



**UGANDA INSTITUTE OF INFORMATION AND  
COMMUNICATIONS TECHNOLOGY**

**FINAL ICT SKILLS AND TRAINING  
ASSESSMENT (STA) REPORT**

June 2022

## **FOREWORD**

The National Development Agenda as articulated in Uganda Vision 2040 identifies Information and Communications Technology and human capital development as critical enablers for Uganda's transformation into a modern and prosperous country. Drawing from Uganda Vision 2040, the Third National Development Plan (NDP III, 2020/21-2024/25) under chapter 14 of Digital Transformation Programme also identifies ICT as a fulcrum of development; an accelerator, amplifier, and augments of change; and a sector with a huge potential to improve national productivity by making Government and business enterprises more efficient, effective and globally competitive. In line with Vision 2040, The Third Development Plan, Parish Development Model, and The National Resistance Movement (NRM) Manifesto 2021-2026 re-emphasizes the role of ICT and human capacity development as strategic pillars for social and economic transformation of the nation into a middle-income country.

While ICTs are earmarked to make a critical contribute to the development of the country, various studies continue to indicate that majority of fresh ICT graduates lack employable skills necessary to cause an immediate impact in their new working environment. Furthermore, the lack of a critical mass of ICT skilled professionals and industry ready workforce has negatively impacted the implementation of most Government ICT projects and initiatives, thus slowing national development.

Thus, in order to contribute to human capital development of the country in the areas of digital skills literacy and ICT professional competencies in the country, Uganda Institute of Information Communication Technology (UICT) commissioned ICT Skills and Training Needs Assessment (STA) in order to identify key capacity ICT gaps in areas of supply, demand and UICT internal capacity to meet market demands. The findings of this study are key in guiding UICT to design and implement robust curricula which that are aligned to the ecosystem demands and the country's development agenda and establish programme delivery frameworks which are contextualized to the various needs of the market segments. This STA is premised on the understanding that an evidence-based ICT skills development framework will facilitate the nurturing of a competitive human resource and contribute to making Uganda a preferred destination for foreign direct investment in ICT sector and other associated industries, besides improving government efficiencies.

Therefore, this report will serve as a reference document for UICT Staff, Management and Council in the development of market drive programmemes, establishment of innovative programme delivery chains, strategic partnerships and innovation of new services to be provided by the Institute. The report will guide UICT management in other areas of action including advocacy for national and institutional policy reforms, staff development initiatives among others. I therefore wish to urge the responsible actors to internalize this report and diligently implement the recommendations relevant to them.

Dr. Fredrick Kitoogo  
**PRINCIPAL**  
**UICT**

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## LIST OF ACRONYMS

4IR	Fourth Industrial Revolution
AFRALTI	African Advanced Level Telecommunications Institute
AITI-KACE	Ghana-India Kofi Annan Centre of Excellence in ICT
BPO	Business Process Outsourcing
COVID-19	Corona Virus Disease 2019
EAC	East African Community
EDI	E-Government Development Index
FGD	Focus Group Discussion
GII	Global Innovation Index
GoU	Government of Uganda
HR	Human Resource
ICDL	International Computer Driving License
ICT	Information and Communications Technology
IDI	ICT Development Index
ITU	International Telecommunications Union
KII	Key Informant Interview
MAAIF	Ministry of Agriculture Animal industry and Fisheries
MDAs	Ministries, Departments and Agencies
MoES	Ministry of Education and Sports
MoICT & NG	Ministry of Information & Communications Technology & National Guidance
MoU	Memoranda of Understanding
NARO	National Agricultural Research Organisation
NDP	National Development Plan
NIISP	National ICT Initiatives Support Programme
NITA-U	National Information Technology Authority – Uganda
SCBF	Skill and Competency-based Framework
STA	Skills and Training Needs Assessment
STAP	Skills and Training Action Plan
ToR	Terms of Reference
TVET	Technical and Vocational Education and Training
UCC	Uganda Communications Commission
UICT	Uganda Institute of Information and Communications Technology
UNESCO	United Nations Scientific Culture Organisation

## **EXECUTIVE SUMMARY**

### **Background to the Study**

ICT is a key pillar in actualization of efficient and effective service delivery for Uganda. Thus, Uganda Institute of Information and Communications Technology (UICT) is positioned as an advisory Centre to direct and advise the public on matters relating to ICT trends, applied research and relevant education programmes. The Government of Uganda through Ministry of ICT and National Guidance (MoICT &NG) has Identified ICT as one of the key areas to be developed so as to enhance national capacity in creating jobs and improve international competitiveness. To this end, ICT training and skilling are a key ingredient. However, most ICT students in Uganda that have completed their formal ICT courses and are lucky to get employment find themselves without the relevant skills to make an immediate impact in their new working environment. The lack of a critical mass of ICT skilled Ugandans and Industry ready workforce has negatively impacted the implementation of most Government ICT projects and initiatives, thus slowing National Development and growth.

In an effort to respond to this call and further strengthen the existing ICT HR skills and competency capacity for the economy, UICT undertook this Skills and Training Assessment (STA), aimed at identifying key technical and functional capacity gaps in UICT itself and across the sectors of, Education, Agriculture, Oil and Gas, Manufacturing, and Health. Other sectors reached were ICT Vendors, ICT industry and ICT Practitioners in Uganda and the region, both in the public and private sectors. The outcome of the STA, is subsequently ought to enrich the design of a robust and responsive ICT curriculum to be implemented at UICT, going forward.

#### **Study Objectives:**

The overall objective of the ICT Skills and Training Assessment was to establish the UICT market ecosystem status and develop a roadmap to enable ICT development, and promote market driven training programmes and services in the areas of ICT Research and Consultancy. In this context, the assessment exercise targeted to identify relevant critical ICT skills needed to support the realization of an ICT led economy for the overall growth and development of the country.

#### **The specific objectives were to:**

- i) Undertake international ICT professionals' skills set benchmarking using best-practice frameworks and implementations such as the Skills Framework for the Information Age (SFIA), Skills Framework for Information Communications Technology (ICT), the Skills Portal–essential skills for the Fourth Industrial Revolution (4IR) and ICT skills in specialized sectors such as Education, Agriculture, Oil and Gas, Manufacturing, Health, etc.
- ii) Conduct an AS-IS Landscape Assessment of ICT professional competencies (knowledge and skills possessed) specific to Government and Private Sectors, especially targeting specialized sectors such as Education, Agriculture, Oil and Gas, Manufacturing, Health, ICT industry (including but not limited to



telecommunications, Information Technology, broadcasting, Creative Industry) in order to identify the ICT HR Capacity.

- iii) Establish the desired TO-BE State of ICT skill sets to support the development and delivery of market driven training programmes.
- iv) Establish the existing skills gaps for ICT Professionals, Researchers and Consultant in the target sectors.
- v) Based on gaps established, identify priority ICT training programmes and other capacity building interventions targeting UICT staff so as to enable UICT deliver the identified recommendations.

The STA was carried out among both government and private sector employees, targeting institutions within the specialized sectors of Education, Agriculture, Oil and Gas, Manufacturing, BPO, Health and ICT industry (telecom, Consulting and research firms, system developers among others),

### **Methodology and Approach:**

The STA study was conducted at four levels of Organisational, Occupational and Individual employee and employed a four-step approach as detailed below:

- a) Undertaking stakeholder mapping, which involved identifying specific institutions from among the targeted specialized sectors of Education, Agriculture, Oil and Gas, Manufacturing, Health, ICT industry in both government and private sector
- b) Identifying core skills and level of responsibility, which involved identification, analysis and documentation of the individual skills/competencies, knowledge and behaviours required to perform a specific role now and in the future.
- c) Organisational, occupational and employee ICT STA, which involved use of well-designed tools, which helped to establish the current and desired ICT knowledge, behaviours and skill sets at both institutional, occupational and employee levels and
- d) Double checking for accuracy, in which the Consultant reviewed the outcomes of steps a-c above.

Four methods were employed in conducting ICT STA, which included; Desk review of relevant documents (*refer to Annex 5.3.1*), International Best Practice Benchmarking (*refer to Annex 5.3.7*), Stakeholder Consultations (*refer to Annex 5.1 a & b*) and HR Gap Analysis (*refer to Annex 5.3.8*).

The Consultant applied mixed research methods, incorporating both qualitative and quantitative data collection tools such as; Key Informant Interviews KII- (*refer to Annex 5.3.5*), Individual ICT Skills and Training Self-Assessment Tool (*refer to Annex 5.3.3*), Organizational ICT Skills and Training Self-Assessment Tool (*refer to Annex 5.3.2*), UICT Alumni Tracer Feedback Tool, UATFT (*refer to Annex 5.3.4*), Focus Group Discussion (FGD) Guide (*refer to Annex 5.3.9*), BPO Stakeholder Tool (*refer to Annex 5.3.6*), Knowledge Co-creation Workshops, Stakeholder Data Validation and Cadre Profiling.

The sample size for the study was estimated using the best fit approach given the nature of information desired and information sources. Accordingly, respondents to this study were selected using a Stratified Purposive Random Sampling Technique. A total of 38 institutions participated in the organizational assessment, with active participation of 27 UICT staff, 95 UICT alumni and current students, 47 Key Informants and 102 individual Self-Assessment respondents. A total of 36 relevant documents were reviewed as outlined under Annex 5.1 and a total of 5 institutions outside Uganda were benchmarked based on their similarities with UICT in terms of mandate, sector ecosystem, recognition and reputation, (refer to *Annex 5.3.8*).

### **Key findings:**

The study findings (conclusions) are arranged according to the study objectives for clarity and logical flow.

#### **1) International ICT professional skills development benchmarking**

- a) Most countries have developed or adopted a national digital skills framework to guide the implementation of the digital skilling programmes for both ICT professionals and non-ICT professional. The mostly used reference frameworks are ICDL and the UNESCO Digital Literacy Skills Framework. It is worth noting that most of the digital skills frameworks used focus on general digital literacy and do not emphasize digital skills for ICT professionals like the SFIA and European Digital Literacy Framework.
- b) Most countries benchmarked have some form of digital skills national funding mechanism targeting special interest groups like youth and government employees.
- c) Digital skills development is one core pillar of African Digital Transformation strategy, encouraging governments across the continent to invest in digital skills development on the continent so as to harness the power of emerging ICT and other emerging technologies like the 4IR.
- d) Institutions on the continent with similar mandate and focus like UICT mainly run skills development programmes at diploma and certification levels.
- e) All institutions benchmarked are running high value collaborative programmes (industry recognized certification programme) with leading industry players like Cisco Systems, Huawei academy, among others.
- f) Most the certification programmes have short durations not exceeding 6 calendar months.
- g) Most institutions are delivering these programmes using blended training approach involving online learning and face to face interaction.
- h) All institutions are developing market driven curriculum through extensive stakeholder consultation process, to establish level of needs, desired means of delivery, pricing modalities, among others.
- i) All instituted profiled are using student centred problem-based learning approaches aiming at knowledge and skills transfer to the learners.

- j) All institutions have three categories of training staff; a) full time employees, b) industry experts deployed on cohort basis, and c) partner institutions' training staff engaged through MoU.
- k) Most institutions are marketing their programmes through the web, social media and direct stakeholder engagements.

## **2) AS-IS Landscape Assessment of ICT and Non-ICT Professional Competencies (Knowledge and Skills Possessed) and Training Needs**

- a) The study revealed that there is insufficiency number of key ICT professionals in the country key among them include; Data Scientists, Cyber Security specialist, enterprise software developers, Multimedia content specialist, Artificial Intelligence specialist, among others. Majority of the organizations assessed (especial those in public sector) indicated that they were understaffed as far as ICT professional staff are concerned compared to their level of mandate and results framework.
- b) The results of the assessment show that majority of senior management teams in institutions have basic skills and knowledge in office applications, email, web browsing and social media usage but are lacking sufficient knowledge in; IT strategic management, change management and IT leadership, among others.
- c) There is no BPO and ITES industry skills development framework or programmes in the country, the only programme which was originally developed at Makerere is no longer running and few international programmes are not contextual to the industry needs. Currently courses are available from BPO Certification Institute and Business Process Outsourcing by Udemy Academy.
- d) Most ICT professionals in service especially in MDAs have an average professional level of skills and competences in systems administration especially windows technologies, networking, user technical support, organizational enterprise systems, basic cyber security and office productivity applications but lack critical 21st century skills, such as cloud computing and virtualization, data science, cyber security, mobile and web technology, research and knowledge management, among others.
- e) In terms of ICT skills possessed by non-ICT professionals in the target institutions, the results revealed that majority of staff in these organizations like; human resource managers, accountants, doctors, auditors have basic skills in office applications and functional specific systems. Generally, most non-ICT professional staff have low awareness of cyber security, and use simple passwords across systems and platforms. They lack skills in data analysis and visualization, social media for productivity, among others.
- f) It is estimated that the country produces about 10,000 ICT professionals every year at various levels (certificate, diploma and degrees), majority of whom are at certificate level. However, the country still faces skills deficiency in critical areas of ICT such as cyber security, animations, artificial intelligence, data science, complex systems development, cloud computing and virtualization, computer engineering, among others. The low supply of these critical skills is attributed to a number of factors and key among them include being new fields of specialization and the high costs of investment in training environment. The leading provider of ICT skills and

training services is still the college of computing and Information Sciences Makerere University.

- g) Generally, there is low investment by organizations in ICT skills development as most institutions don't have budgets for this activity. This action is left to the individual staff efforts in most of the cases.
- h) Since the digital skills development is largely left to staff individual efforts, the study sought to establish the existing incentive structures for staff to acquire ICT skills. The results revealed that majority of the institutions offer appraisal points, recognition of staff, sponsorship of the training activities, salary increment, promotion, and some do pay costs for staff to study in that order of importance.
- i) In terms of level of willingness to acquire ICT skills, majority of both ICT and non-ICT staff indicated that they very willing to invest in ICT skills development if they are sponsored or given time off, but less willing if they are required to sponsor themselves.
- j) The current approach to skilling mainly through face-to-face training sessions (lectures, workshops and seminars) of formally accredited academic programmes or productivity focused short courses.
- k) In terms of skills new ICT graduates lack the most, the study revealed the following; cyber security (20%), data science and database management (16.3%), Basic ICT skills (16%), complex system design and analysis (13%), among others.
- l) With over 600 ICT skills training service providers on NITA-U database in the country, it can be prudently concluded that the country has sufficient suppliers of basic ICT skills and mid-range skills. However, most ICT skills training service providers do not have capacity to deliver top end competencies ideal for 4IR given the high capital investment needed in terms of labs like robotics, big data labs, artificial intelligence laboratories, cyber security and forensics labs, computer systems engineering labs, among others.
- m) Nearly 80% of organizations indicated that they do not participate in curriculum development or delivery at training institutions, citing inhibiting factors, such as lack of collaboration or engagement from universities, lack of time and work overload, lack of facilitation to participate in the events, among others.
- n) Inadequacy of Knowledge Management practices stands out as a challenge across most institutions. This was characterized by lack of knowledge work systems, intelligent techniques, and enterprise-wide knowledge management systems.

### **3) Desired "TO-BE" State of ICT Skillsets by the Market**

- a) At strategic leadership and senior management level, the most desired skills include IT strategic leadership, advanced office productivity, cyber security, change management, IT project management, E-government systems, and social media and web technologies, among others.

- b) The generally desired skills for ICT professional graduates include; artificial intelligence, cyber security, data science, system administration, cloud computing and visualization, complex system development, animations and graphics, mobile and web development, enterprise system development, CCTV and wireless technologies and internet, among others.
- c) For practicing researchers and consultants in the ICT sector the key desired skills are; data science and data analytics, scientific and policy brief writing, presentation skills and public communication, project management and monitoring, corporate laws and basic financial management among others.
- d) For software developers on particular more skills and needed in system architect, requirements engineering and system modelling, enterprise systems development, embedded systems, among others
- e) The most preferred means of ICT skill training was a combination of online and face to face, lasting not more than 5 days for short professional courses.
- f) For BPO industry desires more of certificate courses as opposed to diploma programmes and should last between 3-6 calendar months.
- g) The digital literacy skills programmes need to be contextualized to sector specific requirements, technologies and business processes. For example, oil and gas has special digital technologies and platforms which workers must have appropriate level of knowhow and skills.

#### **4) Skills gaps for ICT Professionals, Researchers and Consultant in the Target Sectors**

- a) Practicing researchers and consultants in ICT sector have insufficient skills in; public relation skills, data analysis, scientific and policy writing, corporate governance, financial management, project management, monitoring and evaluation.
- b) Strategic level institutional leaders in the target organizations indicated insufficient knowledge and skills in; IT strategy development and management, enterprise risk management and cyber security, office productivity applications, internet and web technologies.
- c) ICT practicing professionals have insufficient knowledge and skills in; communication and problem solving, data science and data analytics, artificial intelligence and Internet of things, enterprise software development, business process modelling and requirement engineering, cyber security, wireless technologies, cloud computing and visualization, among others.
- d) The country has very few multimedia content development experts (animators and associated expertise).
- e) The they're few providers of electronic device repair and maintenance training as most of the practitioners are self-taught.

- f) Most non-ICT professionals have insufficient knowledge and skills in basic computing literacy, *Advanced Office Productivity*, sector special technologies and systems, cyber security and privacy, *E-government systems and ICT software and hardware maintenance*.

## **5) UICT Human Resource Capacity Assessment and Alumni Opinions**

- a) Most of the students who enrol at UICT are mainly motivated by the need to develop skills and acquire new careers opportunities.
- b) Most of the students who enrol at UICT are those who did not perform well in exams at “O” and “A” level thus cannot proceed with Bachelors at any University and largely use UICT as stepping stone on their academic progression. These students are mainly from both rural and urban areas, whose families can be characterized as low-income earning families.
- c) Generally, students and alumni ranked the level of satisfaction with UICT training programmes between good and excellent, however they pointed out the need to improve on curriculum design so that it can be aligned to industry needs, upgrade the training infrastructure and enhance training approaches in order to optimize learner skills development.
- d) Generally, UICT current staffing capacity of 39% is far below average. The institute’s capacity to implement its mandate, vision and mission efficiently and effectively specifically considering that 61% of the positions are vacant, is at stake.
- e) Most of the UICT staff have not had or attended any professional training in their areas of specialization to enhance their capacity citing a number of challenges including limited access to funding for such staff development activities.
- f) The research function at UICT is still lower and the institute has only two PhD holders who are fulltime in administration. As such UICT lacks experienced staff to spearhead the research function in the institute.
- g) UICT lacks specialists in emerging areas of 4IR e.g. cloud computing, robotics, artificial intelligence, data science and big data analytics, research and innovation management, among others.
- h) UICT staff have insufficient digital pedagogy knowledge and skills to support the new normal of technology mediate teaching and learning approaches.
- i) Most of UICT academic staff have basic proficiency in digital literacy skills, hence the need to upgrade their skill levels so as to be responsive to ecosystem demands.

## **6) Emerging UICT Priority Training Programmes Capacity Assessment**

- a) For the institutional strategic leaders and managers, the following not in any order of preference have emerged as some of the key priority training programmes UICT needs to pursue;
  - i) IT strategy and project management



- ii) Internet and web technologies
  - iii) Cyber security and data protection
  - iv) Report writing and presentation
  - v) Office productivity applications and domain specific systems, e.g. teacher management information system, URA portal, etc.
- b) For the non-ICT professionals, the following not in any order of preference have emerged as some of the key priority training programmes UICT needs to pursue;
- i) Research methods and data analysis
  - ii) Internet and web technologies
  - iii) Cyber security and data protection
  - iv) Report writing and presentation
  - v) Advance office productivity applications
  - vi) Domain specific systems, e.g. teacher management information system, IPPS, oracle, URA portal, etc.
- c) For the ICT practicing professionals, the following not in any order of preference have emerged as some of the key priority training programmes UICT needs to pursue:
- i) Research methods and data analysis
  - ii) Cloud computing and virtualization
  - iii) BPO certification
  - iv) Enterprise software development
  - v) Business processing engineering
  - vi) Software security and software testing
  - vii) Data science and data analytics
  - viii) Wireless network technologies and internet of things
  - ix) Embedded systems design
  - x) Cyber security
  - xi) Systems administration and network security
  - xii) Mobile and web applications development
  - xiii) IT strategy and project management
  - xiv) Report writing and presentation
- d) For UICT staff the following not in any order of preference have emerged as some of the key priority training programmes:
- i) Research methods and data analysis
  - ii) E-learning and technology mediate learning process

- iii) Internet and web technologies
- iv) Cyber security and data protection
- v) Report writing and presentation
- vi) Advance office productivity applications
- vii) Domain specific technologies in areas of specialization such as cloud computing, security, artificial intelligence, among others.

### **Key Recommendations:**

Below are key recommendations made for the attention of UICT:

- i. Recruit, develop and retain a critical team of professionals in specific skills areas.
- ii. Design flexible and practical curricula inclusive of short and long courses targeting in-service and pre-service trainees, career transitions etc. Refer to the ITU- Digital Transformation Centre Training (2021) Catalogue which provides very useful courses for adoption and implementation
- iii. Adopt flexible delivery approaches involving online and face to face training.
- iv. Sustain and upscale the current (ongoing academic programmes) in the Institute.
- v. Franchise some of the readily available international certification programmes especially in areas of BPO, data science, cyber security, among others.
- vi. UICT should ensure that all academic programmes have appropriate ICT infrastructure such as specialized laboratories to deliver the proposed curricula.
- vii. Keep the specialized training labs updated with relevant infrastructure and software to the current market demand
- viii. Both the infrastructure and curriculum should be subjected to a 5-year mandatory curriculum review to ascertain the functionality of the infrastructure to support continued teaching of the approved curriculum, given the backdrop that technology continually improves and the fact that most ICT equipment has a 3-year lifespan.
- ix. Develop and implement a Quality Assurance Framework
- x. Train Staff on the current policies such as ICT policies among others
- xi. Stock the current existing specialised labs with most needed equipment's to enhance IT training requirements the market world.
- xii. UICT to develop tailor made short courses (combining online and face to face training approaches), targeted at the various levels of employees in organization (strategic leadership, senior management, ICT and non-ICT professionals).
- xiii. UICT should partner with both private and public institutions focused on provision of ICT skills to deliver some of these programmes to government employees.



- xiv. FastTrack adoption and implementation of courses contained in the ITU-Digital Transformation Centre (DTU) Training Catalogue (2021).
- xv. Establish satellite training centres in strategic locations in the country to cater for the massive need on the ground.
- xvi. Restructure the staffing structure to cater for the expansion (satellite centres).
- xvii. Engage in strong marketing strategy, such as district to district approach, Institution to Institutions arrangement, etc.
- xviii. Lobbying through Ministries for IT capacity building in their sectors.
- xix. Lobby for increased government sponsorship budget especially targeting priority sectors of government employees.
- xx. Expand partnership horizon to include willing scholarship partners such as ENABEL and UNESCO who have focus on digital literacy skills development.
- xxi. Establish institute scholarship fund targeting best performing applicants and special interest groups like Refugees.
- xxii. UICT should set up online training programmes for various government agencies in areas where capacity gaps have been identified.
- xxiii. Develop an e-government curriculum aiming as accelerating update of government digital services.
- xxiv. Conduct regular curriculum review in consultation with stakeholders.
- xxv. Alignment UICT curriculum development and delivery with industry demands.
- xxvi. Incorporate industry experts in programme delivery on per cohort basis.
- xxvii. All employees of UICT should complete a minimum of 40 hours of ICT CPD annually. The institute should set up an online tracking portal for this CPD on each individual staff.
- xxviii. Provide Training in the areas of Consultancy skills, Online Pedagogy, Social media and brand development, team building and professional development
- xxix. UICT needs to promote and encourage staff to undertake graduate studies especially at PHD level to improve their research capacity
- xxx. UICT should develop and mainstream into all curricula align to key international Digital Literacy Skills Framework which incorporates best practices from the different international frameworks such as ICDL and the National Local Context Policy.
- xxxi. As a good practice, all ICT academic programmes developed by UICT should be aligned to NDP III and Digital Uganda Vision.

- xxxii. UICT management and staff should regularly conduct research about best practices in other countries and develop appropriate interventions.
- xxxiii. UICT should continuously establish bilateral collaborations with renown institutions with the same mandate as UICT within the African Region and globally.
- xxxiv. UICT management should provide the basic enabling ICT facilities especially, computers and 24-hour fast internet, to all her employees and students.
- xxxv. UICT should involve (incorporate) professionals from industry to provide regular socialized training sessions to students on selected areas of interest.
- xxxvi. Establish and consolidate strategic partnerships with related institutions in the region in order to deliver on demand specialized programmes in Telecommunications, Broadcasting, Postal, Radio, Creative Industry, Multimedia, and Communication Officers among others.
- xxxvii. UICT should encourage their staff to acquire industrial certification to improve their knowledge and skills of developing and delivering market demanded training content.
- xxxviii. UICT management should involve industry in Curriculum development, professional development, Internship Placement, Research and Innovation
- xxxix. UICT should focus student centred problem-based learning to promote skills development. Also, they should promote practical or competence based academic progression assessment as opposed to theoretical examinations.
- xl. UICT should improve management and supervision of student field attachment to ensure meaningful engagement of students in their respective fields of study.
- xli. On a gradual (annual basis), raise the staffing gap from the current 31% to at least 85% over 2-3 years
- xlii. Recruit, develop and retain a critical team of professionals in the specific skills areas.
- xliii. FastTrack implementation of targeted training interventions for the various categories of staff as provided in the UICT Organizational Restructuring, Job Evaluation and Job Grading Report (2021, Sec.11.6).
- xliv. UICT should mainstream into its curriculum a certificate in Knowledge Management as a short course. This can be achieved in affiliation with the Association for Intelligent Information Management (AIIM) for certification in knowledge management
- xlv. Ensure regular capacity building of staff through the use of cross cutting management courses to benefit all categories; Administrative, academic and part-time staff.

## 1.0 INTRODUCTION AND BACKGROUND

### 1.1 Introduction

This report presents the assignment background, details ICT Skills and Training Needs Assessment (STA) methodology, provides the “as-is”, and the “to- be” landscape assessment findings from the target respondents. The report further presents finding of international best practices on ICT skills development and training programmes by training institutions with mandates similar to that of Uganda Institute of Information and Communications Technology (UICT). The report further details findings of UICT human resource gap analysis and presents ICT skills and training gaps that inform the design of programmes and curricula that are responsive to the national development agenda.

### 1.2 Context of ICT Skills and Training Needs Assessment

The Government of Uganda, through various development instruments, notably Uganda Vision 2040<sup>1</sup>, Digital Uganda Vision<sup>2</sup>, the Third National Development Plan, 2020/21-2024/25, National ICT Policy, 2014, E-government Policy Framework, 2011, NITA-U Act 2010 and UCC Act 2013, has earmarked ICT skills development as a critical pillar for transformation of the country into a knowledge based middle income, globally competitive economy.

In the Third National Development Plan (NDP III), Chapter 14: Digital Transformation Programme, Government of Uganda is implementing various initiatives to accelerate the development of ICT innovation, development of ICT human capacity, expansion of the national backbone, increase access to computing devices and infrastructure, lower the barriers to ICT service access and promoting consumption of digital services in the country among others. Furthermore, the efforts are geared towards improving government efficiency and effectiveness, reduction of corruption and wastage in government.

### 1.3 Thrust for ICT STA

The Government of Uganda, through Ministry of ICT and National Guidance (MoICT &NG), has identified ICT as one of the key enablers of job creation and improvement of Uganda’s international competitiveness. Various studies, however, continue to indicate that majority of fresh ICT graduates lack employable skills necessary to cause an immediate impact in their new working environment. Furthermore, the lack of a critical mass of ICT skilled professionals and industry ready workforce has negatively impacted the implementation of most Government ICT projects and initiatives, thus slowing national development<sup>3</sup>.

In order to enhance the digital skills and competency capacity in the country, UICT commissioned ICT STA in order to identify key ICT human resource capacity gaps in areas of supply, demand and UICT internal capacity to meet market demands. The findings of this study will be key in guiding UICT to design and implement robust programmes and

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<sup>1</sup> Uganda Vision 2040 (2013): National Planning Authority

<sup>2</sup> Digital Uganda Vision (2017): Ministry of ICT and National Guidance

<sup>3</sup> Skills Training and Needs Assessment Report, 2021, MoICT & NG

curricula which that are aligned to the ecosystem demands. It is premised on the understanding that an evidence-based ICT skills development framework will facilitate the nurturing of a competitive human resource in the country.

#### 1.4 ICT Skills and Training Needs Assessment Objectives

The overall objective of the assessment was to establish the current ICT skills and training demands in the ecosystem so as to inform the development and delivery of market driven ICT skills development programmes, services and consultancies at UICT. In this context, the assessment exercise targeted to identify relevant critical ICT skills needed to support the realization of an ICT led economy for overall growth and development of the country.

The specific objectives of ICT STA were to:

- i) Undertake international ICT professional skill set benchmarking using best-practice frameworks and implementation, such as the Skills Framework for the Information Age (SFIA), Skills Framework for ICT, the Skills Portal–essential skills for the Fourth Industrial Revolution (4IR) and ICT skills in specialized sectors, such as Education, Agriculture, Oil and Gas, Manufacturing, Health and ICT.
- ii) Conduct an AS-IS landscape assessment of ICT professional competencies (knowledge, skills and abilities/attitudes possessed) specific to Government and Private Sectors, especially targeting specialized sectors such as Education, Agriculture, Oil and Gas, Manufacturing, Health, ICT (including but not limited to telecommunications, IT, broadcasting and creative industry) in order to identify the ICT HR capacity.
- iii) Establish the desired “TO-BE” state of ICT skill sets by the market.
- iv) Establish the existing skills gaps for ICT Professionals, Researchers and Consultants in the target sectors.
- v) Based on gaps established, identify priority ICT training programmes and other capacity building interventions targeting UICT staff so as to enable UICT deliver the identified recommendations.

#### 1.5 Scope of the Assignment

The ICT Skills Training Assessment (STA) was carried out in selected sectors of Education, Agriculture, Oil and Gas, Manufacturing, Health and ICT (telecom, consulting and research firms, system developers, among others) involve both public and private sector organizations. Furthermore, ICT skills and capacity assessment of UICT staff was conducted to establish institutional digital skills capacity gaps. In summary, the ICT STA was conducted at six levels as illustrated in **Error! Reference source not found.** below.

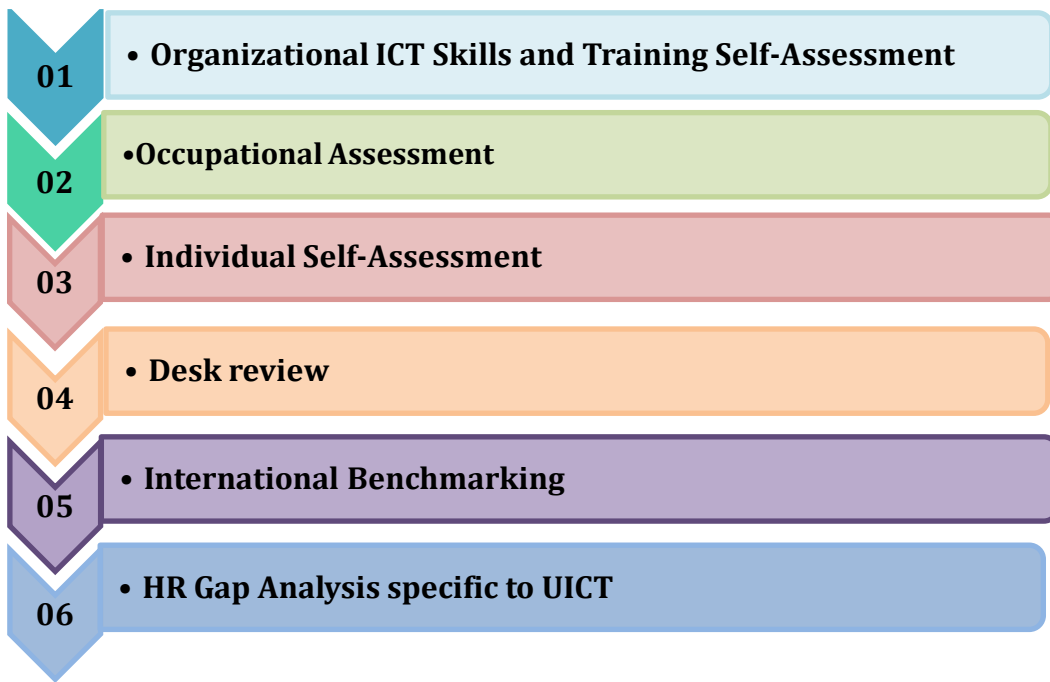


Figure 1: Levels of ICT STA

### 1.5.1 Organizational Assessment

In order to establish the current state of ICT skills and associated ICT skills development practices, an organizational level assessment was conducted in **38** out of the initial target of **55** organizations, representing 69% response rate. The key parameters captured at the organizational level are contained in the Organizational Assessment Tool (refer to *Annex 5.3.2*) and included ICT skills development programmes offered to employees (both ICT and non-ICT professionals), the skills that new ICT and non-ICT professional employees possessed, the ICT skills lacking among employees and the sources of ICT professionals, among others. Other key parameters assessed were the preferred training delivery mode, length for ICT training programmes and the desired ICT knowledge and skills needs per level of responsibility among both ICT and non-ICT professionals.

A tracer study on UICT primary beneficiaries was conducted, and a total of **95** UICT alumni and current students responded against the target of 100. From this target group, the study sought to capture views on students' motivation to take a course at UICT, benefit of the courses attended, level of satisfaction with the training infrastructure, programme delivery approaches, curriculum and curriculum design methods, learning experiences, and capture students' opinions on how best UICT could improve their management skills and training (refer to UICT Alumni Tracer Feedback Tool, *Annex 5.3.4*).

Furthermore, the study sought opinions of ICT sector experts with extensive knowledge about the sector and ICT dynamics surrounding target organizations. Specifically, Key Informant Interviews (KII) were conducted to aid the establishment of the current trends in ICT skills demand and supply in both public and private sectors. A total of 47 out of 50 targeted key informants responded to the study. The Key informant Interview Guide (refer to *Annex 5.3.5*), was used for this purpose.

### 1.5.2 Occupational Assessment

A total of 38 organizations participated in the study, representing various levels of responsibility within organizations, that is, strategic leadership (Boards/Governing Councils), management level (CEOs and Managers), Non-ICT professional staff (for example, Accountants, Human Resource Officers, Auditors) and ICT technical staff (refer to *Annex 5.3.2*) for the organizational ICT Skills and Training Self-Assessment Tool.

### 1.5.3 Individual Self-Assessment

At individual level, the STA exercise focused on capturing from the officers (both ICT and non-ICT professional staff of target institutions), their level of awareness and understanding of an enabling environment, level of proficiency in office productivity digital skills, knowledge and day today workplace behaviours patterns, level of ICT skills needed, preferred means of delivery, incentives for acquiring ICT skills, cost and affordability among others (refer to *Annex 5.3.3*).

A total of **102** out of the target of **120** individuals/employees across institutions within the specialized sectors of Education, Agriculture, Oil and Gas, Manufacturing, Health and ICT (telecom, consulting and research firms, systems developers, among others) participated in the study. The categories of respondents included the ICT professionals, Human Resource Officers, ICT Officers in MDAs, System Administrators, Researchers, Academicians, among others (For details, refer to **Error! Reference source not found.**). In addition to the above levels of assessment, a desk review, international benchmarking, and UICT human resource gap analysis was conducted.

### 1.5.4 Desk Review

This process involved review of extensive literacy covering recent studies on ICT skills and training needs in the country, ICT Policies, National Development Plans, strategic plans for relevant sectors, UICT turnaround strategy, UICT market assessment report, East African Community (EAC) development strategy, Africa development strategy, the World Bank's Digital Economy for Africa (DE4A), African Union's Digital Transformation Strategy for Africa, UNESCO Digital Literacy Global Framework (DLGF), Skills for Information Age (SFIA), Technology Industrial Revolution reports, among others. This was aimed at identification of the ICT trends in Africa and in Uganda, Internet connectivity and access, ICT supply and demand trends and ICT skills competency challenges, among other parameters. Skills for Information Age and the Digital literacy Global Framework were used to benchmark on the desired ICT skills of ICT and NON-ICT professionals in a knowledge based digital economy. In total, **36** relevant documents were reviewed as outlined under *Annex 5.3.1*.

### 1.5.5 International Benchmarking

In an effort to identify appropriate models and strategies for ICT skills development, a benchmarking case study on five (5) institutions outside Uganda was carried out. The institutions for benchmarking were selected in part based on their similarities with UICT in terms of mandate, sector ecosystem, recognition and reputation, availability of information on their operations, among others. The institutions were drawn from Kenya, Ghana, South Africa, Tanzania and Nigeria. The ecosystem characteristics comprised



rankings on international indices, namely: E-Government Development Index (EDI), International Telecommunications Union (ITU), ICT Development Index (IDI) and Global Innovation Index (GII), among others.

The overall goal of benchmarking was to establish the best practices and experiences in terms of ICT human capacity development, with a view of identifying strategies that UICT can adopt. The key areas of focus as contained in the International Best Practices Benchmarking Guide (refer to *Annex 5.3.7*) were institution business model, nature of programmes and services offered, and industry ecosystem covering socio-economic conditions.

### 1.5.6 UICT Human Resource Gap Analysis

An ICT skills capacity assessment involving 27 UICT staff was conducted with the help of the Human Resources Gap analysis Tool (refer to *Annex 5.3.8*) to identify UICT staff human resource gaps in terms of ICT knowledge, skills and behaviours.

