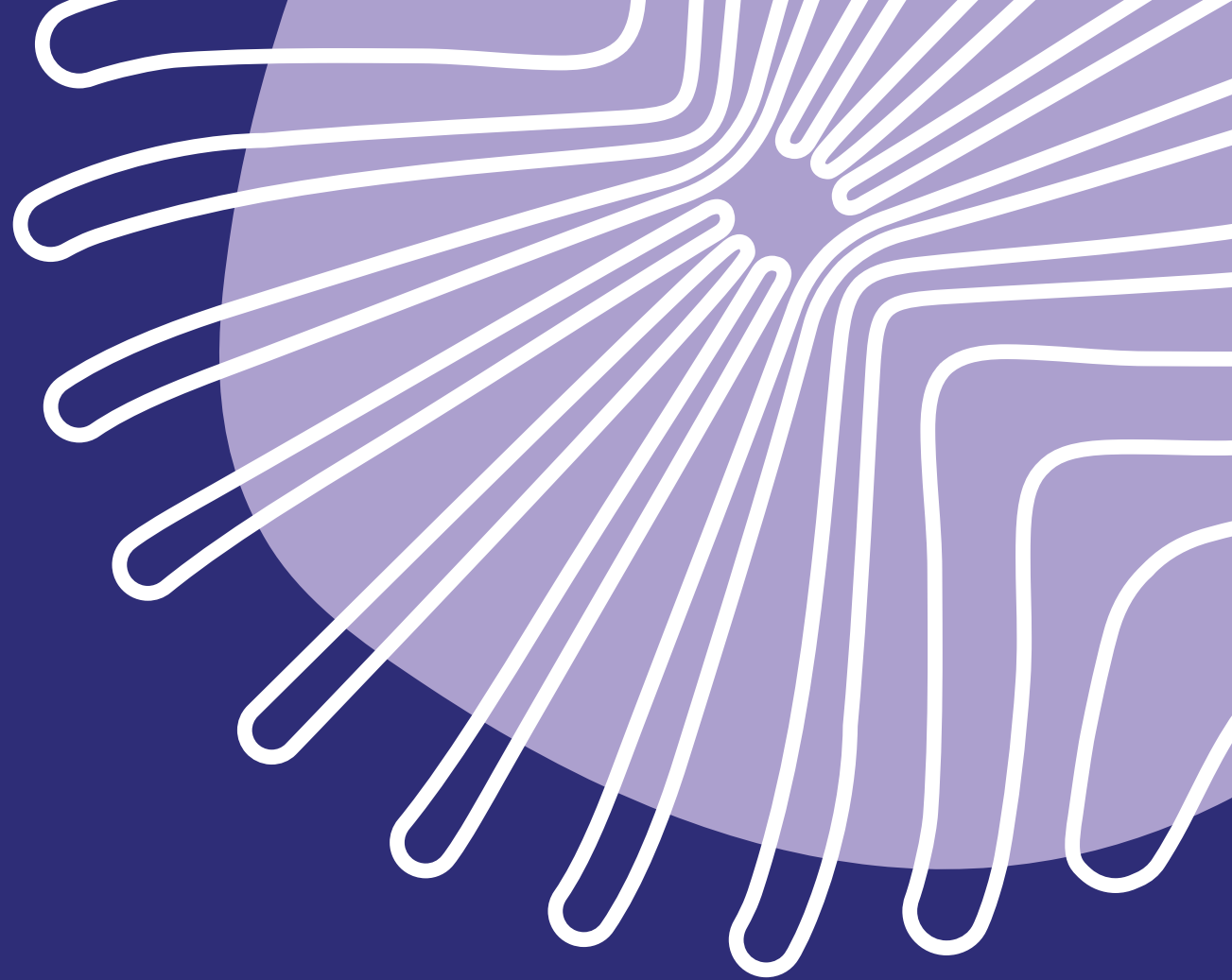
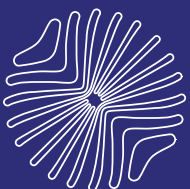




From Classroom to Career:

Lessons on ICT Talent Development from Kenya, Armenia and Nigeria



**Digital
Explorers**

Tallinn, June 2026

Authors:

Prof. Janika Leoste
Prof. Slavko Rakic
Dr. Voldemar Tomusk

Reviewers:

Birgit Rosenberg
Dr. Žilvinas Švedkauskas
Kristijanas Kaminskis

Implemented by:**Co-funded by:****Contracted by:**

This study was produced with the financial support of the European Union, contracted by ICMPD through the Migration Partnership Facility. Its contents are the sole responsibility of VšĮ "OSMOS Global Partnerships" and do not necessarily reflect the views of the European Union.

Table of Contents

Executive Summary	5
Introduction	6
Chapter 1	8
Methodology	8
Chapter 2	9
Digital Explorers	9
Chapter 3	10
Country Backgrounds	10
3.1 Estonia	10
3.2 Kenya	11
3.3 Armenia	11
3.4 Nigeria	12
3.5 Comparative Interpretation	14
Chapter 4	14
ICT in the national development agendas	14
4.1 Estonia: ICT as the foundation of a mature digital state and economy	14
4.2 Kenya: ICT as a driver of development, inclusion, entrepreneurship, and public-sector transformation	15
4.3 Armenia: ICT as a pathway toward high-tech growth, export orientation, and innovation capacity	16
4.4 Nigeria: ICT as a tool for economic diversification, youth employment, and large-scale digital transformation	17
4.5 Comparative interpretation	18
Chapter 5	19
Comparison of ICT education in four countries	19
5.1 ICT education in national higher education systems	20
5.2 Comparison of ICT curricula in six universities covered	22
5.3 Cross-university comparison	24

Chapter 6	26
Validation Evidence: Stakeholder Perspectives on ICT Education, Work-Readiness, and Quality Assurance	26
6.1 Relevance and quality of ICT education	26
6.2 The role of quality assurance	28
6.3 Pathways of talent formation	30
Chapter 7	33
Contribution of DE II project to the skills profiles of recent Kenyan ICT graduates and potential for Kenya and other countries	33
7.1 Assignments	33
7.2 Cross-cutting professional ICT skills developed across the assignments	35
7.3 Cross-cutting soft and transferable skills developed across the programme	36
7.4 Complementarity with ICT curricula	37
7.5 Contribution of DE II project to national ICT and economic development goals	39
7.6 Participants' Feedback on DE II Project	41
7.7 Logical circle from curricula to DE II and back	42
Conclusions	43
Recommendations	45
References	49
Appendix 1. Overview of Source Evidence for Report	54

Executive Summary

Universities across Kenya, Armenia, and Nigeria are producing more ICT graduates than ever before. Yet in ministries and boardrooms in all three countries, the same complaint keeps surfacing: **most of those graduates are not ready to start work on day one**. This report investigates that gap, building on an in-depth Estonia-Kenya case study and new evidence from Armenia and Nigeria, and examining ICT curricula, student experiences, employer expectations, graduate work-readiness, and the potential of international talent mobility. Throughout, it uses one closely documented programme, Digital Explorers II (DE II), as a real-world test of what actually closes the gap between a degree and a career.

