174} The project consisted of 2 components.

1) Component 1 provided research grants within 3 windows:
   a) Window A: Senior or emerging researchers conducting relevant, high-quality scientific and technological research closely connected to graduate training;
   b) Window B: Creation or upgrading of undergraduate programs in basic science and engineering at licensed public and private institutions; and
   c) Window C: Firms and researchers solving problems of direct interest to industry through technology platforms and formal internships for students in science, engineering, and business administration.

2) Component 2 provided support to outreach and policy initiatives including the following:
   a) Outreach programs to promote understanding and appreciation of science for younger Ugandans to encourage them to consider careers in science and technology including

\textsuperscript{171} Ibid
\textsuperscript{172} Ibid
funding for a National Science Week, school visits by researchers, and various media campaigns;

b) Institutional strengthening of the Uganda National Council for Science and Technology and the Uganda Industrial Research Institute; and
c) Policy studies in key areas promoting policy actions.\(^{175}\)

Further, government has increased the proportion of sponsorships to science-based courses at tertiary levels to 75% and created three new science-based universities.\(^{176}\) In setting the foundation for increased enrolment in science-based programs at tertiary level, science subjects have been made compulsory in lower secondary.

In addition, the African Rural University, a women only rural university, located in Kagadi in Western Uganda, was founded by the Uganda Rural Development and Training Programme to provide women with the skills, knowledge and experience to be effective rural development specialists and change agents. The university accepts only 30 new students each year to allow the university to provide maximum dedicated time and coaching to all students. Rather than seeking employment upon graduating, students start their own rural development enterprises.

There are some private organisations, mainly in the ICT and business entrepreneurship areas working to develop economically productive STI human capacity.

1) Women in Technology Uganda have three primary goals:

   a. To inspire young girls and women to take on technology related career
   b. To teach and train women in relevant leadership, technology and business education
   c. To create a community of women leaders, technologists and business people

2) Outbox is a social private business that supports innovation and entrepreneurship by providing the necessary infrastructure to incubate, mentor and launch new companies.

3) Hive Colab is very similar to Outbox in that it helps incubate and launch new technology start-ups.

4.4 Key Actors and Players

<table>
<thead>
<tr>
<th>Actor/Player</th>
<th>Role and Area of Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Science, Technology and Innovation</td>
<td>Main driver of policy and strategic direction</td>
</tr>
<tr>
<td>Uganda National Council for Science and Technology</td>
<td>Primary STI implementation agency</td>
</tr>
<tr>
<td>Makerere University</td>
<td>Principle teaching and research university</td>
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<tr>
<td>National Information Technology Authority Uganda</td>
<td>Responsible for coordinating and regulating IT services in Uganda</td>
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4.5 Challenges facing the STI sector

In 2016, Uganda was ranked 99 out of 128 countries in the Global Innovation Index (GII) with a score of 27.1 and was classified as an achiever in innovation although it was also rated as an Inefficient

\(^{175}\) Ibid
Innovator indicating that, given its current GDP, its innovation score should be higher. Having said this, it should also be noted that, over the past 4 – 5 years, Uganda has outperformed other low-income countries in terms of innovation.

According to the GII 2015 report, although Uganda appears to have numerous policies relating to research and innovation, its current challenge is to get a policy mix that creates an environment conducive to learning and interaction among actors in the public sector, private businesses, and civil society. It calls for more co-ordinated action in this regard from the Uganda National Council for Science and Technology as well as from local and regional innovation networks such as the Innovation Systems and Clusters Programme at Makerere University, Bio-Innovate, AfricaLics, and the Pan African Competitiveness Forum as well as for efforts towards a better match between policy commitments and the allocation of financial resources needed to encourage the various actors to interact with and learn from each other and to, therefore, spur innovation.

Related to this is what the NDPII identifies as out-dated laws that make it difficult to address contemporary issues and do not adequately empower UNCST to effectively oversee the development of STI.

A further challenge relates to Intellectual Property (IP). A number of IP laws have been updated in the past decade but many scientists and innovators are unaware of the protections these laws offer them and so do not leverage them to their competitive advantage. This may be part of the reason for low levels of interaction between role players.