## 1.6 Report Organization

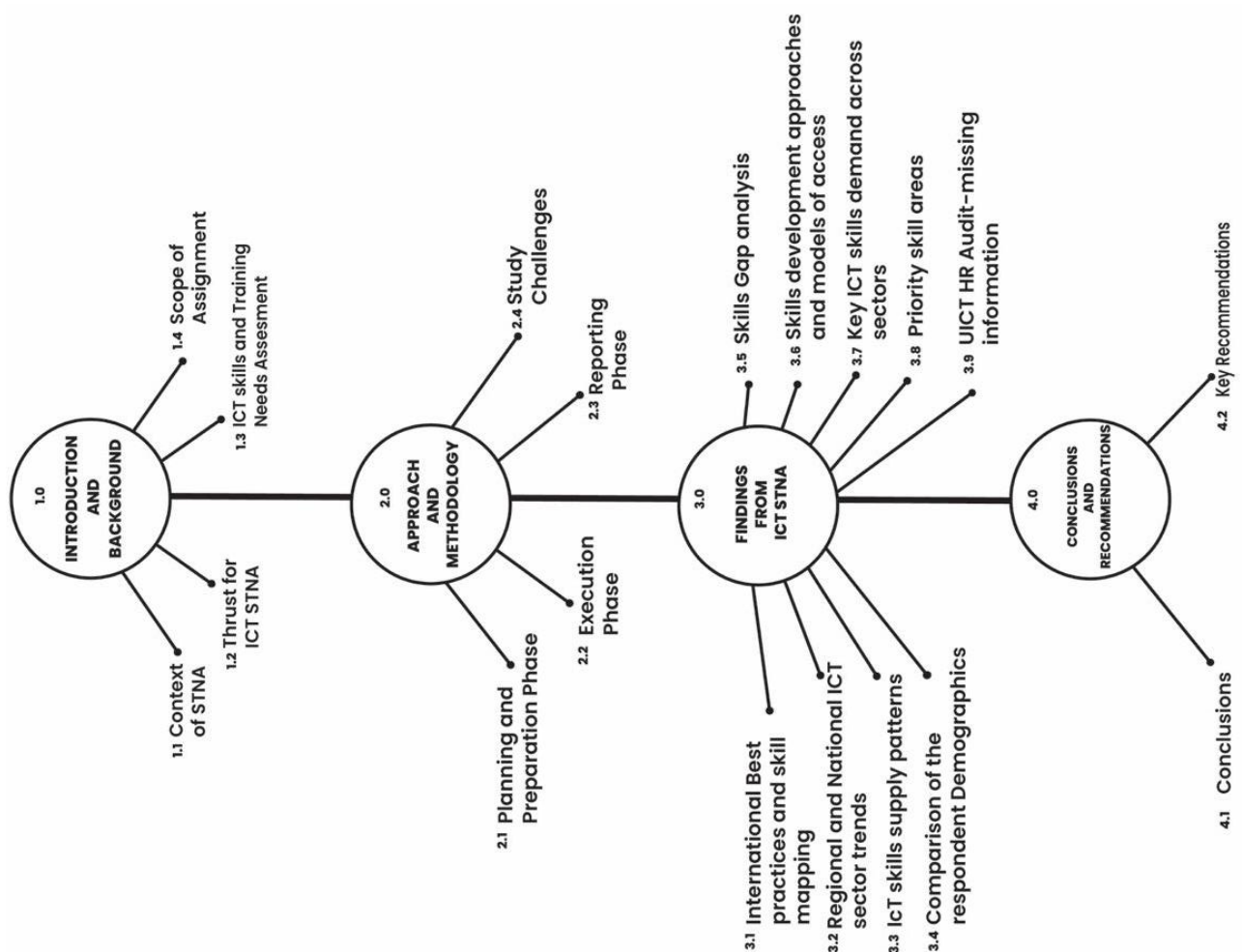


Figure 2: Report Organisation

## 2.0 APPROACH AND METHODOLOGY FOR ICT STA

In terms of approach, the study applied a knowledge co-creation approach. Thus, the study was conducted in a participatory and consultative manner involving relevant stakeholders at each phase of execution. A mixed methods approach incorporating both qualitative and quantitative methods of data collection and analysis was used. The primary and secondary data collection methods included desk reviews, key informant interviews, individual self-assessment questionnaire, organizational self-assessment questionnaires, case study analysis framework, knowledge co-creation meetings and stakeholder data validation engagements. The study was executed in three phases as illustrated in Error! Reference source not found. below:

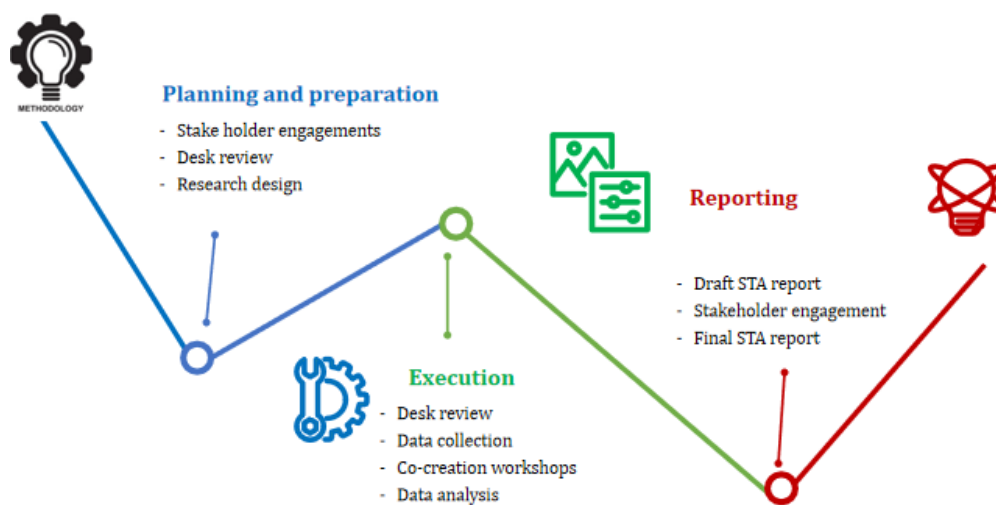


Figure 3: ICT STA Methodology

### 2.1 Planning and Preparation Phase

This phase of the assignment involved the following key activities:

#### a) Study Design

This phase involved the development of appropriate study tools and their digitalization. A stakeholder mapping matrix was developed (*see Annex 5.2*) to guide stakeholder engagement. Other instruments developed include a framework for international benchmarking and a desk review guide as detailed in the execution phase below. Finally, the consulting team was assembled and oriented.

#### b) Desk Review

A preliminary review of key background documents was conducted in order to gain deeper understanding of the assignment objectives and conceptualize the assignment execution. Key parameters reviewed included; African regional and national ICT sector trends in terms of ICT Policy frameworks, internet connectivity, ICT supply and access. Given the centrality of UICT to the study the Institute Strategic Plan 2020/21 – 2024/25 was also

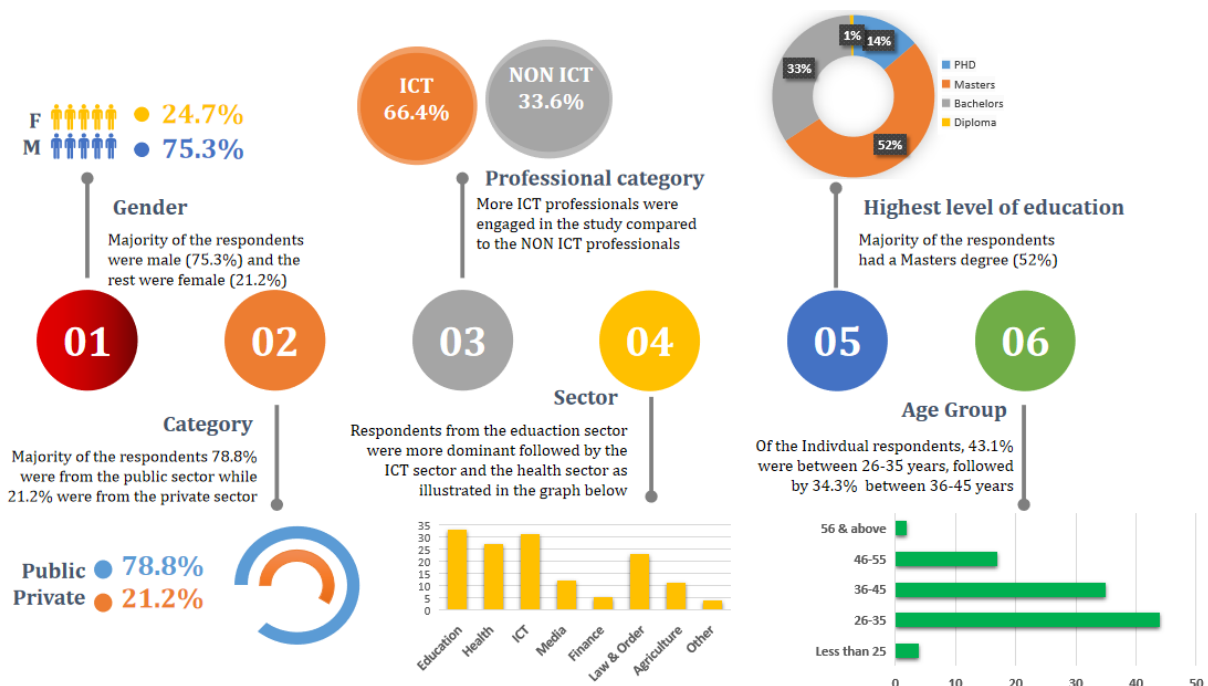


reviewed to establish AS-IS and TO-BE state of the Institute. The list of documents reviewed are presented in *Annex 5.1*.

The Skills Framework for the Information Age (SFIA), was used to establish the ideal skills and competencies of the various professionals in the target organisation. Based on SFIA skills and competence reference guide, and institutional responses on the desired skills, associated skill gaps of various categories of employees in organisation were established.

### c) Stakeholder Identification and Engagement

Study respondents were selected using a Stratified Purposive Random Sampling Technique based on their unique qualities they possessed which would enable them to provide the desired opinions and experiences about the phenomenon under investigation<sup>4</sup>. A total of **306** responded to the study (47 key informants, 102 individual self-assessments, 37 organizational respondents, 95 UICT alumni and 25 respondents from focus group discussions) against a target of **345** (45 Organizational, 50 key informants and 120 individual self-assessments, 100 UICT Alumni and 30 respondents from the focus group discussion). *Figure 4* provides a summary of respondents' demographics.



**Figure 4: Key Informant & Individual Respondent Demographics**

<sup>4</sup> Drake Patrick Mirembe, 2015: "The Threat Nets Approach to Information System Security Risk Analysis"

## 2.2 Execution Phase

This phase mainly involved a) Desk review, b) Data collection, c) Knowledge Co-creation engagements, and d) Data analysis (cleaning, validation and analysis). The matrix below details how each activity was executed.

**Table 1:** Execution Phase Activities

Activity	Description
Desk review	<p>A desk review framework (refer to <i>Annex 5.3.1</i>) was used to guide the review of recent ICT skills survey reports, ICT skills and competency training needs assessments, ICT skill development frameworks, national development plans, strategic plans for relevant sectors, East African Community (EAC) development strategy, Africa development strategy and the digital transformation agenda, scholarly materials, opinion technology industrial revolution papers, among others. This was aimed at identification of the ICT skills competencies desired for various categories, approaches to skills development, gaps in skills demand and supply, among others. The specific areas of focus included:</p> <ul style="list-style-type: none"> <li>i) Regional and national ICT trends in terms of development of skills and knowledge, ICT skills frameworks, policy frameworks, internet connectivity and access, ICT supply and demand;</li> <li>ii) Skills, knowledge and behaviours desired for ICT professionals, Researchers and Consultants to be successful in the global digital economy (ICT skills frameworks);</li> <li>iii) How ICT Professionals, Researchers and Consultants in the country are acquiring the needed ICT knowledge and skills;</li> <li>iv) The UICT human resource capacity in the areas of ICT specialization, research and consultancy;</li> <li>v) The existing business models for delivery of ICT skills in the country and the region; and</li> <li>vi) How organizations establish their ICT skills and training needs, and how frequent they conduct needs analysis.</li> </ul>
<b>Data collection</b>	Data was collected from the identified stakeholders using 9 tools. These included Desk Review Framework ( <i>Annex 5.3.1</i> ), Organizational assessment ( <i>Annex 5.3.2</i> ), individual self-assessment ( <i>Annex 5.3.3</i> ), UICT Alumni Tracer Feedback Tool ( <i>Annex 5.3.4</i> ), Key informant interview Guide- KII ( <i>Annex 5.3.5</i> ), BPO Stakeholder Tool ( <i>Annex 5.3.6</i> ), International Best Practices Benchmarking Guide ( <i>Annex 5.3.7</i> ), HR Gap analysis Tool ( <i>Annex 5.3.8</i> , and Focus Group Discussion Guide ( <i>Annex 5.3.9</i> ).
<b>Co-creation meetings</b>	A number of online and offline knowledge co-creation meetings were held by the consulting team to analyse data and derive the relevant conclusions.
<b>Data analysis</b>	Collected data was evaluated for clarity and completeness. For any responses which were found to be incomplete or unclear concerned stakeholders were engaged to provide any missing data or provide the clarity needed. Qualitative data was analysed using thematic content analysis, while quantitative data was analysed using descriptive statistics.

## 2.3 Reporting Phase

Table 2 below describes the execution of the reporting phase and the associated outputs.

**Table 2:** ICT STA Phase Reports

Report	Description
<b>Draft STA report</b>	<ul style="list-style-type: none"> <li>The draft STA report was generated through peer co-working knowledge engagements and individual writing sessions. The draft report was subjected to internal quality assurance processes of the firm.</li> <li>The draft report was submitted to the client for review and input</li> </ul>
<b>Final Draft STA report</b>	<ul style="list-style-type: none"> <li>Systematic aggregation and incorporation of key observations by the client into the draft STA report.</li> <li>Consultative and engagement meeting (via zoom) with the client for purposes of appreciating and approving the STA report.</li> <li>Incorporation of observations arising out of the consultations</li> <li>Submission of final draft STA Report for approval</li> </ul>
<b>Final STA report</b>	<ul style="list-style-type: none"> <li>Incorporation of final comments from the client</li> <li>Production and submission of the approved Final STA Report</li> </ul>

## 2.4 Study Challenges and Limitations

Like any other assignment of this nature, execution of ICT STA experienced some challenges and limitations that made it difficult to deliver this report within the agreed timelines or provide a holistic picture of the sector.

- i) Some of the Accounting Officers that received introductory letters for the study delegated the activity to Heads of ICT Units, yet participation would have demonstrated the strategic relevance of ICT skills and training particularly in the Uganda Public Sector. Nevertheless, the Heads of ICT Units were very knowledgeable on the ICT skills in their organizations and employed consultative approach in providing responses.
- ii) The study was only limited within the specialized sectors of Education, Agriculture, Oil and Gas, Manufacturing, Health and ICT (telecom, consulting and research firms, system developers, among others). This number was not representative of all the 18 Government Sectors and the vast number of private sector organizations.
- iii) There was low response from UICT staff on individual self-assessment as demonstrated by eight (8) responses recorded. This might undermine the validity and the legitimacy of the feedback provided on key human resource gap analysis of ICT staff.
- iv) There was generally low appreciation of the digital enabled self-assessment method of stakeholder consultations, which resulted in delayed responses and numerous reminders (both electronic and physical). This led to delayed completion of stakeholder consultations and caused overlaps in the delivery schedule.

- v) There was limited availability of relevant official information in print or websites of respondent institutions. This made data collation, sorting, analysis and presentation of valid and accurate institutional data a tall order.

### 3.0 FINDINGS FROM ICT SKILLS AND TRAINING NEEDS ASSESSMENT

This section highlights the key findings of the study. The findings are presented along the thematic parameters of: i) International best practices and skills mapping; ii) Regional and national ICT sector trends; iii) ICT skills supply patterns; iv) Curriculum development practices; v) ICT skills gaps; vi) Key ICT skills demand across sectors in the country; vii) Priority ICT skills areas; and viii) UICT human resource capacity.

#### 3.1 International Best Practices and Skills Mapping

In order to provide a wider context and appreciation of the trends in e-government and ICT skills development, an explorative desk research was conducted on six (6) institutions with similar mandate and Aspiration to UICT in five selected African countries. The review was based on their ICT ecosystem global rank on ICT development index (country rank), regional representation and comparative socio-economic ecosystem relative to UICT, and was guided by the International Best Practice Benchmarking Guide (Annex 5.3.7). The institutions are; Telkom Centre for Learning and Cape Peninsula University of Technology in South Africa, Ghana-India Kofi Annan Centre of Excellence in ICT (AITI-KACE) in Ghana, New Horizons Institute in Nigeria, African Advanced Level Telecommunications Institute (AFRALTI) in Kenya and Dar es Salaam Institute of Technology in Tanzania. The matrices below summaries the findings of the benchmarking study on selected institutions.

##### a) South Africa

**Table 3: International Benchmarking Findings for South Africa**

Elements	Status	Observations and Remarks
Per capita income	USD 5,655.868 (World Bank 2020 data)	Increase in per capita income indicates an increase in the overall size of the economy and productivity. It is worth noting that South Africa has a far more digitalized economy, hence increasing demand for the ICT professionals and digital skills literacy across all sectors of the economy.
Global ICT Development Index (IDI)	South Africa's ICT Development Index has increased from 4.91 in 2016 to 4.96 in 2017 <sup>5</sup> (ITU data)	There has been an increase in ICT development in South Africa over the years with associated increase in digital skills literacy and demand for critical ICT experts.
Global Innovation Index (GII)	South Africa's Global Innovation Index 2020 was 60 with a score of 32.67. In 2021 South Africa's overall GII was 61, broken	South Africa is one of the leading African countries in innovations, with the highest GII rank which

<sup>5</sup> <https://www.itu.int/net4/ITU-D/idi/2017/index.html>

Elements	Status	Observations and Remarks
rank	down as follows: 55 on institutions, 67 on human capital and research, 83 on infrastructure, 23 on market sophistication, 51 on business sophistication, 61 on knowledge and technology outputs and 79 on creative outputs <sup>6</sup>	indicates existence of innovative human capacity in the country. It also has one of the highest research outputs on the continent.
Comparative social economic ecosystem	The economy of South Africa is the third largest in Africa and the most industrialized, technologically advanced, and diversified economy in Africa overall. South Africa is an upper-middle-income economy, one of only eight such countries in Africa.	South Africa is an advanced economy, more digitalized compared to Uganda with a greater demand for ICT skills among the work force.
E-government Development Index (EDI) rank	South Africa's EDI is 0.69 <sup>7</sup> with a ranking of 78 of 193	South Africa's index has been increasing over the years indicating that South Africa's provision of online services, telecommunication and connectivity has been increasing over the years. The high consumption of digital services is closely associated with growing levels of digital literacy skills in the country.
Approach to digital skilling by government	Some of the government suggested initiatives are introducing subjects such as coding and data analytics at primary school level to prepare young people for jobs of the future. This was introduced in 2019 and implementation started in 2020 with 43,774 teachers trained in computer skills and having 1000 schools to be piloted across the five provinces <sup>8</sup> . The government promotes access to industry productivity digital skills within government and in the wider economy, so as to make SA economy globally competitive.	South Africa has clear digital skills development framework based on the International Computer Driving License (ICDL) Framework. South Africa introduced the new curriculum in schools as initiative to prepare young people for the future jobs and also contribute to effectively developing children's creativity, critical thinking, design thinking and digital skills. More importantly, government promotes digital skills development.
ICT Skills supply side	South Africa has about 26 universities and a host of other industry-based firms providing digital skills in the country. The country is the leading supplier of ICT skills training services on the continent in various areas and levels.	There is an increase in the number of institutions that are providing ICT skills, largely at certificate and diploma levels, to meet the rising demand of productivity focused ICT skills, from basic digital literacy to more advanced technical skills in

<sup>6</sup> [https://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2021.pdf](https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2021.pdf)

<sup>7</sup> <https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/159-South-Africa>

<sup>8</sup> <https://www.stateofthenation.gov.za/sona-2019-june/education>

Elements	Status	Observations and Remarks
		areas like data where housing and big data processing, cloud computing, Artificial intelligence, cyber security, internet of things, high speed wireless networks, among others
<b>Higher Education System Status in South Africa</b>		
Elements	Status	Observations and Remarks
Institution	Cape Peninsula University of Technology <sup>9</sup>	Cape Peninsula University of Technology is an internationally acclaimed institution, the only university of technology in the Western Cape, and the largest university in the region with an enrolment of more than 30,000 students. The university has six faculties offering a wide range of accredited undergraduate and postgraduate courses in the fields of Applied Sciences, Business, Education and Social Sciences, Engineering, Informatics and Design as well as Health and Wellness Sciences.
Services/ programmes provided	<p><b>Full time courses</b>  <b>COMNET (Communication Networks)</b>  This Communication Networks foundation course is the first step in the right direction for a career as an entry-level network engineer. It consists of the following modules:</p> <p>IT Essentials I (A+), IT Essentials II (S+), CCNA R&amp;S Introduction to networks, CCNA R&amp;S Routing and Switching Essentials, CCNA R&amp;S Scaling Networks (LAN and Wireless), CCNA R&amp;S Connecting Networks (WAN), Fundamentals of Wireless LANs, Fundamentals of Linux (LPIC L+)</p> <p><b>Advanced COMNET</b>  Students who successfully pass the COMNET Certificate will be able to continue in their second year with the Advanced COMNET course designed to provide them with the skills and knowledge required by a professional level network.. It consists of the following modules:</p>	Majority of the courses offered at Cape Peninsula University of Technology target individuals already having some working experience in order to improve their existing skills as well as school leavers.

<sup>9</sup> <https://www.cput.ac.za/academic/shortcourses>



Elements	Status	Observations and Remarks
	<p>CCNP SWITCH – Advanced Switching and LAN technologies, CCNP ROUTE – Advanced Routing, CCNP TSHOOT – Troubleshooting, CCNA Security – Network Security and Firewall Foundation, CCNP FIREWALL – Advanced Firewall, CCNA Voice – IP Telephony in the small business environment</p> <p><b>Short courses</b>  <b>Communication networks.</b>  Communication Networks course is developed in consultation with leading academics and information technology industry advisors.</p> <p><b>Cyber Security.</b> This includes cybercrime, practical cryptography, cyber intelligence and analysis, cyber security governance, cyber security governance.</p>	
Skills/target	<p><b>Fulltime courses</b>  Entry-level of professional network Engineer  Network Engineer</p> <p><b>Short courses</b>  Computer Networking, Network technician, Network administrator Designer, Engineer, Cyber Security</p>	Professional groups targeted in these courses are similar to targeted groups of professionals for UICT for the similar courses offered
Levels	<p><b>Full time course/Short courses</b>  25 Point Grade 12 for five subjects (50% = 5) excluding Life Orientation  Mathematics 40% (Mathematics Literature 60%)  English (1<sup>st</sup> Language) 50% 2<sup>nd</sup> Language 40%)  University Grade 12 Pass as well as ICT Academy COMNET Certificate or a Cisco Academy CCNA (65%) or CCNA Experience in relevant field</p>	Advanced courses at Cape Peninsula University run for 10 months with only one indicated to run for 5 months i.e. Cyber security
Similar service with UICT	<p>Certification of courses</p> <p><b>Short courses:</b>  CCNA/CISCO  CCNA Network Security  Cyber Security  CCNA Networking</p>	In terms of duration, Cape Peninsula University’s advanced courses run for 10 months and short courses run for 5-6 months. In terms of courses, it is observed that majority of the courses offered at UICT are short courses in telecommunication. These are offered as a complete course at Cape Peninsula University i.e. Communication Networks.



Elements	Status	Observations and Remarks
Stakeholder participation in curriculum development	Education in South Africa is governed by a number of policies, including the Fundamental Policy Framework of the Ministry of Basic Education, the National Education Policy Act, the South African Schools Act, 1996, the Adult Basic Education and Training, and the Employment of Educators Act, 1998. The Department of Higher Education and Training is responsible for tertiary education and vocational training (through Technical and Vocational Education and Training (TVET)) across South Africa. The development of curriculum in South Africa by law involves consultation with different stakeholders. These include teachers, learners, policy developers and implementers.	Stakeholder consultations are important in curriculum development in order to ensure that the curriculum represents the market skills needs and is appropriate in terms of delivery from the tutor/instructor to the student.
Pedagogical approaches used	Pedagogical approach used by educators at all levels of education in South Africa is the learner-centred approach. Which focused on the development of individual learners' skills and competencies to be an active player in an inclusive society	This delivery approach is embedded at all levels of South Africa's education system. For ICT industry-based training, focus is on skill development and learner productivity on one day course completion.
Status of eLearning	On the continent, South African has been a leading e-Learning promoter even before COVID-19. As COVID-19 pandemic set in, South Africa accelerated the implementation of remote learning interventions to mitigate the pandemic's impact on learning. The learning systems provide an interactive online education platform for educators and learners, leading to effective and efficient teaching and learning. It is accessible to teachers and learners anywhere and anytime using different web-enabled devices; equips learners with 21 <sup>st</sup> century skills for the workplace; and supports the emergence of a new type of school. <sup>10</sup> Moodle eLearning platform is widely used followed by blackboard.	South Africa continues to embrace e-learning as strategy of developing knowledge based digitally skilled society to respond to the economy demands.
Funding for ICT skills development	Digital skills are one of the key skillsets required for the creation of new kinds of 21 <sup>st</sup> century jobs. Originality, agility, critical thinking and problem-solving are important 21 <sup>st</sup> century skills that must be interwoven with digital skills.	It is important to firstly identify the ICT skills needs before release of funding to facilitate funding for ICT Skills development. Provision of funding for skills development through the designated

<sup>10</sup> <https://pmg.org.za/committee-meeting/33429/>

Elements	Status	Observations and Remarks
	<p>The Department of Communications and Digital Technologies in South Africa developed a National Digital and Future Skills Strategy in 2020 that envisages a society of digitally skilled South Africans.</p> <p>According to the strategy element 2 in the document, there will be a focus on Digital futures and mastery: Building advanced digital skills, where strategy elements include tertiary curriculum reform; capacity-building for lecturing staff; promoting research related to the digital skills revolution; developing and promoting usage of mobile open online courses to develop digital skills on a widespread basis; and measures to strengthen the CoLabs, tech hubs and all related institution<sup>11</sup>. The National Skills Fund (NSF) which operates under the Department of Higher Education and Training is in charge of providing funding for skills development, a capable workforce and inclusive growth. Its principal focus lies in supporting the education and training of learners.</p>	<p>department in the government compliments the efforts made by institutions, universities and schools to realize improved ICT skills development. This is a model UICT can adapt, through the Universal Access Fund at UICT.</p>

## Conclusion

The Government of South Africa has realized the growing demand for digital skills, thus, introduced a new curriculum in 2019 at primary level, where students are introduced to ICT at this level. South Africa's tertiary institutions have embraced the blended learning (where learning is delivered both online and face to face) and run demand driven programmes through systematic stakeholder consultation. The training is practical oriented, focusing on knowledge transfer and skills development, and this is attracting students and professionals to South Africa to acquire relevant industry skills. The key lessons for UICT include the need to develop market driven training programmes, especially in emerging areas of 4IR; lobbying Uganda Communications Commission (UCC) to support digital skills development in the country through the Universe Access Fund; integrating eLearning in the delivery of trainings; aligning the training delivery with focus on development and application of productivity skills on course completion; among others.

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<sup>11</sup> [https://www.gov.za/sites/default/files/gcis\\_document/202009/43730gen513.pdf](https://www.gov.za/sites/default/files/gcis_document/202009/43730gen513.pdf) (use uniform font type and reduce the size)

## b) Ghana

**Table 4: International Benchmarking Findings for Ghana**

Elements	Status	Observations and Remarks
Per capita income	USD 2,188.00 USD by November 2020	Above average of most of African countries, meaning citizens could spend more on internet and ICT services
Global ICT Development Index (IDI)	Ghana's IDI rank in 2017 was 116 globally with a value of 4.05. Its mobile cellular subscriptions per 100 inhabitants was 139.13 as compared to the rest of Africa at 74.60.	Having the highest international internet bandwidth per internet user at 9850.94 bit/s, Ghana seems to have an increase in active mobile broadband subscriptions.
Global Innovation Index (GII) rank	Ghana is among the top 120 countries in world with high levels of innovations in the areas of business growth.	This is an indicator of expanding ICT services and hence, digital rights
Comparative socio-economic ecosystem	The economy of Ghana has a diverse and rich resource base, including the manufacturing and exportation of digital technology goods, automotive and ship construction and exportation, and the exportation of diverse and rich resources such as hydrocarbons and industrial minerals. These have given Ghana one of the highest GDP per capita in West Africa. Owing to a GDP re-basement, in 2011, Ghana became the fastest-growing economy in the world. <sup>12</sup>	The growing manufacturing sector and export business are driving demand for ICT skilled workforce, hence the growing demand for skills service providers.
E-government Development Index (EDI) rank	Ghana has performed well on EDI for 2016. Ghana improved on her ranking from 123 in 2014 to 120 in 2016 (UN, 2016).  Ghana's government has come to realize the benefits of e-government and how its utilization could improve service delivery to its citizens whose requirements are satisfied and bringing businesses closer to their governments as an important feature of e-government.	Ghana has embraced e-governance through citizen involvement with government activities.
ICT professionals' recruitment and management in Government	As of April 30, 2015, the Human Resource Management (HRM) Policy Framework and Manual for Ghana Public Services (under PSC) applied to the public services of Ghana as defined	Flexible governing HRM policy frameworks make it easy to cater for emerging developments, commonly realized in the fast-

<sup>12</sup> [https://en.wikipedia.org/wiki/Economy\\_of\\_Ghana](https://en.wikipedia.org/wiki/Economy_of_Ghana)

Elements	Status	Observations and Remarks
	<p>by Article 190 of the 1992 Constitution of the Republic of Ghana. The Framework outlines the principles that guide the approach to human resource management, governance and the development of human resource management policy in the public service.</p> <p>Policies, systems, structures and programmes of HRM practice are still evolving. Much needs to be done in order for Ghana to benefit the full complement of HRM practice.</p>	developing ICT sector world over.
Approach to digital skilling in government	Ghana emphasizes lifelong learning through online learning, distance learning, formal (face to face) training and blended learning approaches to digital skilling.	By employing a multiplicity of skilling approaches, the interests of the majority of the citizens are taken care of and the scope of digitally skilled people is widened.
ICT Skills supply side	Higher education institutions in Ghana include 10 public universities, eight technical universities, and seven university-level professional training institutions. In 2019, a total of 109,874 students graduated from these institutions in various fields, including ICT related academic programmes.	All ICT academic programmes in Ghana institutions of higher learning are aligned to the development needs of Ghana as a country. Digital skills are integral part of Ghana education system at all levels.
<b>Ghana-India Kofi Annan Centre of Excellence in ICT(AITI-KACE)</b>		
Elements	Status	Observations and Remarks
Institution	Ghana-India Kofi Annan Centre of Excellence in ICT(AITI-KACE)	Established in 2003, the Ghana-India Kofi Annan Centre of Excellence in ICT (AITI-KACE) is the ICT Capacity Development Agency of the Ministry of Communications and Digitalization, Government of Ghana. AITI-KACE works to promote individual and institutional capacity building; research and innovation; consultancy and advisory services in the area of ICT and E-Governance solutions in Ghana and Africa.

Elements	Status	Observations and Remarks
Services/programmes provided	<p><b>Regular Courses</b>            Computing Infrastructure System and Security pathway            Multimedia and Animation            DBC in Web Technologies            International Computer Driving License (ICDL)            Certificate in software Development            DBC in Enterprise programming            Diploma in Business computing- Big Data Analytics</p> <p><b>Professional Courses</b>            Oracle Database            Cyber Security and Malware Analytics            Certificate in cyber-attack and preventive techniques            Cisco certified network associate            Certified information system auditor            Network and information security</p> <p><b>Sandwich course</b>            PHP Programming (core)</p>	<p>Courses are categorized into Regular courses, 26 weeks is the highest duration of the regular courses and 4 weeks is the minimum duration.</p> <p>Professional courses have a maximum duration of 17-12 weeks and a minimum of 7-2 weeks. The existing sandwich course was 4 weeks</p>
Skills/target profession	<p><b>Regular Courses</b>            Network or Network Support Engineer, Graphic Designer            Net software developer            Web Application Developer, Back End            Web App Developer, Django Instructor.            Front End developer, Web master, jQuery Instructor            Web Application Developer, Back End            Web App Developer, Laravel Instructor.            Big Data Engineer and Big Data Architect</p> <p><b>Professional courses</b>            Computer engineer            CCNA, CSD</p> <p><b>Sandwich Course</b>            Familiar with HTML, MySQL, CSS</p>	<p>Most of these courses are meant to supplement the existing set skills from the courses undertaken by the prospective candidates. Therefore, most of these courses are hands on training courses meant to provide in-depth knowledge on the target course.</p>
Levels	<p>Certificate in Software Development            Basic knowledge in Java            For cyber security, Diploma in Business computing, Cisco Certified Network Associate, Professional work experience</p>	<p>Most require a graduate related to the course to be undertaken</p>
Similar service with UICT	<p>Certification of courses  <b>Professional/short courses</b>            Cyber security</p>	<p>UICT doesn't have courses on big data analytics, Networking, multimedia</p>

Elements	Status	Observations and Remarks
	CCNA Networking Multimedia	and animation and these are offered at Ghana-India Kofi Annan Centre of Excellence.  In terms of entry requirements, most of the diploma and certificate courses offered at UICT require UACE and UCE which is different for most of the courses at Kofi Annan Centre of Excellence in ICT.
Stakeholder participation in curriculum development	The curriculum development involves extensive stakeholder consultation and engagement (subject matter experts including teachers, school leaders, curriculum officers, education authorities, parent bodies, professional education associations, business, industry and community groups; and academics). Research and development are also key stakeholders in curriculum reviews. Curriculum and teacher reference groups are formed during curriculum reviews and tasked with providing feedback.	Stakeholders in various themes are well represented in the processes of planning and budgeting and implementation of ICT curriculums at all levels, including for industrial level certifications.
Pedagogical approaches used	Pedagogies currently being used by most teachers in Ghana are based on a long tradition of learner-centered theories of education that require a learning to be: <ul style="list-style-type: none"> <li>- Individualized and collaborative</li> <li>- Experiential, building on prior learning</li> <li>- Self-managed and cumulative</li> <li>- Authentic</li> <li>- Directed to higher-order problem solving</li> </ul>	Ghana's pedagogical approaches are well enlisted in a strategy – something other countries that are looking to advance ICT can integrate.
Status of eLearning	The relative ease with which learning content can be put online and its reduced costs (printing and face to face dynamics) has resulted in an increase in online offerings across the higher education sector. More institutions are offering online courses with an increase in the number of intakes.  Statistics from the Ghana Government Department of Education show that this	Growth in e-learning has a direct bearing on the growth and development of e-government and ICT. The more literate the society becomes (as a result of e-learning in part), the more the uptake for ICT and e-government services.

Elements	Status	Observations and Remarks
	<p>number is rising faster than those studying on campus. This growth is entirely changing the dynamics in which institutions plan, develop and deliver education. However, one key challenge is the completion rate of such students.</p> <p>Both traditional and e-learning methods are being used side by side as viable learning approaches.</p> <p>The Ghana government has developed strategies and policies that back-up and support e-learning<sup>13</sup>.</p>	
Funding for ICT skills development	<p>Funding and grants are managed under the Department of Education Skills and Employment.</p> <p>The Ghana Government has <i>committed to funding skills development in schools and higher institutions of learning and ensuring the Ghana workforce is well equipped for ICT development.</i></p>	<p>Commitment by the government of Ghana to fund the ICT skills development ensures sustainability of the ICT programmes in institutions of higher learning.</p>

## Conclusion

The study revealed that in Ghana more training institutions are offering online courses with an increase in the number of intakes. Majority of the ICT short courses offered in Ghana are offered have a duration of 4 to 7 weeks, ICT diploma programmes have a duration of 2 years and ICT degrees have a duration of between 3 to 4 years. From the research, it is observed that Ghana emphasizes online learning, distance learning, formal (face to face) training and blended learning approaches to digital skilling. The level of literacy is generally comparable to Uganda. Ghana has a well-developed national digital skills framework which is based on ICDL core and the development of the skill is based on a market led approach, complimented by government funding, which targets schools and higher institutions of learning, alongside government departments and agencies.

The key lesson for UICT is to integrate e-learning and caravan training into UICT delivery approaches, optimize professional and short course delivery to no-more than 6 weeks and establish funding partnership with government, private sector and development partners to accelerated update of UICT programmes.

<sup>13</sup> Josie Misko et. al, 2004: E-Learning in Australia and Korea; Learning from Practice



## c) Nigeria

**Table 5: International benchmarking findings for Nigeria**

Elements	Status	Observations and Remarks
Per capita income	The Gross Domestic Product per capita in Nigeria was last recorded at USD 2396.04 in 2020. The GDP per capita in Nigeria is equivalent to 19 percent of the world's average. The Nigeria GDP per capita is projected to trend around 2400.00 USD in 2022 and 2500.00 USD in 2023, according to our econometric models. <sup>14</sup>	Nigeria became Africa's largest economy in 2014. As Nigeria's Gross Domestic Product (GDP) per capita grew by nearly 70%. Between 1992 and 2009, poverty rates fell by 6%. However, while the proportion of impoverished Nigerians decreased slightly, the population grew by 54.3%, increasing the absolute number of Nigerians below the poverty line.
Global ICT Development Index (IDI)	Nigeria currently ranks 143 on the global ICT development index (IDI) for 2017 <sup>15</sup>	Nigeria ICT Development Index (IDI) rank fluctuated substantially in recent years. It tended to increase through 2010-2017 period ending at 143 <sup>rd</sup> rank, the highest development in ICT in 2017.
Global Innovation Index (GII) rank	Nigeria ranks 118 among the 132 economies featured in the GII 2021. Nigeria ranks 28 <sup>th</sup> among the 34 lower middle-income group economies and 16 <sup>th</sup> among the 27 economies in Sub-Saharan Africa. <sup>16</sup>	Compared to the level of economy Nigeria is under performing on ICT innovations ranking, much as the country has a vibrant higher education sector with numerous institutions and skills service providers.
Comparative socio-economic ecosystem	The economy of Nigeria is a middle-income, mixed economy and emerging market, with expanding manufacturing, financial, service, communications, technology and entertainment sectors. It is ranked as the 27 <sup>th</sup> -largest economy in the world in terms of nominal GDP, and the 24 <sup>th</sup> largest in terms of purchasing power parity.	Nigeria has the largest economy in Africa. The country's re-emergent manufacturing sector became the largest on the continent in 2013, and it produces a large proportion of goods and services for the region of West Africa. The growing economy and digitalization are driving demand for ICT skilled workforce, hence the growing demand for skills service providers.
E-government Development Index (EDI) rank	Nigeria ranks 143 in e-government index out of 193	Nigeria improved in its world e-Government development ranking from 162 in 2012 to 141 in 2014, slipped two spaces in 2016 and unchanged in 2018 to 143 according to UN e-Government Development Index

<sup>14</sup> <https://tradingeconomics.com/nigeria/gdp-per-capita>

<sup>15</sup> <https://knoema.com/ITUKIICT2019Apr/global-ict-developments>

<sup>16</sup> Global Innovation Index 2021



Elements	Status	Observations and Remarks
Approach to digital skilling in government	Nigeria is currently promoting digital skills training among the youth or young Nigerians. Nigeria has a collaboration between the Federal Ministry of Communication and Digital Economy and Huawei Technologies (Nigeria) Limited aimed at developing the skills of citizens in the country.	Partnerships and collaborations are key approaches Nigeria has embraced to accelerate development of critical digital skills demanded by the expanding economy.
ICT Skills supply side	The country has 43 Federal universities, 48 State universities, 79 Private universities and 14 modern computerized automation centres which disseminate ICT skills to the country. In Nigeria, there are good number of IT training institutes that gives special education on IT courses. With digitalization taking root in the country, there is certainly a need for IT training institutes in order to train professionals for the information and technology sector.	The supply of ICT skills is mostly facilitated by educational institutions mostly the IT training institutes since they give a broader conception and specialization in the IT sector skills.