The four countries differ substantially in economic scale, digital maturity, and labour-market conditions, allowing the study to examine ICT talent development across contrasting contexts. **Estonia** is a mature digital economy that still cannot find enough specialists. **Kenya** treats ICT as the engine of youth employment, entrepreneurship, digital inclusion, and public-sector transformation - and trains so many graduates that one recent government talent programme drew ten thousand applicants for four hundred places. **Armenia** is building an export-oriented high-tech sector that increasingly needs professionals with deeper specialisation. **Nigeria** has the scale to build an enormous ICT workforce - virtually all of its 300-plus higher education institutions teach some form of ICT - but chronic shortages of equipment, classroom space, and industry contact hold many graduates back. Four different starting points, one shared conclusion: **a strong curriculum on paper is not the same as a work-ready graduate in practice**.

That conclusion did not come from reading curricula alone. The research team compared six university programmes course by course, interviewed 26 Kenyan students and 13 Kenyan policymakers and university staff, and ran two employer focus groups, then extended the same approach to Armenia (four interviews and a class observation) and Nigeria (five interviews). **The interviews indicate that employability depends on practical learning, internships, employer engagement, and communication skills alongside formal technical content**. "Whatever is being taught is not enough," as one Kenyan student put it - not a complaint about any single university, but a description of a system in which the strongest graduates are consistently the ones who pair their degree with bootcamps, certifications, hackathons, internships, and the informal peer networks that teach what the classroom does not.

DE II shows what closing that gap looks like in practice. Between February and May 2026, twenty Kenyan ICT graduates spent four months inside eight Estonian companies and organisations, working on real problems: redesigning a fleet-management dashboard, building a digital handbook for prison inmates, automating onboarding for a small training centre. Visits to companies such as Bolt, Pipedrive, and Genius Sports gave them a clearer view of the career ladder ahead. Participants came back with sharper technical skills, stronger communication, better problem-framing, and, in their own words, a different sense of what they were capable of. The report's argument is that this is the real value of DE II: less a mobility perk than a feedback loop, showing universities exactly which skills their curricula are missing.

That argument drives the report's central recommendation. Donors, national governments, accreditation agencies, and universities should integrate curriculum reform, accreditation, and international mobility into a single education-to-employment pathway that pairs **academic learning** with **employer-linked projects**, **recognises skills** gained through bootcamps, lecture halls, and other learning settings, and **supports graduates** after programme completion. Estonia offers one useful proof point: after the country scrapped rigid, centrally run programme accreditation in 2016 in favour of lighter institutional oversight, quality did not collapse – universities simply gained the freedom to keep pace with a field that moves faster than any four-year review cycle. The findings reach well beyond DE II. They speak to a question facing universities, governments, and donors everywhere: not how to produce more ICT graduates, but **how to make sure the ones already arriving are ready for the work waiting for them**.

Introduction

The growing demand for digital skills has made Information and Communication Technology (ICT) a strategic priority for economic competitiveness, public-sector modernisation, innovation, and international cooperation. Across Europe and partner countries, however, ICT education and labour-market development remain uneven. Advanced digital economies face persistent shortages of qualified specialists; while emerging digital economies must strengthen the link between higher education, practical training, graduate employability, and international career pathways (OECD, 2026).

The DE II project has responded to this challenge by supporting cross-border ICT talent partnerships between the Baltic region and partner countries, including Kenya, Nigeria, and Armenia. The project reaches beyond mobility by combining digital skills training, internships, employment pathways, mentoring, intercultural learning, and ecosystem cooperation. Its structure includes several complementary tracks: trainee, professional and ambassador.

The current report consolidates the findings from two phases of the study. **Phase I** analysed the Estonia–Kenya case, focusing on curriculum alignment, student experiences, employer expectations, and the transition from ICT education in Kenya to study and work-based learning in Estonia. **Phase II** extended the analysis to Armenia and Nigeria, examining whether the findings from the Estonia–Kenya case are transferable to other partner-country contexts and identifying country-specific barriers and opportunities. In addition to these findings the report also includes outcomes of 20 recent ICT graduates' placements in Estonian IT companies in February – May 2026, in terms of the additional skills acquired as well as the participants' own insights regarding the benefits of the project.

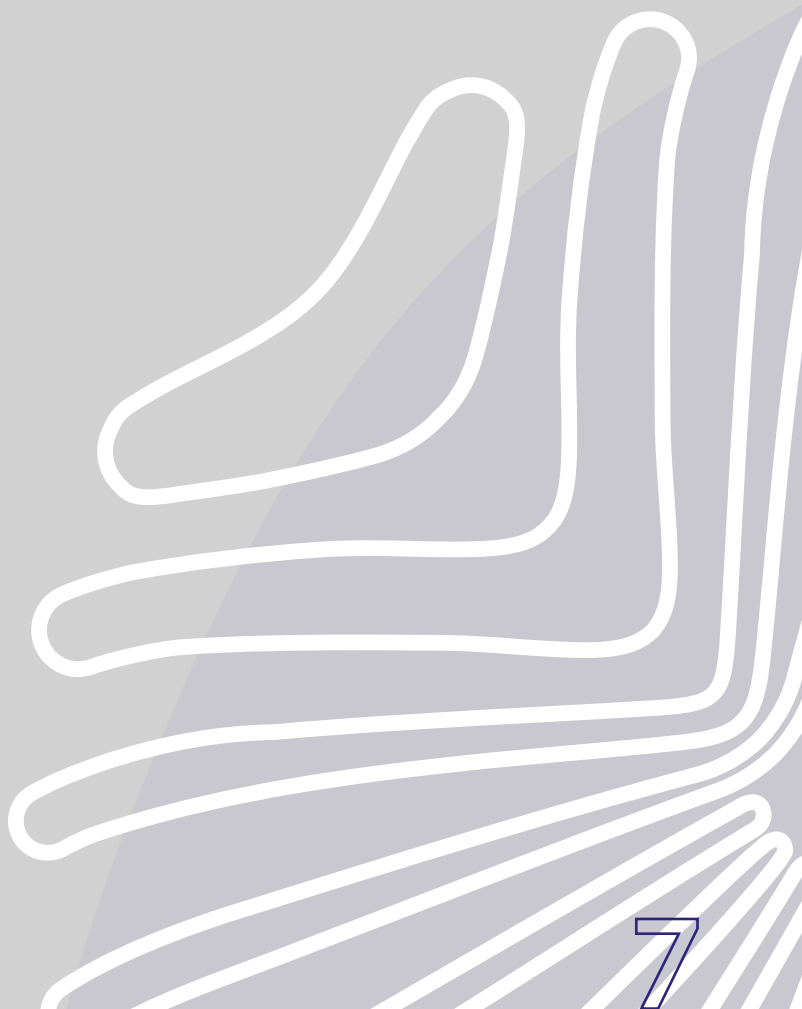
Building on these studies, the report provides a comparative synthesis across Estonia, Kenya, Armenia, and Nigeria. Estonia is used as a benchmark of a mature digital economy with strong digital infrastructure and continued demand for ICT specialists. Kenya, Armenia, and Nigeria are analysed as partner-country contexts with significant ICT potential, but different structural conditions, institutional capacities, labour-market needs, and mobility challenges.

The report is guided by the following central question: **how effectively do selected ICT education systems and talent-development pathways in Kenya, Armenia, and Nigeria align with evolving labour-market needs and relevant international benchmarks, and what lessons can be drawn from comparison with Estonia to strengthen digital skills development and cross-border cooperation?**

Methodologically, the report combines curriculum analysis, desk research, student perspectives, and interviews with multiple stakeholder groups involved in ICT education, labour-market alignment, and DE II implementation. The multi-perspective approach makes it possible to compare formal curricula with lived student experience, employer expectations, institutional views, and real mobility pathways.