The NDPII also identifies unsustainable STI funding models as a challenge. Public universities and other research organizations do receive direct government grants but, on average, only 2% of these funds are allocated to research and innovation activities (GII, 2015). Such direct funding could be replaced with an annual competitive grants process that will attract talent and encourage creativity in recipient organisations. This will also ensure high levels of accountability for results and resource usage. Such a grant process is currently being used by the NCST for its National Science, Technology and Innovation Programme.

### 5 Conclusion

What is immediately clear is that there has been a proliferation of policy and strategy initiatives that have taken place over the past decade, many, particularly those in the ICT, Education and STI sectors, are in line with Uganda’s vision of transforming itself into a middle-income country by leveraging the development of a modern knowledge and innovation based economy to do so. These policy and strategy initiatives have laid a solid foundation for progressing and realising this vision.

Uganda has achieved economic growth of more than 5% per annum for the past 25 years. However, a great number of Ugandans still live at or below the poverty line and are economically dependent on agriculture, generally poorly educated and culturally relatively conservative. There have also been some gains made in terms of access to ICT such as improved access to broadband Internet services, mobile phone growth and general telecommunication liberalisation. There have been some advances made in terms of making government more accessible, transparent and efficient. Current optic fibre infrastructure projects should lead to further gains being realised.

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for more people. One notable exception to this is the access to electricity, especially in rural areas. This will most certainly continue to limit any further ICT gains in terms of quality, accessibility and price.

In comparative terms though, Uganda is doing poorly in ICT sector development and was ranked 157\textsuperscript{th} out of 175 in 2016 (down from 155 out of 175 in 2015) with an ICT Development Index (IDI) of 1.95. It is true that Uganda’s score has improved in recent years, however, gains have not been as large as competitors in the region. Uganda is currently ranked 23\textsuperscript{rd} out of 39 in Africa and is well below the average developing economy score of 4.07.

The Education Sector Strategic Plan (ESSP, 2007-2015), Universal Primary Education (UPE), and the Skilling Uganda BTVE\textsuperscript{T} Strategic Plan 2012/3-2021/22, supported by the Second National Development Plan 2015/2016 – 2019/2020, the National ICT Policy for Uganda (2012) and the National Broadband Strategy for Uganda 2016 – 2020 (2016) underpin current efforts to transform the education sector. Enrolments are up and gender parity, especially in primary education, has basically been reached. But poor quality and throughput rates remain stubborn challenges. Current curriculum revisions, especially to the lower secondary curriculum aim to bring about both a better match between education outcomes and job market requirements as well as increased enrolments into post-primary and tertiary programmes related to STI or in areas demanded by the economy. Efforts in all these regards are being hampered by the slow and relatively uncoordinated implementation of ICT into the various education systems.

The development and implementation of the National Science, Technology and Innovation Plan 2012/13 – 2017/18 (2012) is having some positive effects on STI including an increase in research and development capacity. Space is slowly being created for local and foreign investment to spur R&D and innovation. For example, initiatives such as the establishment of the Microsoft Innovation Centre and the African Rural University (ARU) have led to the stimulation of technology innovation. In spite of these gains, however, the STI sector is challenged by a lack of legal and regulatory frameworks, especially with regard to IP protection, weak and overlapping research institutions, and a lack of institutional and administrative reforms to facilitate STI and R&D. There is also inadequate partnering between the various public and private role players. Further, universities offer inadequate course provision in science, technology and engineering despite these subjects’ critical contribution towards innovation and enrolments in such programmes remains below 25\% of all students.\textsuperscript{179} The funding of research institutions is also inadequate while the indigenous technologies that are developed lack promotion and exploitation.

To conclude, the journey towards a knowledge society through realising of all these plans and policies requires systematic coordination and commitment from government agencies and respective stakeholders. Currently, substantial numbers of interventions are in place in Uganda to achieve KS status but more needs to be done to accelerate and consolidate KS development.

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About GESCI

The Global e-Schools and Communities Initiative (GESCI) is an international non-profit organisation founded on the recommendation of the United Nations Task Force on Information Communication Technology (ICT). GESCI was established in 2003 at the first World Summit on the Information Society.

The United Nations ICT Task Force identified education as an area in critical need of development, and one where ICT has the potential to make a positive impact. Initially GESCI was headquartered in Dublin, Ireland, and in 2011 moved its headquarters to Nairobi, Kenya.

GESCI’s mandate is to assist governments in the socio-economic development of their countries through the widespread integration of technology for inclusive and sustainable knowledge society development.
Assessment of Knowledge Society Development in Uganda June 2017

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