#### New Horizons Nigeria

Elements	Status	Observations and Remarks
Institution	New Horizons Nigeria	New Horizons positions itself as the source for the world's best information technology courses. Since its establishment in the United States in 1982, a tremendous teaching experience was accumulated and modern scientific approaches were developed. The Nigerian branch began training students in 2005. <sup>17</sup>
Services /programmes provided	Corporate Trainings Certified in Risk and Information Systems Control (CRISC) CHFV V9 Training and Certificate Comptia Server+ MS-203: Microsoft 365 Messaging Administrator AZ-303T00 – Microsoft Azure Architect Technologies. Microsoft Azure Architect Design Individual Training Advanced Web Development (PHP/MySQL/PHP Frameworks) Big Data on AWS Certified Ethical Hacker	The IT Training Institution partners with universities for technology certifications which creates a basis of trust in quality of certifications

<sup>17</sup> <https://www.newhorizonsnigeria.com.ng/>

Elements	Status	Observations and Remarks
	<p>Certified Hacking Forensic Investigator            Certified Information Systems Security Professional (CISSP)            Certified Internet of Things (IoT) Practitioner            Cisco (CCNP) – Implementing Cisco Implementing and Administering Cisco Solutions (CCNA)</p> <p><b>Other services include</b>            Online training            Education services            Certification Exams</p>	
Skills	The skillsets supplied by the data analysis and visualization, Information systems security management, web development, Graphics designing, Cyber Security Analysis, Digital marketing, Basic and Advanced computing, Ethical Hacking	Technical ICT education increase knowledge and skills through hands-on experiences.
Levels	New Horizons Nigeria has no restricted levels of entry. It offers courses on skills demand to everyone interested in gaining specific skills.	New Horizons has short courses which help to provide ICT skills on demand in the Country
Similar service with UICT	New Horizons Nigeria offers ICT courses particular to ICT sector but offers mostly ICT short course i.e. Certified Hacking Forensic Investigator, Certified in Risk and Information Systems Control (CRISC), Cyber Security First Responder Threat Detection and Response, Network Security, Graphic Design, WEB Design And several other ICT courses	The difference is that UICT offers some courses which are not specific to ICT such as business short courses, UICT also offers Bachelor’s degree programmes, which is not a case at New Horizons Nigeria
Stakeholder participation in curriculum development	During Curriculum development in Nigeria, the three agencies - NUC, NBTE and NCCE publish Minimum Standards for each programme, discipline or course of study. Accreditation of programmes in Universities, Polytechnics and Colleges of Education is based on these minimum standards. At the Colleges of Education level, each department in all colleges is notified by the NCCE to make inputs into the curriculum. Such inputs may require them to suggest new content/course, expand, deepen, or reduce the content and so on. Modifications made at the	Nigeria has a significant level of stakeholder inclusion in curriculum development

Elements	Status	Observations and Remarks
	College level are then sent to the NCCE who schedules are meeting of all heads of departments of affected programmes to harmonize their inputs. Ministry of Education officials, policy makers, stakeholders' representatives of the NERDC are usually at this meeting. <sup>18</sup>	
Pedagogical approaches used	ICT skills development is focused on learner centred models of delivery, aiming at knowledge and skills transfer to the learner. Nigeria is promoting lifelong learning in order to keep the workforce equipped with relevant 4IR skills.	Lifelong learning is a must have model to ensure the workforce retain cutting edge industrial focused skills and skills in demand
Status of eLearning	E-Learning is widely available in Nigeria especially on higher education and in delivery of industry oriented professional skills.	
Funding for ICT skills development	ICT skills development in Nigeria is market driven and beneficiary funded.	

## Conclusion

Nigeria embraced e-learning is as means of promoting access education in the Africa's most populous nation. E-Learning is being used to promote distance education and support lifelong learning, which are critical in maintaining digitally skilled workforce in the 4IR economy. Digital skilling is privately funded by primary beneficiaries and the industry depending on their need. The key lessons for UICT is integration of eLearning as a means of enabling lifelong learning models, develop market driven courses, involve stakeholders along the programme value chain from curriculum development through delivery to feedback learning and enhancement.

## d) Kenya

**Table 6:** International Benchmarking Findings for Kenya

Elements	Status	Observations and Remarks
Per capita income	According to Trading Economics global macro models, Kenya GDP per capita is estimated at 1090 USD, with rapidly expanding ICT sector.	The rapidly expanding economy and growing ICT sector are key enablers for digital skills demand.
Global ICT Development Index (IDI)	Kenya achieved an improvement in its IDI score by 0.21 up from 2.78 in 2015 to 2.99 in 2016	Kenya is considered to have one of the fastest growing ICT sectors in Africa, and this has attracted a number of multi-national corporates, including Microsoft, Google, HP, Cisco etc.

<sup>18</sup> <https://nou.edu.ng/sites/default/files/>

Elements	Status	Observations and Remarks
		to set up regional headquarters in Nairobi.
Global Innovation Index (GII) rank	Kenya has been ranked 86 global, and is considered one of the countries having exceptional performance in ICT innovations development	Kenya is known as one of the most innovative countries in the world. ICT innovations thrive where there is a dynamic, agile and skilled human resource.
Comparative socio-economic ecosystem	Kenya has a market-based economy and is generally considered the economic, commercial, financial and logistics hub of East Africa. With the strongest industrial base in East Africa, Kenya has been successful in attracting U.S. exporters and investors.	The structure of Kenya's ICT sector is comparative to that of Uganda largely driven by telecoms and government development agenda. Kenya, just like Uganda, has rapidly growing demand for ICT skills.
E-government Development Index (EDI) rank	Kenya's GEI is 0.5326 with a ranking of 116 of 193.	At regional level, Kenya embraces eLearning and e-governance, which inherently promotes open government.
ICT professionals' recruitment and management	Employers in Kenya emphasize the need for critical life skills (teamwork, work ethics, and integrity over technical skills), though many also seek candidates with strong computer skills.	Flexible governing HRM policy frameworks make it easy to cater for emerging developments, commonly realized in the fast-developing ICT sector world over.
Approach to digital skilling	According to a study by CENFRI (May 26, 2020), digital skills test results in Kenya averaged 55%, well below the normative benchmark. Youth performed better on content creation and worst on digital security. Overall, men performed better than women, regardless of the socio-economic background. Youth showed a strong preference for using smartphones over laptops for the test. Kenya focuses development of industrial ready digital skills, to address the emerging 4IR demands and trends.	The focus on industrial oriented skills development is more practical and impactful to the economy than academic degrees.
ICT Skills supply side	Kenya has 30 public universities, 30 chartered private universities and 30 universities with Letter of Interim Authority (LIA). These churn out ICT professionals on an annual basis to match the ICT demands from the public and the private sectors. The country has hundreds of firms and training institutions providing ICT skills training services	The growing number of institutions of higher learning in Kenya help to meet the demand for ICT professionals in Kenya. This implied Kenya is pursuing a strategy of self-reliance on human capacity development especially in the areas of ICT skills development
Institution Focus		
Elements	Status	Observations and Remarks
Institution	African Advanced Level Telecommunications Institute (AFRALTI)	AFRALTI is an Inter-Governmental Institute

Elements	Status	Observations and Remarks
		<p>established in 1991 to supplement and spearhead ICT development efforts mainly in English-speaking Africa. Currently, the member States that have ratified the Intergovernmental Agreement (IGA) include Lesotho, Kenya, Malawi, Mozambique, Kingdom of Eswatini, Tanzania, Uganda and Zimbabwe, out of the 23 eligible members.</p>
<p>Services /programmes provided</p>	<p>The institute offers a wide range of workshops and courses in the following areas:</p> <p><b>Telecommunications Engineering</b></p> <ul style="list-style-type: none"> <li>• Next Generation Networks</li> <li>• Satellite Communication</li> <li>• Ethernet Backhauling for Mobile Networks</li> <li>• Soft switch Systems</li> <li>• Voice Over Internet Protocols and MPLS</li> <li>• IP for Next Generation Networks</li> <li>• Emerging Networking Technologies</li> <li>• Wireless Technologies</li> </ul> <p><b>Telecommunications Policy, Management and Regulation</b></p> <ul style="list-style-type: none"> <li>• Employee Performance &amp; Wellness</li> <li>• Strengthening Consumer Protection in the Internet Economy</li> <li>• Quality of Service, Monitoring &amp; Compliance</li> <li>• Competition Law</li> <li>• Project Management in Telecommunications</li> <li>• Business Continuity Management</li> <li>• Alternative Dispute Resolution</li> <li>• ICT Policy &amp; Regulation</li> <li>• ICT Trends and Use of Social Media</li> <li>• ICT E-Government</li> <li>• Fraud Management &amp; Revenue Assurance</li> <li>• Interconnection Business</li> <li>• Telecoms Policy and Regulations</li> <li>• Network Cost Model Development</li> <li>• Strategic Planning for ICT</li> <li>• ICT Marketing Strategy</li> </ul>	<p>AFRALTI is an institution set up to give opportunities for senior staff in high technical and managerial positions to receive advanced level specialized training in aspects of telecommunications network operations and management, telecommunications policy, regulation as well as computer technologies</p>

Elements	Status	Observations and Remarks
	<p><b>CISCO Networking</b></p> <ul style="list-style-type: none"> <li>• Cisco Certified Network Associate (CCNA)</li> <li>• Cisco Certified Network Professional (CCNP)</li> <li>• CCNA Security</li> <li>• PC Hardware &amp; Software (A+)</li> </ul> <p><b>HUAWEI</b></p> <ul style="list-style-type: none"> <li>• Huawei Certified Data Associate (HCDA)</li> <li>• Huawei Certified Data Professional (HCDP)</li> </ul> <p><b>Certified Fibre Optics Training</b></p> <ul style="list-style-type: none"> <li>• Fibre Optics Basics – Certified Fibre Optics Technician (CFOT)</li> <li>• Premises Cabling Systems – Certified Premises Cabling Technician (CPCT)</li> <li>• Outside Plant Fibre Optics – Certified Fibre Optics Specialist in Outside Plant Cabling (CFOS/O)</li> </ul> <p><b>EC-Council</b></p> <ul style="list-style-type: none"> <li>• EC-Council Certified Security Analyst (ECSA)</li> <li>• Certified Ethical Hacker (CEH)</li> <li>• Computer Hacking Forensic Investigator (CHFI)</li> <li>• Certified Application Security Engineer (CASE.NET / CASE JAVA)</li> <li>• Certified Network Defender (CND)</li> <li>• Disaster Recovery (EDRP)</li> <li>• EC-Council Incident Handling (ICIH)</li> <li>• Certified Threat Intelligence Analyst (CTIA)</li> <li>• Certified SOC Analyst (CSA)</li> <li>• EC-Council Certified Encryption Specialist (ECES)</li> <li>• Certified Secure Computer User (CSCU)</li> <li>• Fundamentals of Information Security (FD IS)</li> <li>• Fundamentals of Computer Forensics (FD CF)</li> <li>• Fundamentals of Network Security (FD NS)</li> <li>• EC-Council Security Specialist (ECSS)</li> </ul> <p><b>Research and Consultancy in the ICT Field</b></p> <ul style="list-style-type: none"> <li>• Feasibility studies and market analysis</li> <li>• Network planning and design</li> </ul>	

Elements	Status	Observations and Remarks
	<ul style="list-style-type: none"> <li>• Preparation of technical specifications and tender documents</li> <li>• Billing systems and management</li> <li>• Interconnection negotiations and management</li> <li>• Interference and spectrum analysis</li> <li>• Lighting, power surges and transient's protection</li> <li>• Telecommunication standards and QoS testing</li> <li>• Tele-traffic engineering</li> <li>• Fraud and Revenue Assurance</li> <li>• Test approval of telecoms equipment</li> <li>• Calibration of test equipment</li> <li>• Network Security</li> <li>• IT Auditing</li> </ul> <p><b>Online Master of Communications Management (eMCM)</b></p>	
Skills/ target	Communication, Management, Information Technology specialist and Computer Forensics, Telecommunication engineering	Skills obtained are based on the course or workshop attended given that the institute provides workshop in a variety of areas
Similar service with UICT	Diploma and Certificate Programmes in ICT and Engineering disciplines including; <ul style="list-style-type: none"> <li>• Diploma in Computer Technology (DCT)</li> <li>• Information Technology Business (ITB)</li> <li>• Diploma in Multimedia Technology (DMT)</li> <li>• Diploma in Information Technology Science (DITS)</li> <li>• Diploma in Electrical and Electronics Engineering (DEEE)</li> <li>• Telecommunications Engineering (TE)</li> </ul>	In terms of course design, AFRALTI offers mainly IT based courses and they are designed for professionals to improve their skills and have duration compared to UICT course which are spread with in IT and business and are undertaken for a longer period of time.
Stakeholder participation in curriculum development	In Kenya, policy provides for representation of the various stakeholders (from industry, government and community), in the governing boards of institutions of higher learning. This promotes stakeholder participation in the curriculum development process for universities and other tertiary institutions.	Wider participation of stakeholders helps enrich and make the curriculum relevant. It also enhances employability of graduates after school.
Pedagogical approaches used	Commonly applied Pedagogical approaches in Kenyan institutions are Collaborative, Technology Integrative, Reflective and Inquiry Based Learning. These put emphasis on thinking skills and application, yielding practical and competent ICT professionals	The type of pedagogical approaches used determine the competency of graduates



Elements	Status	Observations and Remarks
Status of eLearning	E-learning is at heart of AFRALTI, right from the early days of Cisco Academy	Kenya's growth of e-learning is by far and large supported by the gradually increasing access to internet opportunities for all citizens, and the presence of a functional ICT infrastructure in the country.
Funding for ICT skills development	Like any other African country, Kenya benefits from grants from donors like such as USAID, DFID, GSMA, and Gates Foundation. These form part of the supplementary funding in addition to the direct funding by the government of Kenya from the consolidated fund and the private sponsorship by the beneficiary students.	Commitment by government to fund the ICT skills development ensures sustainability of the ICT programmes in institutions of higher learning. Meanwhile, parents are willing to pay for ICT courses on demand in the market.

## Conclusion

Kenya has favorable policy landscape for the development of ICT skills in the country. The high internet penetration presents opportunities for eLearning, and the government focus on digitalization and e-service innovation is rising demand for ICT skills in the country. The level of literacy is generally comparable to Uganda. The average per capita income means Kenyans can spend more in internet and e-services, but more importantly on acquiring industry relevant ICT skills for increased competitiveness. The key lessons for UICT from Kenya are about partnership and collaboration especially with international certification bodies, working with government to skill the government workforce, and focusing on hands- on diploma and short courses.

## e) Tanzania

**Table 7:** International benchmarking findings for Tanzania

Elements	Status	Observations and Remarks
Per capita income	In the long-term, the Tanzania GDP per capita is projected to trend around 990.00 USD in 2022 and 995.00 USD in 2023. <sup>19</sup>	The real GDP of Tanzania grew by 4.8% reaching USD 64.4 billion versus USD 60.8 billion from 2019. This growth made it the 2nd largest economy in East Africa after Kenya, and the 7th largest in Sub-Saharan Africa.
Global ICT Development Index (IDI)	Tanzania is ranked 161 on the global IDI rank with a score of 1.81	Tanzania's IDI rank fluctuated substantially in recent years. It tended to increase through 2002-2017 period, ending at 165 rank. Just like Uganda, the general trend for Tanzania is upward growth in ICT sector

<sup>19</sup> <https://tradingeconomics.com/tanzania/gdp-per-capita#>:

Elements	Status	Observations and Remarks
Global Innovation Index (GII) rank	The average value for Tanzania was 26.37 points with a minimum of 23.9 points in 2012 and a maximum of 28.1 points in 2018. The latest value from 2021 is 25.6 points. For comparison, the world average in 2021 based on 132 countries is 34.30 points <sup>20</sup>	Tanzania Global Innovation Index (GII) rank has improved from 23.9 points to 25.6 which means the country's innovation ecosystem performance is improving over time. Implying growing human capacity and rising demand for digital skills in the economy.
Comparative social economic ecosystem	The economic outlook is positive, with real GDP projected to grow 4.1% in 2021 and 5.8% in the current year, due to improved performance of the tourism sector and the reopening of trade corridors. Energy and fuel price increases are expected to persist in 2021, raising <sup>21</sup> overall inflation to 3.9% in 2021 and 3.4% in the current year. The Tanzanian economy has grown at an average annual rate of around 6-7 percent for more than a decade. <sup>22</sup>	There is a significant level of growth of the economy of Tanzania, which amounts to around 6-7 percent for more than a decade. The growth is significant in the services sector powered by digital transformation.
E-government Development Index (EDI) rank	Tanzania's EDI is 0.40206, with a ranking of 152 of 193 <sup>23</sup>	Tanzania's EDI is still low which implies a low development and uptake of e-services in the country.
ICT professionals' recruitment and management in Government	The Tanzania Country Level Knowledge Network (CLKnet) is an organized forum to provide a platform for the employment and ICT stakeholders to share knowledge, experiences and accordingly so, suggest the best and convenient mechanisms which the Public Service Recruitment Secretariat can adapt to improve the employment services rendered to the Public.	With the current development of the ICT sector, the current recruitment processes in the public sector can as well allow the application of ICT through the use of e.g. the websites, social media for wider reach out of service users on job advertisements, notifications relevant to attend interviews as well as notifying regrets.
Approach to digital skilling	The approach to digital skilling in Tanzania is private sector and individual demand driven approach, with a few interventions by government to support government employees	Limited public sector participation in digital skilling implies limited appreciation of digital literacy and investment in digital infrastructure and facilities.
ICT Skills supply side	The country has 43 universities, 20 tertiary colleges (vocational training centres), and 53 teacher-training colleges that supply ICT skills in	The ICT skills supply in Tanzania is mainly from academic institutions, including universities and tertiary institutions, with a few consulting

<sup>20</sup> [https://www.theglobaleconomy.com/Tanzania/GII\\_Index/](https://www.theglobaleconomy.com/Tanzania/GII_Index/)

<sup>21</sup> <https://www.afdb.org/en/countries-east-africa-tanzania>

<sup>22</sup> <https://www.worldbank.org/en/country/tanzania/publication/tanzania-economic-update>

<sup>23</sup> <https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/183-United-Republic-of-Tanzania>

Elements	Status	Observations and Remarks
	Tanzania through ICT education programmes, with hundreds of ICT firms that provide industrial grade ICT training programmes.	firms complementing the main suppliers.
<b>Dar es Salaam Institute of Technology</b>		
Elements	Status	Observations and Remarks
Institution	Dar es Salaam Institute of Technology	Dar es Salaam Institute of Technology (DIT) is the government Institution established in 1997 by Act of parliament. "The DIT Act No 6 of 1997" to replace the Dar es Salaam Technical College which had a long history of technical training in Tanzania from 1957. The Dar-es Salaam Technical Institute was established aiming at providing vocational training in the country. The Institute later expanded its scope to offer technical secondary school courses and training for Technical Assistants before it was upgraded in 1962 to become the Dar es Salaam Technical College (DTC), the first formal technical training institution in the country.
Services and programmes offered	<p><b>Ordinary Diploma Programmes</b></p> <ul style="list-style-type: none"> <li>• Ordinary Diploma in Computer Engineering</li> <li>• Ordinary Diploma in Information Technology</li> <li>• Ordinary Diploma Multimedia and Film Technology</li> </ul> <p><b>Undergraduate Programmes</b></p> <ul style="list-style-type: none"> <li>• Bachelor of Engineering (B. Eng) in Computer Engineering</li> </ul> <p><b>Postgraduate Programmes</b></p> <ul style="list-style-type: none"> <li>• Master of Technology in Computing and Communications.</li> <li>• Master in Computational Science and Engineering</li> </ul>	Dar es Salaam Institute of Technology (DIT) offers ICT Programmes majorly in 3 categories which are Ordinary Diploma Programmes, Undergraduate Programmes and Postgraduate Programmes.
Skills / target	Civil Engineering, Computer Engineering, Electrical Engineering, Electronics and Telecommunications Engineering, Mechanical Engineering and Science and Laboratory Technology.	DIT emphasizes key research projects are in areas, such as renewable energy, hydroelectric power, biogas technology, compressed natural gas, and social innovations projects, such as traffic light systems, call center system, 3D technology and numeric control

Elements	Status	Observations and Remarks
		systems.
Levels	<p>In order to qualify for admission under direct scheme, a candidate must be a holder of a Certificate of Secondary Education (CSEE) with at least four (4) passes (i.e. D grade or higher) in Physics/Engineering Science, Mathematics and Chemistry and any other subject excluding a religious subject.</p> <p>Applicants must be Holders of Bachelor's degree in Engineering or Science with a GPA of at least 2.7 from a recognized higher learning institution.</p> <p>In order to qualify for admission into Bachelor's degree (NTA' level 7- 8) four (4) years programmes, the following minimum entry qualifications are required: (ii) Holder of the Advanced Certificate of Secondary Education (ACSEE) in the combination of Physics, Chemistry and Mathematics (PCM) or Physics, Geography and Mathematics (PGM) with principal Pass in Mathematics and Physics from the same sitting with a total of not less than 4.0 points</p>	<p>Several levels of entry have different minimum requirements for ICT institutions in Tanzania. Certificate of secondary is key for diploma applicants while Advanced Certificate of Secondary Education is a priority for Bachelor's degree applicants.</p>
Similar service with UICT	<p><b>Diploma Courses</b> Computer technologies, Information Technology Science, Information Technology Business, Electrical and Electronically engineering</p>	DIT has undergraduate and post graduate programmes which is not a case for UICT.
Stakeholder participation in curriculum development	Curriculum can be developed at either National or Institutional level. In either case, the procedure is the same except that apart from assisting institutions in curriculum development process, NACTE is also mandated to validate curricula that have been developed or revised by technic institutions themselves or through any other responsible organ. This promotes stakeholder participation	Tanzania is not lagging behind when it comes to attracting more stakeholders to venture into the education sector and provide a helping hand in making sure that the desire to attain quality education is concerned.
Pedagogical approaches used	The most common approaches in Tanzania are student-centered approach and teacher-centered approach. Informed by the	The proper use of critical pedagogy at any level of education can move students toward deeper professional dialogue and reflection

Elements	Status	Observations and Remarks
	constructivist and socio-cultural theories of learning, the student-centred approach considers students as the centre of learning, giving them autonomy to participate in the choice of the learning content and methods <sup>24</sup>	Furthermore, adopting critical pedagogy in teaching and learning can lead to meaningful classroom experiences that place social issues at the centre of the classroom discussion.
Status of eLearning	The use of modern technologies in teaching and learning processes is considered a competitive tool for improving the academic performance of Higher Learning Institutions (HLIs) in developing countries, and Tanzania in particular. Amongst the widely used technology in teaching and learning in HLIs is E-learning. The use of e-learning has resulted in a number of changes in HLIs as far as education delivery is concerned (Lwoga & Komba, 2015). E-learning usage has allowed people in rural areas to have access to education and made distance education to become possible in Tanzania.	E-learning is considered as an important component of enhancing teaching and learning processes by Higher Learning Institutions in Tanzania. In the context of teaching and learning, e-learning is generally a new concept in Tanzania, but growing inspired by COVID19 pandemic.
Funding for ICT skills development	Tanzania ICT skills development is supported both internally and externally by donors (UNESCO, ADB and African Development Fund). Internally, Tanzania has the Skills Development Fund and Tanzania Education Fund aimed at empowering students of Tanzania to learn, lead and thrive.	Tanzania has designed National Skills Development Strategy (NSDS) to address these challenges in ICT skills development

## Conclusion

Rapid technological changes in Tanzania have presented policymakers in the country with significant digital opportunities. New technologies like e-learning have created the potential to revolutionize the institutions in Tanzania, thus promoting the education sector. It is estimated that around 40% blend their face-to-face teaching with online exercises, such as tests and online discussions. Moreover, universities have developed a number of complete online courses at Masters level, and continuing education is highly prioritized at University level. The approach to digital skilling is similar to Uganda. Tanzania has a National Skills Development Framework and Strategy, supported with government led Nation Skills Development Fund.

<sup>24</sup> <https://files.eric.ed.gov>

**Table 8: Observed good practices and lessons for UICT from the benchmarked institutions.**

The matrix below provides observed good practices and lessons for UICT from the benchmarked institutions.

Country	Institution	Good Practice	Lessons Learned
<b>South Africa</b>	Cape Peninsula University of Technology	<p>Courses at Cape Peninsula University of Technology are categorized into full-time courses and short courses, with clear prerequisites stated for each course. As an institution, they focus on building skills that the individual needs to get hired and succeed in that profession.</p> <p>For each course, an applicant is provided with a list of entry requirements, target audience, course structure, assessment and certification and the mode of delivery for the courses</p>	<p>UICT should benchmark on the critical skills that employers expect ICT graduates to possess. These skills should guide in the course development /review process.</p> <p>A prospective student or applicant at UICT should understand entry requirements, target audience, course structure, assessment and certification and the mode of delivery for the courses</p>
<b>Ghana</b>	Ghana-India Kofi Annan Centre of Excellence in ICT(AITI-KACE)	<p>In terms of programme design, AITI-KACE programmes are designed for a short period of time meant to supplement the existing skill sets from the courses (regular and professional) undertaken by the prospective candidates.</p> <p>Blended learning is used most especially for professional courses.</p>	All good for UICT
<b>Nigeria</b>	New Horizons Nigeria	<p>New Horizons Nigeria uniquely offers short courses that provide real skills needs rather than programmes like diplomas, Bachelor’s degrees, etc.</p> <p>The learning methods include Instructor-Led Training, Online LIVE, eLearning, On-Site Training and Private Class</p> <p>There is a high level of stakeholder participation in curriculum development. Since it is developed by 3 agencies, input is made by departments from 14 representative colleges and representatives from Ministry of</p>	<p>It is very important to offer several short courses they promote and compliment on skill development, industry accreditation, accessibility, continuing professional development, career exploration and a realistic pathway to further studies. Short courses are affordable and price friendly thus easier to uptake.</p> <p>Using several methods of learning helps to cater for different categories of learners. Methods E-</p>



Country	Institution	Good Practice	Lessons Learned
		Education officials, policy makers. Nigeria uses Blended Learning Systems which include physical and eLearning system more especially in Nigerian Universities	learning, Online LIVE save time and money. With online learning, learners can access content anywhere and anytime, thus leading to better retention.
<b>Kenya</b>	African Advanced Level Telecommunications Institute (AFRALTI)	<ul style="list-style-type: none"> <li>• AFRALTI is focused on market driven programmes</li> <li>• Uses blended approach to programme delivery</li> <li>• Pursues collaborations and partnership to acquire in demand programmes, such as those of Cisco and Huawei</li> <li>• Uses industry experts in programme delivery who are paid on per cohort basis</li> <li>• Lobbies governments on investment in skills development and regional market access</li> <li>• Prices courses using a market competitive price modelling</li> </ul>	UICT should consider partnering with organizations and institutions, such as CISCO, UCC, and telecom companies, among others, so as to improve on the delivery of courses. This enables UICT to get resources and other ICT devices that can be expensive to procure. This also provides UICT with an opportunity to be marketed by these partners, thus improving its visibility.
<b>Tanzania</b>	Dar es Salaam Institute of Technology (DIT)	<ul style="list-style-type: none"> <li>• Focuses on undergraduate and post accredited graduate diploma programmes and short courses</li> <li>• Uses student centred approaches to training</li> <li>• Provides promotional programmes in line with her mandate</li> </ul>	UICT should adopt all these practices.

### 3.2 Regional and National ICT Sector Trends

This sub-section highlights the key outcomes of desk review. Some of the key documents reviewed include ICT skills survey reports, Digital trends in Africa 2021 (ITU), Africa Development Strategy, East African Community (EAC) Development Strategy (2016/17 - 2020/21), Uganda e-Government Master Plan (2012), Uganda National Development Plan III, SE-UICT ICT Skills Survey Report (2021), Digital Literacy Skills Transfer M & E Framework (2021), Market Needs Assessment Survey for the Review and Development of UICT Strategic Plan (2021/2022 – 2025/2026), UICT Strategic Plan (2016-2021), strategic plans for relevant sectors, Technology Industrial Revolution Reports, Digital Skills framework among others. The review aimed at identifying ICT trends, ICT skills



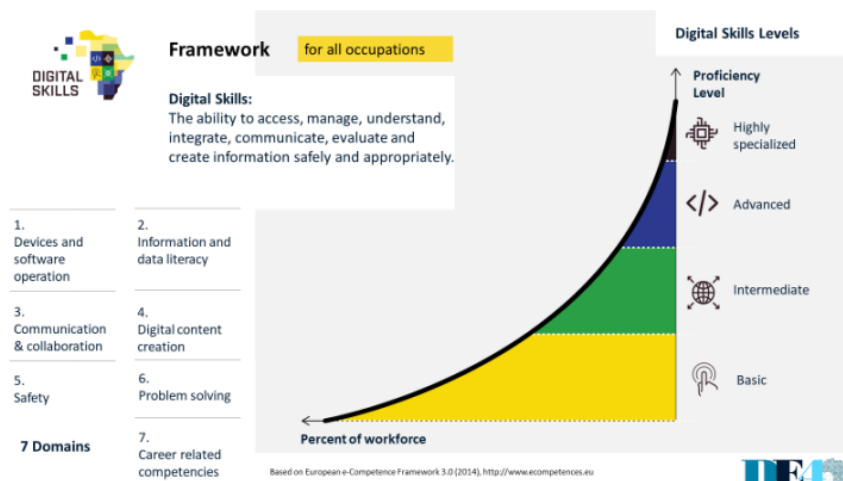
competency challenges and the various approaches for addressing the same at regional and national levels.

### 3.2.1 ICT Trends: African Region

According to International Telecommunications Union (ITU, 2021) publications over the last four years, the African Region has seen continued, albeit slow growth, in most areas of ICT infrastructure, access and use. Mobile cellular coverage in Africa (the percentage of the population that lives within reach of a mobile cellular signal) is estimated to be at 88.4 per cent. Just over 77 per cent of the population is now within reach of a 3G signal, and 44.3 per cent is within reach of a long-term evolution (LTE) mobile broadband signal.

As digital technologies penetrate an increasing number of sectors and occupations, sections of the workforce that are in non-ICT professions and occupations will also require more specialized digital competences characteristic of ICT technicians and specialists. The increasing access to technology and penetration of internet is accelerating the demand for digital skills both for ICT and Non-ICT professionals.

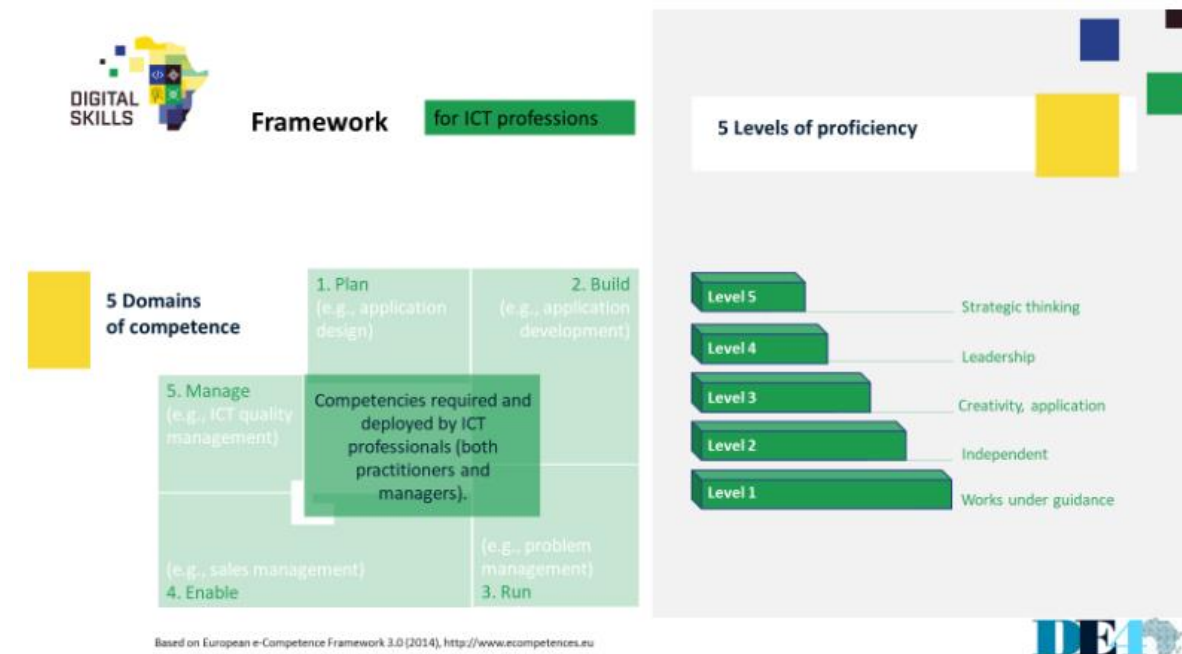
While demand for digital skills is difficult to assess, especially in the informal sector, the requirement for basic digital skills is becoming universal and ubiquitous especially with rapid development of digital services in the region. According to European Union Digital Competence Framework 2.0, two distinct digital skills competences must exist to cover both the ICT professionals on one hand, and the Non-ICT professional and citizens, on the other hand. Error! Reference source not found. shows the key digital skills for non-professionals and citizens.



**Figure 5:** Digital Skills Framework for General Workforce and Population- 7 Competencies and 4 Proficiency Levels (Source: World Bank<sup>25</sup>)

<sup>25</sup> <https://openknowledge.worldbank.org/bitstream/handle/10986/35080/Digital-Skills-Frameworks-and-Programmemes.pdf>

Digital skills for ICT professionals require a separate framework that describes the highly technical content and composition of skills applied in the ICT workplace. The Digital Transformation Strategy for Africa adopted the European e-Competence Framework for ICT professionals as illustrated in *Figure 6* below.



**Figure 6:** European e-Competence Framework for ICT professionals.<sup>26</sup>

From the above framework, it is clear that ICT professional have 5 domain competences with 5 levels of proficiency. The level of competence applies for both ICT managers and practitioners, such as systems administrators, software developers, etc.

The study sought to establish the key trends of most in demand digital skills. The review of the findings by International Financial Corporation on digital skills demand indicates that various levels of digital skills are needed by all economies of the world in order to address challenges and opportunities of the 4IR trends. *Figure 7* below shows the various skills demands and level of demand. The top three (3) most in demand digital skills are critical analytical thinking, communication and problem solving, while the least demanded skills are language and socialization (*refer to **Error! Reference source not found.***).

<sup>26</sup> <https://openknowledge.worldbank.org/bitstream/handle/10986/35080/Digital-Skills-Frameworks-and-Programmemes.pdf>

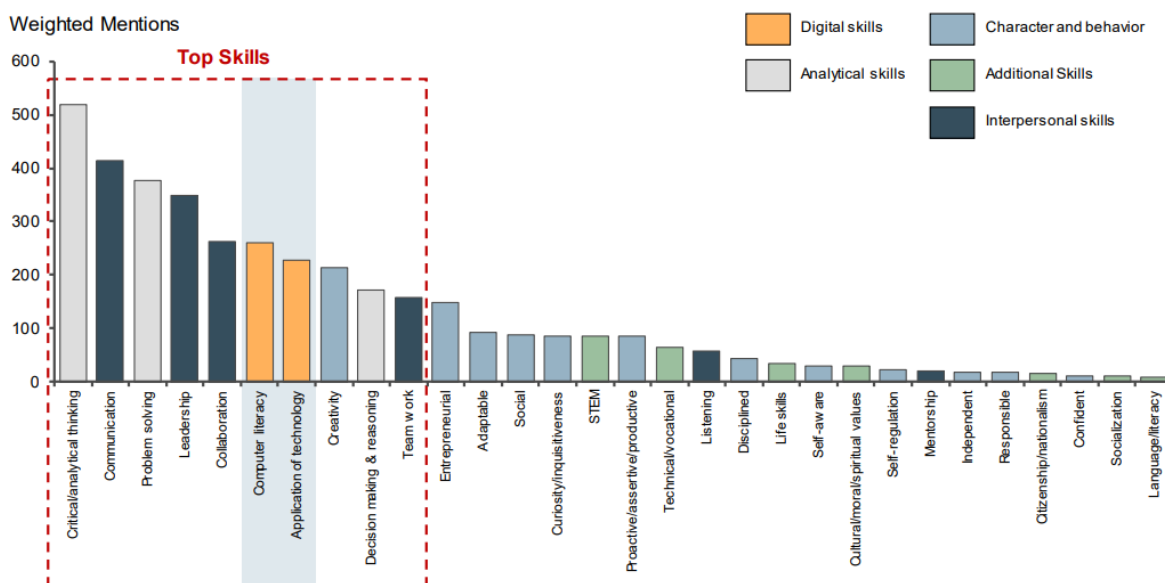


Figure 7: Digital Skills needed by all Economies in the World<sup>27</sup>

### 3.2.2 Internet Connectivity

Internet penetration in Africa has increased from 24.8 percent in 2017 to about 26% by the end of 2020, with households that have home internet access increasing by 0.1 percentage points from 14.2 percent in 2017 to 14.3 percent by the end of 2020. Both fixed and mobile broadband markets have shown some growth over the last four years, with active mobile broadband subscriptions outpacing fixed broadband subscriptions. Nevertheless, a very significant gender gap and a rural/urban divide persist. In 2020, only 20.2 per cent of women used the Internet, compared with 37.1 percent of men. Moreover, only 6.3 percent of rural households had access to internet in 2020, compared with 28 percent of urban households. In the 15 to 24-year-old age group, 39.6 percent used internet in 2020, which is higher than the regional average, yet significantly lower than the world average of 69 percent<sup>28</sup>.