The purpose of this report is to provide an **evidence-based** and **policy-relevant assessment** of how ICT education, practical readiness, employer expectations, and mobility pathways interact. By triangulating evidence across countries and stakeholder groups, the report identifies both common bottlenecks and context-specific needs.

The report contributes to the design of more effective ICT talent partnerships by arguing that future cooperation should move beyond short-term mobility and isolated curriculum comparison towards integrated education-to-employment pathways. Such pathways should combine curriculum renewal, practical learning, employer engagement, skills recognition, mobility preparation, and post-programme continuity.



Chapter 1

Methodology

The methodology of the study followed a three-stage mixed-methods approach. Phase I focused on the Estonia–Kenya case, Phase II extended and validated the findings in Armenia and Nigeria. The final stage brought the evidence together into a comparative synthesis across the four countries and added the most recent DE participants experience. The purpose of the study was to assess how ICT curricula, graduate work-readiness, labour-market needs, and talent-partnership opportunities connect in different national contexts.

The study combined **curriculum analysis, desk research, student interviews, stakeholder interviews, focus groups, class observation, and analysis of DE II placement-related evidence**. In total, six ICT study programmes were reviewed across Estonia, Kenya, Armenia, and Nigeria. The curriculum analysis focused on programme structure, content, practical-training components, learning outcomes, soft-skills coverage, quality-assurance elements, and visible links with labour-market expectations.

The desk research covered policy documents, official reports, institutional documents, academic literature, strategic studies, labour-market analyses, and quality-assurance materials. These sources were used to contextualise ICT education, digital transformation priorities, university–industry cooperation, skills demand, and mobility-related challenges in the four countries.

The empirical component of Phase I included 26 Kenyan student participants connected to the DE programme. This included 16 students in three semi-structured group interviews and 10 students in individual interviews. The student interviews focused on prior ICT education in Kenya, teaching and learning differences between Kenya and Estonia, practical relevance of training, adaptation to international academic and workplace environments, perceived skills gaps, and preparation for labour-market entry.

Phase I also included 13 stakeholder interviews in Kenya with policy representatives and university staff, including five policy representatives and eight university staff members. In addition, two focus groups were conducted with eight participants from private-sector companies and public-sector organisations. Further Digital Explorers-related evidence was collected from Ambassador Track representatives, Tallinn University staff, and Estonian host-company representatives.

Phase II extended the same analytical logic to Armenia and Nigeria. In Armenia, four semi-structured interviews were conducted with industry and university representatives, together with one class observation involving approximately 20 students. In Nigeria, five semi-structured interviews were conducted with industry and university representatives. These interviews were used to examine whether the Estonia–Kenya findings were also visible in other partner-country contexts and to identify country-specific barriers and opportunities.

Overall, the study included the perspectives of **students, university staff, employers, public-sector representatives, private-sector organisations, ecosystem actors, Ambassador Track participants, and Digital Explorers-related host institutions**. This made it possible to compare formal curriculum design with student experience, employer expectations, institutional perspectives, and evidence from practical placements.

The analysis was conducted through comparative and thematic synthesis. Curriculum documents were first reviewed to identify similarities and differences across programmes and countries. Interview and focus-group material was then analysed around recurring themes such as practical readiness, employer expectations, skills gaps, adaptation challenges, mobility barriers, and cooperation between universities and industry.

Triangulation across curriculum evidence, desk research, student perspectives, stakeholder interviews, focus groups, class observation, and placement-related evidence formed the core of the analytical approach. Findings were treated as stronger when similar patterns appeared across several evidence sources. Differences between sources were interpreted as context-specific variations, perception gaps, or implementation challenges.

The final report integrates the evidence from Phase I and Phase II into a comparative assessment of Estonia, Kenya, Armenia, and Nigeria. It identifies common patterns and country-specific differences in ICT education, labour-market alignment, graduate readiness, and talent mobility. **The results are used to formulate practical recommendations** for strengthening ICT curricula, improving education-to-employment pathways, supporting university-industry cooperation, and developing future international talent partnerships.

Chapter 2

Digital Explorers

DE II is presented in this report as a practical example of how international talent partnerships can connect education, skills development, workplace exposure, and institutional cooperation. The programme integrates mobility into a pathway in which participants move from preparation and training into real work-based learning, professional networking, and cross-border cooperation. This allows developing an understanding how ICT education can respond more effectively to labour-market expectations.

The programme addresses needs on both sides of the partnership. For Baltic and European technology ecosystems, it contributes to widening access to highly motivated ICT talent in a context where labour-market analyses continue to show demand for ICT specialists (Mets & Viia, 2021). For partner countries, it offers young professionals, students, entrepreneurs, and public-sector representatives' opportunities to gain international experience, strengthen practical ICT competencies, and build professional networks that can later support development in their home ecosystems.

DE II can be seen as a cross-border ICT talent pathway. It connects preparation before mobility, practical learning during mobility, employer expectations, mentoring, intercultural learning, and post-programme opportunities. Adopting this pathway perspective demonstrates the significance of formal curriculum content, practical exposure, communication skills, adaptability, and the ability to work in real organisational contexts.

The project brings together several target groups through three complementary tracks: **trainee, professional, and ambassador**. The **Trainee Track** supports early-career ICT talent through practical training and short-term placements. The **Professional Track** focuses on more experienced ICT specialists seeking international employment opportunities. The **Ambassador Track** involves entrepreneurs, university representatives, public-sector actors, and ecosystem stakeholders, with the aim of strengthening institutional learning, policy exchange, and long-term cooperation between the Baltic region and partner countries.

For mobility to create sustainable value, it needs to be connected with curriculum relevance, practical learning, employer engagement, institutional cooperation, and post-programme continuity. In this sense, DE II also functions as a capacity-building instrument, as it includes pre-training, mentoring, intercultural support, networking, gap analysis of ICT education systems, and assessment of talent-partnership models.

Chapter 3

Country Backgrounds

The four countries covered in this study -Estonia, Kenya, Armenia, and Nigeria - represent different economic, demographic, and digital development contexts. Each country operates under specific structural conditions, including population size, income level, structure of the economy, youth demographics, digital maturity, labour-market absorption capacity, and national development priorities. These specific features define the needs for qualified ICT specialists, their expected skills' profiles and the capacity of the economies to absorb ICT graduates as well as resources available to provide high level practice-oriented training in technologically adequate learning environments. The comparison shows how ICT competencies are developed, and how countries face different pressures in connecting education, employment, and international mobility.

3.1 Estonia

Estonia represents a small, high-income, digitally mature economy. In 2025, Estonia had a population of approximately 1.34 million, with 30.0% of the population aged 0–30 and 28.1% aged 60 and above. In 2024, its GDP was approximately €37.24 billion, while GDP per capita reached about €28,970. Its economic growth has remained modest in recent years, which makes the productive use of digital capacity particularly important for future competitiveness.

Estonia's socio-economic profile is strongly shaped by digitalisation. Internet use is very high, and ICT is already embedded in the functioning of the state, the economy, and public services. The ICT sector contributes around 8% of GDP and employs more than 37,000 people, making it a mature pillar of the national economy. Estonia's development challenge is therefore not primarily basic digital access, but the need to sustain a highly digitalised society with enough skilled specialists.

The country faces a tight labour market and continuous demand for high-value ICT professionals. Labour-market analyses show that Estonia requires a steady inflow of new ICT specialists, with demand extending across the ICT sector and the wider economy (Mets & Viia, 2021). Estonia therefore serves as an example of an advanced digital economy whose **key challenge is to maintain competitiveness, attract and retain ICT specialists, and support deeper digital capability across sectors** in search of new avenues for economic growth.

3.2 Kenya

Kenya represents a **large, fast-growing lower-middle-income economy** with a young population and **substantial pressure to move young people from education into employment**. In 2025, Kenya had a population of approximately 58.63 million, with 65.0% of the population aged 0–30 and only 4.9% aged 60 and above. In 2024, Kenya’s GDP was approximately €103.96 billion, with GDP per capita about €2,100, indicating a very different level of available per-capita resources compared as to Estonia.

Kenya’s economy is shaped by demographic expansion, youth employment pressure, and the need to create scalable education-to-employment pathways. This is particularly relevant in sectors with growth potential such as ICT, where national policy connects digital development with employment, innovation, public services, and inclusion. Kenya’s digital transformation agenda places ICT at the centre of national development and links it with broadband expansion, digital services, innovation, and job creation (Republic of Kenya, 2019).

Kenya remains at a different stage of digital maturity than Estonia. Internet use was reported at 35% in 2025, while ICT contributed 2.4% of GDP in 2023. This positions ICT as a strategic growth area within Kenya’s economy. Kenya’s digital economy is expected to expand significantly, which reinforces the need to scale skills development, institutional capacity, and labour-market absorption.

Kenya’s national development profile is marked by ambition and scale. It is often described as a regional digital leader, supported by strengths such as mobile-money ecosystems, expanding digital services, and its broader reputation as the “Silicon Savannah.” However, existing analyses also point to implementation challenges, including coordination gaps, uneven operationalisation of policy goals, and the need for stronger digital-skills development (e-Governance Academy Foundation, 2022).

Kenya’s core challenge is to **ensure that education, practical training, and labour-market needs are better connected**. This is consistent with evidence showing persistent concerns about graduate work-readiness, practical exposure, and the need for stronger university–industry linkages (Karanja et al., 2021). Its socio-economic development goals are therefore closely linked to digital inclusion, entrepreneurship, job creation, public-sector transformation, and the ability to scale ICT capacity for a young and growing population.

3.3 Armenia

Armenia represents a **smaller, more digitally connected, and increasingly high-tech-oriented economy**. In 2025, Armenia had a population of approximately 2.93 million, with 31.0% of the population aged 0–30. In 2024, its GDP was approximately €22.43 billion, with GDP per capita around €7,700.

Armenia’s development profile is strongly connected to the growth of its ICT and high-tech sectors. The IT sector accounted for 8.3% of gross value added in 2024, while communication contributed an additional 1.0% (Chervyakov et al., 2025). The sector’s share of gross value added more than doubled from 3.5% in 2021 to 8.3% in 2024, showing that digital and IT-intensive activities have become a significant part of the national economy (Chervyakov et al., 2025).

Digital maturity is also visible in Armenia's broader indicators. Internet use was reported at 80.0% in 2025, and the country has made progress in digital governance, including improvement in the E-Government Development Index. Armenia's digitalisation framework identifies education and digital skills as important conditions for national digital transformation, alongside cybersecurity, data policy, infrastructure, and legislative reform (Ministry of High-Tech Industry of Armenia, 2021).

The Armenian economy is also increasingly internationally oriented in the ICT field. The IT sector's turnover reached €2.1 billion in 2023, with a large share generated in foreign markets. This export orientation means that the country's ICT workforce serves domestic needs and responds to international standards, competition, and demand for advanced capabilities. Recent evidence shows that Armenia's ICT sector has become strongly export-oriented, with a major share of IT turnover generated in foreign markets (United Nations Armenia, 2025).

In socio-economic terms, Armenia's main challenge is less about basic scale and more about **moving toward higher-value specialisation and innovation capacity**. The country has a growing ICT education pipeline and a strong technical base, but its longer-term development depends on strengthening advanced skills, research capacity, practical readiness, and the ability to retain talent in an internationally competitive sector. World Bank analysis similarly argues that Armenia's high-tech potential depends on moving beyond outsourcing toward higher-value activities, stronger research capacity, and deeper advanced skills (World Bank, 2020). Armenia therefore represents a case where the next challenge is to deepen innovation capacity and reduce mismatch between education and high-tech labour-market expectations.

3.4 Nigeria

Nigeria represents **the largest and most demographically pressured** country in this study. In 2025, Nigeria had a population of approximately 242.4 million, with 70.0% of the population aged 0–30. In 2024, its GDP was approximately €217.93 billion, while GDP per capita was approximately €810, indicating a highly constrained environment for education, infrastructure, and skills development.

Nigeria's very large and young population creates enormous demand for education, digital skills development, and also for employment. While the country has a major opportunity to develop a large ICT workforce, it also faces the challenge of ensuring that young people can move from education into high-quality employment. Existing skills evidence points to persistent structural weaknesses in Nigeria's skills system, including limited practical training capacity, learning-quality challenges, and weak coordination between education providers and labour-market demand (World Bank, 2015).

Nigeria's development goals are closely linked to digital transformation, but implementation takes place in a complex environment. The ICT sector is economically significant, with ICT contributing approximately 14% to GDP, while the digital sector is expected to expand further. At the same time, the country's digital access remains uneven, with important gaps in infrastructure, connectivity, and digital-skills availability. The Nigerian Communications Commission has highlighted uneven levels of digital skills among women, youth, and persons with disabilities, showing that digital inclusion remains an important policy challenge (Nigerian Communications Commission, 2023).

The country’s national digital strategy places digital literacy and skills among the core pillars of transformation and aims to expand broadband penetration and digital literacy. However, the wider socio-economic context includes infrastructure constraints, regulatory complexity, informal employment, uneven access to digital tools, and pressure on higher education institutions to serve very large student populations. These challenges are reinforced by labour-market data showing significant employment pressures and structural constraints in the transition from education to work (National Bureau of Statistics, 2024).

In the context of this study, Nigeria represents a country with substantial ICT potential but significant structural constraints. Its main challenge is **to transform a large youth population and growing digital economy into consistent, practical, and internationally relevant ICT talent**. This requires stronger links between digital policy, infrastructure, higher education, practical training, and formal employment pathways.

Based on the country comparison, the following two tables (Table 1 and Table 2) present the key demographic and digital infrastructure profile, followed by the economic and education profile of Estonia, Kenya, Armenia, and Nigeria on Table 3 in the next chapter.

Table 1. Demographic and Digital Infrastructure Profiles

Country	Population	Youth under 30 (%)	Internet access (%)	Smart gadget ownership by households (%)
Estonia	1,361,000	30.0	96.4	97.5
Kenya	58,536,000	65.0	35.0	76.0
Armenia	2,931,000	31.0	80.0	92.0
Nigeria	242,431,000	70.0	39.2	68.0

Source: Adapted from United Nations Data (United Nations, 2025).

Table 2. Economic and Education Profiles

Country	GDP per capita (€)	Real GDP growth 2024/25 (%)	ICT share in exports (%)	Gross tertiary participation (%)	Graduate unemployment (%)
Estonia	28,970	0.60	12.0	54.0	3.6
Kenya	2,100	4.80	1.9	10.0	60.0
Armenia	7,700	7.10	11.5	61.3	16.0–19.0
Nigeria	810	3.90	0.15	12.0	45.0–55.0

Source: Adapted from United Nations Data and World Bank indicators.