The rise of connectivity across the continent is stimulating deployment and use of digital services, which in terms as stimulating the rising demands of digital skills for both ICT and Non-ICT professionals. It is rising demand for skilled workforce and growing population that is behind the rapid expansion of the higher education sector on the continent. Currently, innovations and entrepreneurship are key flagship programmes and integral part of African higher education institutions. The increasing connectivity is also providing new opportunities with the emergence of eLearning and virtual education services providers. These technologies are providing opportunities of expanding skills development programmes, such as distance education and lifelong learning.

<sup>27</sup> Digital Skills in Sub-Saharan Africa Spotlight on Ghana by IFC World Bank Group

<sup>28</sup> ITU Publications Africa, 2021

### 3.2.3 ICT Policy Frameworks

In terms of policy aspirations, all African countries are focusing their national ICT policies on digital transformation of their economies and society into knowledge-based economies. The review of a number of national ICT policies and strategies on the continent reveals a pattern of critical focus areas as improving digital infrastructure connectivity and access, development of human capacity, development of digital services, and promotion of innovations and entrepreneurship.

For uniformed transformation through ICT most African countries have adopted collaborative regulation approach, which embraces holistic policy development involving various stakeholders. The collaborative regulation puts a new emphasis on consumer benefits and protection and leverages the resources of government institutions and industry to deliver them through organic consultation, collaboration and conciliation. In fairly successful countries, such as Mauritius, Kenya and Ghana, reputable laws governing the ICT sector have facilitated its growth, leading to the provision of more opportunities to citizens to participate in ICT. Good progress towards inclusive and collaborative regulation is needed for the good of all users of digital services, now and into the future. Collaborative regulation has a direct benefit in promoting ICT skills development, access and demand. Nations across the continent are making strategic investment in development of national level digital skills competence frameworks to guide the design and delivery of ICT skills capacity development programmes.

### 3.2.4 ICT Trends in Uganda

Just like other African countries, the Government of Uganda has taken deliberate steps to promote the development of the ICT sector as an enabler for social and economic transformation of Uganda. The government has put in place a number of legal and regulatory instruments such as; NITA-U 2009 Act, the Data Privacy and Protection Act, 2019, Computer Misuse Act, 2011, National Information Security Policy (NITAU- 2014) and the National Broadband Policy (MoICT-2018), Others are; the Press and Journalist Statute, 1995, the Electronic Media Statute, 1996, The Uganda Communications Act, 1997, the Rural Communications Development Policy, 2001 among others. These are all geared at enhancing access to ICT services and protection of the ICT service users.

The Uganda Vision 2040 identifies Information and Communications Technology (ICT) among the key fundamentals to spur Uganda's transformation into a modern and prosperous country. The Third National Development Plan (NDP III, 2020/21-2024/25) also identifies ICT as a fulcrum of development; an accelerator, amplifier, and augments of change; and a sector with a huge potential to improve national productivity by making Government and business enterprises more efficient, effective and globally competitive. The National Resistance Movement (NRM) Manifesto 2021-2026 also defines ICT as strategic pillar for social and economic transformation of Uganda into a middle-income country.

Operationally, the Government of Uganda has prioritized Digital Transformation Programme in its NDPs (II & III) by pursuing the following among other objectives; to increase the ICT human resource capital through:

- a) Developing a well-grounded ICT professional workforce; developing an ICT professional's quality assurance framework.
- b) Providing digital literacy training; developing ICT centres of excellence and vocational institutions.
- c) Reviewing and implementing ICT training curriculum at all levels of education system in line with the emerging technologies.
- d) Implementing targeted capacity building for teachers and trainers to incorporate ICT in pedagogy to acquire the relevant skills.

In light of the above, over the last five years, Uganda has focused on promoting the use of ICT in the entire economy and society through:

- a) Deploying secure, integrated and cross sector infrastructure
- b) Developing and promoting usage of quality communication and e- services
- c) Digital inclusion and citizen participation
- d) Ensuring standardization and interoperability of systems
- e) Enhancing national cyber security
- f) Promoting innovation and commercialization of ICT products
- g) Enhancing digital literacy and developing skills through the Digital Literacy Transfer Project (DLTP) by UCC.
- h) Supporting development and uptake of emerging technologies such as Fourth Industrial Revolution Technologies.
- i) Process re-engineering and automation for end-to-end government business and service delivery.

The country currently has one of the fastest expanding ICT sectors, signaling the increasing access to the internet and associated services. As of September 2020, the country had a nationwide telephone penetration of 64 lines for every 100 Ugandans. While still growing, Uganda is still well below the average in Africa of 74.60 per 100 inhabitants. On the global connectivity index, Uganda stands at 77 positions of the 79 countries profiles, behind Kenya at 70 and Ghana at position 72. Uganda's internet penetration stands at between 37-49%, and the number of registered internet users rapidly increased to 20 million in September 2020, steered by COVID-19 demands for online services, the expansion of access to sea cables, growing ICT services and the lowering costs of international bandwidth.

However, according to a study by Adriano et al<sup>29</sup> , the initiatives above, have not been as successful as originally envisioned due to the scarcity of critical ICT skills such as; DevOps specialists, Graphic Designing specialists, Software Engineering specialists, Software Developers, Software Quality Testing (SQT) Automation specialists, Web Programming specialists, System auditors, Information Technology managers, Enterprise architecture specialists, among others. In this space, UICT with its mandate perfectly fits in as a training institution of government, an agent in ICT skills-based training/learning, research, innovation, pre-incubation, consultancy and advisory Centre to provide the

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<sup>29</sup> 2021 JCSE-IITPSA ICT Skills Survey Adrian Schofield & Professor Barry Dwolatzky

much-needed ICT skills, knowledge and attitudes for the country's growth. In line with the recommendations of the 'Report on the Market Needs Assessment Survey for the Review and Development of the UICT Strategic Plan (2021/2022 – 2025/2026)', the Institute has a task to develop and/or enhance comprehensive programmes for enhancing digital literacy or ICT skills of human resources across MDAs and LGs, and for providing continuous or periodic retooling or in-service training in ICTs.

### 3.3 ICT Skills Supply Patterns

A number of methods were used to establish the supply patterns of ICT skills and training which included, key informant interviews and literature review which were focused on evaluation of curriculum development practices, estimated number of ICT graduates at Certificate, Diploma, Bachelor and Postgraduate levels annually, type of programmes offered, models of programme delivery, staff calibre, and level of stakeholder engagement in programme design and delivery modes.

#### 3.3.1 Number of ICT Graduates Produced

Currently, Uganda's higher education system is estimated to produce over 10,000 ICT graduates at various levels from certifications to PhD, majority being on certificate level.<sup>30</sup> On average, each university offers about 6 ICT programmes at 4 levels: certificate, diploma, Bachelor's and master's degree. Below are the average annual ICT graduates produced per institution sampled.

##### a) Makerere University, College of Computing and Information Sciences

The College of Computing and Information Science (CoCIS) offers a number of programmes, over 50 at certificate, diploma, Bachelor and postgraduate levels in the 2 schools using a demand driven approach for curriculum development to gather stakeholder input mainly through curriculum development workshops, internship feedback, international benchmarking and to a lesser extent, tracer studies.

The University is home to the youngest and largest cohort of ICT doctoral graduates at the COCIS in the country, with more than 50 academic staff with doctorate degrees in various ICT specializations, most of whom have graduated from outside Uganda. The Makerere University graduates an average of 4,000 students annually at various qualifications, graduate, professional, undergraduate and graduate levels in ICT and related disciplines.

According to MoICT & NG Skills Training and Needs Assessment Report, 2021, most of the ICT start-ups on Kanjokya Street (*a start-ups hub area*) are alumni of the College (CoCIS). The College delivers training using student centred learning, encouraging innovations, critical thinking, and entrepreneurship. The college also runs a number of professional programmes in collaboration with a number of partners such as Huawei, CISCO Systems, Microsoft, ITU among others. The College provides customized digital skills programmes through the Centre of Innovation and Professional Skills Development (CiPSD) for both government and private sector. It is estimated that COCIS has trained over 50,000 people in the last 10 years on various levels (certificate, diploma, Bachelor and postgraduate degree). In the last 12 months alone CoCIS through her Centre for

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<sup>30</sup> [http://www.ugandainvest.go.ug/uiia/images/Download\\_Center/SECTOR\\_PROFILE/ICT\\_SECTOR\\_PROFILE.pdf](http://www.ugandainvest.go.ug/uiia/images/Download_Center/SECTOR_PROFILE/ICT_SECTOR_PROFILE.pdf)



Innovation and Professional Skills Development (CiPSD) has trained over 5,000 individuals through Huawei, CISCO and MasterCard partnerships. Makerere University, College of Computing and Information Sciences, is the largest ICT training facility in the country. Table 5 below shows the number of ICT graduates from the College for the period of 2015 to 2019 as a trend indicator of ICT skills supply to the sector annually.

**Table 9:** Number of ICT graduates from CoCIS for the period; 2015 to 2019 (Source: Makerere University Annual Reports)

Year	Undergraduate	Masters
2019	780	24
2018	933	39
2017	1199	76
2016	1578	62
2015	1110	80

### b) Nakawa Institute of Business Studies

Nakawa Institute of Business Studies commonly abbreviated as NIBS, was established in 1998 as a body Corporate with an objective of providing tertiary Education. It was registered and classified by the Ministry of Education and Sports as a Tertiary Business Training Institution in 1999. Among other things the Institute focuses mainly on serving Ugandans and non-Ugandans; especially those faced with varied constraints that inhibit them from accessing Government sponsorship. The Institution provides affordable opportunities for accessing intentionally recognized Academic awards. As such NIBS offers training to persons interested in obtaining Certificates and Diplomas awarded by the Uganda Business and Technical Examination Board (UBTEB) and the Directorate for Industrial Training (DIT).

The major Study Programmes offered at NIBS include Business Diploma 2 years (UBTEB), Technical Diploma 2 years (UBTEB), Business Certificate 2 years (UBTEB), Technical Certificates 2 years (UBTEB), Community Polytechnic Certificate – 3 years (UBTEB), Technical Courses 2 years Examined by Directorate for Industrial Training and other short courses of 2 -3 months.

The key qualifications for entry to a diploma course, requires the applicant to have obtained at least 1 principal pass and 2 subsidiaries at A' level or its equivalent. The Diploma enables the student to advance to a Bachelor's degree at University level. The Technical Diploma also enables the student to advance to a Bachelor's degree at University level. The minimum Qualifications for Technical Diplomas under UBTEB, requires the applicant to have passed Physics and Mathematics at O' level (UCE) and must have done Sciences at A' level (UACE) or its equivalent.

### c) Makerere Business Institute

MBI was founded by an enterprising professional as a private business skills training institution in 1993 with the prime objective of providing quality and pertinent business education that instils confidence to the graduates and puts them at a competitive advantage in the labour market. MBI imparts practical skills for job creation and awards diploma and certificates that are internationally recognized for further studies and job



placement both in private and public Universities/service.<sup>31</sup> While requirements for short courses are open at the institution, it requires an O' level certificate, one principle pass and 2 subsidiaries at A' level or a certificate in a relevant field to enrol for a diploma course at MBI, and an O' level certificate is a key requirement to enrol for a certificate course.

Courses offered at MBI include, Database designing and management, Dynamic Website designing and hosting, Desktop application development, computer repair and software maintenance, computer networks and data communications, computer graphics, computer applications and computer graphics and several other fields. The tuition for courses offered at certificate level range from 293,000 and above, Diploma courses cost 463,000 UGX for evening and 443,000UGX for day. The duration for short courses ranges from 1 week to 2 months.

#### **d) APTECH Computer School**

APTECH Computer School operates a total of 16 programmes, of which 6 programmes are for a certificate course and 10 are for diploma courses. APTECH is known for high quality experts in the field of information technology such as Cyber Security, Cisco, and other short courses that takes about 6 months. According to the most important information provider, APTECH is a validated international test centre for various certifications in ICT.

The school has a talented team of lecturers together with international experts. According to the Manager of APTECH, the school is a Software Engineering Centre with programmes suitable for Uganda's economic transformation. Key respondents said APTECH's curriculum development is demand-driven, based on research from ICT experts and feedback from student internships, workshops, international benchmarks and tracer studies. The knowledge and skill levels of the trainers, are measured according to APTECH's internal quality assurance framework. This framework is measured in the light of international best practices such as: Use of current technology in education, peer assessment of performance, level of students who have passed international exams, and student feedback.

According to key informants, the school graduates about 1000 students annually in various programmes and is one of the leading providers of ICT skill services in the country. Schools can organize customized ICT training programmes, except for those that require specific training equipment that requires time to mobilize<sup>32</sup>.

#### **e) ICT Association of Uganda**

ICT Association of Uganda is an Industry advocacy group whose main purpose is to aggregate the voices of the members in the sector at key decision-making levels. The

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<sup>31</sup> MBI website, About us page, 2022 ( <https://www.mbi.ac.ug/>) Accessed on 28<sup>th</sup>,

<sup>32</sup> MoICT&NG Skills Training and Needs Assessment Report, 2021

Association through its members does provide internship, coaching and mentoring programmes to mainly young professionals in the field of ICT. Through partnering, the association does provide capacity building programmes largely to members especially in the areas of business development, compliance, product innovation, among others. The association does participate in public dialogues, skilling initiative, curriculum development approaches and guest lecturing through her members. The association has also been at the forefront of ICT innovation sub-sector development as the driver of skilling and innovation development. The association through its members does provide annually, over 1000 internship placements, 10 networking events and 3 training events, according to former Committee Members of the Association.

#### **f) Innovation Hubs**

Uganda is estimated to have between 10 to 15 operational ICT innovation centres and hubs spread across the country. Most of these hubs are based at tertiary academic institutions. According to key informants, these hubs provide skilling programmes targeting both soft and hard technology skills. The most popular hubs are Outbox, HiveColab, Innovation village, Centre for Innovation and Professional Skills Development, Makerere Innovation Centre and ComTech Mbarara. It is estimated by some key informants of the study that these innovation hubs do train about 500 people per year on various short-term skills. The hubs are largely unfunded and most work is done on cost recovery and margin make-ups. The programmes in the hubs are a mixtures of ICT technical skills like programming to business courses like product development and marketing. The programmes are largely delivered face to face over a short duration spanning a few days to weeks.

### **3.4 ICT Curriculum Development Practices**

The study sought to establish how academic and ICT training institutions approach curriculum development, the results from the key informant revealed the following;

#### **a) Level of Participation in Curriculum Development**

Engagements with various key informants revealed that majority of the stakeholders 68.2% do not participate in curriculum development process while only 27.3% do as illustrated in the **Error! Reference source not found.** below.

**Table 10:** Level of stakeholder participation in curriculum development

<b>Variable</b>	<b>Frequency</b>	<b>Percentage</b>
Yes	12	27.3%
No	30	68.2%
Not sure	2	4.55%
<b>Total</b>	<b>44</b>	<b>100</b>

**b) Reasons for insufficient engagement between academia and industry in curriculum development:**

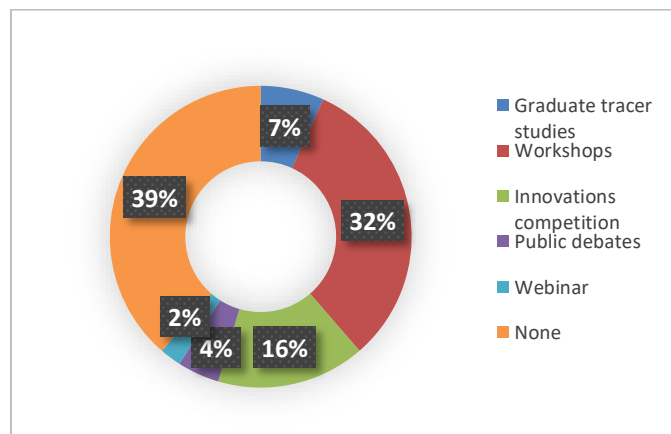
- Limited time to participate in the exercise due to high workload.
- Lack of invitation from academia
- Low incentives for industry to participate
- Lack of enabling policies at institutional level to enable participation of staff in curriculum development
- Lack of facilitation to participate
- Poor mobilization and coordination by academia

As noted by a Key Informant from one of the MDAs;

*“There is limited participation in curriculum development by most MDAs due to the lack of clear engagement models by academic training institutions, most of the training institutions do not involve MDAs to participate in their programmes design or delivery”*

**c) Ways of Engagement in Curriculum Development**

The study sought to establish how academia and ICT training institutions are involved in the curriculum development process and the results indicated that **workshops and innovation competitions** are the most commonly used ways of engagement, while the least forms used were webinars and public debates. It is worth noting that 39% of key informants indicated not being involved in any form of curriculum development as illustrated in the *Figure 8: Ways of engagement in curriculum development.*



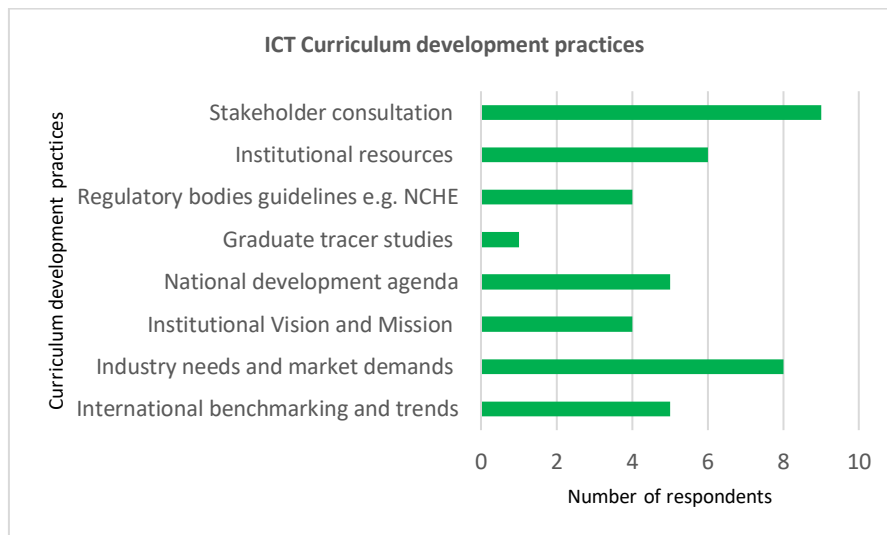
**Figure 8: Ways of engagement in curriculum development**

According to a key informant from NCDC,

*“The curriculum development process adopted by NCDC requires engagement with the world of work before and during the curriculum development process, it further encourages participation of industry practitioners in the delivery of the courses.”*

According to MoICT & NG Skills Training and Needs Assessment Report (2021), industry needs and institutional resources are the key pillars that influence the type of ICT

programme development at given training institution. This in part explains the limited availability of industry on demand courses like data science, robotics and artificial intelligence, cloud computing, embedded systems, computer systems engineering and digital forensics as they are resource intensive, requiring a higher investment by training institutions. **Error! Reference source not found.** shows various approaches of academia-industry engagement during curriculum development;



**Figure 9: Key ICT curriculum development practices**

### 3.4.1 Type of ICT Programmes Offered

The most common fields of study in ICT in various training institutions are; information technology, computer science, software engineering and business computing and information systems among others, while the most common ICT professional certifications are; Cisco networking, Microsoft technologies, Oracle, Cyber security and office productivity applications (ICDL). The ICT professional certifications are largely classified in three levels; Associate, Professional and Expert.

Most of the ICT professional associate certificate programmes cost an average of 600 USD to complete, meanwhile the professional courses cost about 1200 USD and digital literacy and productivity programmes cost an average of 85 USD. The average tuition fees for an ICT Bachelor’s degree courses at universities is 300 USD per semester, exclusive of functional fees, which averages 250 USD.<sup>33</sup> Majority of higher education institutions and IT consulting firms do provide customized training programmes to suit the clients’ unique requests. Figure 10 shows the summary of short course information at COCIS Makerere University, highlight the type of course duration, study schedule and fees charged.

<sup>33</sup> MoICT & NG Skills Training and Needs Assessment Report, 2021

COURSE	START DATES	SCHEDULE	COST UGX
Certificate in Computer Applications (CCA) (5 weeks)	7/03/2022	Week days (9 - 11 am & 11am - 1pm)	200,000
IC3 Digital Literacy ( 2 months)	7/03/2022	Weekdays (9 - 11am)	800,000
IT Essentials (PC Repairs & Maintenance) (6 weeks)	7/03/2022	Week days (10 - 12 pm) only	450,000
Programming	28/03/2022	Week days (10 - 12 pm) only	600,000
Microsoft Azure Infrastructure – 5 modules ( 2 Months)	25/04/2022	Week days (6 - 9 pm) only	700,000@
Cisco Certified Networking Associate (6 Months)	7/03/2022	Week days (6 - 8 am,)	650,000
	7/03/2022	Week days (10 - 12 pm, 6 - 8 pm)	700,000
		Weekends	
CCNA Security (2 months)	28/03/2022	Week days (6 - 8 pm)	550,000
CCNA Cyber Security Operations ( 2 months)	28/03/2022	Week days (10 - 12pm)	700,000
International Computer Driving License (2 Months)	28/03/2022	Week days (5 - 7 pm)	800,000
Computer Systems Engineering (CSE) (10 weeks)	28/03/2022	Week days (4 - 6 pm)	800,000
ORACLE (3 Months)	25/04/2022	Weekends only	800,000
Cisco Certified Networking Professional (6 Months)	25/04/2022	Week days (6 - 8 pm)	1,000,000
Cert. in Graphics & Image Editing (8 weeks)	28/03/2022	Week days (5 - 7 pm)	450,000
Dynamic Website Development (10 weeks)	28/03/2022	Weekends only	500,000
Cert. in Video editing & Motion Graphics (10 weeks)	28/03/2022	Week days (5 - 7 pm)	500,000
Geographical Information Systems (1 month)	28/03/2022	Week days (5 - 7 pm)	600,000
LINUX Systems Administration (2 months)	28/03/2022	Weekends only	500,000
Mobile Applications Development (2 months )	28/03/2022	Week days (10 - 12 pm)	500,000

**Figure 10:** Structure of short courses at COCIS, Makerere University

**Table 11** below summarizes programmes offered at all the aforementioned institutions in sub-section 3.3.1 above.

**Table 11:** A Summary of Key ICT skills providers in Uganda

No.	Institution	Short Courses/Certificates	Diploma Courses	Bachelor's Degree Courses
1	Makerere University	Certificate in Computer Application, ICDL, IT Essential 1&2, CCNA 1-4, CCNP, Oracle Certified Associate Programme, Oracle Certified Professional, Microsoft Certifications MCITP, MCDBA and MCSE, Website development	Diploma in Computer Science and Information Technology (DCSI)	Computer Science, Information Technology, Information Systems, Software Engineering, Data Communications and Software Engineering, Information Systems and Technology.
2	APTECH Computer Training Centre	National Certificate in Information and Communication Technology, ACSE (Advanced Certificate in Software Engineering), CISSP - Certified Information Systems Security Professional PCSE (Professional Certificate in Software Engineering), CPISM (Certificate of Proficiency in Information Systems Management), HDIM (Higher Diploma in Multimedia) , PCIM (Professional Certificate in Multimedia), CIMA (Certificate In Multimedia & Animation), CIM (Certificate in Multimedia), HDIM (Higher Diploma in Multimedia), PCIM (Professional Certificate in Multimedia), CIMA (Certificate In Multimedia & Animation), CIM (Certificate in Multimedia)	ADSE (Advanced Diploma in Software Engineering) HDSE (Higher Diploma in Software Engineering) HDIM (Higher Diploma in Multimedia)	
3	Nakawa Institute of Business Studies	Certificates in Information Technology, Computer Applications, Computer Repair and Maintenance, Statistical and Data Analysis, Computerized Accounting, Networking, Database Management, Video Editing and Shooting, Programming, Information Systems Management	Diplomas in Information Technology, Computer Science, Networking and PC Engineering, Graphics Design, E-commerce and Web design, Business Computing.	

No.	Institution	Short Courses/Certificates	Diploma Courses	Bachelor's Degree Courses
4	Makerere Business Institute	Database designing and management, Dynamic Website designing and hosting, Desktop application development, computer repair and software maintenance, computer networks and data communications, computer graphics, computer applications and computer graphics	Diploma in I.C.T (Information and Communications Technology) Diploma in Business Computing	
5	Kampala International University	Certificate in computer science Certificate in library and information science	Diploma in Computer Science Diploma in Library and Information Science Diploma in Information Technology	
6	Clarke International University	Data Management and Analysis in Research (SPSS/STATS, Epi-Data & Info) 4 weeks Records Management and Information Systems in health Introduction to computer skills		Bachelor of Information Systems
7	Kampala University	Certificate in Computer and Information Technology (CCSIT) CCNA IT Essentials Cyber Security	Diploma in Computer Science and Information Technology (DCSIT)	Bachelor of Library and Information Science
8	Uganda Institute of Information and Communications Technology	Certificate in Information and Communication Technology	Diploma in Computer Technology (DCT) Information Technology Business (ITB) Diploma in Multimedia Technology (DMT) Diploma in Information Technology Science (DITS) Diploma in Electrical and Electronics Engineering (DEEE) Telecommunications Engineering (TE)	Software Engineering



No.	Institution	Short Courses/Certificates	Diploma Courses	Bachelors Courses
9	Cavendish University	Certificate in Information Technology	Diploma in Computer Science and Information Technology	
10	Victoria University	Basic Computer Applications Cisco Certified Network Associate (CCNA) Cisco- IT Essential	Diploma in Business Information Systems Diploma in Information Technology	Bachelor of Information Science, Bachelor of Science in Computer Science, Bachelor of Science in Computer Engineering, Bachelor of Science in Software Engineering, Bachelor of Information Systems & Technology, Bachelor of Science in Computer Security & Forensics, Bachelor of Science in Mobile Computing & Communications, Bachelor of Business Computing
11	Bugema University	Certificate in Information Technology CISCO Certified Network Associate (CCNA) CISCO Certified Network Associate Security (CCNAS) Linux Professional Institute Certificate (LPIC)	Diploma in Computer Forensics. Diploma in Information technology. Diploma in Information Technology	Bachelor of Information Technology and Computing, Bachelor of Information Systems, Bachelor of Library and Information Science
12	St. Lawrence University		Diploma of library and information science Diploma in information technology Diploma in Computer science	Bachelor of Computer Science, Bachelor of Information Technology, Bachelor of Science in Software Engineering, Bachelor of Science in Computer Engineering

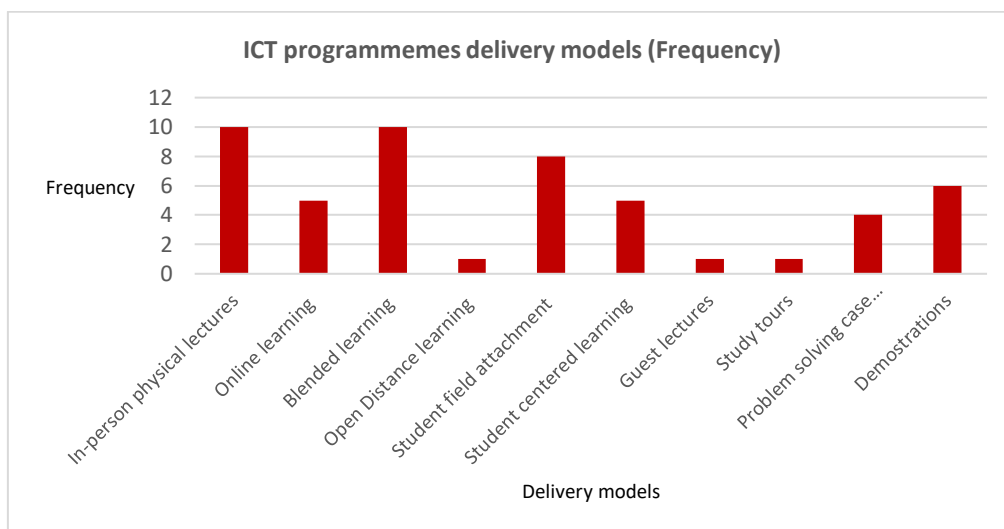
No.	Institution	Short Courses/Certificates	Diploma Courses	Bachelors Courses
13	Nkumba University	Computer Essentials, Microsoft Office, Online Collaboration, IT Security Advanced MS Office, Data Analytics, Advanced Databases, ICT in Education and Health, Graphics and Branding, Mobile App Development	Diploma in Computer science Diploma in Graphic Digital Design Diploma in Information Technology	
14	Uganda Christian University	Data Management and Analysis, Health Informatics Cisco Certified Network Associate (CCNA) Certificate in Computer Applications Certificate in Web Development Certificate in Cyber-Security	Diploma in Entrepreneurship & Information Technology	Bachelor of Applied Computing & Technologies
15	Ndejje University	Advanced Certificate in Computer Science	Diploma in Computing and Information Technology (DCIT) Diploma of Computer Science with Education	
16	International University of East Africa	Certificate in Multimedia Design Certificate in Web Design and Web Development Certificate in Graphic Design Certificate in 3D Game Design and Development CCNA	Diploma in computer science	Bachelor of Computer Science and Information Technology (BCSIT)

### 3.4.2 Models of ICT Academic Programme Delivery

The results of the assessment revealed that, majority of the undergraduate ICT programmes in the country are delivered via face-to face lectures on day and evening study arrangements, while postgraduate programmes which offer more specialization are largely delivered through evening and weekend face to face programmes.

The study resulted revealed that, the post Covid19 era is characterized rapid integration of eLearning at most university, as thus a number of universities include Makerere University, Nkumba University, Uganda Technology and Management University (UTAMU), ISBAT University and Virtual University among others have adopted online learning and offer some ICT programmes through blended learning models.

According to the MoICT&NG Skills Training and Needs Assessment Report (2021), the most commonly used ICT delivery model was; In person physical lectures followed by blended learning and student field attachment, Figure 11 below captures these views from the key informants on the ICT skills supply side on ICT academic programme delivery. (Illustrated in **Error! Reference source not found.**)



**Figure 11: ICT academic programme delivery models**

The following was noted by a lecturer at Makerere University:

*"In our programme design, nearly all ICT academic programmes have over 60% course load in terms of lecturer hours and less than 40% in other learning activities like practical's and field work. Also, all our undergraduate courses are designed to have course work graded at 40% and written final exam at 60%. Yet for courses of this nature, practical assessment should have been the best"*

### 3.4.3 Calibre of ICT Staff in ICT Skills Training Institutions

The recent study by the National Council for Higher Education (NCHE) and Makerere University show that Uganda has a about 1,179 PhD holders in various disciplines of these, 1,025 are based at public universities, while 172 are based at private universities,

moreover, very few of these are in the ICT field. According to key informants, it is estimated that Uganda has less than 100 PhDs in computing and information technology, most of who (~65%) are estimated to be stationed at Makerere University College of Computing and Information Sciences. The analysis of respondents of ICT skills services provider revealed that most of the academic staff at universities (~70%) at least possess a master's degree; a clear indicator of high calibre staff. However, fewer academic staff possess industrial professional certifications such as Cisco, Oracle, Microsoft certifications among others. The lack of professional qualification among academic staff might be responsible for the weak industrial experience passed on to graduates from these training institutions<sup>34</sup>.

This was well stated by one key respondent at one of the universities consulted:

*“Industrial professional certifications are not recognized by the university in terms of academic career progress and there are no other incentives for staff to acquire these qualifications. Reason most of us don't pursue those qualifications even if they're key in improving our quality of programme delivery, hence, overall quality of graduates”*

#### **3.4.4 Overview of ICT Skills Training Suppliers in the Country**

In terms of training service providers, Uganda has about 53 universities<sup>35</sup>, majority (over 70%) of which do offer courses in ICT at the levels of certificate, diploma, Bachelors and postgraduate level. There are also over 80 diploma awarding institutions of which, majority offer courses at certificate and diploma level in ICT field.

Furthermore, there are over 500 private consulting firms, listed by NITA-U as providers of ICT training services as part of their core services<sup>36</sup>. There is a wealth of; Industry professional certifications in the country (over 200), Open-Source online programmes (In thousands) and On-Job coaching and mentoring (available in nearly all organizations). **Error! Reference source not found.** highlights the status of ICT skills providers in the country.

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<sup>34</sup> MoICT & NG Skills Training and Needs Assessment Report, 2021

<sup>35</sup> A list of all Registered Institutions <https://unche.or.ug/institutions/>

<sup>36</sup> List of certified Firms <https://itco.nita.go.ug/list-of-certified-companies/>



Figure 12: ICT skills service providers

### 3.4.5 ICT Skills Demand Patterns

Through key informant interviews, focus group discussions, scenario planning and literature review, the demand side assessment focused on drivers of ICT skills demand in target sectors and institutions, ICT professionals in short supply, in-service ICT skills capacity building in target organizations, target organization staff willingness to invest in ICT skills development and associated incentives. The supply side assessment, on the other hand, focused on evaluation of curriculum development practices, estimated number of ICT graduates at bachelor and postgraduate levels annually, type of programmes offered, models of programme delivery, staff calibre, and level of stakeholder engagement in programme design and delivery modes. The study also reviewed the key finding of the MoICT & NG Skills Training and Needs Assessment Report (2021). The matrix below summarizes the key study finding on thematic issues:

Issue	Description
<p><b>Key ICT Skills in demand for both ICT and Non-ICT professionals</b></p>	<p>Generally, ICT professionals are expected to possess advanced skills in; office productivity systems like MS Office, internet and email application, e-government systems aligned to their sector and areas of deployment, cyber security and digital forensics, cloud computing and virtualization, wireless computing technologies, institutional specific customer software’s and excellent skills in report writing and system incident management.</p> <p>Non-ICT professionals on the other hand are expected to have proficiency in; office applications, web and e-mail applications, functional enterprise systems and associated e-government systems, data management and security, presentation and collaboration, among others.</p>

Issue	Description
<b>ICT professionals in short supply on target MDAs</b>	The key ICT professionals in short supply include; cyber security experts, data scientists, multi-media content authors especially animators, enterprise systems developers, embedded systems developers, software architects and business process engineers
<b>Drivers for ICT skills demand in MDAs</b>	The key drivers for ICT skills demand in MDA are; government policy on digitalization and e-government, rapidly expanding ICT sector and internet penetration, increased access to ICT devices like smartphones and laptops, global geo-political forces which are promoting nationalism over globalization, forcing countries to develop local capacity to service their citizens.
<b>In-service ICT skills development on MDAs</b>	<p>To remain relevant and competitive, institutions have a number of ICT continuous professional development options available and key among them include:</p> <ul style="list-style-type: none"> <li>• Coaching: In-house hands-on support (skilling) to individual staff by senior internal ICT technocrats</li> <li>• Mentoring: Continuous guidance by senior ICT Technocrats</li> <li>• Job shadowing</li> <li>• Job rotation</li> <li>• Online-based self-paced training</li> <li>• Peer to peer support</li> <li>• Workshops facilitated by external experts</li> <li>• Formalized refresher Courses/ Short courses</li> </ul> <p>The assessment of the state of Continuous Professional Development (CPD) reveal that about 70% of the organizations sampled had not provided any specific ICT skills training to both ICT and non-ICT professionals as a means of building their ICT competences in the last 12 month or more. This is contrary to the principle of Professionalism, which requires all public sector institutions to plan, monitor and evaluate trainings, as espoused in the Uganda Public Service Training Policy (2006).</p>
<b>CPD incentives and MDA staff willingness to invest in ICT skill development</b>	<p>Majority of the RICP agencies offer appraisal points, staff recognition, sponsorship of the training activities, salary increment, study leave and promotion to encourage staff acquire relevant knowledge and skills.</p> <p>In terms of staff willingness to acquire ICT skills, majority of staff in MDA's (both ICT and non-ICT) indicated readiness to invest in ICT skills development if they are sponsored or given time off, but less willing if they are required to sponsor themselves.</p> <p>There is limited access to CPD as over 70% of the organizations sampled had not provided any specific ICT skills training to both ICT and non-ICT professionals as a means of building their ICT competences in the last 12 months, beside nearly 80% of the staff had not attended any CPD in the less 12 months.</p>
<b>Business downtime due to COVID-19</b>	Due to COVID-19 Lock downs, business, both in the public and private sectors have experienced slow down effect. This has drastic effect on uptake of ICTS and e-government services.
<b>Low Per capital income (National)</b>	Uganda's Per capital income stood at 860.00 USD by November 2020 with annual economic growth rate of 6.3%. This is still low (below 1 USD). The citizens may not have enough money to sustainably meet the

Issue	Description
	costs of ICT in the household. The 2018 RIA After Access Survey confirmed that affordability of devices and Services were the main constraint on uptake and use.
<b>Weak integration of E-government Service Platforms</b>	A number of e-services have been rolled out, including e-procurement portal, e-passport system, e-receipting, IFMS, IPP. Some still work in silos (not integrated).

### 3.4.6 Comparison of the Respondent Demographics

The study demographics are detailed in this section.

#### a) Respondents Gender versus Category

Analysis of results from both key informants and individual respondents indicated that there were more male respondents from the ICT professional category compared to the females, as indicated in Table 12 below.

**Table 12:** Showing cross tabulation of gender against Category (ICT/ non-ICT)

Category	Gender		Total
	Female	Male	
ICT	23	80	103
Non-ICT	13	30	43
<b>Total</b>	<b>36</b>	<b>110</b>	<b>146</b>

The results above are also backed by the Code Institute article on gender gap in ICT, that states that; the estimated figures show that the gender gap in ICT is not specific to just one country. In South Africa, approximately 28% of the tech workforce are women. In Canada, reports indicate that 26.7% of ICT employees are female. Australia is similar situation, with one source indicating 28% of their sector being female. As a continent, Europe seems to be in an even worse state, with the European Institute for Gender Equality stating “around 17% of the almost 8 million ICT specialists are women”. According to Forbes, women represent 24% of the tech industry in the USA<sup>37</sup>. Therefore, the respondent’s demographics are backed by the global sector trends implying the opinions of the respondents from the gender perspectives can be relied on to make objective deduction on the objectives of the study.