3.5 Comparative Interpretation

The background information of the four countries shows that Estonia, Kenya, Armenia, and Nigeria are not simply positioned at different points on a single development continuum. They represent different structural conditions. Estonia is a small, mature digital economy with strong institutional capacity but persistent ICT labour shortages. Kenya is a fast-growing, youth-driven economy where digital transformation is closely linked to inclusion, entrepreneurship, public-sector modernization, and employment creation. Armenia is a smaller and increasingly high-tech economy where the priority is to deepen specialization, innovation capacity, and international competitiveness. Nigeria is a large, demographically dynamic economy with major ICT potential, but also strong constraints related to infrastructure, access, scale, and labour-market absorption.

The same broad themes **digital skills, employability, curriculum relevance, practical training, and international mobility appear across all four countries**, but their meaning differs according to each country's profile.

Chapter 4

ICT in the national development agendas

ICT occupies a central place in the national development agendas of all four countries covered in this study, but its role differs according to each country's economic structure, institutional capacity, demographic conditions, and stage of digital maturity.

4.1 Estonia: ICT as the foundation of a mature digital state and economy

In Estonia, **ICT is not treated only as a sector of economic activity, but as part of the country's wider institutional model**. Digital technologies support public administration, public-service delivery, business processes, education, and the functioning of the knowledge-based economy. This gives Estonia a different development profile from countries where the main priority is still to expand basic digital access and infrastructure. In the Estonian case, the central issue is **how to sustain, renew, and further develop** an already advanced digital ecosystem.

Estonia's level of digital maturity is visible in both infrastructure use and sectoral contribution (Estonian Association of Information Technology and Telecommunications, 2024).

The strategic importance of ICT is closely connected to labour-market sustainability. OSKA evidence shows that Estonia needs at least 2,600 new ICT specialists each year, while the annual supply from formal education remains below demand (Mets & Viia, 2021). This shortage is not limited to technology companies, because ICT specialists are also needed across other sectors where digital solutions, data systems, cybersecurity, automation, and platform-based services are becoming part of everyday work.

Estonia's development agenda focuses on producing more ICT graduates and developing higher-value competences. The demand is particularly strong for specialists with broader and deeper profiles, including software and systems development, cybersecurity, data-related work, sector-specific digital solutions, and understanding of business processes (Mets et al., 2024). This means that ICT education must support both technical depth and the ability to work across organisational and disciplinary boundaries.

Artificial intelligence adds a further layer to this agenda. The AI Leap programme presents AI as a new stage in Estonia's digital education development, with a focus on preparing students and teachers to use AI tools in learning and teaching (Ministry of Education and Research, 2025). This shows that Estonia's ICT agenda has moved beyond basic digitalisation toward the challenge of adapting a mature digital society to generative AI, AI-supported learning, and new forms of digital competence.

Estonia's main challenge is therefore to maintain a continuous supply of qualified ICT talent while updating digital competences in response to technological change. This is also connected to the recent slowdown in economic growth, which increases the importance of using ICT, AI, and digital innovation as sources of the next development cycle. In this context, Estonian universities, researchers, companies, and public-sector institutions need to identify new ways to translate advanced ICT capacity into productivity, innovation, and long-term economic renewal.

4.2 Kenya: ICT as a driver of development, inclusion, entrepreneurship, and public-sector transformation

In Kenya, **ICT is positioned both as a standalone growth sector and as a cross-sector enabler of national development.** The National ICT Policy links ICT development with broadband access, job creation, innovation, and public-service delivery (Ministry of Information, Communications and Technology, 2019). The Digital Economy Blueprint expands this agenda by connecting digital development with digital government, digital business, infrastructure, innovation-driven entrepreneurship, and digital skills and values (Republic of Kenya, 2019). The Kenya National Digital Master Plan 2022–2032 further operationalises this direction through digital infrastructure, digital government services and data management, digital skills, and digital innovation and business (Ministry of ICT, Innovation and Youth Affairs, 2022).

Kenya's ICT agenda is especially precise in the area of infrastructure expansion. The National Digital Master Plan includes large-scale flagship initiatives such as 100,000 km of high-speed fibre, 25,000 public internet hotspots, 1,450 village digital hubs, digitisation of government records, a digital one-stop shop for government services, national public key infrastructure, and large-scale digital capacity building for citizens, civil servants, teachers, and ICT professionals (Ministry of ICT, Innovation and Youth Affairs, 2022). The earlier National Broadband Strategy also framed broadband as a national development enabler linked to infrastructure, content, services, skills, and public-private investment (Republic of Kenya, 2018).

At the same time, Kenya's national development agenda links ICT to employment and youth opportunity. The country has a large and young population, which creates strong pressure to convert education into employability. ICT is therefore expected to support job creation, entrepreneurship, and labour-market participation. Labour-market evidence confirms that information technology was the most demanded career field in the Federation of Kenya Employers Skills Needs Survey 2023, identified by 35% of responding enterprises (Federation of Kenya Employers, 2023).

The country has strengths in mobile-money ecosystems, connectivity, and expanding digital services. However, the same evidence also points to implementation constraints, including co-ordination gaps, siloed implementation, duplication, insufficient operationalisation of long-term policy goals, and the need for a more integrated approach to digital-skills development (e-Governance Academy Foundation, 2022).

Kenya's **ICT agenda is ambitious**, but its **implementation remains uneven**. ICT is expected to support national transformation, but the success of this agenda depends on whether infrastructure expansion, curriculum reform, practical skills development, and labour-market absorption can progress together. For this reason, Kenya's role in the study shows **how digital transformation in a fast-growing economy requires strong education-to-work pathways and better alignment between universities, employers, and public-sector goals**.

4.3 Armenia: ICT as a pathway toward high-tech growth, export orientation, and innovation capacity

In Armenia, **ICT is central to the country's broader transition toward a high-tech and internationally oriented economy**. The IT sector accounted for 8.3% of gross value added in 2024, while communication accounted for an additional 1.0%, demonstrating rapid growth and the increasing structural importance of digital and IT-intensive activities in the Armenian economy (Chervyakov et al., 2025).

Recent growth was also influenced by the relocation of Russian ICT companies, specialists, and capital to Armenia after 2022. This inflow helped accelerate the development of the local technology ecosystem, contributed to employment and salary growth, and partly filled existing skills gaps. However, it also creates a sustainability challenge, because part of the recent expansion depends on geopolitical circumstances and may not automatically translate into long-term domestic innovation capacity (United Nations Armenia, 2025).

Armenia's national digitalisation framework identifies education and digital skills as fundamental conditions for implementing digital transformation, alongside cybersecurity, data policy, infrastructure, and legislative reform (Ministry of High-Tech Industry of Armenia, 2021). This shows that the country understands ICT development as an agenda encompassing economic growth, governance, and capacity building. Digital skills are necessary for public-sector modernisation, business development, and the country's ability to operate in a more complex digital environment.

The Armenian ICT agenda is also strongly connected to international markets. This export orientation creates a specific development pressure. Armenian ICT education and workforce development must respond to domestic demand and international standards in software development, data, artificial intelligence, product development, and professional communication.

At the same time, Armenia's development agenda faces a transition challenge. The country has a growing ICT education pipeline and strong technical foundations, but moving from outsourcing and service provision toward higher-value activities requires deeper specialisation, stronger research capacity, postgraduate development, and more advanced innovation systems. This includes areas such as AI research and engineering, advanced product development, and deeper scientific and mathematical capacity. Armenia's high-tech potential depends on stronger innovation capacity and a transition towards higher-value activities (World Bank, 2020).

The country's agenda therefore depends on closer alignment between higher education, high-tech industry, research capacity, and international competitiveness. Armenia's case shows that **even when ICT is already a strong economic sector, national development requires continuous adaptation to rapidly changing technologies and labour-market expectations**.

4.4 Nigeria: ICT as a tool for economic diversification, youth employment, and large-scale digital transformation

Nigeria's ICT agenda **operates under conditions of exceptional scale**. With a very large and young population, the country faces the challenge of using digital transformation to support economic diversification, skills development, and labour-market inclusion. Nigeria's National Digital Economy Policy and Strategy 2020–2030 positions digital literacy and skills as one of the country's core pillars for transformation. It sets ambitious goals, including expanded broadband penetration and high levels of digital literacy, and calls for digital skills to be integrated into education at all levels (Federal Ministry of Communications and Digital Economy, 2020).

Nigeria is the largest ICT market in Africa, and ICT contributes a substantial share to national GDP. In Q2 2024, ICT contributed 19.78% to GDP, confirming its position as a central driver of economic diversification (National Bureau of Statistics, 2024). National initiatives such as the 3 Million Technical Talent (3MTT) programme demonstrate strong policy commitment to building a digital workforce. The 3MTT programme aims to train three million young Nigerians in technical skills including software development, data science, cybersecurity, and AI (3MTT Nigeria, 2024). These elements show that ICT is treated as a major instrument for national economic transformation and employment growth. Beyond formal university pathways, Nigeria also has a growing parallel ICT training ecosystem that helps compensate for gaps in practical delivery within higher education Initiatives such as 3MTT, Andela, Ingressive for Good, and the MTN Foundation ICT and Business Skills Training as examples of government-, private-sector-, and foundation-led routes into ICT skills development. These initiatives focus on rapid skill acquisition, industry partnerships, employment-oriented training, and access to practical learning opportunities outside traditional degree programmes. Nigeria's main challenge is to **deliver ICT education at scale by connecting curricula, universities, accelerated training models, employers, infrastructure, and employment pathways into a coherent national ICT talent system**.

However, Nigeria's development agenda is strongly shaped by access and implementation barriers. While the country has significant digital potential, its digital infrastructure and access remain uneven. Household ownership of computers remains limited, and so is access to the internet, especially across rural areas. World Bank evidence shows that only 9.4% of households owned a computer and 34.6% had internet access at home, with much lower figures in rural areas (De Simone & Manolio, 2024).

Achieving Nigeria's ICT goals faces institutional and regulatory constraints. Higher education curricula are strongly influenced by national regulation, and although newer curriculum models allow some institutional flexibility, a large share of curriculum design remains centrally determined. Under the CCMAS framework, 70% of the core curriculum is centrally determined, while universities retain autonomy over the remaining 30% for local content development (Solomon, 2024). This can slow adaptation to fast-changing ICT labour-market needs. At the same time, large class sizes, infrastructure gaps, and limited practical tools make it difficult for universities to translate formal ICT curricula into consistent hands-on competence.

Nigeria has the population scale, policy ambition, and market size to become a major ICT talent hub, but achieving this requires stronger links between digital policy, infrastructure, higher education, practical training, and formal employment opportunities. Nigeria's case shows that **a national ICT agenda cannot succeed only through strategy documents or large-scale skills targets**; it also requires **delivery capacity at institutional level and practical pathways for the graduates into work**.

4.5 Comparative interpretation

Across the four countries, ICT plays a strategic role in national development, but the function of ICT differs by context. The comparison also shows that ICT development agendas are increasingly linked to education and labour-market systems. In all four countries, **digital transformation depends on whether universities and training systems can prepare graduates with relevant technical, practical, and transversal skills**. However, the pressure points differ. Estonia needs more high-level specialists. Kenya needs stronger operational alignment between digital ambition and graduate readiness. Armenia needs deeper specialization and research capacity. Nigeria needs scalable access, infrastructure, practical training, and stronger implementation capacity.

Table 3 confirms that ICT **cooperation between the four countries should not be based on a simple donor-recipient or advanced-developing country model**. Instead, cooperation should be understood in terms of ecosystem bridging. Digital Explorers-type cooperation can create value by connecting these different strengths, while also addressing the specific bottlenecks that limit education-to-work transitions in each context. To achieve economic growth an increase employment, mobilising ICT in support of the informal sector of the economy would be a high priority for both Kenya and Nigeria, and, somewhat surprisingly, to some degree also for Armenia.

Table 3. Labour Force and GDP Structure by Formal and Informal Economy

Country	Metric Type	Formal Agriculture	Formal Industry	Formal Services incl. ICT	Pure Informal Economy	Total
Estonia	Labour Force	3.1%	25.1%	60.8%	11.0%	100%
	GDP Share	3.6%	24.3%	62.4%	9.7%	100%
Kenya	Labour Force	1.1%	2.6%	12.9%	83.4%	100%
	GDP Share	3.5%	12.0%	59.9%	24.6%	100%
Armenia	Labour Force	4.5%	13.1%	40.4%	42.0%	100%
	GDP Share	4.8%	22.3%	48.7%	24.2%	100%
Nigeria	Labour Force	0.9%	2.1%	4.7%	92.3%	100%
	GDP Share	1.1%	18.5%	43.6%	36.8%	100%

Source: Authors' synthesis based on available national and international labour-market and economic indicators.

Chapter 5

Comparison of ICT education in four countries

The curriculum comparison conducted as a part of this study included selected Computer Science or ICT-related programmes from six universities: Tallinn University and Tallinn University of Technology in Estonia, Kenyatta University and Strathmore University in Kenya, the American University of Armenia, and the University of Lagos in Nigeria. The programmes were selected to support comparison across different institutional contexts, including 4 public and 2 private universities, Bachelor-level and Master-level provision, and systems with different levels of flexibility, scale, and labour-market alignment.

Table 4. Comparative Size of Bachelor-Level ICT Education, Employment and Cost

Country	Total number of ICT bachelor level students	As a percentage of the total bachelor-level students in the country	Percentage of female students	Estimated unemployment among Bachelor level ICT graduates	The public cost of a Bachelor level ICT graduate, over the nominal period of studies, €
Armenia	5,780	9.77%	34.4%	3-5%	4,500
Estonia	2,540	14.33%	21.0%	1.5-3%	42,000
Kenya	26,500	4.60%	28.0%	25-35%	2,100
Nigeria	96,900	5.23%	24.0%	35-45%	1,000

Source: Compiled by the authors from national higher-education statistics authorities (Statistical Committee of the Republic of Armenia; Statistics Estonia; Kenya Commission for University Education, University Statistics Report; Nigeria National Universities Commission, University System Statistical Digest).

Table 4 offers selected statistics on ICT education in the four countries covered by the current report. Perhaps one of the most significant differences between the countries is the public funding for ICT training for the totals as well as relative against GDP per capita. While three countries spend app. 1 GDP per capita unit per degree holder, for Estonia the multiplier is 1.4. Which, however, in absolute terms means that Estonia is spending on an ICT degree holder 40 times more than Nigeria and almost 20 times more than Kenya. The available funding has a direct impact on the technical resources available for training, international competitiveness of the faculty as well as pedagogy universities can apply, for example in terms of the class sizes. The gender dimension is also visible in ICT enrolment patterns. Data shows that female participation in ICT bachelor-level education differs across the four countries, ranging from lower participation in Estonia and Nigeria to higher shares in Armenia. This indicates that ICT talent development depends on graduate numbers, equitable access to ICT education, and the inclusiveness of the future digital workforce. It is also important to notice that although in relative terms their ICT student populations are considerably smaller than those in Estonia and Armenia, both Kenya and Nigeria do suffer from significant graduate unemployment, suggesting several suboptimalities working in intersection.