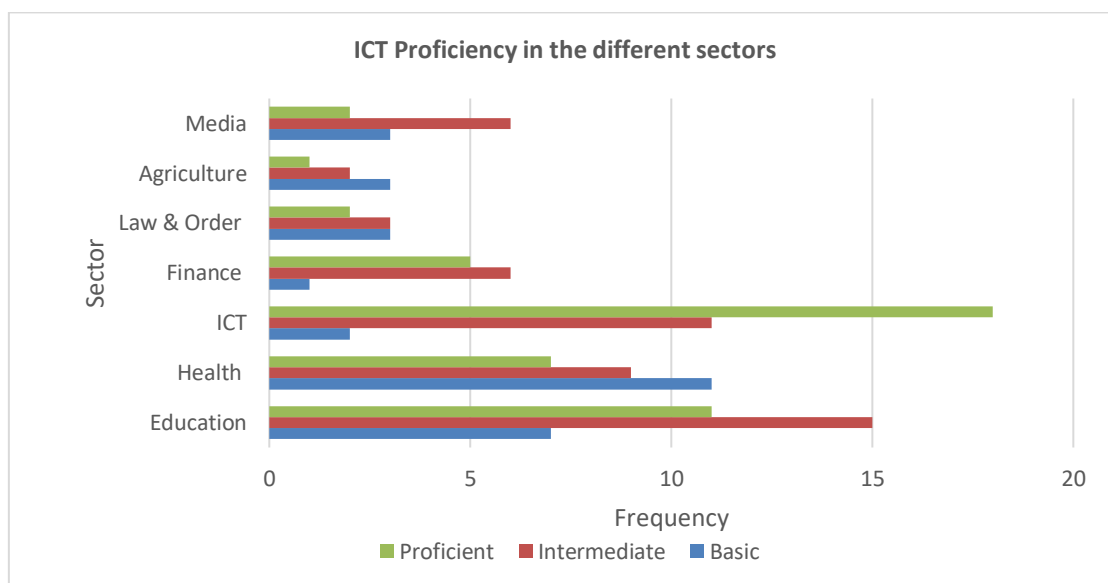
#### b) Level of ICT Digital Skills Proficiency Per Sector

Digital proficiency are complementary skills which involve the use of business, commercial, or consumer applications and tools like word processing, spreadsheets, business and desktop graphics, email, and collaboration tools. The digital skills proficiency against the sectors of operation for the different stake holders in the ICT,

<sup>37</sup> Code Institute article on gender gap in ICT. Source : <https://codeinstitute.net/global/blog/gender-gap-in-ict/>, accessed on 21<sup>st</sup> March 2021



education, health and finance sectors respondents indicated high levels of ICT proficiency compared to other sectors as illustrated in *Figure 13* below.



**Figure 13: Respondents ICT proficiency against sector**

*(Basic – Foundational computer literacy skills; Intermediate – Computer literacy and competency beyond the foundational level; Proficient – Computer literacy and competency beyond the intermediate level applied in educational and work settings.)*

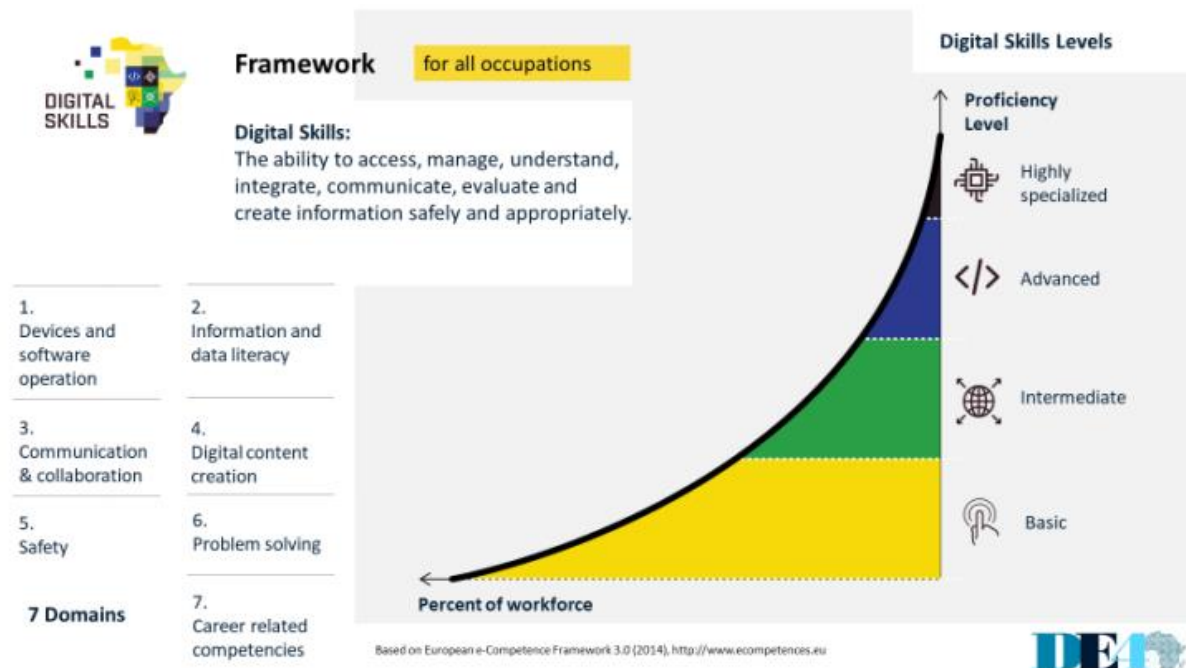
As illustrated in Figure 13, most sectors of the economy have insufficient digital literacy skills an indicator to government to formulate policies that would encourage and stimulate the use of ICT in the different sectors of the economy, this is an opportunity for UICT to exploit the existing gaps and provide on demand ICT programmes and related human capacity building initiatives.

### 3.5 Skills Gap Analysis

This sub-section highlights the ICT professional competencies of the different cadres in the target MDAs.

#### 3.5.1 ICT Professional Competencies

This sub-section presents the results of analysis of the current ICT skills possessed by employees at different levels of responsibility in target organizations, skills that new ICT professionals lack the most, a synthesis of Uganda’s ICT legal and regulatory environment, enabling infrastructure, Proficiency in key computer applications, Knowledge on key ICT concepts, Work place behavior and UICT staff skills gaps. According to the European Digital skills competencies framework upon which other frameworks like Skills for Information Age (SFIA) are development. Every formal occupation/ professional in a knowledge based digital economy must possess at least 7 critical cross cutting digital skills as illustrated in *Figure 14* below.



**Figure 14: The Digital Skills Framework**

**a) ICT Skills Possessed by Employees at Different Levels of Responsibility**

According to the Manpower Survey Uganda, (2016/2017), Strong skills required to succeed in a career include Managerial skills, Communication skills, Human Health, Social work activities, Public Administration, Customer care skills. Considering the occupation, the skills required for projected jobs for Managers include: managerial skills, technical skills and communication skills. In the case of forecast jobs for Professionals the required skills range from technical skills, to didactic/teaching skills to managerial skills. This was demonstrated in figure 15 below.

**Table 4.19: Skill Requirements for Forecast Jobs by Main Activity of Establishment, Occupation, Sector, (%)**

Activity	Skills											Total	Number
	Managerial	Technical	Entrepreneur	Language	Customer				Teaching	Communicate	Other		
					Care	Creativity	IT skills						
Manufacturing	7.1	37.6	6.0	1.3	5.9	9.3	2.6	0.1	13.6	16.5	100	33,843	
Trade and Repairs	10.6	17.4	4.7	3.1	18.5	3.7	4.2	3.1	10.8	24.1	100	12,280	
Transportation & Storage	19.5	11.2	3.7	1.7	18.5	0.4	3.5	0.0	8.6	32.8	100	8,573	
Accommodation and Food	6.9	17.9	1.9	2.5	29.4	7.8	0.8	0.1	10.8	21.9	100	12,792	
Financial and Insurance	18.2	19.3	3.2	1.8	19.4	5.5	6.2	0.2	12.1	14.0	100	6,916	
Professional, Scientific & Technical	19.5	27.9	0.9	1.6	9.2	3.0	5.5	0.8	4.6	26.9	100	7,008	
Administrative & Support Services	23.1	17.1	0.0	4.9	8.2	1.8	7.7	0.8	18.6	17.8	100	3,835	
Public Administration	23.1	43.0	3.0	0.6	3.0	2.1	8.2	1.5	9.2	6.4	100	56,282	
Education	8.3	21.8	1.1	3.0	4.6	3.5	4.7	19.2	16.4	17.4	100	60,872	
Human Health and Social Work	9.2	56.7	0.5	0.9	10.2	1.8	1.6	0.5	6.9	11.5	100	16,194	
Arts, Entertainment & Recreation	4.7	27.4	0.0	0.0	21.9	1.1	2.7	0.9	17.1	24.3	100	2,982	
Other Service Activities	15.6	12.5	3.6	2.6	18.2	8.8	6.2	0.6	9.2	22.7	100	5,275	
<b>Total</b>	<b>13.4</b>	<b>30.9</b>	<b>2.7</b>	<b>1.8</b>	<b>8.7</b>	<b>4.1</b>	<b>4.9</b>	<b>5.8</b>	<b>12.0</b>	<b>15.7</b>	<b>100</b>	<b>226,852</b>	
<b>Occupation</b>													
Managers	40.2	22.4	5.0	0.3	3.6	4.2	4.6	3.7	14.0	2.1	100	29,097	
Professionals	14.1	39.9	3.1	1.1	2.0	3.8	6.2	17.5	6.6	5.6	100	63,447	
Technicians & associate professionals	15.7	55.4	2.7	0.3	4.6	4.4	2.9	1.4	7.9	4.8	100	31,497	
Clerical support workers	9.8	22.6	1.8	2.4	23.9	4.6	19.2	0.6	10.7	4.6	100	21,050	
Service and sales workers	7.0	17.9	2.9	3.9	24.0	5.2	1.6	1.1	26.6	9.7	100	30,523	
Plant & machine operators & assemblers	0.5	62.2	0.3	0.7	1.6	0.2	0.1	0.0	14.8	19.6	100	7,102	
Other	0.0	79.1	3.5	1.6	1.3	10.4	0.0	0.0	0.0	4.1	100	4010	
Elementary occupation	1.4	20.6	0.2	9.2	17.8	10.1	0.1	0.0	20.3	20.2	100	13,396	
<b>Total*</b>	<b>15.0</b>	<b>34.9</b>	<b>2.9</b>	<b>1.9</b>	<b>9.3</b>	<b>4.7</b>	<b>5.3</b>	<b>6.6</b>	<b>12.4</b>	<b>6.9</b>	<b>100</b>	<b>200,122</b>	
<b>Sector</b>													
Public	19.3	42.4	2.1	0.7	3.6	1.8	7.1	5.4	9.0	8.4	100	81,863	
Private	10.0	24.4	3.0	2.5	11.5	5.4	3.6	6.1	13.7	19.8	100	144,989	
<b>Total</b>	<b>13.4</b>	<b>30.9</b>	<b>2.7</b>	<b>1.8</b>	<b>8.7</b>	<b>4.1</b>	<b>4.9</b>	<b>5.8</b>	<b>12.0</b>	<b>15.7</b>	<b>100</b>	<b>226,852</b>	

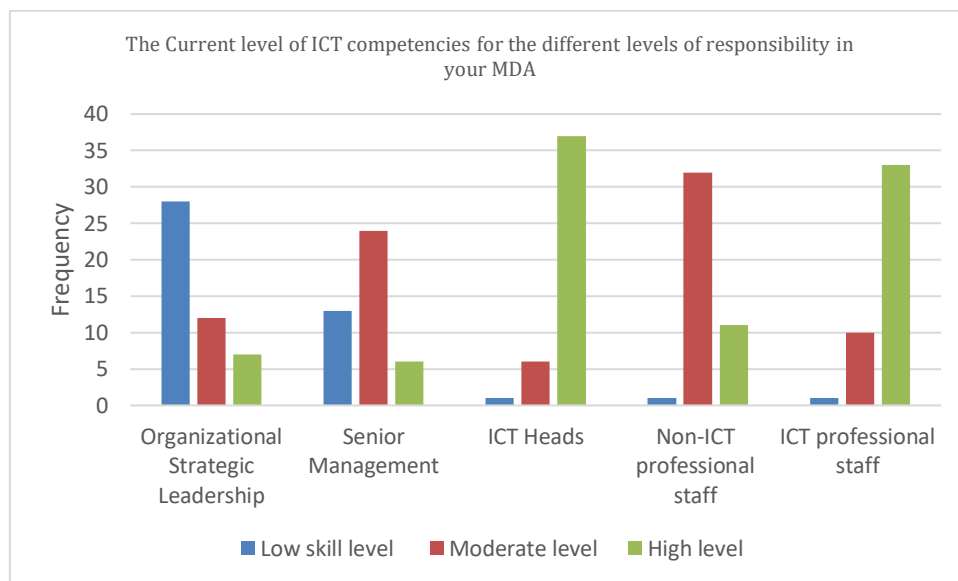
Note: Other includes Craft and related trades workers, skilled agricultural, fisheries and forestry workers and armed forces occupations

**Figure 15: Requirements for forecast jobs by Main Activity of Establishment, Occupation and sector**

As illustrated in figure 15 above, every occupation in a knowledge based digital economy requires both digital literacy skills and Information Technology skills. Digital literacy skills. Digital literacy refers to an individual's ability to find, evaluate, and communicate information through typing and other media on various digital platforms. It is evaluated by an individual's grammar, composition, typing skills and ability to produce text, images, audio and designs using technology<sup>38</sup>. IT skills (also known as information technology skills) are technical skills necessary to work within technical support, maintenance, and development. IT skills are a rather wide skill set that range from hardware instalment and software development to troubleshooting and data analysis.

<sup>38</sup> [https://en.wikipedia.org/wiki/Digital\\_literacy](https://en.wikipedia.org/wiki/Digital_literacy)

Results from the key informants revealed that ICT Heads have a high level of ICT skills proficiency followed by ICT professional staff while the Non-ICT staff and top organizational leadership have medium level ICT skills, it is worth noting that the strategic level leaders have low skill level as illustrated in *Figure 16* below.



**Figure 16:** The current level of ICT Competencies for the Different Levels of Responsibility

According to the Uganda Skills Needs Assessment Report, 2019 the lack of cognitive and socioemotional skills in Uganda’s economically active population seems to be a major hindrance to effective and efficient business operations in the different sectors besides insufficient technical skills, practice and work experience. “Although Technical skills are somewhat available, the lack of enthusiasm, motivation, and self-drive in skilled Ugandans is alarming.

The report also highlights skills gaps in most professionals and they include; Teamwork, Communication, Reporting, Creativity, Organisation, prioritizing and Planning work, Professionalism, working to Deadline/Time-management, IT skills, Problem solving, Giving and Receiving Constructive Criticism Overall, the lack of self-drive, enthusiasm and motivation is the most lacking skill among employees.

In terms of the current skills for ICT and Non-ICT professionals, respondents from the target organizations revealed that most Non-ICT professionals currently possessed basic digital literacy skills such as; use of E-government systems and internet use; while ICT professionals were more proficient in; System Administration and Mobile and Web technologies. However, it was observed that other emerging industry skills such as; data science, cyber security, content authoring, data analysis, communication, cloud computing, digital forensics and Internet of Things were a requirement for the 21st Century and the Fourth Industrial Revolution (4IR) as illustrated in *Table 13* below.

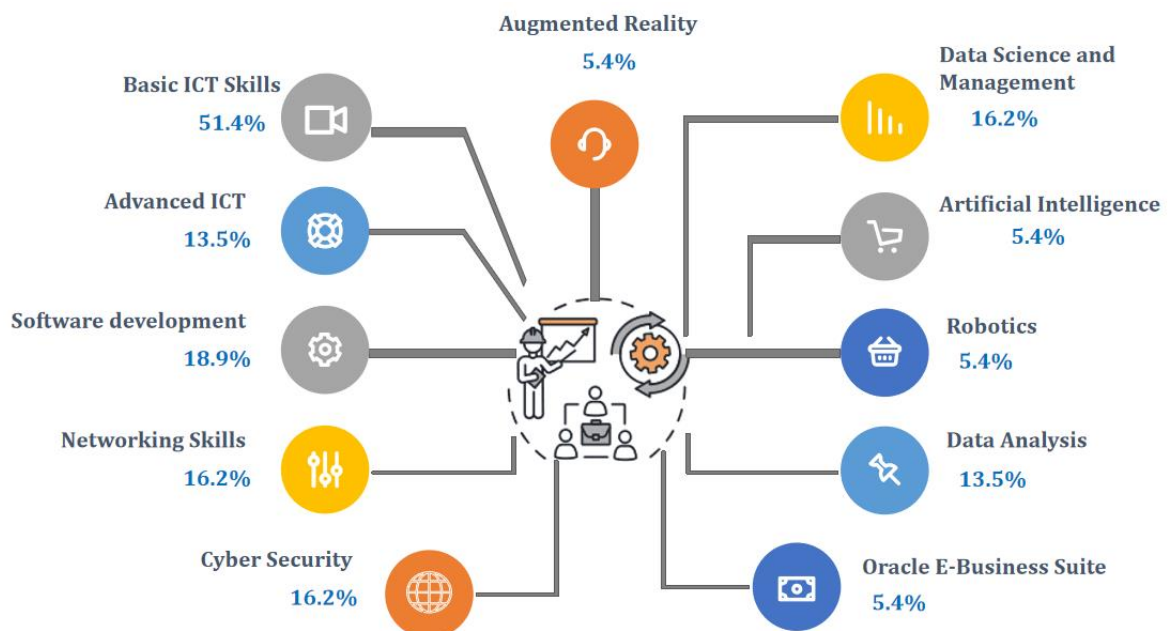
**Table 13:** ICT skills possessed by the different levels of staff in an institution

Category	Cadre	Variable	Percentage (%)
Organizational Strategic Leadership	Directors of private enterprises, Heads of agencies, etc.	Basic digital literacy skills	54.5%
		strategic IT management	6.8%
		ICT Policy awareness	11.4%
		Data analysis & management	4.5%
		internet use and web browsing	9.1%
		E-government policies	13.6%
		Other	18.2%
Senior Management	Directors, and Commissioners, CEOs/ EDs	Basic digital literacy skills	36.4%
		strategic IT management	9.1%
		ICT Policy awareness	6.8%
		Data processing	2.3%
		internet use and web browsing	20.5%
		E-government policies	13.6%
		Other	11.4%
Non-ICT professional staff	Accountants, HR officers, Procurement officers, auditors, etc.)	Basic digital literacy skills	36.4%
		Policy awareness	20.5%
		IT Project management	2.3%
		E-government systems	22.7%
		financial management systems	27.3%
		Data analysis & management	15.9%
		IT Support	2.3%
Other	13.6%		
Head of departments	Heads of Finance, HR, etc.	Basic digital literacy skills	22.7%
		Policy awareness	6.8%
		Strategic IT management	6.8%
		Cyber security	6.8%
		E-government	4.5%
		Data analysis & management	2.3%
		System Administration	20.5%
		Mobile and Web technologies	25.0%
		IT Support	4.5%
		Other	11.4%
ICT Professional staff	Systems administrators, Networks engineers, Software developers, IT end user support staff	Basic ICT skills	13.6%
		High policy awareness	4.5%
		Strategic IT management	4.5%
		Cyber security	9.1%
		E-government	11.4%
		Data analysis & management	15.9%
		System Administration	27.3%

Category	Cadre	Variable	Percentage (%)
		Mobile and Web technologies	20.5%
		Software development	18.2%
		IT Support	25.0%
		Other	15.9%

### b) Skills that Fresh ICT Graduates Lack the Most

Concerning the skill-set fresh ICT employees lack most, the results of the study revealed that Basic ICT skills, software development, cyber security, data science and database management, networking skills and data analysis skills in that order of preference; are skills lacked most by new ICT graduates on their first job. Other key skills that were identified as lacking include: Change management, digital forensics, E-government framework infrastructure, repair and maintenance of ICT equipment, ICDL, MCSA, MCSD, MCSE, CISA, ITIL, CGEIT, PMP, PRINCE2 as illustrated in *Figure 17* below.



**Figure 17: Skills new ICT professionals lack the most**

These results were also backed by the MoICT & NG Skills Training and Needs Assessment Report (2021). One of the key informants observed as follows:

*“Some of the ICT graduates cannot prepare a decent document like a CV’, simple things like formatting a document or making a PowerPoint presentation is a big challenge. How do you expect such a graduate to support other non-ICT professionals acquire basic ICT skills? Universities must focus on practical skills development especially for the basic computing skills, it is an embarrassment sometimes.”*



### c) Uganda's ICT legal and Regulatory Environment

The current status of ICT sector in Uganda has been influenced by various Policies, Statutes, Laws, Acts and Regulations enacted in the last 10 years. These have, among other things, brought about liberalization in the various social/economic sectors that have led to impressive sector performance and expansion. The some of the key policies include; The Press and Journalist Statute, 1995, The Electronic Media Statute, 1996, The Uganda Communications Act, 2013, The Rural Communications Development Policy, 2001, The National ICT Innovation Support Programme (NIISP) and The National ICT Policy 2013<sup>39</sup>, among others. In regards to Uganda's ICT legal and regulatory environment, the majority of the key informants (65.9%), indicated that it is constraining, does not promote skills growth and development and observed that most of the ICT policies and provision are not implemented. Table 13 presents a summary of opinions from respondents on the question whether the ICT sector regulatory environment is enabling or constraining.

**Table 14:** State of Uganda's ICT legal and regulatory environment

Variable	Reason	Yes
<b>Constraining</b>	<ul style="list-style-type: none"> <li>• Insufficient ICT skills possessed by the different organization managers</li> <li>• Rigid policies</li> <li>• Limits participation of private institutions</li> <li>• Limited Scope</li> <li>• Lack of requisite infrastructure and equity, less in rural and public schools compared to urban and private schools and institutions.</li> <li>• Some of the laws are inhibiting and limits innovation.</li> <li>• It's not fully integrated with the existing policies.</li> <li>• Its lacking an implementation mechanism since it does not cater for explicit following of the different ICT policies.</li> <li>• It requires improvement especially in supporting upcoming start-ups.</li> <li>• There is inadequate facilitation to enforce the regulations (e.g. access).</li> </ul>	65.9%
<b>Good</b>	<ul style="list-style-type: none"> <li>• Its promoting skills growth though the adoption is at a low rate</li> <li>• Government needs to support private universities with installation of specialized labs.</li> <li>• Institutionalization of the ICT cadre is a great step, and this will influence the skills development of ICT.</li> <li>• Promotion of innovation is a good pointer in ICT skills development.</li> <li>• It allows development of relevant programmes for skills development.</li> <li>• The institutionalization of the ICT cadre is a great step, and this will influence the skills development of ICT.</li> </ul>	34.1%

According to a key informant from NCDC;

<sup>39</sup> National ICT Policy, 2003



*“As far as ICT skills development is concerned it is very low, and perhaps there is lack of equipment (in some cases outdated equipment) to promote ICT”*

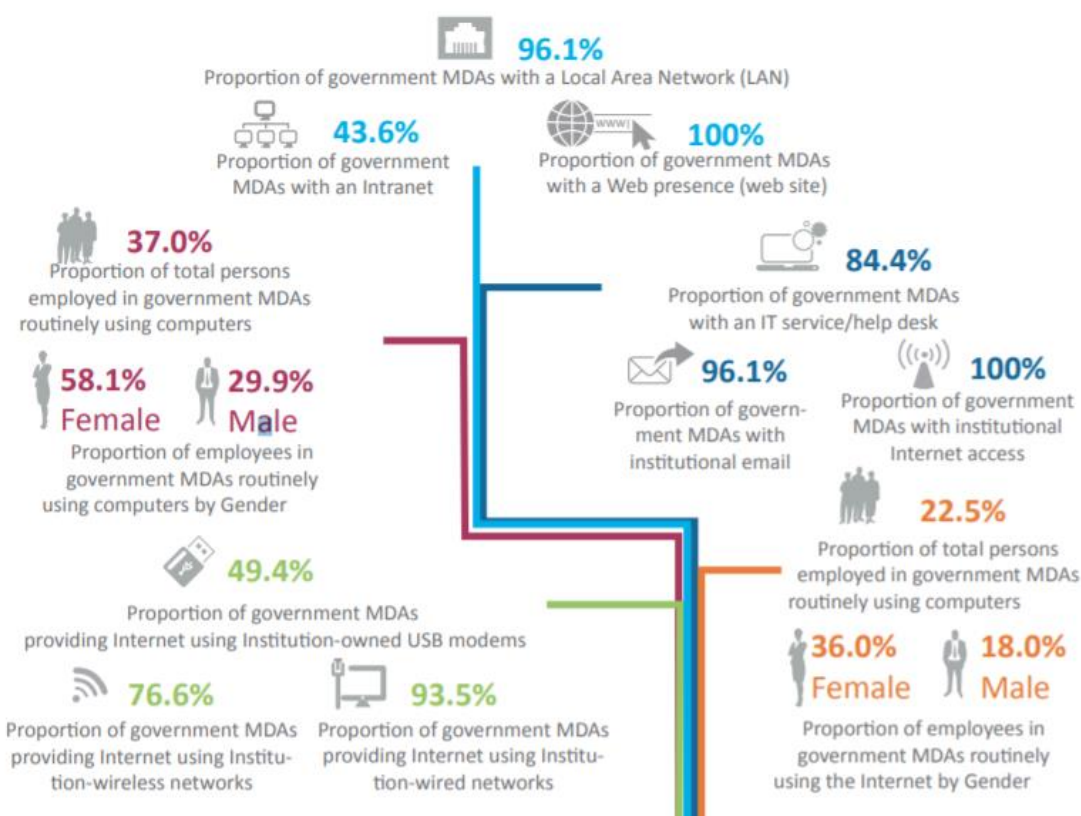
The Government recognizes the importance of ICTs as critical for the delivery of the Vision 2040 Digital Uganda, by striving to empower citizens through digital innovations and delivering various government services, including agriculture, education, health, social security, banking, justice and communications. Vision 2040 clearly stipulates that there is potential to improve the availability of digital content and e-products; to provide automated government processes and inter-agency connectivity; to bridge the gap between industry, services and academia; and to enhance commercialization of research and development. It is clear from Vision 2040, Digital Uganda Vision, NDPIII and other instruments that human capacity and digital skilling are central to government agenda. However, full implementation of policies and their associated strategies remains the big challenge.

These observations were stated by a respondent from UNCHE, who observed that;

*“Most of the policy docs stay on paper. No enablers are put in place to support the policies. You are expected to use internet yet no fibre connectivity at district level. This was to be done by NITA-U years ago but so many districts are not yet connected. Then the cost of data is too expensive to the ordinary man”*

#### **d) Enabling Infrastructure**

Availability and access to an enabling infrastructure is important in promoting development of ICT skills. The Study conducted in 2019 by NITA-U entitled “National IT survey 2019” summarized the state of enabling infrastructure in MDAs a good proxy indicator to the level of connectivity in the country as show in **Error! Reference source not found.**



**Figure 18: Government MDA IT indicators**

(Source: National IT Survey 2017/2018- NITA-U)

The study also sought to establish the availability of enabling ICT infrastructure in the target sectors of (ICT, Health, Justice, Law and Order, Agriculture and Education) from the lens of organizational representatives and selected staff. ICT infrastructure has been defined as; internet reliability, use of up-to-date computer, use of updated software, supportive IT technical team, among others.

The results as shown in the table below show that about 40.2% most likely agreed to having updated software for office productivity, followed by 38% that most likely agreed to have reliable internet at the duty station and an up-to-date computer and 35.3% who agreed to have a supportive IT technical team. This is an indication that in regards to the organizational ICT infrastructure development, limited support is required. *In this study, the Likert scale was adopted as: (1= none, 2= Less likely, 3 =Most likely, 4 =Agree, 5 = Strongly Agree)*

**Table 15: Existence of enabling infrastructure**

	1	2	3	4	5
Internet is reliable at my duty station	6.9%	12.7%	38.2%	27.5%	14.7%
I have an up-to-date computer	4.9%	12.7%	38.2%	30.4%	13.7%
I have updated software for my office productivity	2.9%	11.8%	40.2%	32.4%	12.7%
Supportive IT technical team	6.9%	15.7%	35.3%	28.4%	13.7%

### e) Proficiency in Key Computer Applications

In terms of proficiency in key computer applications, the ICT staff in the target organizations had advanced level skills while majority of the non-ICT staff had intermediate and basic level skills for the different application as illustrated in Figure 19. Error! Reference source not found. below.

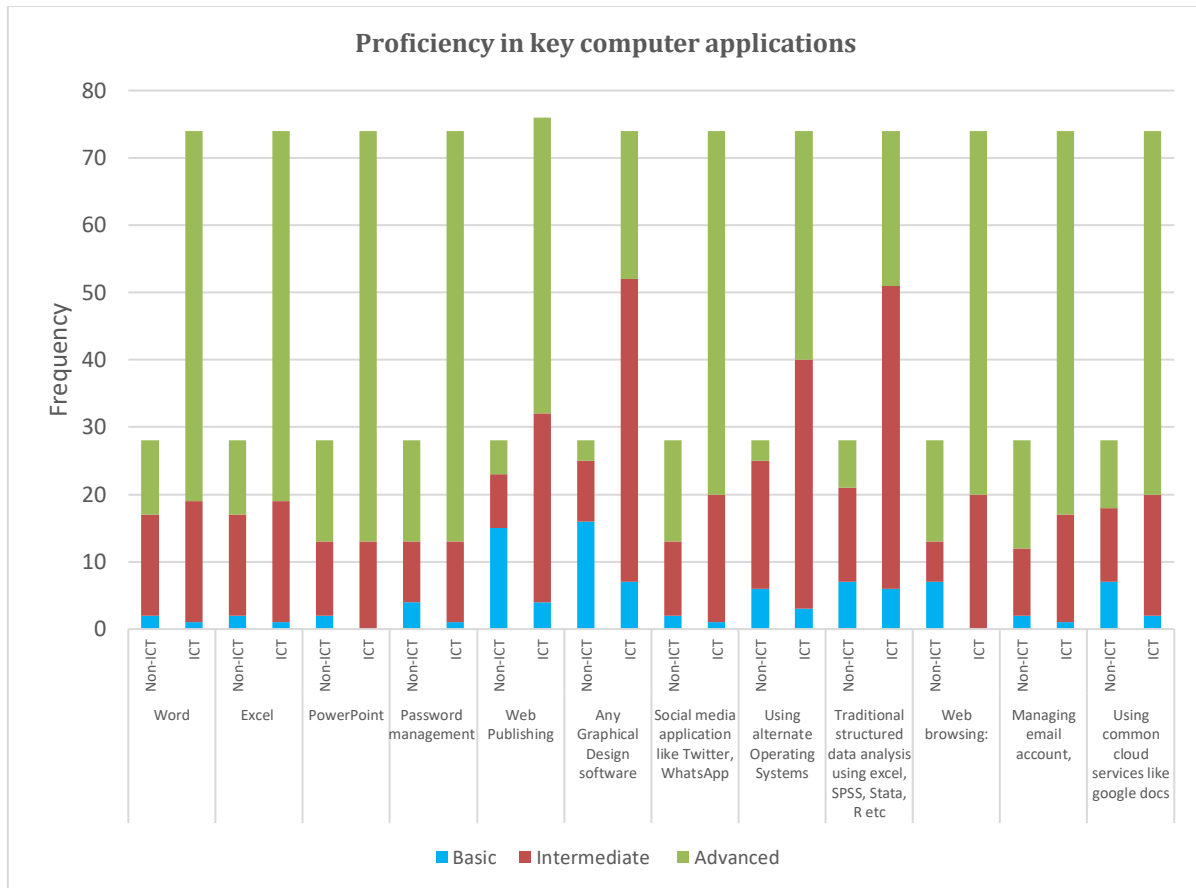
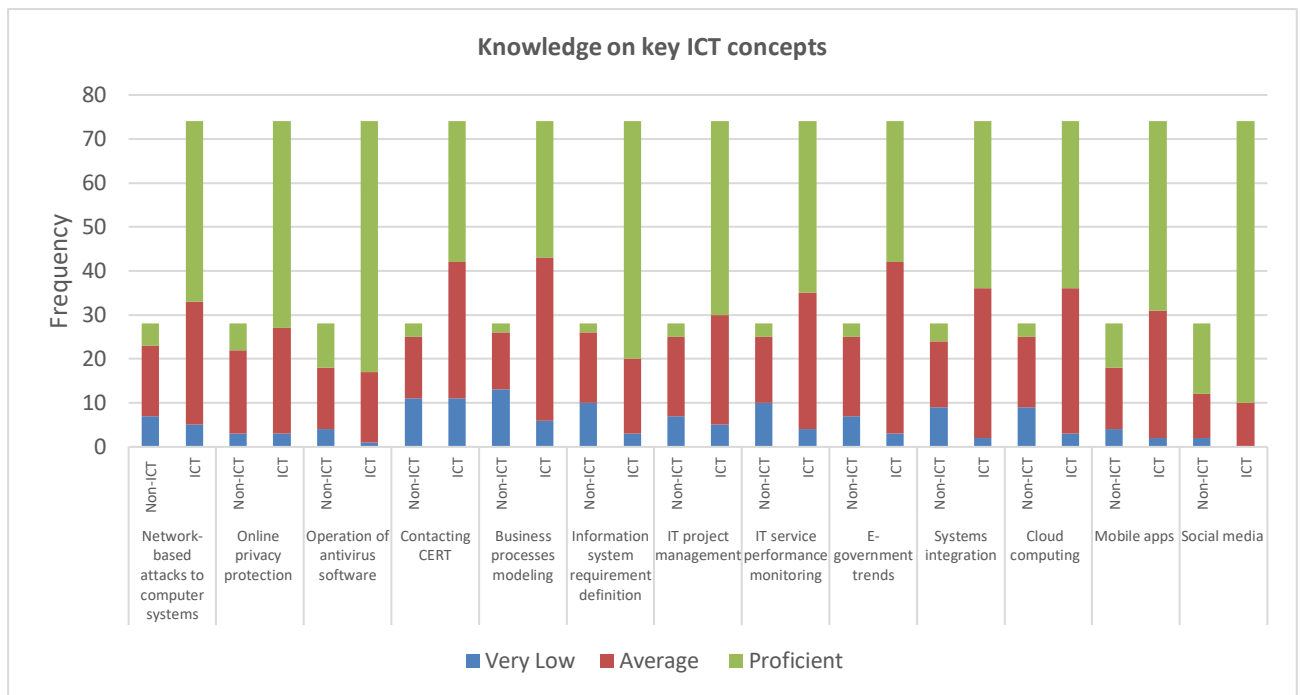


Figure 19: Proficiency in key computer applications by staff

### f) Knowledge on Key ICT Concepts

From the study, it was shown that majority of the ICT professionals were knowledgeable in the key ICT concepts i.e. **operation of anti-virus software, Information system requirement definition, IT project management, Mobile Applications, and online privacy protection**, and in that order of preference while the Non-ICT professionals were likely knowledgeable in social media, mobile applications and online privacy protection. It is worth noting that the majority of the Non-ICT professionals were not knowledgeable in; **business process modelling, cloud computing, contacting Cert, IT project management, IT service performance monitoring, e-Government trends and system integration** as illustrated in Figure 20:



**Figure 20: Staff knowledge in key ICT Concepts**

**g) Work Place behaviour**

Workplace behaviour in the use of ICT systems was factored into three aspects; a) password security: (sharing passwords to colleagues, using the same password multiple times); b) backup of office data; and c) maintain an online diary. The responses from the respondents are as highlighted in Figure 21 below.



**Figure 21: Key ICT workplace behaviours among staff in target organizations**

### 3.5.2 Skills Framework for the Information Age (SFIA)

Skills Framework for Information Age (SFIA) is an ICT Skills Framework, that provides a common ICT competence reference model conventionally used across the globe. It is an ICT Skills skill framework that contains recommendation on essential skills for the Fourth Industrial Revolution (4IR), which are relevant in driving the performance of specialized sectors such as Education, Agriculture, Oil and Gas, Manufacturing, Health, etc.

SFIA originated as a framework for the ICT community. It has evolved to be a framework that defines the skills and competencies required by business and technology professionals who design, develop, implement, manage and protect the data and technology that power the digital world. Within the scope of SFIA are many of the world's most in-demand occupations, encompassing professionals working in areas such as but not limited to: information and communications technology, business change, digital transformation, data science and analytics, software engineering, information and cyber security, learning and education, applied computing and computational science, user centred design, digital product development, sales and marketing and human resource and workforce management.<sup>40</sup>

Below is a reference guide for the required skills for the different professional categories under the SFIA framework vis a vi the available skills among the staff categories in the target organizations in their respective sectors.

**Table 16:** Existing SFIA skills and available skills possessed

Category	Cadre	Required skills under SFIA	Available skills
Strategic Leadership	Ministers and Board of Directors	Strategic Planning	Basic digital literacy skills
		Enterprise and Business architecture	Strategic IT management
		Solution architecture	ICT Policy awareness
		Research	Data processing
		Continuity management	Internet use and web browsing
		Personal data protection	E-government policies
		Governance	
		Risk Management	
		Project management	
		Consultancy	
		Methods and tools	
Institutional Senior management	Permanent Secretaries, CEO, Directors, ED) etc.	Business Situation Analysis	
		Strategic planning	Basic digital literacy skills
		Information systems coordination	strategic IT management
		Enterprise and Business architecture	ICT Policy awareness
		Research	Data processing
Financial management	internet use and web browsing		

<sup>40</sup> <https://sfia-online.org/en>

Category	Cadre	Required skills under SFIA	Available skills
		Measurement of project, processes and work products	E-government policies
		Sustainability	Other
		Continuity management	
		Risk Management	
		Quality Management	
		Project Management	
		Consultancy	
		Feasibility assessment	
Non-ICT professional staff	Accountants, HR officers, Procurement officers, auditors, etc)	Information management	Basic digital literacy skills
		Research	Policy awareness
		Investment appraisal	IT Project management
		Financial management	E-government systems
		Information assurance	Data management
		Risk Management	IT Support
		Audit	
		Consultancy	
		Specialist Advice	
		Feasibility assessment	
Head of Departments		Strategic Planning	Basic digital literacy skills
		Information systems coordination	Policy awareness
		Information management	Strategic IT management
		Innovation	Cyber security
		Emerging technology monitoring	E-government
		Financial management	Data management
		Measurement of project, processes and work products	System Administration
		Personal data protection	Mobile and Web technologies
		Consultancy	IT Support
ICT Professional staff	Systems administrators, Networks engineers, Software developers, IT end user support staff	Information systems coordination	
		Information management	Basic ICT skills
		Innovation	High policy awareness
		Emerging technology monitoring	Strategic IT management
		Information security	Cyber security
		Information assurance	E-government
		Threat intelligence	Data management
		Quality Management and assurance	System Administration
		Consultancy	Mobile and Web technologies
		System testing and auditing	Software development
IT Project management	IT Support		

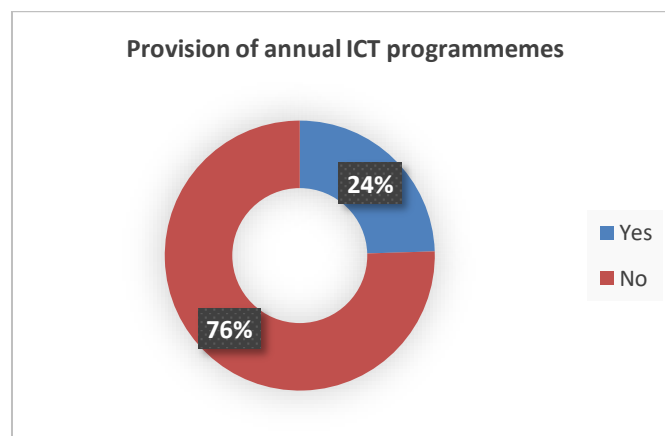
Category	Cadre	Required skills under SFIA	Available skills
		Specialist Advice	

### 3.5.3 Skills Development Approaches and Models of Access

This section details emerging observation from the study on the current approaches to skills development in the target organizations.