5.1 ICT education in national higher education systems

01 Estonia

The Estonian labour market requires ICT professionals for the ICT sector as well as for digital transformation across the wider economy. This creates pressure on universities to produce graduates with solid technical foundations, practical competence, and the ability to work across domains. In the Estonian case, competence development appears to be distributed vertically across study levels. Tallinn University's Bachelor programme provides an applied and technically substantial foundation, while more advanced specialist competences are developed more clearly at Master's level, represented in this study by TalTech's Computer Science and Artificial Intelligence programme. This suggests a system logic in which the Bachelor level builds applied and general professional capacity, while higher-level specialization is developed through advanced studies. The structure aligns with labour-market evidence emphasising the need for more ICT graduates and high-value specialists with broader and deeper competence.

02 Kenya

Kenya's ICT education operates under different structural conditions. The country has a large and young population, a rapidly developing digital economy, and a national agenda that places ICT at the centre of development, inclusion, entrepreneurship, and public-sector transformation. In this context, the Bachelor level carries substantial responsibility for preparing graduates for work across several ICT domains. Kenya has some 70 accredited higher education institutions, out of which approximately 30 offer B.Sc. degrees in IT. The Kenyan programmes show broad technical coverage, including mathematics, programming, systems, networks, databases, artificial intelligence, project work, and industrial or work-based components. The central challenge in Kenya is the translation of policy ambition and formal curriculum design into consistently work-ready graduate outcomes. Employer evidence points to persistent concerns regarding practical readiness, communication, problem-solving, soft skills, and the need for stronger university-industry linkages. This suggests that Kenyan ICT education provides important academic and technical foundations, but that practical training and labour-market integration still need to be strengthened.

03 Armenia

Armenia's ICT higher education system is closely aligned with the country's broader ambition to strengthen its digital and high-tech economy. Armenia has expanded its ICT education pipeline, with the number of ICT students steadily increasing. Armenia's system appears relatively strong in technical and mathematical foundations, particularly in more internationally oriented or private institutions. The analysed Armenian programme demonstrates strong preparation in mathematics, programming, data science, machine learning, and applied technical areas. Stakeholder evidence suggests that private and internationally connected universities may adapt more quickly to labour-market changes than more traditional institutions. Armenia's ICT sector is highly exposed to international markets and requires graduates who can work with advanced technologies, adapt to industry change, and operate in international business environments. At the same time, the Armenian system faces several higher education challenges. Some engineering and computer science curricula still require regular modernization, especially where course content has lagged industry needs. Armenia's ICT education challenge is less about basic ICT expansion and more about maintaining curriculum responsiveness, strengthening practical readiness, and supporting movement toward higher-value innovation.

04 Nigeria

While Nigerian national policy places digital literacy and skills at the centre of digital transformation, universities work under difficult implementation conditions, largely determined by the limited public funding. ICT is being taught nearly all if its 300+ higher education institutions with some 50 accredited universities offering B.Sc. degrees in IT or ICT. The Nigerian programme analysed for the purposes of the current report demonstrates broad formal technical coverage, including programming, networking, cybersecurity, robotics, systems, artificial intelligence, data-related areas, and industrial work experience. However, the main challenge lies in implementation. Stakeholder evidence points to large class sizes, limited infrastructure, insufficient practical tools, and a gap between theoretical instruction and real industry requirements. This means that Nigerian ICT education can be strong on paper, but uneven in practical delivery. Nigeria's higher education challenge is therefore shaped by scale, regulation, infrastructure, and labour-market absorption. The system has the potential to produce a very large ICT workforce, but formal curriculum provision does not automatically translate into work-ready competence. Students often need additional training after graduation, and many practical skills are developed outside formal university structures. In this respect, Nigeria shares some common patterns with Kenya, but under even greater demographic and institutional pressure.

5.2 Comparison of ICT curricula in six universities covered

#1 Tallinn University, Estonia

Tallinn University's Bachelor of Science in Computer Science represents an applied Computer Science profile. The programme combines a software-development core with optional pathways in software engineering, interaction design, and data analytics. It includes web programming and related applied development subjects, while areas such as front-end development, data visualization, data science technologies, machine learning, and the Internet of Things are mainly available through elective modules. The programme also includes interdisciplinary learning, compulsory professional placement, and a Bachelor's thesis. The main strength of Tallinn University's programme is its applied and project-oriented character. It prepares students for digital product development, software-related work, and further specialization. In comparison with the Kenyan programmes, its profile is less broad in classical systems coverage but more clearly oriented toward applied development, professional placement, and project-based learning. Its main analytical role in the study is to show **how an Estonian Bachelor-level programme can provide a practical foundation while leaving deeper specialist competence to later study pathways.**

#2 Tallinn University of Technology, Estonia

TalTech's Computer Science and Artificial Intelligence programme serves as a Master-level reference point for advanced specialist competence. Its inclusion is important because it illustrates how Estonia develops deeper specialist competence at a higher study level. The programme includes distributed systems, machine learning, computer vision, natural language processing, robotics, cryptography, project-based study, and a substantial Master's project. This programme reflects a different level of competence formation from the Bachelor-level curricula. It is not designed as a general first-cycle Computer Science programme, but as an advanced pathway into specialized ICT and AI-related roles. In the wider comparison, **TalTech helps explain the vertical structure of Estonian ICT education: applied competence begins at Bachelor level, while more advanced specialist and research-oriented competence is developed at Master level.**

#3 Kenyatta University, Kenya

Kenyatta University's Bachelor of Science in Computer Science represents a broad public-university Computer Science curriculum. It includes strong mathematical and technical foundations, such as discrete mathematics, linear algebra, calculus, probability and statistics, automata theory, programming, computer organization and architecture, electronics, microprocessors, operating systems, networks, databases, artificial intelligence, simulation and modelling, industrial attachment, and a final project. The curriculum also includes communication skills, critical thinking, research methods, legal and ethical issues, and entrepreneurship. The programme's **main strength is its breadth. It provides a wide systems-oriented technical profile and prepares graduates to move across multiple ICT domains.** However, compared with Tallinn University and Strathmore University, its practical learning elements are less central to the programme identity. Industrial attachment and project work are present, but the study suggests that the key question is how deeply these practical components are integrated into the learning experience and how strongly they connect with real labour-market expectations.

#4 Strathmore University, Kenya

Strathmore University's Bachelor of Science in Informatics and Computer Science combines strong technical foundations with explicit professional, ethical, and work-facing components. The programme includes advanced mathematics, programming, software engineering, computer systems, databases, networking, distributed systems, cloud computing, artificial intelligence, machine learning, and information security. It is also supported by structured project progression through Project I and Project II. In addition, it includes service-based learning, work-based learning, business ethics, corporate governance, social informatics, business law, foreign languages, and international industry experience. The main strength of Strathmore's programme is the formal integration of technical, professional, and societal dimensions. Compared with Kenyatta University, it has a more explicit employability orientation and a stronger institutionalized connection to work-based learning. Compared with Tallinn University, it appears broader in technical and professional coverage, particularly through its integration of cloud, AI, security, business, ethics, and international industry experience. In the comparative analysis, Strathmore is therefore presented as **the programme with the strongest formal integration of technical breadth, work-readiness, and professional orientation**.