#### a) Accessibility to Continuous Professional Development Opportunities

Staff training is a core strategy of building and sustaining an efficient, effective and professionally competent staff in organizations <sup>41</sup>. The assessment sought to establish the extent to which staff in target organizations have access to annual ICT skills programmes. The results of this assessment established that majority (76%) of the organizations had not provided any ICT training to staff in the last 12 months which further attributed to a large number of the individuals (77.3%) not having attended any ICT training in the past 12 months. This presents a huge opportunity to UICT to fill the gaps observed. This is well illustrated in *Figure 22* below.



**Figure 22:** Provision of annual ICT programmes to staff in target organizations

<sup>41</sup> Public Service Training Policy (2006)



**b) Willingness to Take a Professional Certificate or Short ICT Course**

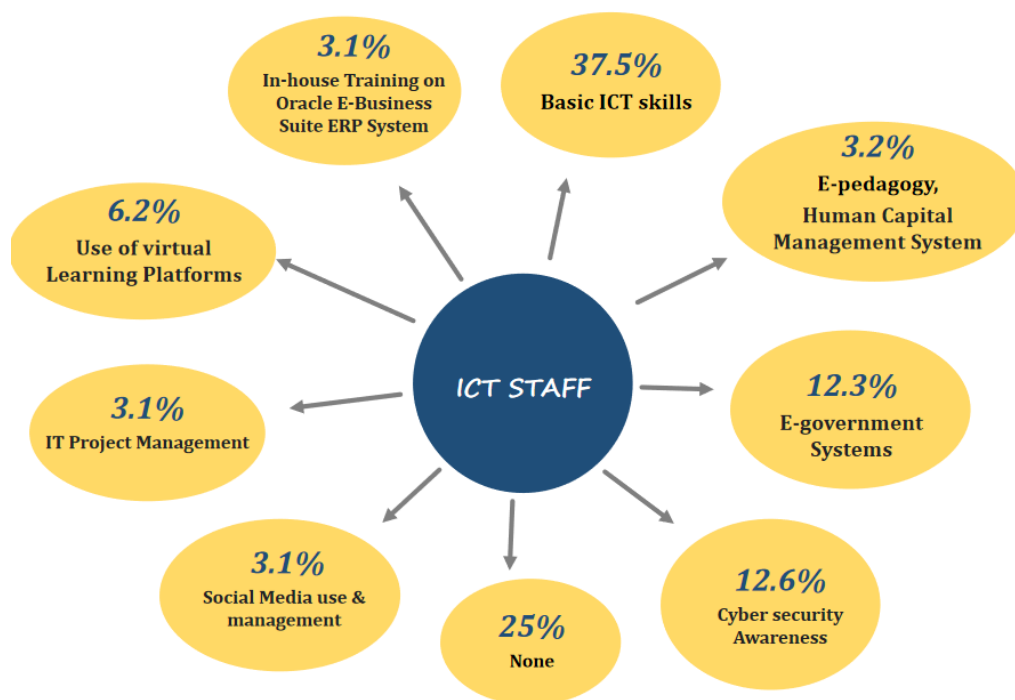
Majority of the respondents 62.7% were most likely willing to take a professional or short course in ICT as illustrated in the **Error! Reference source not found.**;

**Table 17:** Staff willingness to take a professional certificate or short course

	Frequency	Percentage
<b>Most likely</b>	64	62.7%
<b>Likely</b>	32	31.4%
<b>Less likely</b>	5	4.9%
<b>Unlikely</b>	1	1%

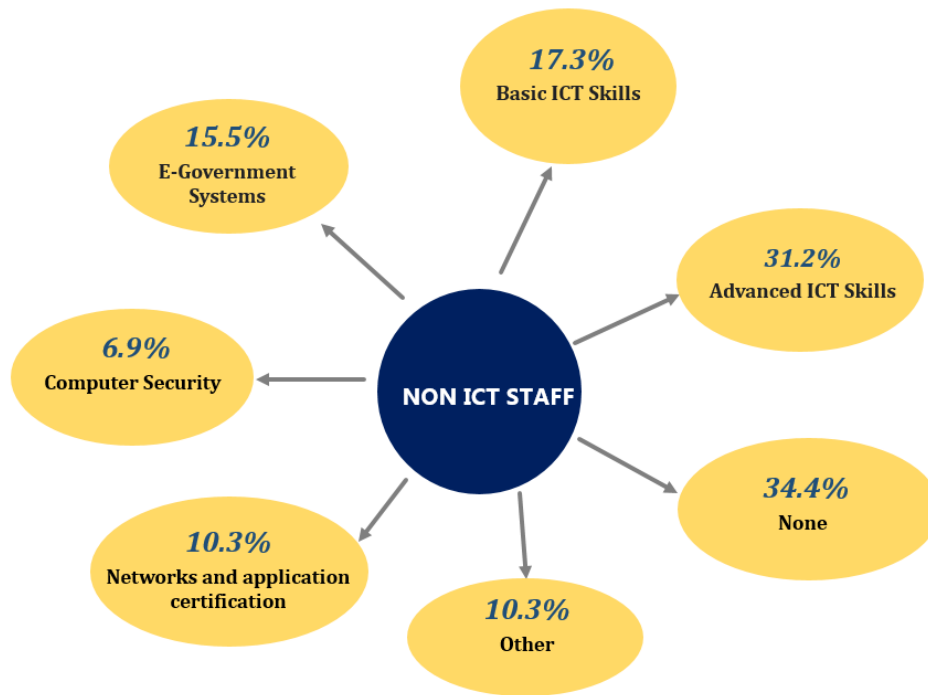
**c) Types of ICT Training Programmes Offered in the Last 12 months**

Given the fact that 24% of the organizations indicated having offered ICT skills development programmes to their staff, the study sought to establish the type of ICT skills development programmes offered to both ICT and non-ICT. The ICT staff acquired training in basic ICT skills, social media, cyber security awareness, professional productivity systems, among others. These trainings were accessed and delivery through a number of models including use of virtual learning platforms as illustrated in **Figure 23** below.



**Figure 23:** Types of ICT Programmes Provided to ICT Staff

On the other hand, the Non-ICT staff acquired training in Advanced ICT skills, basic ICT skills, office productivity application, and networks and applications as illustrated in *Figure 24* below.

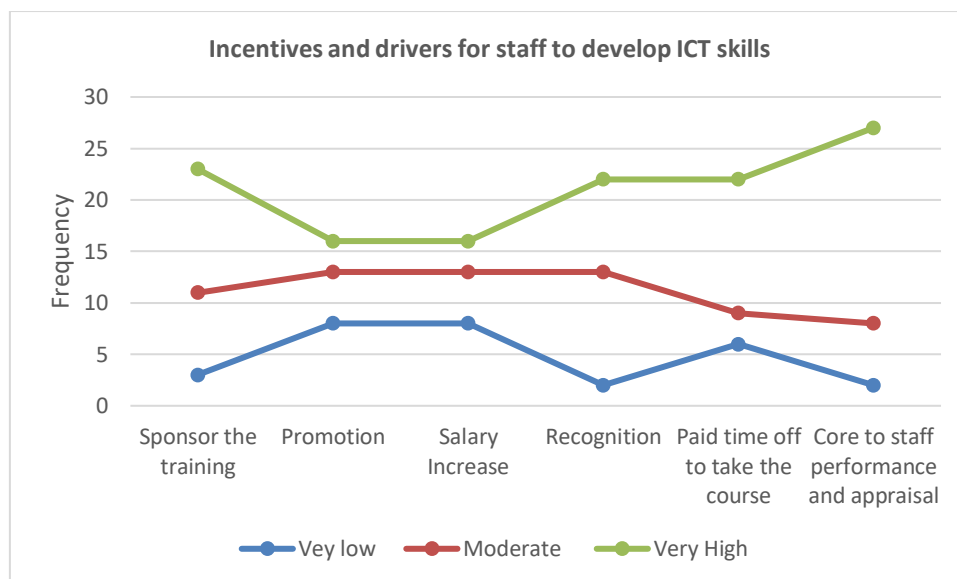


**Figure 24:** Types of ICT Programmes Provided to Non-ICT Staff

It is worth noting that the key industry skills that ICT staff lack most i.e. cybersecurity and data analysis among others, were also not mentioned as part of the training offered to staff thus raising a greater need for staff skills acquisition in order to fill that gap.

#### **d) Incentives and Drivers for Staff to Develop ICT Skills in the Target MDAs**

The study also sought to establish the kind of incentives given to staff in target organization to promote ICT skills development in the target organizations, and the results from the human resource managers indicated that; majority of the organizations offer *appraisal points, sponsorship to attend training programmes, recognition of staff, paid time off to take up a course* in that order of preference, it is worth noting that *salary increment and promotions* were least considered as illustrated in *Figure 25* below.



**Figure 25: Incentives and Drivers for Staff to Develop ICT Skills**

From the results in the Error! Reference source not found.5 above, UICT should consider using appraisal of staff, sponsorship to attend training programmes, recognition of staff and paid time off to take up a course, as critical factors that can be used to motivate staff to acquire more skills and training.

### e) Approaches to skills development in organizations

Given the dynamic nature of the ICT industry and technology, all government civil servants must maintain a high level of professional growth.

As a result, in order to stay relevant and competitive, institutions should employ less expensive (and sometimes budget-neutral) approaches to ICT continuing professional development, such as:

- i) On job peer mentoring
- ii) Professional Short courses
- iii) Productivity short courses
- iv) Self-paced Online courses
- v) Online certification programmes
- vi) Computer online based training
- vii) In service training
- viii) Refresher Courses

### 3.6 Key ICT Skills Demand across Sectors

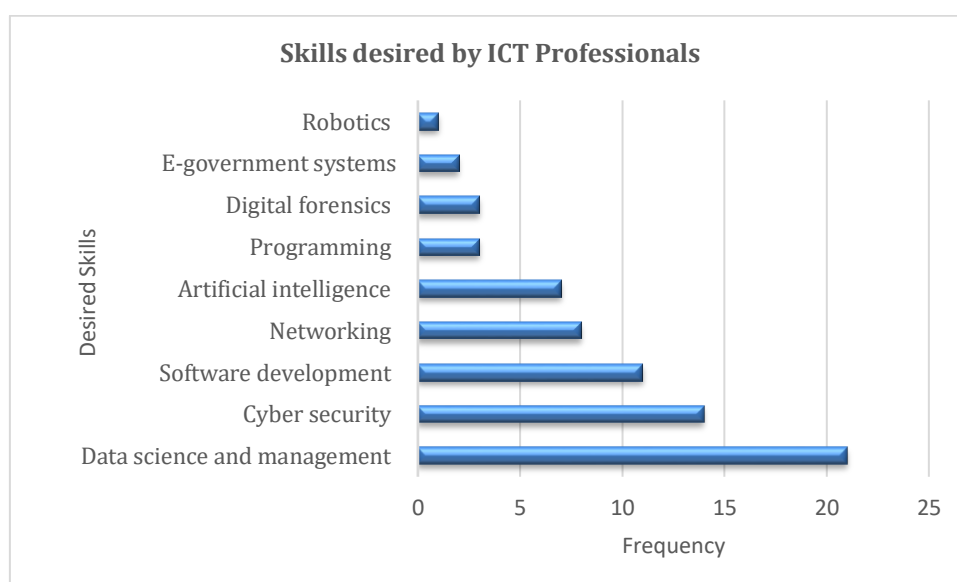
This sub-section highlights findings of the study as far the desired ICT skills and knowledge, and the desired employers from employees in the target organizations.

#### 3.6.1 Desired ICT Skills and Knowledge

##### a) Desired Skills by ICT and Non-ICT Professionals

The study sought to establish the type of ICT skills desired by both ICT and Non-ICT professionals in order to execute their mandate effectively. The results from stakeholder consultation revealed that: **Data science, Cyber Security, Software Development, Networking, Artificial Intelligence, Programming, Digital Forensics, E-government Systems, Robotics and Multimedia** (in that order) are the preferred key digital skills desired by ICT professionals.

An interesting observation indicated that Robotics, Multimedia and **e-Government systems** were least desired (Figure 26).

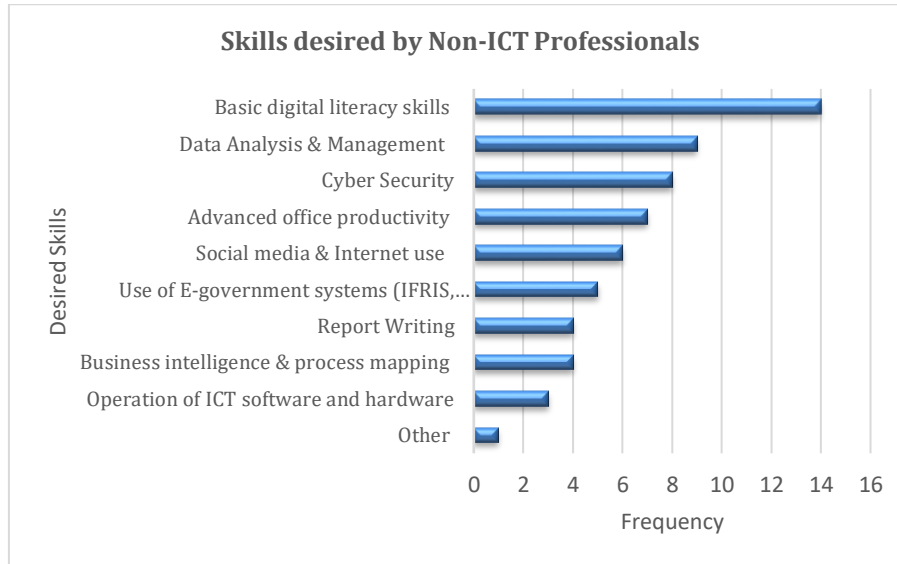


**Figure 26: Desired ICT Skills for ICT Professionals**

It is worth noting that there are a number of industry desired skills and these include; Emerging Technologies such as Artificial Intelligence, Blockchain, Machine Learning, Data Science, Big Data, the Internet of Things, and other 4IR Technologies, Software Engineering, DevOps, BPO/ITES, etc. therefore the lack of these skills among the professionals arises the need for consistent training through partnerships between UICT and others institutions that can offer the training e.g. the existing partnership with AFRLITI that initiated the following courses Telecommunications, Broadcasting, Postal, Radio, Creative Industry, Multimedia, and Communication Officers.

For the non-ICT professionals, the most desired skills were: **Basic digital literacy, Data analysis and management, Cyber Security, Advanced Office Productivity, Social media & Internet use, Use of E-government systems, Business Intelligence, report**

writing and ICT software and hardware maintenance in that order of importance. Among these the least desired skills were; other Multimedia & Graphics, Digital learning platforms like LMS, Artificial intelligence, Research and Knowledge management, as illustrated in **Error! Reference source not found.7** below.



**Figure 27:** Desired ICT skills for Non-ICT Professionals in Target Organizations

**b) Desired skills of ICT professionals in small medium and large enterprise both in private and public sectors**

Generally, it was observed that there are limited differences in terms of skills desired among ICT professionals serving in SMEs and large cooperation’s both in private and public sectors. However, it emerged that SMEs desire broader ICT technical and non-technical skills among their ICT staff compared to large corporates which have more specialized job descriptions.

*As observed by one of the members of the national 4IR taskforce;*

*“Most SME’s are small as such have to rely on small number of staffs to complete most tasks completed in a large corporation. Given the small revenue based and high staff costs, these SMEs desire someone with a broader technical and business skills to cover more ground, which is not a case of well establish corporations which focused on driving efficiency through specialization”*

Crosscutting obstacles in attracting the above skills in the Industry and Government by different occupational groups was found to be;

- a) Scarcity of specialized ICT skills such Enterprise Developer, Software architects Data Scientists, Cyber Security Experts etc.
- b) Generic organisational structures, as designed by MoPS, which are usually not responsive to the core ICT needs of individual organisations
- c) Resource Constraints which affect most public institutions

### c) How ICT skills for non-ICT Professionals can be Sustainably Enhanced

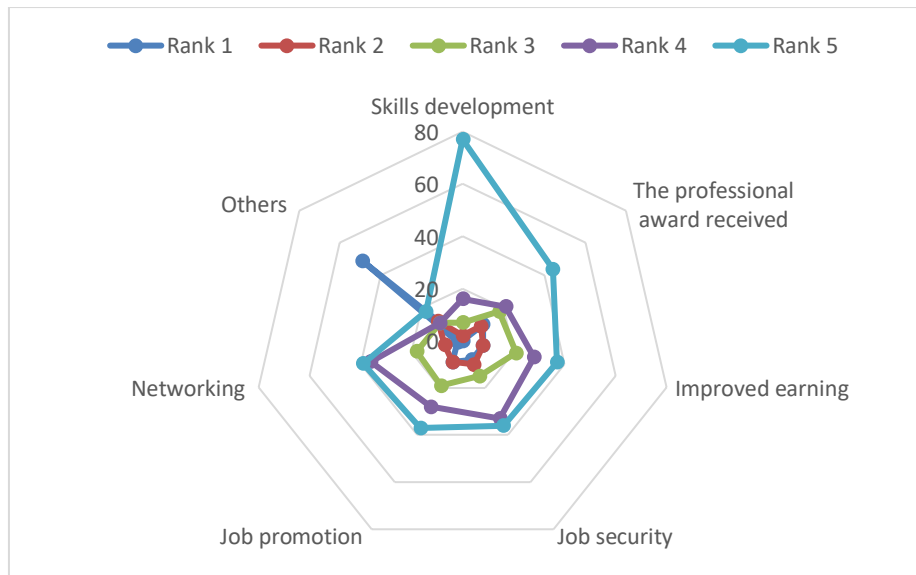
In terms of skills enhancement for the non-ICT professionals, the results from the stakeholder's consultation indicated that ICT skills for non-ICT can be sustainably enhanced through;

- a) Continuous Training; Learning and Relearning and a lot of emphasis on the hands-on skills in collaboration with academia.
- b) The work environment should be good enough to adopt. They need local support and good policy guidelines. Systems should be largely user friendly
- c) Knowledge management initiatives are required focusing on staff training in order to create and develop the basic skills for e-Government usage.
- d) Through dissemination of information
- e) Inclusion of a dedicated budget vote for skill enhancement of staff
- f) MDAs should have a dedicated budget for an ICT support department that is fully staffed and properly managed
- g) Design a course for non-ICT Professionals and this course delivered for all cadres through UICT and/or Civil Service College
- h) Working in collaboration with academia, through online learning, sharing resources within government agencies for experts and NITA-U can lead training and mentoring of the different cadres.
- i) Annual needs assessments through a systematic performance management system.
- j) Nurturing and mentor-ship from eminent ICT people/leaders
- k) Training and awareness building by competent firms or at established training facilities.

### d) Motivation for Acquiring Digital Skills

It is well acknowledged in human capacity development modes that the biggest challenges employers do face is how to motivate employees to commit time to acquire new skills. Two types of motivations exist; the intrinsic and extrinsic. Learning is an intrinsic part of human nature, which propels one to be curious, active, to initiate thought and behaviour, to make meaning from experience, and to be effective in doing the things we value. These are the primary sources of motivation, and it is therefore crucial that training programmes are designed around both extrinsic and intrinsic factors that motivate employees.

The study sought to establish factors that motivate employees to attend trainings and the results revealed that majority of the staff are motivated **to develop skills**, acquire the **professional award** given for that training, **network** with other individuals from other organizations and fields, **job promotion**, **job security** and **increased pay** in that order of preference as illustrated in *Figure 28* below.



**Figure 28: Motivation for Acquiring Digital Skills**

Some of the comments from the respondents were captured verbatim as below:

*“The IT Courses to be done should be in line of individual professions rather than being General, i.e., a farmer should do a course related to his or her profession”*

*“Training will help to improve skills in the use and appreciation of usefulness in work situations”*

*“It’s good to ensure that at least 90% of the staff are equipped with ICT knowledge*

*We are living in the changing world of technology, and we need to move with current trends”*

### **e) Preferred Mode of Delivery, Duration and Location**

According to LinkedIn’s 2019 Workplace Learning Report, organizations are increasingly seeking the help of learning and development (L&D) to complement business strategy by attracting, developing and retaining top talent. A critical aspect to consider, besides the type of training to deliver, is the method of training delivery itself. Choosing a training delivery method can be a daunting task, given the number of considerations, including budget, size and type of the workforce, location, time frame, and goals. In addition, complexity are the multiple training delivery options available today that make decision-making easier said than done.<sup>42</sup>

<sup>42</sup> <https://trainingindustry.com/articles/content-development/5-training-delivery-methods-to-use-in-your-ld-programmemes/>



The research further sought to establish the desired modes of training delivery among the target respondents and the results revealed that; 60.8% of the staff preferred blended learning approach, in case of on station face to face 50.5% preferred 5 days of training, for online training 33.3% preferred training for less than 4 weeks for face to face off station, 35.3% preferred less than 4 weeks and for face to face, 40.6% preferred a day off from work, in that order of preference as illustrated in *Figure 29* Figure 29 below.

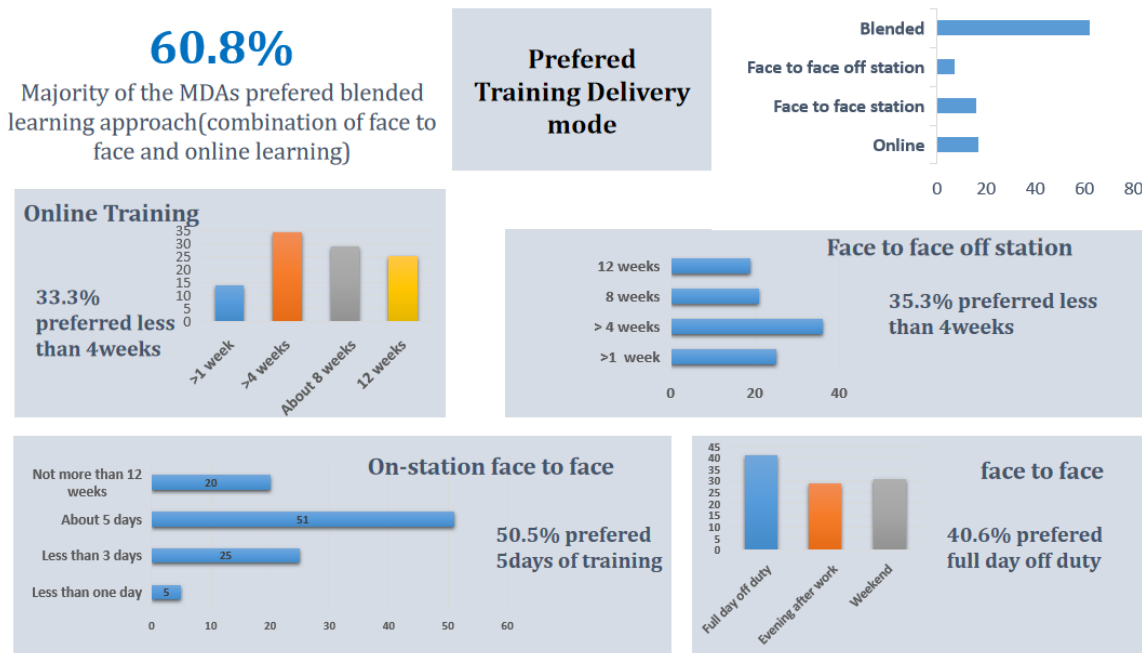
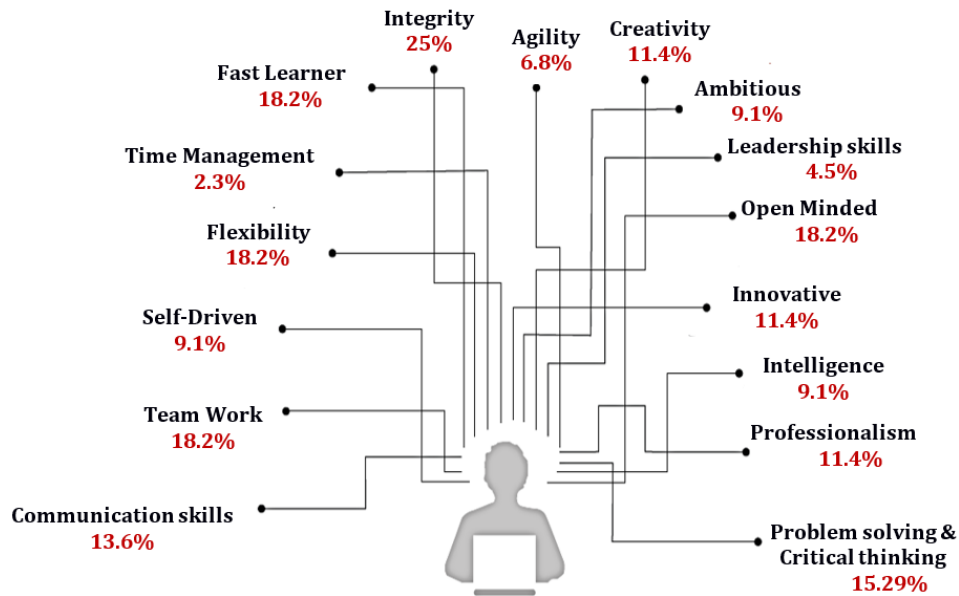


Figure 29: Preferred Mode of Delivery, Duration and Location

### 3.6.2 Desired Employee Behaviours

Regarding individual desired employee behaviour for successful implementation of e-Government and digitalization in organizations, the response showed that; **integrity** (25%) was more significant, followed by **flexibility**, **fast learner**, **Open minded and team work** which all scored (18.2%), followed by **Critical thinking** (15.9%), **communication skills** (13.6%). **Creativity**, **Innovativeness and professionalism** received the same score of (11.4%), meaning they were rated equally important. **Ambitious**, **Intelligence** and **self-driven** traits scored the same (9.1%). The least desired employee traits were **Agility** (6.8%), **Leadership skills** (4.5%) and **time management** (2.3%)

It can therefore be concluded that for Individual employee traits; **integrity**, **flexibility**, **Fast learner**, **Open minded and team work** should be considered in the implementation of e-Government programmes as illustrated *Figure 3030* below.



**Figure 30: Desired Employee Traits for Successful in Organizations**

### 3.7 Priority Skill Areas

This sub-section presents the analysis of ICT skills and training gaps in the target organizations. In sub-section 3.7.1, quantity and quality of ICT professionals presented in terms of; ICT professionals staffing levels, existing skills and knowledge of ICT staff vis a vis the desired and sub-section 3.7.2 discusses current skills verses emerging demands. Sub-section

#### 3.7.1 Quantity and Quality of ICT Professionals

The assessment sought to establish the existing ICT staffing numbers vis a vis the desire numbers and the ICT skills gaps according to the level of responsibility.

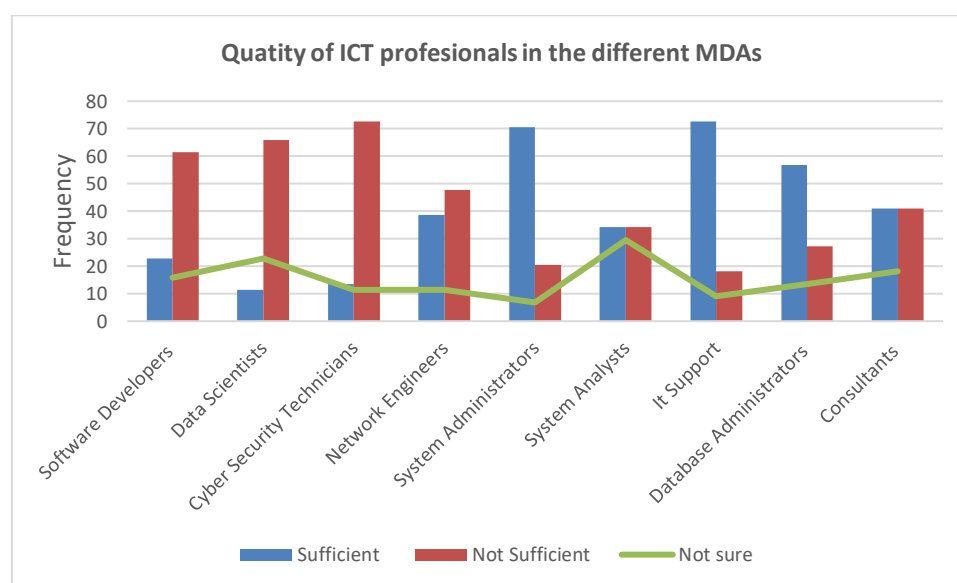
##### a) Quantity and Quality of ICT Professionals in the Target Organizations

The quantity and quality of ICT professionals has a big impact on the organizational productivity through enhancing business enterprises to be more efficient, effective and globally competitive. Majority of target sectors reported insufficient number of ICT professionals in different cadres. Table below summarizes the perceived level of adequacy in terms of numbers of key ICT staff in position in the assessed MDAs.

**Table 18:** Level of Adequacy in Terms of Numbers of Key ICT Staff in Position in the Assessed MDAs.

	Sufficient	Not Sufficient	Not sure
Software Developers	22.7%	61.4%	15.9%
Data Scientists	11.4%	65.9%	22.7%
Cyber Security Technicians	13.6%	72.7%	11.4%
Network Engineers	38.6%	47.7%	11.4%
System Administrators	70.5%	20.5%	6.8%
System Analysts	34.1%	34.1%	29.5%
It Support	72.7%	18.2%	9.1%
Database Administrators	56.8%	27.3%	13.6%
Consultants	40.9%	40.9%	18.2%

It is worth noting that; cyber security experts, Data scientists and software developers were not sufficient in most of the MDAs targeted, while the ICT support and system administrators were the most sufficient ICT staff in the different organizations as illustrated in *Figure 31* below.



**Figure 31:** Level of Adequacy of Key ICT Professionals in Target MDAS

These results are also backed by the MoICT & NG Skills Training and Needs Assessment Report, 2021, which revealed that:

*“It suffices to note that the insufficiency of Data Scientists, Cyber Security specialist, Software Developers, Network Engineers, System analysts and Software Developers in most of the institutions has a direct negative effect on the capacity of such institutions to advance their mandates in line with e-governance framework and the National Development Plan II. This stands out as a gap and an area of focus for MoICT & NG going forward”.*

### 3.7.2 Current Skills vs. Emerging Industry Skill Needs

The International Telecommunication Union (ITU) spells out six emerging ICT industry skill needs which have a direct potential to drive the future of ICT skills demand and supply. With Uganda pushing to be a knowledge based digital economy as outlined in its Third National Development Plan, there is need to develop framework of human capacity development to develop the critical skills earmarked by ITU. It is worth noting that, the Fourth Industrial Revolution (4IR) is a complex application of science, technology, engineering and mathematical (STEM) knowledge. In its simplicity it is an extension of Industrial Revolution 1, 2 and 3 with an addition of artificial intelligence built into machines that can think and do most things that were the sole prerogatives of the human species in the past. Therefore, the critical areas for skills development to support a 4IR economy include the following:

**Cloud Computing:** is a key driver of Digital Transformation. It is a disruptive delivery model of information technology services that is based on a business model that is flexible and on demand. Microsoft defines cloud computing as the delivery of computing services - servers, storage, databases, networking, software, analytics and more - over the Internet (the cloud). The manner in which cloud computing evolves puts pressure on (how stakeholders need to approach) skills development. A study by the International Data Corporation reveals that in South Africa more than 90% of South African organizations are either already engaged in developing these skills or in the process of planning for development of such skills (Nebula, 2018), with a similar 90% having increased their spending on cloud computing (World Wide Worx, 2018). Uganda is lacking in both technical and user level skills to fully develop and exploit the potential of cloud computing technologies. These presents an opportunity of UICT to develop novel programmes in this area of specialization.

**Internet of Things (IoT):** is another change driver in the ICT sector that comes with the 4IR. It refers to the ever- growing network of physical objects that feature an Internet Protocol address for Internet connectivity, and the communication that occurs between these objects and other Internet enabled devices and systems. IoT will continue to grow as the cloud computing and cloud apps offering space expands in the coming years. IoT thus links to virtually all of the 4IR change drivers, further expanding the impact of 4IR. Much as a majority of organizations in the region expressed a need for more IoT specialists, currently no such occupation exists in the strictest sense, instead IoT specialists may emerge as specializations of existing fields such as software development and design.

**Big Data Analytics:** With the emergence of the 4IR, properly managing big data has become an important assignment for many organizations. The demand for highly qualified big data analysts and artificial intelligence professionals is outperforming supply to the point where it can take many months to fill vacancies. The root problem of this is that big data analytics is a new field.

**Information Security:** Increasing digitization has come with greater security risks. Given the increasing dependency on ICT systems, and the growing complexity of connected environments, there is strong demand for and diffusion of software and tools to ensure IT systems security at all levels. In Africa, many organizations are experiencing challenges with cybercrimes. The supply of cyber security experts is lagging not only in

Africa but globally. Law enforcement agencies currently lack the ability to swiftly investigate and prosecute these crimes whilst organizations have to constantly improve their security features to fend off potential attacks.

**Artificial Intelligence and Robotics:** Artificial intelligence (AI) can be defined as different technologies that can be combined in different ways to sense, comprehend, act and learn (Accenture South Africa, 2017). The field of robotics is a multidisciplinary study that incorporates mechanical engineering, electronic engineering, and information engineering and computer science, amongst others, to develop and operate robotic machines, including AI robots. Robots are often used to automate processes, especially when it is too dangerous or expensive to utilize human workers. The growth in the development and use of AI is spurred on by complementary technologies such as big data analytics, cloud computing and the Internet of Things. Much as demand for AI experts has sure growth in the future of the African development path, supply of the same is still at rudimentary levels.

*The skill gaps in emerging technologies was well stated by a CEO of an IT firm one of the key respondents:*

*“For Uganda to catch-up with ICT sector development, we need to invest in development of critical human capacity in high end skills sets like robotics, artificial intelligence, big data analytics, low level programming, embedded system programming, 5G technologies and cyber security. The events involving Russia and Ukraine show that building self-reliance in technology is critical for national hood existence.”*

### **3.8 UICT Capacity Assessment**

This section presents findings of UICT staff capacity assessment in the areas of ICT skills, competencies in research and consultancy and associated recommendations to address the gaps. Sub-section 3.8.1, presents the existing gaps in UICT staff, sub section 3.8.2 on UICT HR gap analysis, and 3.8.3 that presents the proposed interventions to address the identified gaps among the UICT staff.

Uganda Institute of Information and Communications Technology (UICT) is a government capacity building institution operated and managed by Uganda Communications Commission (UCC) in line with the UCC Act 2013. The institute runs over 10 programmes in the field of ICT (6 Diploma and 5 Certificate courses), all aiming at providing high quality market driven ICT skills to improve management and technical practices. UICT uses relevant research from professional practice, student inquiries about courses, curriculum development committees to gather stakeholder needs plus international benchmarking to predict future ICT skills demands and trends.

The Institute employs highly trained staff, well versed with the latest ICT knowledge and have qualifications such as PhD, Masters Degrees and professional certifications. The institute graduates about 500 students per year with Diplomas and Certificates in various disciplines that also include digital skills in ICDL modules. Currently, the Institute is undergoing a rebranding and repositioning and in the process of implementing the turnaround strategy to make it an ICT Centre of excellence in sub-Saharan Africa. The

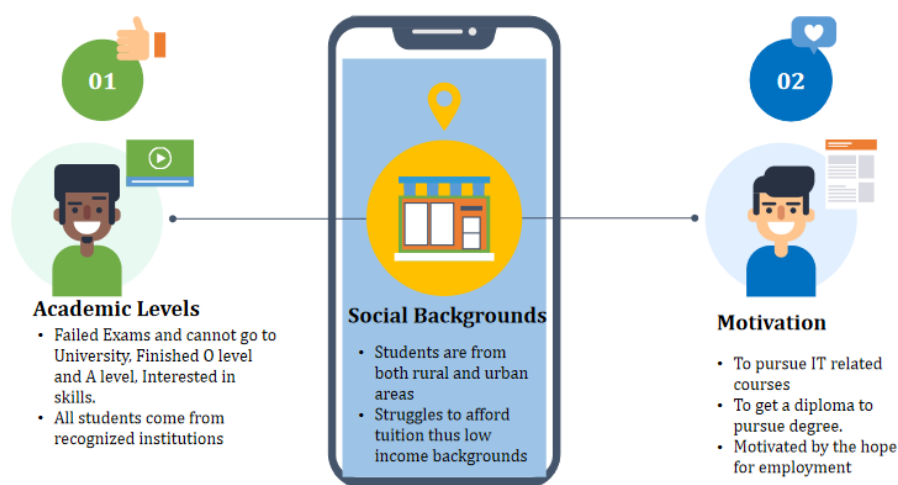
Institute also offers caravan training programmes on demand to various stakeholders especially digital productivity skills to government entities.

### a) Characteristics of Students who Join UICT

The results from the UICT staff revealed the following;

**Academic Levels:** Some of the students admitted are those that did not perform well in exams at O and A level thus cannot proceed with Bachelors at university. They are only interested in getting skills

**Social Background:** Some students from both rural and urban areas come from low income earning homes. They are however motivated by the desire to pursue practical ICT courses, so as to acquire a diploma and later proceed to a degree with the hope for easy employment and career growth after completion of the course as illustrated in *Figure 32* below.



**Figure 32: Characteristic of Students who Join UICT**

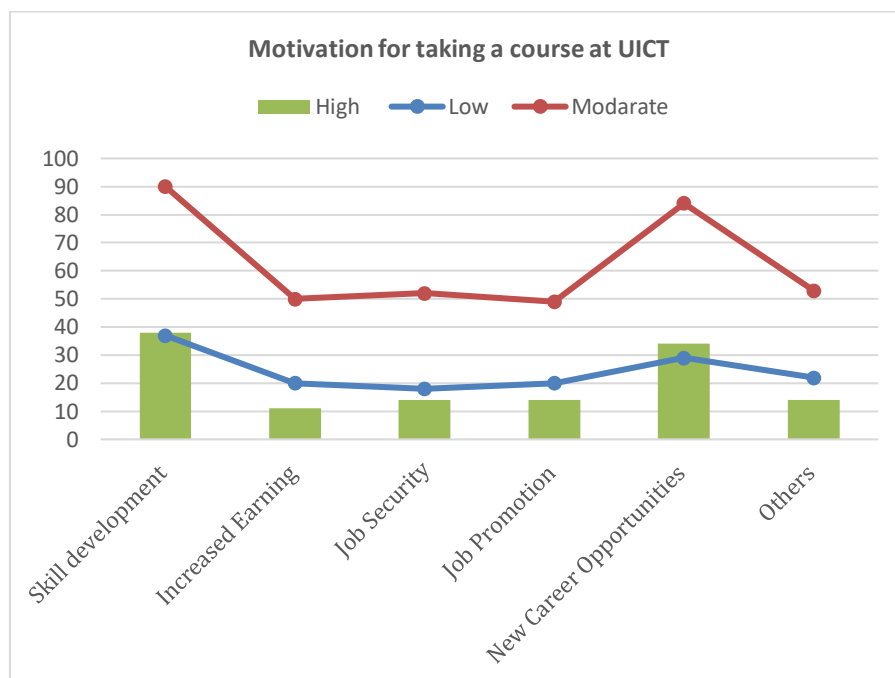
Results in Figure 32 above are affirmed by a response from one UICT staff during the FGD that indicated;

*“On average most students who join UICT for certificate courses, obtained 4-5 passes in O’level. Those for diploma courses obtained only 1 Principal pass and 2 subsidiaries at A’Level. Achieving quality is a challenged. There is need to change the admission requirements in future.*

*“In terms of Social background, most students come from low-income families; they have social problems that hinder them from performing well. Some pay fees for themselves, therefore, student retention rate is low.”*

## b) Students Motivation to Take a Course at UICT

On their motivation to take a course at UICT, the responses from the UICT students and alumni indicated the need to acquire new career opportunities, skills development and job security; in that order of ranking, as their motivation for taking a course at UICT as illustrated in *Figure 33* below.



**Figure 33: Motivation for Students to Take a Course at UICT**

## c) Level of satisfaction with the Course Delivery at UICT

The table below shows the respondents' satisfaction levels in course delivery at UICT; the delivery approaches, training infrastructure and curriculum design were rated as good, while satisfaction with the training offered was rated as excellent as illustrated in *Error! Reference source not found.* below.

**Table 19: Level of Satisfaction by Students and Alumni**

Variable	Excellent	Good	Satisfactory	Poor
Satisfaction with the training offered	48.8%	41.9%	7%	2.3%
Training Infrastructure	34.8%	54.3%	7.6%	3.3%
Delivery Approaches	32.6%	56.5%	9.8%	1.1%
Curriculum used	37.6%	47.3%	10.8%	4.3%

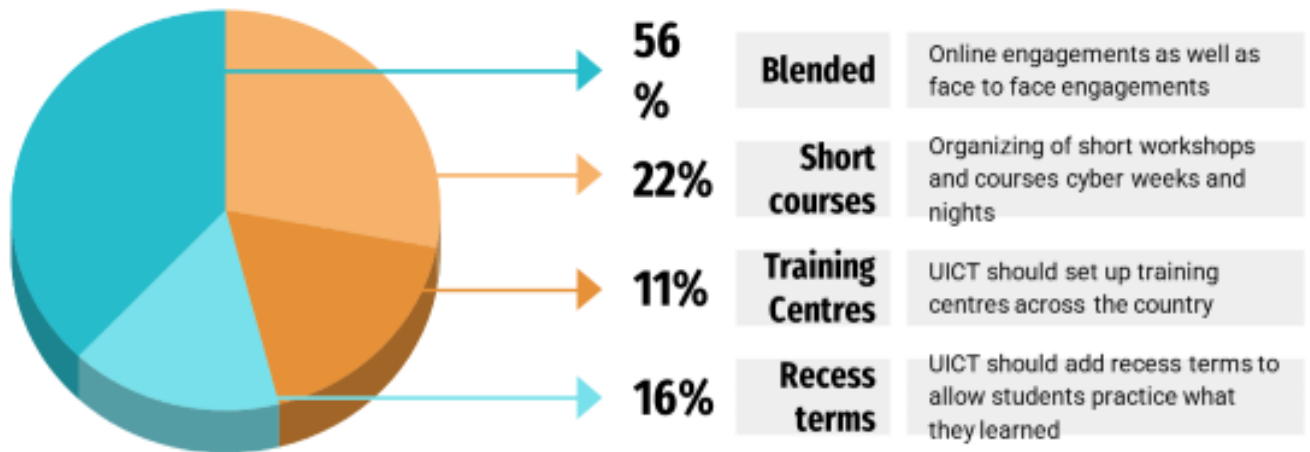
Generally, the students and alumni of UICT are satisfied with the curricula and the programme delivery per the findings in Table 18. However, they indicated the need to improve the infrastructure and make the training more practical. As summarized by one alumnus of UICT;



*“The programmes at UICT are generally good, however the training needs to be made more practical and there is need to keep the training labs updated with hardware and software. Also, the institute needs to develop short courses in BPO, Oil and Gas areas as they’re the in-demand areas of the economy”*

#### d) Preferred Programme Delivery Mode

In terms of desired mode of programme delivery, analysis of data from the UICT staff and students revealed that they prefer Blended learning compared to other learning approaches as illustrated in Figure 34.



**Figure 34:** Preferred Training Delivery Mode for UICT Courses

A respondent emphasized this during the FGD and stated;

*“UICT needs to intensify more on the practical ICT courses, unfortunately learning devices are inadequate in the computer labs and yet the majority of our students cannot afford their own devices.”*

### 3.8.1 ICT Staff Skill Gaps

#### a) ICT Skills Desired by the UICT Staff

A number of training opportunities are provided to staff to improve their skills and ability to deliver their various courses. The study revealed the following as the most desired training areas by staff; data science, ICT Applied research and publications, cyber law, SQL Server database management, emerging trends and ethical hacking in that order of preference.

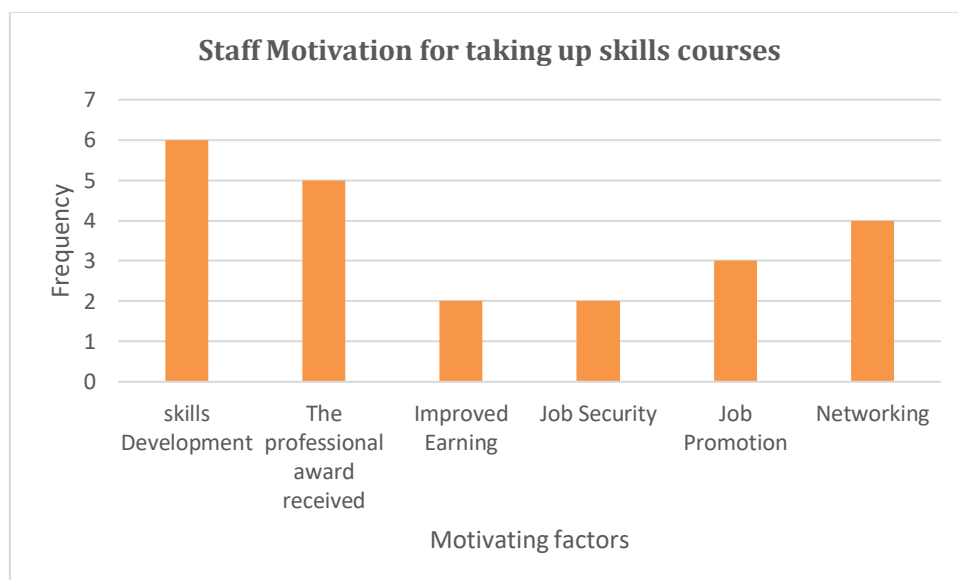


**Figure 35: ICT Skills Desired by the UICT Staff**

It is worth noting that these skills are in tandem with the desired skills for the ICT professionals illustrated in *Figure 25*.

**a) UICT Staff Motivation to Take Up ICT Skills Training Courses**

The need to develop their skills was picked as a great motivator for UICT staff to acquire an ICT training course, followed by the professional award received, networking and job promotion in that order of importance. Improved earnings and job security were the least motivating factors for the staff as illustrated in *Figure 36*.



**Figure 36: Motivating Factors for UICT staff to take up an ICT Skills Training Course**

As stated by a staff member during a FDG;

*“The ICT sector is very dynamic, therefore for one remain relevant he/she must maintain an updated skillset, the reason I always keep updating my knowledge and skills in my areas of specialization”*

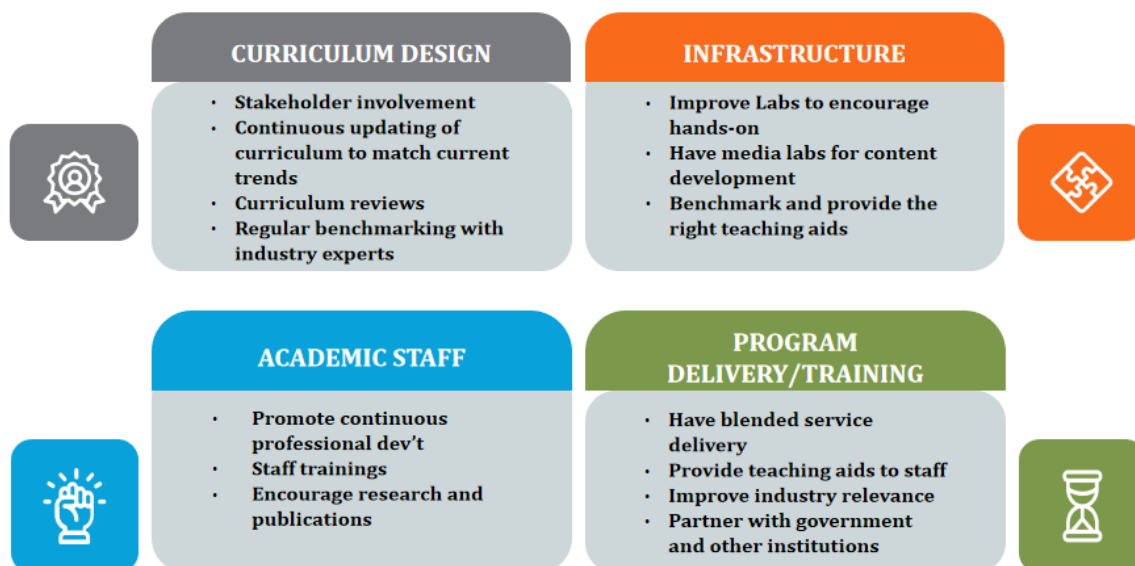
## b) Proposed Strategies to Attract, Motivate, Develop and Retain Competitive Human Resources at UICT

The engagement of UICT staff on desired approaches to attract, develop and maintain a skilled and motivation work forces revealed the following key strategies:

- a) Provide a positive working environment
- b) Employ competent staff
- c) Recognize and reward staff performance
- d) Reinforce good behaviour
- e) Develop skills and potential of the staff to deliver to the UICT mandate
- f) Promote continuous professional development among staff
- g) Link to industry and get professionals who are relevant and highly skilled in a specific area
- h) Encourage staff to venture into research and innovation
- i) Offer refresher training to the staff

## c) Proposed Strategies to Improve on the Key Performance Areas in UICT

The strategies focused on four key performance areas; Curriculum design, Infrastructure, Academic staff and Programme delivery/ training as illustrated in *Figure 37*.



**Figure 37:** Proposed Strategies to Improve on the Key Performance Areas

### Other strategies include:

- a. Holding Team building activities and workshops
- b. Develop industry aligned short courses
- c. offer internally equivalent certifications,
- d. benchmark international curriculum to capture international skills demanded by the industry
- e. get out of the comfort zone of thinking about ICT as a stand-alone sector, and venture into other sectors like gas, health,
- f. Closely work in partnership with other agencies in the sector like UCC, NITA-U, the ministry
- g. closely network with the alumni to understand what exactly they do in the market and if the training they received was useful. This will make us reflect on our delivery method

It was emphasized by a respondent during the FGD that;

*“Being a national ICT Institute, UICT needs to intensify its marketing strategies to reach out to more organizations, schools and the general public in order to increase on the students’ numbers through Utilizing the digital platforms, rebranding and making sure UICT is more visible”*

### d) Priority Areas of UICT



Figure 38: Priority areas of UICT

### 3.8.2 UICT HR Gap Analysis

In the backdrop that, UICT is an agent in ICT skills-based training/learning, research, innovation, pre-incubation, consultancy and advisory Centre to provide the much-needed ICT skills, knowledge and attitudes for the country's growth, the study undertook an in-house HR gap analysis specific of UICT. The purpose was to find out the staffing structure and requirements, the knowledge and skillsets possessed and expected of the office bearers. Below is the outcome of this analysis:

**Table 20: UICT HR Gap Analysis**

Categories of staff	Established	In position	Desired	Knowledge and Skills gaps observed
Researchers	-	-	7	Lack of experienced staff to conduct research
PhD holders	-	2	-	-
Computer Scientist	-	2	2	Lack of competent staff to design software, experiment and investigate technological fields such as artificial intelligence, robotics and virtual reality
Data scientist	-	-	2	No existing staff with the knowledge that can help to build machine learning algorithms and enhance the data collection process
Cyber Security specialist	-	-	-	Lack of staff with ability to guide/ teach students in the use of forensic approach to solving challenges
Networks specialist	-	-	-	Lack of key competencies such as information security and vulnerability assessment among others
System admin specialist	1	1	1	-
Digital Literacy specialist	-	-	-	Lack of knowledge in digitalization and the application of emerging technologies have accelerated the demand for digital skills
ICT support	12	5	13	Lack of multi-skills to be applied during setting practical procedures and solving routine challenges.

Furthermore, the review of the recent HR gap analysis report by UICT highlighted a number of human resource capacity gaps at the institution across board covering academic and non-academic staff. The key gaps identified per the category of staff are summarised in the matrix below;

Table 21: UICT Human Resource Capacity Gaps

S/n	Details	Staff
1	Approved Establishment according to the current structure	107
2	Filled Positions	42 (39%)
3	Vacant positions	65 (61%)

[Source: UICT Organizational Restructuring, Job Evaluation and Job Grading Report (2021)]

## Conclusions

- a) UICT's capacity to implement its mandate, vision and mission efficiently and effectively specifically considering that 61% of the positions are vacant, is at stake.
- b) UICT lacks experienced staff to spearhead research. This scenario has implications such as static curricula which is not responsive to the needs of the country. In addition, students (graduates) who are not grounded in research, tend to be academic in the field of work.
- c) Specialists badly needed on the ground, are equally lacking, (and therefore not produced) at UICT i.e. Data scientists, Computer Scientists, Cyber Security specialists, Networks specialist and Digital Literacy specialist. This has a big risk to the future of the industry.

### 3.8.3 Proposed Interventions to Address the Identified Gaps

- a) Focus should be on skills development as a niche.
- b) Have proper relationship with Industry stakeholders to link the graduates to proper internships.
- c) Put resources into course that promote hands-on which will make UICT the place to go to.
- d) Proper administrative structure that are customer centric.
- e) UICT should benchmark with other centres of excellence, its structures should be informed by the wider strategic goals as shown in NDP III.
- f) Well trained and highly motivated academic staff to provide the required hands-on training.
- g) Adequate, specialized laboratories which are well equipped with modern items/systems.
- h) Spacious, organized, and well-equipped classrooms and library for students.
- i) UICT should have more of teaching aids like state of art labs and employ more practical oriented staff.
- j) Employ more ICT Experts. Acquire relevant teaching equipment in the specialized labs and acquire more.

- k) By aligning our goals and objectives (business strategy) with the IT strategy to avoid automation for the sake of automation but to automate our core business processes with the aim of increasing productivity from our workforce, improving efficiency, better communication with external stakeholders (customers, suppliers and partners).
- l) The bureaucracies need to be minimized by having semi-autonomous units with shorter lines of reporting and clear KPIs.



## 4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the finding of the ICT skills and training needs assessment, a number of conclusions have emerged in line with the study objectives. Thus, sub-section 4.1 details the conclusions emerging from the study and sub-section 4.2 presents the proposed recommendations especially targeting UICT management and staff.

### 4.1 Assessment Conclusions

The conclusions are arranged according to the study objectives for clarity and logical flow.

#### 7) International ICT professional skills development benchmarking

- a) Most countries have developed or adopted a national digital skills framework to guide the implementation of the digital skilling programmes for both ICT professionals and non-ICT professional. The mostly used reference frameworks are ICDL and the UNESCO Digital Literacy Skills Framework. It is worth noting that most of the digital skills frameworks used focus on general digital literacy and do not emphasize digital skills for ICT professionals like the SFIA and European Digital Literacy Framework.
- b) Most countries benchmarked have some form of digital skills national funding mechanism targeting special interest groups like youth and government employees.
- c) Digital skills development is one core pillar of African Digital Transformation strategy, encouraging governments across the continent to invest in digital skills development on the continent so as to harness the power of emerging ICT and other emerging technologies like the 4IR.
- d) Institutions on the continent with similar mandate and focus like UICT mainly run skills development programmes at diploma and certification levels.
- e) All institutions benchmarked are running high value collaborative programmes (industry recognized certification programme) with leading industry players like Cisco Systems, Huawei academy, among others.
- f) Most the certification programmes have short durations not exceeding 6 calendar months.
- g) Most institutions are delivering these programmes using blended training approach involving online learning and face to face interaction.
- h) All institutions are developing market driven curriculum through extensive stakeholder consultation process, to establish level of needs, desired means of delivery, pricing modalities, among others.
- i) All instituted profiled are using student centred problem-based learning approaches aiming at knowledge and skills transfer to the learners.

- j) All institutions have three categories of training staff; a) full time employees, b) industry experts deployed on cohort basis, and c) partner institutions' training staff engaged through MoU.
- k) Most institutions are marketing their programmes through the web, social media and direct stakeholder engagements.

### **8) AS-IS Landscape Assessment of ICT and Non-ICT Professional Competencies (Knowledge and Skills Possessed) and Training Needs.**

- a) The study revealed that there is insufficiency number of key ICT professionals in the country key among them include; Data Scientists, Cyber Security specialist, enterprise software developers, Multimedia content specialist, Artificial Intelligence specialist, among others. Majority of the organizations assessed (especial those in public sector) indicated that they were understaffed as far as ICT professional staff are concerned compared to their level of mandate and results framework.
- b) The results of the assessment show that majority of senior management teams in institutions have basic skills and knowledge in office applications, email, web browsing and social media usage but are lacking sufficient knowledge in; IT strategic management, change management and IT leadership, among others.
- c) There is no BPO and ITES industry skills development framework or programmes in the country, the only programme which was originally developed at Makerere is no longer running and few international programmes are not contextual to the industry needs. Currently courses are available from BPO Certification Institute and Business Process Outsourcing by Udemy Academy.
- d) Most ICT professionals in service especially in MDAs have an average professional level of skills and competences in systems administration especially windows technologies, networking, user technical support, organizational enterprise systems, basic cyber security and office productivity applications but lack critical 21st century skills, such as cloud computing and virtualization, data science, cyber security, mobile and web technology, research and knowledge management, among others.
- e) In terms of ICT skills possessed by non-ICT professionals in the target institutions, the results revealed that majority of staff in these organizations like; human resource managers, accountants, doctors, auditors have basic skills in office applications and functional specific systems. Generally, most non-ICT professional staff have low awareness of cyber security, and use simple passwords across systems and platforms. They lack skills in data analysis and visualization, social media for productivity, among others.
- f) It is estimated that the country produces about 10,000 ICT professionals every year at various levels (certificate, diploma and degrees), majority of whom are at certificate level. However, the country still faces skills deficiency in critical areas of ICT such as cyber security, animations, artificial intelligence, data science, complex systems development, cloud computing and virtualization, computer engineering, among others. The low supply of these critical skills is attributed to a number of factors and key among them include being new fields of specialization and the high costs of investment in training environment. The leading provider of ICT skills and

training services is still the college of computing and Information Sciences Makerere University.

- g) Generally, there is low investment by organizations in ICT skills development as most institutions don't have budgets for this activity. This action is left to the individual staff efforts in most of the cases.
  - h) Since the digital skills development is largely left to staff individual efforts, the study sought to establish the existing incentive structures for staff to acquire ICT skills. The results revealed that majority of the institutions offer appraisal points, recognition of staff, sponsorship of the training activities, salary increment, promotion, and some do pay costs for staff to study in that order of importance.
  - i) In terms of level of willingness to acquire ICT skills, majority of both ICT and non-ICT staff indicated that they very willing to invest in ICT skills development if they are sponsored or given time off, but less willing if they are required to sponsor themselves.
  - j) The current approach to skilling mainly through face-to-face training sessions (lectures, workshops and seminars) of formally accredited academic programmes or productivity focused short courses.
  - k) In terms of skills new ICT graduates lack the most, the study revealed the following; cyber security (20%), data science and database management (16.3%), Basic ICT skills (16%), complex system design and analysis (13%), among others.
  - l) With over 600 ICT skills training service providers on NITA-U database in the country, it can be prudently concluded that the country has sufficient suppliers of basic ICT skills and mid-range skills. However, most ICT skills training service providers do not have capacity to deliver top end competencies ideal for 4IR given the high capital investment needed in terms of labs like robotics, big data labs, artificial intelligence laboratories, cyber security and forensics labs, computer systems engineering labs, among others.
  - m) Nearly 80% of organizations indicated that they do not participate in curriculum development or delivery at training institutions, citing inhibiting factors, such as lack of collaboration or engagement from universities, lack of time and work overload, lack of facilitation to participate in the events, among others.
  - n) Inadequacy of Knowledge Management practices stands out as a challenge across most institutions. This was characterized by lack of knowledge work systems, intelligent techniques, and enterprise-wide knowledge management systems.
- 9) Desired "TO-BE" State of ICT Skillsets by the Market**
- a) At strategic leadership and senior management level, the most desired skills include IT strategic leadership, advanced office productivity, cyber security, change management, IT project management, E-government systems, and social media and web technologies, among others.

- b) The generally desired skills for ICT professional graduates include; artificial intelligence, cyber security, data science, system administration, cloud computing and visualization, complex system development, animations and graphics, mobile and web development, enterprise system development, CCTV and wireless technologies and internet, among others.
- c) For practicing researchers and consultants in the ICT sector the key desired skills are; data science and data analytics, scientific and policy brief writing, presentation skills and public communication, project management and monitoring, corporate laws and basic financial management, among others.
- d) For software developers on particular more skills and needed in system architect, requirements engineering and system modelling, enterprise systems development, embedded systems, among others.
- e) The most preferred means of ICT skill training was a combination of online and face to face, lasting not more than 5 days for short professional courses.
- f) For BPO industry desires more of certificate courses as opposed to diploma programmes and should last between 3-6 calendar months.
- g) The digital literacy skills programmes need to be contextualized to sector specific requirements, technologies and business processes. For example, oil and gas has special digital technologies and platforms which workers must have appropriate level of knowhow and skills.

#### **10) Skills gaps for ICT Professionals, Researchers and Consultant in the Target Sectors**

- a) Practicing researchers and consultants in ICT sector have insufficient skills in; public relation skills, data analysis, scientific and policy writing, corporate governance, financial management, project management, monitoring and evaluation.
- b) Strategic level institutional leaders in the target organizations indicated insufficient knowledge and skills in; IT strategy development and management, enterprise risk management and cyber security, office productivity applications, internet and web technologies.
- c) ICT practicing professionals have insufficient knowledge and skills in; communication and problem solving, data science and data analytics, artificial intelligence and Internet of things, enterprise software development, business process modelling and requirement engineering, cyber security, wireless technologies, cloud computing and visualization, among others.
- d) The country has very few multimedia content development experts (animators and associated expertise).
- e) The they're few providers of electronic device repair and maintenance training as most of the practitioners are self-taught.

- f) Most non-ICT professionals have insufficient knowledge and skills in basic computing literacy, *Advanced Office Productivity*, sector special technologies and systems, cyber security and privacy, *E-government systems and ICT software and hardware maintenance*.

## **11) UICT Human Resource Capacity Assessment and Alumni Opinions**

- a) Most of the students who enrol at UICT are mainly motivated by the need to develop skills and acquire new careers opportunities.
- b) Most of the students who enrol at UICT are those who did not perform well in exams at “O” and “A” level thus cannot proceed with Bachelors at any University and largely use UICT as stepping stone on their academic progression. These students are mainly from both rural and urban areas, whose families can be characterized as low-income earning families.
- c) Generally, students and alumni ranked the level of satisfaction with UICT training programmes between good and excellent, however they pointed out the need to improve on curriculum design so that it can be aligned to industry needs, upgrade the training infrastructure and enhance training approaches in order to optimize learner skills development.
- d) Generally, UICT current staffing capacity of 39% is far below average. The institute’s capacity to implement its mandate, vision and mission efficiently and effectively specifically considering that 61% of the positions are vacant, is at stake
- e) Most of the UICT staff have not had or attended any professional training in their areas of specialization to enhance their capacity citing a number of challenges including limited access to funding for such staff development activities.
- f) The research function at UICT is still lower and the institute has only two PhD holders who are fulltime in administration. As such UICT lacks experienced staff to spearhead the research function in the institute.
- g) UICT lacks specialists in emerging areas of 4IR e.g. cloud computing, robotics, artificial intelligence, data science and big data analytics, research and innovation management, among others.
- h) UICT staff have insufficient digital pedagogy knowledge and skills to support the new normal of technology mediate teaching and learning approaches.
- i) Most of UICT academic staff have basic proficiency in digital literacy skills, hence the need to upgrade their skill levels so as to be responsive to ecosystem demands.

## **12) Emerging UICT Priority Training Programmes Capacity Assessment**

- a) For the institutional strategic leaders and managers, the following not in any order of preference have emerged as some of the key priority training programmes UICT needs to pursue:
  - i) IT strategy and project management

- ii) Internet and web technologies
  - iii) Cyber security and data protection
  - iv) Report writing and presentation
  - v) Office productivity applications and domain specific systems, e.g. teacher management information system, URA portal, etc.
- b) For the non-ICT professionals, the following not in any order of preference have emerged as some of the key priority training programmes UICT needs to pursue;
- i) Research methods and data analysis
  - ii) Internet and web technologies
  - iii) Cyber security and data protection
  - iv) Report writing and presentation
  - v) Advance office productivity applications
  - vi) Domain specific systems, e.g. teacher management information system, IPPS, oracle, URA portal, etc.
- c) For the ICT practicing professionals, the following not in any order of preference have emerged as some of the key priority training programmes UICT needs to pursue:
- i) Research methods and data analysis
  - ii) Cloud computing and virtualization
  - iii) BPO certification
  - iv) Enterprise software development
  - v) Business processing engineering
  - vi) Software security and software testing
  - vii) Data science and data analytics
  - viii) Wireless network technologies and internet of things
  - ix) Embedded systems design
  - x) Cyber security
  - xi) Systems administration and network security
  - xii) Mobile and web applications development
  - xiii) IT strategy and project management
  - xiv) Report writing and presentation

- d) For UICT staff the following not in any order of preference have emerged as some of the key priority training programmes:
- i) Research methods and data analysis
  - ii) E-learning and technology mediate learning process
  - iii) Internet and web technologies
  - iv) Cyber security and data protection
  - v) Report writing and presentation
  - vi) Advance office productivity applications
  - vii) Domain specific technologies in areas of specialization such as cloud computing, security, artificial intelligence, among others.



## 4.2 Assessment Recommendations

From the assessment findings, the recommendations in the table 21, which directly respond to issues highlighted in the conclusions above, have been drawn. To guide planning and implementation, a priority column has been added to the attention of the respective actors:

**Table 22: Assessment Recommendations**

No	Issues to address	Action/Recommendation	Actor	Priority
1	Insufficiency of some specific ICT professionals to drive the country's economy in both private and public sectors (artificial intelligence, cyber security, data science, Software Developers, cloud computing and virtualization, complex system development, animations and graphics, mobile and web development, CCTV, Network Administrators and wireless technologies and internet, IT strategy management and Internet of things)	<ul style="list-style-type: none"> <li>Recruit, develop and retain a critical team of professionals in the specific skills areas.</li> <li>Design flexible and practical curricula inclusive of short and long courses targeting in-service and pre-service trainees, career transitions etc.</li> <li>Adopt flexible delivery approaches involving online and face to face training.</li> <li>Sustain and upscale the current (ongoing academic programmes) in the Institute.</li> <li>Franchise some of the readily available international certification programmes especially in areas of BPO, data science, cyber security, among others.</li> </ul>	UICT Governing Council & Management	High
2	ICT training quality assurance	<ul style="list-style-type: none"> <li>UICT should ensure that all academic programmes have appropriate ICT infrastructure such as specialized laboratories to deliver the proposed curricula.</li> <li>Keep the specialized training labs updated with relevant infrastructure and software to the current market demand</li> <li>Both the infrastructure and curriculum should be subjected to a 5-year mandatory curriculum review to ascertain the</li> </ul>	UICT Management	Medium

No	Issues to address	Action/Recommendation	Actor	Priority
		<p>functionality of the infrastructure to support continued teaching of the approved curriculum, given the backdrop that technology continually improves and the fact that most ICT equipment has a 3-year lifespan.</p> <ul style="list-style-type: none"> <li>• Develop Quality assurance framework</li> <li>• Train Staff on the current policies such as ICT policies among others</li> <li>• Should Stock the current existing specialised labs with most needed equipment's to enhance IT training requirements the market world.</li> </ul>		
3	Massive need for continuous professional development by employees in both public and private sector and preference for a combination of online and face-to-face training not exceeding 5 days	<ul style="list-style-type: none"> <li>• UICT to develop tailor made short courses (combining online and face to face training approaches), targeted at the various levels of employees in organization (strategic leadership, senior management, ICT and non-ICT professionals).</li> <li>• UICT should partner with both private and public institutions focused on provision of ICT skills to deliver some of these programmes to government employees.</li> <li>• FastTrack adoption and implementation of courses contained in the ITU-Digital Transformation Centre (DTU) Training Catalogue (2021).</li> </ul>	UICT Governing Council and Management	High
4	Local governments and other institutions operating outside Kampala have the same level needs as far as ICT skills and training needs are concerned.	<ul style="list-style-type: none"> <li>• Establish satellite training centres in strategic locations in the country to cater for the massive need on the ground.</li> <li>• Restructure the staffing structure to cater for the expansion (satellite centres).</li> <li>• Engage in strong marketing strategy, such as district to district approach, Institution to Institutions arrangement, etc.</li> <li>• Lobbying through Ministries for IT capacity building in their sectors.</li> </ul>	UICT Governing Council and Management	Medium
5	Existing willingness to acquire ICT skills by majority	<ul style="list-style-type: none"> <li>• Lobby for increased government sponsorship budget especially targeting priority sectors of government employees.</li> </ul>	UICT Governing Council	High

No	Issues to address	Action/Recommendation	Actor	Priority
	of both ICT and non-ICT professionals if sponsored	<ul style="list-style-type: none"> <li>Expand partnership horizon to include willing scholarship partners such as ENABEL and UNESCO who have focus on digital literacy skills development.</li> <li>Establish institute scholarship fund targeting best performing applicants and special interest groups like Refugees.</li> <li>UICT, should set up <b>online training programmes</b> for various government agencies in areas where capacity gaps have been identified.</li> </ul>		
6	Support governing digitalization processes	<ul style="list-style-type: none"> <li>Develop an e-government curriculum aiming as accelerating update of government digital services.</li> </ul>	UICT Management	High
7	Demand driven curriculum development (Low participation of stakeholder in curriculum development or delivery)	<ul style="list-style-type: none"> <li>Conduct regular curriculum review in consultation with stakeholders.</li> <li>Alignment UICT curriculum development and delivery with industry demands.</li> <li>Incorporate industry experts in programme delivery on per cohort basis.</li> </ul>	UICT Governing Council and Management	High
8	Mandatory ICT Continuous Professional Development (CPD) for UICT staff	<ul style="list-style-type: none"> <li>All employees of UICT should complete a minimum of 40 hours of ICT CPD annually. The institute should set up an online tracking portal for this CPD on each individual staff.</li> </ul>	UICT Human Resource Manager	Lower
		<ul style="list-style-type: none"> <li>Provide Training in the areas of Consultancy skills, Online Pedagogy, social media and brand development, team building and professional development</li> <li>UICT needs to promote and encourage staff to undertake graduate studies especially at PHD level to improve their research capacity</li> </ul>	UICT Human Resource Manager	Medium
9	Digital Literacy Skills Framework	<ul style="list-style-type: none"> <li>UICT should develop and mainstream into all curricula align to key international Digital Literacy Skills Framework which incorporates best practices from the different international frameworks such as ICDL and the National Local Context Policy.</li> </ul>	UICT Management	Medium

No	Issues to address	Action/Recommendation	Actor	Priority
10	Alignment of academic programmes with Digital Transformation Programme and National Development Agenda	<ul style="list-style-type: none"> <li>As a good practice, all ICT academic programmes developed by UICT should be aligned to NDP III and Digital Uganda Vision.</li> </ul>	UICT Management	High
11	Continuous benchmarking and learning	<ul style="list-style-type: none"> <li>UICT management and staff should regularly conduct research about best practices in other countries and develop appropriate interventions.</li> <li>UICT should continuously establish bilateral collaborations with renown institutions with the same mandate as UICT within the African Region and globally.</li> </ul>	UICT Management	Medium
12	Providing enabling infrastructure	<ul style="list-style-type: none"> <li>UICT management should provide the basic enabling ICT facilities especially, computers and 24-hour fast internet, to all her employees and students.</li> </ul>	UICT Management	High
13	UICT- Industry partnership for enhanced academic performance	<ul style="list-style-type: none"> <li>UICT should involve (incorporate) professionals from industry to provide regular socialized training sessions to students on selected areas of interest.</li> <li>Establish and consolidate strategic partnerships with related institutions in the region in order to deliver on demand specialized programmes in Telecommunications, Broadcasting, Postal, Radio, Creative Industry, Multimedia, and Communication Officers among others.</li> </ul>	UICT Management	High
		<ul style="list-style-type: none"> <li>UICT should encourage their staff to acquire industrial certification to improve their knowledge and skills of developing and delivering market demanded training content.</li> <li>UICT management should involve industry in Curriculum development, professional development, Internship Placement, Research and Innovation</li> </ul>	UICT Management	Low
14	Promoting student-centred problem-based learning	<ul style="list-style-type: none"> <li>UICT should focus <b>student centred</b> problem-based learning to promote skills development. Also, they should promote practical or competence based academic progression assessment as opposed to theoretical examinations.</li> </ul>	UICT Management	High

No	Issues to address	Action/Recommendation	Actor	Priority
15	Production of work ready graduates	<ul style="list-style-type: none"> <li>• UICT should improve management and supervision of student field attachment to ensure meaningful engagement of students in their respective fields of study.</li> </ul>	UICT Management	High
16	Under staffing at UICT and Inadequacy of Knowledge Management practices across MDAs	<ul style="list-style-type: none"> <li>• On a gradual (annual basis), raise the staffing gap from the current 31% to at least 85% over 2-3 years</li> <li>• Recruit, develop and retain a critical team of professionals in the specific skills areas.</li> <li>• FastTrack implementation of targeted training interventions for the various categories of staff as provided in the UICT Organizational Restructuring, Job Evaluation and Job Grading Report (2021, Sec.11.6).</li> <li>• UICT should mainstream into its curriculum a certificate in Knowledge Management as a short course. This can be achieved in affiliation with the Association for Intelligent Information Management (AIIM) for certification in knowledge management</li> <li>• Ensure regular capacity building of staff through the use of cross cutting management courses to benefit all categories; Administrative, academic and part time staff.</li> </ul>	UICT Management	High

## 5.0 ANNEXES

### Annex 5.1: Some of the Documents Reviewed

1. Uganda Institute of Information and Communications Technology (UICT) Strategic Plan 2016-2021
2. ITU (2021): Information and Communication Technology Trends and Developments in the Africa Region, 2017-2020.
3. 2021 JCSE-UICT ICT Skills Survey Report (First Ugandan Edition).
4. ICT Sector Strategy and Investment Plan, 2015 – 2020
5. National Information and Communications Policy for Uganda, 2014
6. National Electronic Government (e-Government) Policy Framework, 2011
7. The 3<sup>rd</sup> National Development (NDP III), 2020/21-2024/25
8. The 2<sup>nd</sup> National Development Plan (NDP II), 2015/16-2019/20
9. Uganda Vision 2040
10. Uganda Public Service Standing Orders, 2010
11. Cabinet Memo (77 CT2016)
12. National Council for Higher Education. Strategic Plan, 2020/2021 - 2024/2025
13. National ICT Policy, 2014
14. National Broadcasting Policy
15. Uganda Communications Act, 2013
16. Ministry of ICT & National Guidance Skills and Training Assessment report, 2021
17. E-Government Strategy and e-Government Master Plan
18. NITA-U Strategic Plan, 2018/19-2022/23
19. National Cyber Security Framework (2014)
20. Business Outsourcing (BPO) Strategy
21. Data Protection and Privacy Act, 2019
22. ICT and Disability Policy, 2017 (draft)
23. BTVET Strategic Plan, 2011-2020
24. ICT Issues Paper, 2018
25. Access to Information Act, 2005
26. Uganda Public Service Training Policy, 2006
27. Evidence for ICT Policy Action: Policy Paper (8, 2012)
28. The draft report for Enhancement of the ICT function in Government
29. The NITA-U e-Service Delivery Model
30. The Curriculum for e-Government developed by NITA-U
31. Uganda's Readiness assessment for the 4<sup>th</sup> Industrial Revolution Report
32. Andela Annual Developer Uganda Survey 2019
33. UN E-Government Survey 2020: Digital Government in the Decade of Action for Sustainable Development
34. UICT report on the Market Needs Assessment Survey for Review and Development of the Strategic Plan (2021)
35. UICT Organizational Restructuring, Job Evaluation and Job Grading Report (2021, Sec.11.6)
36. ITU-DTC, Training Catalogue (2021).

## Annex 5.2: Matrix of Respondents

### a) Participating organizations in the KII, Individual and organizational assessment

No.	Organization	No.
1.	Directorate of Industrial Training	1
2.	Ministry of Education and Sports	4
3.	National Information Technology Authority-Uganda	1
4.	MAAIF	4
5.	National BPO/ ITES Council	4
6.	National Animal Genetic Resources Centre and Data Bank	1
7.	NARO	1
8.	Directorate of Education Standards	1
9.	Uganda Electricity Transmission Company	2
10.	Wekebere company limited	1
11.	Kasky Technologies Ltd	1
12.	Ministry of ICT and National Guidance	3
13.	Directorate of Public Prosecutions	3
14.	Education Service Commission	2
15.	National Curriculum Development Centre	3
16.	PPDA	3
17.	APTECH	1
18.	Ministry of education and sports	1
19.	Uganda Police Force	4
20.	Uganda Media Centre	6
21.	Uganda National Health Research Organization	1
22.	Uganda Blood Transfusion Service	1
23.	NIISP	1
24.	NCHE	1
25.	Uganda Communications Commission	4
26.	Innovation village	5
27.	Makerere University	11
28.	Hive Collab	2
29.	Uganda Broad Casting services	1
30.	Mbarara University	1
31.	Outbox	2
32.	ISBAT University	2
33.	MIC Makerere	3
34.	Gulu University	3
35.	Uganda Registration Services Bureau	1
36.	Clinic Master	2
37.	Refractory	3



No.	Organization	No.
38.	Uganda National Council for Science and Technology	2
39.	Uganda Blood Bank Transfusion Services	2
40.	Eight Tech Consults	6
41.	4 <sup>th</sup> Industrial Revolution Taskforce	1
42.	RUFORUM	2
43.	Directorate of Industrial Training	2
44.	Insurance Training College	1
45.	St. Michael's food ltd	2
46.	International Organization for Migration	1
47.	National Council for Higher Education	1
48.	Chairperson	2
49.	Uganda Prisons Service	2
50.	National Drugs Authority	4
51.	Ibabaza Media	2
52.	Directorate of Public Prosecutions	1
53.	Future Link technologies	2
54.	Socnet Solutions	2
55.	National planning Authority	2
56.	National Medical Stores	2
57.	Uganda Registration Services Bureau	1
58.	Health Service Commission	1
59.	Mulago National Referral Hospital	2
60.	Ministry of Health	1
61.	Judiciary	11
62.	Thin Void	1
63.	Clinic Master	2
64.	Global IT	1
65.	Uganda Aids Commission	3
66.	Uganda Prisons Service	1
67.	Uganda Virus Research Institute	1
68.	Uganda Blood Bank Transfusion Services	1
69.	National Agricultural Advisory Services	2
70.	NCDC	1
71.	JKA	2
72.	National Animal Genetic Resources Centre and Databank	1
73.	My world company	1
74.	St Andrew Kaggwa Gome High School	1
75.	WILLIBOOKS LIMITED AFRICA	1
76.	Eclipse Focus UK	1
77.	Other	12

**b) UICT FGD Participants**

<b>S/n</b>	<b>Name</b>	<b>Position</b>
1	Musinguzi Ivan	Lecturer - ICT
2	Dr. Fredrick Kitoogo	Principal
3	Dr. Irene Nakiyimba	Deputy Principal UICT
4	Nyongyera Bettles	Administrative Office HR
5	Bwengye Michael	Acting Academic Registrar & H.O.D Mgt Department
6	Nalugya Sylvia	Ag. Secretary management
7	Mugenyi Moses	Administrative Officer for Academics
8	Aruma Joseph	Assistant Bursar
9	Aboki Tonny	Assistant lecturer & HOD ICT
10	Bwire Francis	Administrative Officer Business Development
11	Buluma Naphtali	Laboratory technician
12	Dr. Nakiyimba Irene	Deputy Principal UICT
13	Charles Yakani	ICT-lecturer
14	Nalunkuma Elizabeth	Library assistant
15	Ambrose Johnson Bakwasiibwe	Institute secretary
16	Najjingo Roseline	Accounts assistant
17	Margaret Namugamba	AO-ICT
18	Namukwaya Dorothy S.	Secretary (to principal)
19	Nalugya Silivia	Receptionist
20	Tony Rovis	Management Lecturer-Part -Time
21	Nambobi Olivia	Senior library assistant
22	Joyce Wanyana	Management Lecturer-Part -Time
23	F.K Lwanga	Principal lecturer
24	Edwin Nasasira	Laboratory technician
25	Lydia Nabanja	Marketing Officer
26	John Bwire	Lecturer ICT Part-time lecturer
27	Musinguzi Ivan	Lecturer - ICT

## **Annex 5.3: Stakeholder Consultation Tools**

### **Annex 5.3.1: Desk Review Framework**

#### **Part One: Background**

Uganda Institute of Information and Communications Technology (UICT) is a Public Tertiary Institution under the Ministry of Education and Sports. The Institute is undertaking ICT skills Gap Assessment to identify key technical and functional capacity gaps among both government and private sector employees and develop a Skills and Training Action Plan (STAP). Based on the STAP, UICT will be guided in developing robust curricula, which will be implemented in nurturing a competitive ICT human resource base for National growth.

As part of the task, relevant documents will be reviewed to broaden the Consultants' understanding of the task and best practices. The purpose of this tool is to lay out a document review guide the Consultant will use in ensuring relevance and completeness of desk review.

#### **Part Two: Guiding Research Questions**

- i) What are the key; skills, knowledge and behaviours desired for an; ICT professional, Researcher and Consultant to be successful in the global digital economy?
- ii) How are the ICT Professionals, Researchers and Consultants in the country acquiring the needed knowledge and skills?
- iii) What are the regional trends in terms of development of skills and knowledge for the target practitioners?
- iv) What is the existing UICT human capacity in the areas of; ICT specialization, research and consultancy
- v) What are the existing business models for delivery of ICT skills in the country and region?
- vi) How do organizations establish their ICT skills and training needs? And frequent do they conduct the needs analysis?
- vii) What are the capacity gaps and capacity development approaches? This will make a holistic analysis of the gaps in capacity in Uganda as well as effective approaches to meet the gaps identified

### Annex 5.3.2: Organizational ICT Skills and Training Self-Assessment Tool for HR Managers

Uganda Institute of Information and Communications Technology (UICT) is a Public Tertiary Institution under the Ministry of Education and Sports. The Institute is undertaking ICT Skills Training Assessment (STA) to identify key technical and functional ICT capacity gaps among both government and private sector employees and thereafter develop a Skills and Training Action Plan (STAP). Based on the STAP, UICT will be guided in developing robust curricula, which will be implemented in nurturing a competitive ICT human resource base for National growth. This exercise is target at institutions within the specialized sectors of Education, Agriculture, Oil and Gas, Manufacturing, Health and ICT industry (telecom, Consulting and research firms, system developers among others.). The tool is informed by UICT stakeholder mapping in the strategic plan and the international standards Skills Framework for the Information Age (SFIA)

The purpose of this tool is to establish the current state of ICT Skills development in your organization and also establish the desired ICT skills, knowledge and behaviours for various levels of responsibility. The tool seeks opinions of human resource managers.

**Disclaimer:** *In line with the data privacy Act 2019, the information provided shall be strictly used for purposes of the study and any personal identifiable information shall be held with utmost confidentiality and shall only be used for verification of facts by the researchers, and at the end of the assignment the personal data shall be destroyed.*

Institutional name:..... Responding Officer: .....

Date: .....

Tel: .....email: .....

1. What kind of skill ICT development training have you offered to your staff in the last 12 months? (List all)

No.	Category	List
1	ICT Professionals	
2	Non-ICT Professionals	

2. How many ICT professionals do you have in your Organization and how many would you desire?

No.	Category (List all specialization application)	In position	Desired
1	System Admin		
2	Software developer		
3	Graphics and multimedia		
	Cyber Security		
4	Systems architects and Analysts		
5	Data scientists		
6	Database administrators		
7	Network engineers		
8	IT technical support		

3. What are the key skills and knowledge do you desire to see your ICT employees possess (list many as you can)
  - a. ....
  - b. ....
  - c. ....
  - d. ....
4. "Where do you source your ICT professionals?"
  - a) Private Universities
  - b) Public Universities
  - c) Cross Boarder universities etc.
  - d) Professional Bodies
5. How satisfied are you on the scale of 1-5, with 5 being the highest with your ICT employees that come from?

<b>Institution category</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Private universities					
Public Universities					
Private BTVET institutions					
Public BTVET institutions					

6. Which of these technical skills does your organization need most for your ICT core staff? rank on the scale of 1-5, with 5 indicating most needed

<b>Skill</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
E-government systems e.g., IFMS technical maintenance and user support					
Data scientist and analytics					
Software engineers					
System developer (DevOps role family)					
Business analysts					
Information and cyber security specialists					
Software testing and quality assurance					
IT project management specialist					
Agile systems developers					
Systems Architects					
Service management					
Technology infrastructure platform specialist					
Learning & development role family					
Internet and social media applications					
Research and knowledge management					
System administration					
Cyber security and digital forensics					
Networking and wireless technologies					
Multimedia systems					

Skill	1	2	3	4	5
Mobile and web application development					
Database management system					
Enterprise systems development					
Business process engineering					
Computer Repair					

7. Do graduates from Non-ICT disciplines have sufficient ICT skills and knowledge for their entry level position?

- a) Yes    b) No    c) very little    d) just sufficient to start

8. What incentive do you provide to your staff to motivate them to pursue ICT skills development?

Incentive	1	2	3	4	5
Sponsor the training					
Promotion					
Salary increase					
Recognition					
Paid time off to take the course					
Core to staff performance and appraisal					

9. Provide a snapshot of the state of your ICT department as of December 2021

Element of measure	Established number	Actual status	Remarks
Number of ICT professionals			
Target number to be recruited in the next 24 months			
Number of master holders			
Number of ICT staff who have left service in last 4 Years			

10. Which training delivery mode for ICT training would you prefer for your organization?

- a) Online (b) face-to-face on station (c) face-to-face off-station (d) Combination of online and face-to face (e) Others (specify)

11. How long would you prefer the online training to be?

- a) less than a one week (b) less than 4 weeks (c) about 8 weeks (d) not more than 12weeks (e) Other

12. How long would you prefer the on-station face to face training to be?

- a) less than a one-day (b) less than 3 days (c) about 5 days (d) not more than 12weeks (e) Others (specify)

13. How long would you prefer the face- face off -station training to be?  
(a) less than a one-week (b) less than 4 weeks (c) about 8 weeks (d) not more than 12weeks (e) Others (specify)

14. How long would you prefer the blended (online and face-face) training to be?  
(a) less than a one-week (b) less than 4 weeks (c) about 8 weeks (d) not more than 12weeks (e) Others (specify)

15. Summary of your MDA ICT skills and knowledge needs per line position of responsibility

16. Provide comments on the ICT skills and Training needs for your organization, which can make a basis for providing ICT capacity enhancement for your organization

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Thank you for your participation in this Study



### Annex 5.3.3: Individual ICT Skills and Training Self-Assessment Tool

Uganda Institute of Information and Communications Technology (UICT) is a Public Tertiary Institution under the Ministry of Education and Sports. The Institute is undertaking ICT Skills Training Assessment (STA) to identify key technical and functional ICT capacity gaps among both government and private sector employees and thereafter develop a Skills and Training Action Plan (STAP). Based on the STAP, UICT will be guided in developing robust curricula, which will be implemented in nurturing a competitive ICT human resource base for National growth. This exercise is target at institutions within the specialized sectors of Education, Agriculture, Oil and Gas, Manufacturing, Health and ICT industry (telecom, Consulting and research firms, system developers, among others).

The purpose of this tool is to establish the current state of Skills development needs of; ICT Professionals, Researchers and Consultants in terms knowledge and skills. The tool seeks opinions of individual professionals.

**Disclaimer:** *In line with the data privacy Act 2019, the information provided shall be strictly used for purposes of the study and any personal identifiable information shall be held with utmost confidentiality and shall only be used for verification of facts by the researchers, and at the end of the assignment the personal data shall be destroyed.*

#### Instructions

NB: While Parts 1-3 are compulsory, Part 4 is strictly to be answered by **Non-ICT Professionals** and Part 5 to be answered by **ICT Professionals**

#### Part one: Respondent's Profile

1. Respondent category (Public, Private Sector)
2. Gender: (M/F)
3. Highest Academic qualification
  - a) PhD
  - b) Masters
  - c) Bachelors
  - d) Diploma
4. Have you attended any ICT professional or short course training in the last 12 months?
  - a) Yes
  - b) No
5. List (at most 4) most recent ICT trainings you attended (if any) indicating; qualification, awarding institution and year.

S/n	Qualification	Awarding Institution	Year
1			
2			
3			
4			

6. Your age group
  - a) less than 25 b) 26-35 c) 36-45 d) 46-55 e) 56 and above
7. Years of professional working experience
  - a) 0-2 b) 3-5 c) 6-10 d) 11-20 and 20 and above
8. Years of experience at senior management level in the MDA or your sector
  - a) None b) 1-2 c) 3-5 d) 6-10 e) 11-20 (f) 20 and above
9. Professional category
  - a) ICT b) Non-ICT

**Part Two: Awareness and Understanding of Enabling Environment**

1. Does your organization provide Annual ICT training programmes to staff?
  - a. Yes b) No
2. If yes in 1, above list at least 2 trainings you attended organized or supported by your MDA (title, date and award (if any))
3. Do you have appropriate ICT infrastructure and technical support at your workplace to support you; acquire, grow and retain appropriate ICT skill for your level of responsibility? (rank your level of satisfaction)

Factor	1	2	3	4	5
Internet is reliable at my duty station					
I have an up-to-date computer					
I have an updated software for my office productivity					
Supportive IT technical team					

**Part Three: Office Productivity Digital Skills, Knowledge and Behaviour Self-Assessment**

**A: Digital skills**

1. On a scale of 0 (very low) to 5 (very high), indicate your level of proficiency in the following computer applications.

Skill	1	2	3	4	5
<b>Word</b> (General document formatting, automatic generation of table of contents, file protection, mail merge, macros, forms, bibliographic databases, extensions, export and importation from other office applications)					
<b>Excel</b> (Sheet formatting, cell management, functions, charts, pivotal tables, inter sheet/inter workbook operations, exportations and importation in other applications, excel data analysis, macros)					
<b>PowerPoint</b> (Making basic presentations, animations, slide design, slide transition, linkage to other applications, slide automation, sounds, macros)					

<b>Password management</b> (use a password that is more than 8 characters, which is alphanumeric, change password regularly every 3 months)					
Web Publishing (website development, CSS, knowledge of some CMSs, securing website, optimizing website)					
Any Graphical Design software					
Social media application like Twitter, WhatsApp					
Using alternate Operating Systems (Using spreadsheets, word processors and presentations from non-windows operating systems and exporting/importing to/from windows)					
Traditional structured data analysis using excel, SPSS, Stata, R etc					
Web browsing: (Searching the web, optimising search keys, use of bookmarks)					
Managing email account, sending, replying, copying, carbon copying, blind carbon copying, managing address book, mail merging emails, auto replies					
Using common cloud services like google docs					

2. On a scale of 0 (very low) to 5 (very high) indicate your level of proficiency in the following computer applications.

Skill	1	2	3	4	5
Access (design view and wizard creation of tables, forms, queries and reports, macros, modules using VB)					
Web browsing: (Searching the web, optimizing search keys, use of bookmarks)					
Managing email account, sending, replying, copying, carbon copying, blind carbon copying, managing address book, mail merging emails, auto replies					
Using common cloud services like google docs					

## B: Current State of ICT Knowledge

Considering the scale from 0 [knowing nothing] to 5 [Knowing very well], how would you gauge yourself in knowledge about the following ICT aspects

Knowledge	1	2	3	4	5
<b>Security</b>					
Network based attacks to computer systems					
Online privacy protection					
Operation of antivirus software					
Contacting CERT					
<b>Process and Project Management</b>					
Business processes modelling					
Information system requirement definition					
IT project management					
IT service performance monitoring					
E-government trends					

Systems integration					
<b>ICT trends</b>					
Cloud computing					
Mobile apps					
Social media					

**C: Day today workplace behaviour**

4. Do you share your passwords with colleagues on systems you access?
5. Do you use the same password on multiple systems?
6. Do you maintain an online diary?
7. Do you back up your office data and if so, on what devices?

**Part four [ICT Professionals]: Level of ICT skills need, means of delivery, cost and affordability**

8. Would you take a professional certificate or short course in ICT training like CCNA?  
a) Unlikely,            b) less likely,            c) likely,            d) most likely
9. To what extent would you need the following ICT skills in your current position to become more effective in-service delivery? Score from 1-5, with 5 being the highest

Skill	1	2	3	4	5
E-government systems e.g. IFMS technical maintenance and user support					
Artificial intelligence and data science					
Internet and social media applications					
Research and knowledge management					
System administration					
Cyber security and digital forensics					
Networking and wireless technologies					
Multimedia systems					
Mobile and web application development					
Database management system					
enterprise systems development					
Business process engineering					
Systems analysis and design					

10. List any other ICT skills or knowledge areas in which you would prefer to have more training, in order to be effective and efficient at your position

- a)
- b)

11. What would be your motivation for taking such a course? (rank from 1-5, with 5 being the highest)

Motivation	1	2	3	4	5
Skills development					
The professional award received					

Improved earning					
Job security					
Job promotion					
Networking					
Others .....					

12. Which training delivery mode for ICT training would you prefer?  
(a) Online (b) face-to-face on station (c) face-to-face off-station (d) Combination of online and face-to face

13. How long would you prefer the online training to be?  
a) less than a one week (b) less than 4 weeks (c) about 8 weeks (d) not more than 12weeks

14. How long would you prefer the on-station face to face training to be  
a) less than a one day (b) less than 3 days (c) about 5 days (d) not more than 12weeks

15. How long would you prefer the face- face off -station training to be?  
(a) less than a one week (b) less than 4 weeks (c) about 8 weeks (d) not more than 12weeks

16. How long would prefer the blended (online and face-face) training to be?  
b) less than a one week (b) less than 4 weeks (c) about 8 weeks (d) not more than 12weeks

17. For face-to-face trainings what would be your preferred time of study?  
(a) fully day off-duty (b) evening after work (c) weekend

18. Would you attend an ICT training course if?

<b>If</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
You're sponsored					
Required to pay the training costs					
Given time off to attend the training					

19. Provide any comments on the preferred ICT training needs for your current position in your organization

**Thank you for participating in this Study**

### Annex 5.3.4: UICT Alumni Tracer Feedback Tool

Uganda Institute of Information and Communications Technology (UICT) is a Public Tertiary Institution under the Ministry of Education and Sports. The Institute is undertaking ICT Skills Training Assessment (STA) to identify key technical and functional ICT capacity gaps among both government and private sector employees and thereafter develop a Skills and Training Action Plan (STAP). Based on the STAP, UICT will be guided in developing robust curricula, which will be implemented in nurturing a competitive ICT human resource base for National growth. This exercise is target at institutions within the specialized sectors of Education, Agriculture, Oil and Gas, Manufacturing, Health and ICT industry (telecom, Consulting and research firms, system developers among others.).

The purpose of this tool is to gather feedback from the UICT Alumni on the performance of the different UICT trainings/courses and how they have benefited from them.

**Disclaimer:** *In line with the data privacy Act 2019, the information provided shall be strictly used for purposes of the study and any personal identifiable information shall be held with utmost confidentiality and shall only be used for verification of facts by the researchers, and at the end of the assignment the personal data shall be destroyed.*

1. Designation (Position) .....
2. Industry (e.g. Health, Education, ICT, etc) .....
3. Highest Academic qualification
  - a) PhD      b) Masters      c) Bachelors,      d) Diploma

1. Have you ever participated in a course/training from UICT/under UICT programmes?

- a) Yes
- b) No

2. Which course /training did you participate? And indicate the years

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Motivation	1	2	3	4	5
Skills improvement					
For the certificate/award					
Improved earning					
Get a proper job					
Job promotion					
Networking					
Others .....					

3. What was your motivation for taking such a course/training? (rank from 1-5, with 5 being the highest)

4. How has courses/training attended at UICT benefited you in your career?

<b>Motivation</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Skills development					
Increased earning					
Job security					
Job promotion					
New career opportunities .....					
Others.....					
Others					

5. How satisfactory was your overall training programme you attended at UICT?

- a) Excellent
- b) Good
- c) Satisfactory
- d) Poor

6. How satisfied are with overall training infrastructure at UICT?

- a) Excellent
- b) Good
- c) Satisfactory
- d) Poor

7. How satisfied are training programme delivery approaches at UICT?

- a) Excellent
- b) Good
- c) Satisfactory
- d) Poor

8. How satisfied are you will curriculum use followed at UICT?

- a) Excellent
- b) Good
- c) Satisfactory
- d) Poor



9. How useful was the learning experience at UICT as a whole for your own situation?
  - a) Very useful
  - b) Quite useful
  - c) Not useful at all
  
10. In your opinion what should UICT management improve in the following key areas
  - a. Curriculum design .....
  - b. Infrastructure .....
  - c. Academic staff.....
  - d. Programme delivery/ training .....
  - e. Others (specify).....
  
11. Indicate the skills and training programmes from your opinion as a practitioner which UICT should focus on in the next 5 years (list as many as you wish)

### Annex 5.3.5 Key Informant Interview (KII) Guide

Uganda Institute of Information and Communications Technology (UICT) is a Public Tertiary Institution under the Ministry of Education and Sports. The Institute is undertaking ICT Skills Training Assessment (STA) to identify key technical and functional ICT capacity gaps among both government and private sector employees and thereafter develop a Skills and Training Action Plan (STAP). Based on the STAP, UICT will be guided in developing robust curricula, which will be implemented in nurturing a competitive ICT human resource base for National growth. This exercise is target at institutions within the specialized sectors of Education, Agriculture, Oil and Gas, Manufacturing, Health and ICT industry (telecom, Consulting and research firms, system developers among others).

The purpose of this tool is to establish the current state of Skills development needs of; ICT Professionals, Researchers and Consultants in terms knowledge and skills from the perspective of sector opinion leaders and institutional strategic vision bearers

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#### Part one: Respondent' Profile Information

1. Category (Public or Private sector): ..... Gender: .....
2. Sector (Education, Health, ICT, Agriculture, Oil and Gas, etc)
3. Years of experience at senior management level in the sector: .....
4. Highest Academic qualifications: .....
5. Professional qualifications: .....
6. How do you rank your ICT digital skills proficiency on the scale of 1-5, with 5 being the highest? .....

#### Part Two: Awareness of e-Government Systems and State of Enabling environment

1. In your opinion, what are your thoughts on the state of Uganda's ICT legal and regulatory environment as far as ICT skills development is concerned? is it promoting skills growth or constraining and why?
2. Have you participated in any ICT curriculum development? and do you think there is sufficient engagement between academia and industry in curriculum development and course delivery?
3. If there is any participation in what form? graduate tracer studies, workshop, innovations competition, public debates, others...?

#### Part Three: Current state of ICT skills and Training needs both private and public sectors

1. Do you think your sector has a sufficient number of ICT professionals in service such as?

- Software Developers
  - Data Scientists
  - Cyber Security Technicians
  - Network Engineers
  - System Administrators
  - System Analysts
  - It Support
  - Database Administrators
  - Consultants
2. Do you think non-ICT professionals in service of government (MDA) have sufficient ICT skills to enable them to implement the e-government agenda? state the kind of skills do you think are critical for them
  3. On the scale of 1-5 with 5 being the highest, rank the current level of ICT competences for the following levels of responsibility in your MDA/ Sector, and state the kind of ICT skills each level possesses.
    - Policy level (Ministers and board members for MDAs)
    - Top MDA leadership (Permanent secretaries, directors and commissioners)
    - ICT Heads
    - Non-ICT professional staff (e.g. accountants, HR, procurement, auditors, etc)
    - ICT professional staff (e.g. systems admin, software developers, network engineers, data scientist, etc)
  4. In your opinion, how long on average does it take for a fresh university ICT graduate to be trained by an MDA to an appreciable level of productivity? 2months, 3month, 6month or 1 year?
  5. Do non-ICT fresh graduates who join the industry have sufficient digital literacy skills for their level of responsibility? rank on the scale of 1-5, with 5 being the highest and justify your stand.
  6. Currently how is ICT staff capacity development of in the sector conducted?

**Part Five: Desired Skills, Knowledge and Behaviours in organizations and how to deliver them**

1. Which key skills and knowledge are currently and will continue to be demanded by industry like yours for ICT professionals?
2. Which key skills and knowledge are currently and will continue to be demanded by MDA's like yours for non- ICT professionals?
3. What type of individual employee traits would you consider ideal for successful implementation of E-Government in your sector? (not more than ten)
4. How should ICT skills for non-ICT professionals and policy makers in government be sustainably enhanced?
5. What should the academic institutions do to enhance the availability of appropriate skills in government service?
6. Which contribution can the private sector make in enhancing availability of appropriate skills in the economy?
7. Provide any comments or remarks on how ICT skills in government service for ICT and Non-ICT professionals can be sustainability enhanced.

**Thank you for participating in this Study**

### Annex 5.3.6 BPO Stakeholder Tool

Uganda Institute of Information and Communications Technology (UICT) is a Public Tertiary Institution under the Ministry of Education and Sports. The Institute is undertaking ICT Skills Training Assessment (STA) to identify key technical and functional ICT capacity gaps among both government and private sector employees and thereafter develop a Skills and Training Action Plan (STAP). Based on the STAP, UICT will be guided in developing robust curricula, which will be implemented in nurturing a competitive ICT human resource base for National growth. This exercise is target at institutions within the specialized sectors of Education, Agriculture, Oil and Gas, Manufacturing, BPO, Health and ICT industry (telecom, Consulting and research firms, system developers among others.).

The purpose of this tool is to gather feedback from BPO stakeholders on industry skills requirements gaps and man power estimated for the next 5 year to guide UICT in programme and curriculum design.

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1. Designation (Position) .....
2. Organization .....
3. Years of experience in BPO/ITES industry .....
4. Role in BPO/ITES industry.....
5. Highest Academic qualification  
b) PhD      b) Masters      c) Bachelors,      d) Diploma
6. What are the critical skills in demand for BPO/ITES industry (list all that apply).....
7. Who are the main suppliers of BPO/ITES training services in the region? (List all you know).....
8. How are the BPO/ITES programmes designed?
9. What are is average duration of BPO/ITES training programmes?
10. What is main mode of delivery of BPO/ITES programmes? (E.g. online, workshop, formal courses, blended, etc.).....
11. An average how many BPO/ITES are being produced annually? .....
12. In your opinion how many BPO/ITES professional do you project the industry will need in the next 5 years.....
13. Provided any insight on BPO/ITES industry skills demand and supply in the country .....

### **Annex 5.3.7 Benchmarking International Best Practice Guide**

Uganda Institute of Information and Communications Technology (UICT) is a Public Tertiary Institution under the Ministry of Education and Sports. Th Institute is undertaking ICT skills Gap Assessment to identify key technical and functional capacity gaps among both government and private sector employees and develop a Skills and Training Action Plan (STAP). Based on the STAP, UICT will be guided in developing robust curricula, which will be implemented in nurturing a competitive ICT human resource base for National growth.

As part of the task, relevant documents will be reviewed to broaden the Consultants' understanding of the task and best practices. The purpose of this tool is to lay out a document review guide the Consultant will use in ensuring relevance and completeness of desk review.

#### **Guiding framework**

- i) Identify countries to benchmark with based on; their global rank on ICT development index, regional representation and comparative social economic ecosystem
- ii) Identify Institutions with comparative mandate and business model for UICT in countries being studied
- iii) Document the types of programmes and services being offered by this institution at various levels
- iv) Generate a comparative map of UICT services and products comparatives to benchmarked institutions
- v) Generate an industry ecosystem comparative matrix covering the countries and Uganda in terms of the social economic conductions

### Annex 5.3.8 HR Gap Analysis Tool

Uganda Institute of Information and Communications Technology (UICT) is a Public Tertiary Institution under the Ministry of Education and Sports. Th Institute is undertaking ICT skills Gap Assessment to identify key technical and functional capacity gaps among both government and private sector employees and develop a Skills and Training Action Plan (STAP). Based on the STAP, UICT will be guided in developing robust curricula, which will be implemented in nurturing a competitive ICT human resource base for National growth. As part of the task, the Consultant lays this HR gap analysis tool which will be used in ensuring accuracy, relevance and completeness of the analysis process.

#### Human Resource Gap Analysis Template

Categories of staff	Established	In position	Desired	Knowledge and Skills gaps observed
Researchers				
PhD holders				
Computer Scientist				
Data scientist				
Cyber Security specialist				
Networks specialist				
System admin specialist				
Digital Literacy specialist				

### Annex 5.3.9 Focus Group Discussion Guide

Uganda Institute of Information and Communications Technology (UICT) is a Public Tertiary Institution under the Ministry of Education and Sports. The Institute is undertaking ICT Skills Training Assessment (STA) to identify key technical and functional ICT capacity gaps among both government and private sector employees and thereafter develop a Skills and Training Action Plan (STAP). Based on the STAP, UICT will be guided in developing robust curricula, which will be implemented in nurturing a competitive ICT human resource base for National growth. This exercise is targeting institutions within the specialized sectors of Education, Agriculture, Oil and Gas, Manufacturing, BPO, Health and ICT industry (telecom, Consulting and research firms, system developers among others.).

The purpose of this tool is to gather feedback from the UICT staff on the UICT training programme development, desired institutional changes among others.

**Disclaimer:** In line with the data privacy Act 2019, the information provided shall be strictly used for purposes of the study and any personal identifiable information shall be held with utmost confidentiality and shall only be used for verification of facts by the researchers, and at the end of the assignment the personal data shall be destroyed.

1. Are you aware of UICT theory of change?
  - 1.1 What are the key pillars of UICT institution strategy?
2. Briefly describe how training programmes are currently developed at UICT?
3. Briefly describe the key characteristics of students who enrol on UICT programmes in terms of academic levels, social background and motivation of joining UICT?
4. How should UICT be organized in terms of structures and systems to transform into a centre of excellence?
5. What do you consider as strength and weakness of UICT as an institution?
6. Given the emerging government reforms and changes in the ICT sectors, what should be the priority areas for the UICT in the next 5-10 years? In terms of training programmes and services
  - 6.1 How should these programmes be delivered to customers?
7. What strategies should UICT implement to attract, motivation, development and retain competitive human resources?
8. In your opinion what should UICT management do to improve in the following key areas;
  - a) Curriculum design
  - b) Infrastructure
  - c) Academic staff
  - d) Programme delivery/ training
  - e) e. Others (explain)
9. Which factors inform the nature of programme development and their means of delivery?



10. In your opinion how should UICT position herself to operate in the emerging dynamic world?
11. Which strategies should the institute pursue to promote her programmes and why?

**Part two: Level of ICT skills need, means of delivery, cost and affordability**

12. Would you take a professional certificate or short course in ICT training like CCNA?
  - a) Unlikely
  - b) Less likely
  - c) Likely
  - d) Most likely
13. To what extent would you need the following ICT SKILLS in your current position to become more effective in-service delivery? Score from 1-3, with 3 being the highest

Skill	1	2	3
E-government systems e.g. IFMS technical maintenance and user support			
Artificial intelligence and data science			
Internet and social media applications			
Research and knowledge management			
System administration			
Cyber security and digital forensics			
Networking and wireless technologies			
Multimedia systems			
Mobile and web application development			
Database management system			
Enterprise systems development			
Business process engineering			
Computer Repair			

14. List any other ICT skills or knowledge areas in which you would prefer to have more training, in order to be effective and efficient at your position
15. What would be your motivation for taking such a course? (rank from 1-5, with 5 being the highest)

Motivation	1	2	3
Skills development			
The professional award received			
Improved earning			
Job security			
Job promotion			
Networking			
Others .....			

16. Which training delivery mode for ICT training would you prefer?  
 (a) Online (b) face-to-face on station (c) face-to-face off-station (d) Combination of online and face-to face

17. How long would you prefer the online training to be?  
 (a) less than a one week (b) less than 4 weeks (c) about 8 weeks (d) not more than 12weeks

18. How long would you prefer the on-station face to face training to be?  
 (a) less than a one day (b) less than 3 days (c) about 5 days (d) not more than 12weeks

19. How long would you prefer the face- face off -station training to be?  
 less than a one week (b) less than 4 weeks (c) about 8 weeks (d) not more than 12weeks

20. How long would you prefer the blended (online and face-face) training to be?  
 less than a one week (b) less than 4 weeks (c) about 8 weeks] (d) not more than 12weeks

21. For face to face trainings what would be your preferred time of study?  
 fully day off-duty (b) evening after work (c) weekend

22. Would you attend an ICT training course if?

If	1	2	3	4	5
You're sponsored					
Required to pay the training costs					
Given time off to attend the training					

## Annex 5.4: STA Key Tasks and Activities

The matrix below highlights the key activities performed by the consultant before, during and after the STA process:

Key tasks	Key activities undertaken	Status
Meetings with the Client	<p>One online meeting with the client to:</p> <ul style="list-style-type: none"> <li>Understand the assignment and approval of strategies as spelt out in the inception report.</li> </ul> <p>NB: Several consultative phone calls with the Contract Manager UICT</p>	Achieved
Stakeholder identification	<p>In consultation with the Client, a stakeholder mapping was conducted that culminated into a line-up of key stakeholders for consultation.</p> <ul style="list-style-type: none"> <li>The organizations were selected based on their areas of specialty and key ICT needs to facilitate them in implementing their mandates</li> <li>The organizations' top-level respondents (Accounting Officers, heads of Human Resource and heads of ICT) together with members of the governing council of UICT, were identified based on the critical and strategic role they play in ICT human capacity development.</li> <li>The individual respondents (ICT professionals and UICT staff) and were identified based on their positions in the organizational structure, in consultation with the designated Accounting Officer of the target organization.</li> <li>The alumni were identified by use of tracer approach in consultation with the UICT contract manager</li> <li>Due to the need to gather feedback on ICT industry skills and man power requirements estimated for the next 5, the BPO as a critical data source were identified for this.</li> </ul>	Achieved
Tool development	<ul style="list-style-type: none"> <li>Involved the design of data collection tools, tool testing and validation, and data collection tool digitalization.</li> <li>To design appropriate tools, guiding research questions were defined and discussed with the client. Drafts of tools rafting, with assurance for completeness and clarity, were approved</li> </ul> <p>A total of 9 tools were developed i.e. Desk Review Framework (Annex III a), Organisational assessment (Annex III b), individual self-assessment, (Annex III c), UICT Alumni Tracer Feedback Tool (Annex III (d), Key informant interview Guide (KII) (Annex III e), BPO Stakeholder Tool (Annex III f), International Best Practices Benchmarking Guide (Annex III g), HR Gap analysis Tool (Annex III h) and Focus group discussion guide (Annex II i)</p> <p>The tools were peer reviewed for clarity, consistency and validity.</p>	Achieved

Key tasks	Key activities undertaken	Status
Tool testing and validation	<ul style="list-style-type: none"> <li>The tools were pilot tested using selected respondents in randomly selected institutions with similar mandates</li> <li>Revision and finalisation of f tools</li> <li>Digitization of tools to ensure standardized data capture and reporting</li> </ul>	Achieved
Data collection team orientation	<ul style="list-style-type: none"> <li>An orientation workshop of the data collection team involving experts and research assistants on; the research tools and methods, processes and observance of COVID19 Standard Operating Procedures as key items of the agenda, was conducted.</li> <li>This was done at Empower Consult offices, Ntinda (Kigowa, Kampala</li> </ul>	Achieved
Data capture	<ul style="list-style-type: none"> <li>Institutional assessment, key informant interview and self-assessment tools were digitally administered to selected respondents and</li> <li>Online Focus Group Discussions were facilitated by the consultants themselves.</li> <li>Regular monitoring of the data dash board to determine the levels of response and quality was done</li> <li>Data mining of thematic issues was done</li> </ul>	Achieved
International bench marking	<p>Document review of target institutions with similar mandates to UICT to elicit relevant information to the STA (<b>African Advanced Level Telecommunications Institute (AFRALTI), Kenya</b>, Telkom Centre for Learning and Cape Peninsula University of Technology in South Africa, Ghana-India Kofi Annan Centre of Excellence in ICT(AITI-KACE) in Ghana, Dar es Salaam Institute of Technology in Tanzania and New Horizons Institute Nigeria.</p> <p>Areas reviewed were: ICT sector policies, regulations and strategies that have supported the successful establishment and development of strong and sustainable ICT functions in those Governments, including curriculum designs and implementation in their ICT Training institutions.</p>	Achieved
Data cleaning and completeness	<ul style="list-style-type: none"> <li>Evaluation of data</li> <li>Cleaning of data</li> <li>Summarizing of data</li> </ul>	Achieved
Data validation	<ul style="list-style-type: none"> <li>Primary data collected from respondents was analyzed and shared with the respondents to confirm validity of opinions</li> </ul>	Achieved
Data analysis	<ul style="list-style-type: none"> <li>Qualitative data was analyzed using thematic content analysis, while quantitative data was analyzed using descriptive statistics.</li> </ul>	Achieved

Key tasks	Key activities undertaken	Status
Report writing	<ul style="list-style-type: none"> <li>• Consultative and engagement meeting (via zoom) with the client for purposes of appreciating and approving the STA reporting template (structure).</li> <li>• Several consultative phone calls with Contract Manager and/or Team leader of UICT to draft the STA were made</li> <li>• Extended in-depth data mining of thematic issues from the responses</li> <li>• Draft ICT STA Report was prepared</li> </ul>	Achieved
Regular updates	<ul style="list-style-type: none"> <li>• Internal coordination by consulting team member which provided daily updates on their actions on the assignment.</li> <li>• On regular intervals the Consultant provided updates to the client's contract manager, through the WhatsApp group, emails, phone calls and progress activity reports.</li> </ul>	Achieved
STA report	<ul style="list-style-type: none"> <li>• Systematic aggregation and incorporation of key observations into the draft STA report (this document).</li> <li>• Consultative and engagement meeting (via zoom) with client for purposes of appreciating and approving the STA report.</li> <li>• Incorporation of client observations</li> <li>• Submission of draft ICT STA Report</li> </ul>	Achieved
Final Draft STA report	<ul style="list-style-type: none"> <li>• Systematic aggregation and incorporation of key observations by the client into the draft STA report.</li> <li>• Consultative and engagement meeting (via zoom) with the client for purposes of appreciating and approving the STA report.</li> <li>• Incorporation of observations arising out of the consultations</li> <li>• Submission final draft STA Report for approval</li> </ul>	Achieved