#5 American University of Armenia, Armenia

The American University of Armenia represents the Armenian private-university case in the study. Its programme is described as structured, mathematically grounded, and specialization-oriented, combining theory with applied data and artificial intelligence. The curriculum shows strong emphasis on mathematics, programming, software development, data and information management, machine learning, and advanced technical topics. Project-based learning and teamwork are integrated, and the learning environment appears more controlled and consistent due to smaller scale and stronger institutional flexibility. The main strength of the Armenian case is **coherence and specialization**. Compared with Nigeria, the Armenian programme appears more focused and more consistently implemented. **It is particularly strong in analytical and technical preparation**, and stakeholder evidence suggests **relatively strong transitions into employment, including junior developer roles**. However, the study also notes that broader employability areas such as communication, soft skills, law, ethics, and society are less visible in the core requirements. This means that the programme is technically strong, but its work-readiness model could be further strengthened through more explicit professional and transversal competence development.

#6 University of Lagos, Nigeria

The University of Lagos represents the Nigerian public-university case in the study. Its curriculum is broad and system-oriented, combining technical ICT training with teaching and generalist competencies. It includes wide technical coverage, including programming, networking, cybersecurity, robotics, systems, artificial intelligence, data and information management, methodological skills, communication, and industrial work experience. Formally, the programme therefore covers many areas expected in a contemporary ICT curriculum. The main challenge for Lagos lies in its infrastructure constraints, large class sizes, limited equipment, and the gap between theoretical instruction and industry requirements. The Nigerian case has been described as **a broad system with strong technical scope** but significant gaps in work-readiness and implementation.

5.3 Cross-university comparison

Across the six universities, the comparison shows that **all selected programmes include relevant ICT content, but differ in programme logic, technical depth, practical learning, and employability orientation**. Tallinn University offers an applied software-and-data profile with project orientation. TalTech represents advanced Master-level specialization in Computer Science and Artificial Intelligence. Kenyatta University provides the broadest classical technical and systems-oriented Bachelor-level profile. Strathmore University combines technical breadth with the strongest formal work-facing, ethical, and professional orientation. The American University of Armenia offers a coherent, mathematically grounded, specialization-oriented programme with strong data and AI focus. The University of Lagos provides broad technical coverage but faces significant implementation constraints that weaken practical readiness. Table 5 shows Comparative Curriculum Profile and Employability Orientation of Analysed ICT Bachelor Programs.

Table 5. Comparative Curriculum Profile and Employability Orientation of Selected ICT Bachelor Programs

Tallinn University	Overall program logic: applied software-and-data profile with project orientation Technical emphasis: software development, data, project-based applied digital development Practical learning visibility: professional placement and interdisciplinary/project-based learning are clearly visible Employability orientation: applied digital-development and continuation pathway into practice or further study Main analytical takeaway: most applied and project-oriented profile
Kenyatta University	Overall program logic: broad and systems-oriented technical profile Technical emphasis: mathematics, systems, architecture, networks, databases, AI, wide technical range Practical learning visibility: industrial attachment and project work are present but less central to program identity Employability orientation: generalist technical graduate able to move across multiple ICT domains Main analytical takeaway: broadest classical technical and systems profile

Strathmore University

Overall program logic: technical breadth combined with explicit work-facing and professional orientation

Technical emphasis: strong core computing plus networking, cloud, AI, and software engineering

Practical learning visibility: work-based learning, service-based learning, and project progression are formally prominent

Employability orientation: technical graduate with clearer work-readiness, international orientation, and organizational awareness

Main analytical takeaway: strongest formal integration of technical, professional, and societal orientation

American University of Armenia

Overall program logic: structured, mathematically grounded and specialization-oriented program combining theory and applied data/AI focus

Technical emphasis: strong focus on mathematics, programming, machine learning, and data science with depth in advanced topics

Practical learning visibility: project-based learning and teamwork are integrated, with consistent implementation in smaller and controlled environments

Employability orientation: strong analytical and technical preparation with high transition into employment (e.g. junior developer roles)

Main analytical takeaway: coherent, flexible, and specialization-oriented system with strong alignment between education and labour market needs

University of Lagos

Overall program logic: broad and system-oriented program combining technical ICT training with teaching and generalist competencies

Technical emphasis: wide technical coverage including programming, networking, cybersecurity, robotics, and systems

Practical learning visibility: industrial training and projects are formally present but limited in practice due to infrastructure and large class sizes

Employability orientation: generalist profile, often requiring additional training after graduation to reach job readiness

Main analytical takeaway: broad system with strong technical scope but significant gaps in implementation and work-readiness

Chapter 6

Validation Evidence: Stakeholder Perspectives on ICT Education, Work-Readiness, and Quality Assurance

This chapter presents validation evidence on the curriculum comparison gathered across the different stakeholder groups involved in the study. It draws on student perspectives, views of university staff, company and employer representatives' opinions, public-sector and policy actors' evidence. Further insights were provided by Digital Explorers-related host institutions, and Ambassador Track participants. The chapter reaches **beyond formal curriculum comparison**, examining how ICT education is **experienced, delivered, interpreted, and validated** by those **directly connected** to education-to-work talent pipeline.

6.1 Relevance and quality of ICT education

The ICT curricula provided by universities of Kenya, Nigeria and Armenia included in this study appear by no means inferior to those offered by Tallinn University and Tallinn University of Technology. In broad terms these curricula compare well to any of their counterparts offered by the universities in the Global North. Starting with the Massachusetts Institute of Technology (MIT) in 2007, major universities worldwide have made their course materials publicly available (UNESCO, 2019). For almost 20 years universities globally have been able to offer the same content as MIT and other leading engineering schools worldwide. While the body of world-class ICT knowledge is easily available also to universities in Armenia, Kenya, Nigeria, and elsewhere, there appears to be a number of reasons why they still find it difficult to convert the advanced scientific and technological knowledge into skills and competencies that would meet the employers' needs and even beyond that – those of the societies facing the arduous task of large scale employment creation, **as it is the case for example in many Sub-Saharan countries (Sánchez Puerta et al., 2018).**

The following section is based on interviews with students, public and private sector representatives, ICT specialists and representatives of government agencies in Armenia, Kenya, and Nigeria, exposing some of the issues that limit universities' success meeting the growing demand for highly qualified ICT specialists, addressing skills mismatch and indicating a gap between training for available jobs and that of job creation. As one Kenyan business representative argues:

“...there's definitely a huge disconnect between industry and universities. Partially it could be curriculum, that the curriculum is fairly rigid, inflexible, kind of outdated, review processes take time.”

While the theoretical curriculum content appears to be strongly in place and the course delivery sensibly sequenced, **resources available to deliver the curricula effectively may appear somewhat limited.** This concerns both faculty resources as well as the necessary technical means, such as for example laboratories. Students' views are particularly helpful identifying some of such problems. In response to demographic pressures, universities admit increasing numbers of students. This, however, has a direct impact on teaching. One Kenyan student describes the university environment as somewhat overstretched:

“In public universities it's just crazy, they have big classes... they have their classes in halls, the lecturer has to put on a microphone... the lecturer to student ratio in public universities is a mess... the infrastructure is broken.”

Occasionally students' comments on teaching convey a sense of frustration. Students may portray lectures as passive, note-driven, and focused on information delivery:

"You're going to a class, and the lecturer is literally just reading out notes for you... you can clearly tell that he himself does not understand quite well whatever he's trying to teach."

Several students mention problems related to instructors' pedagogical skills:

"Most of these lecturers really... they don't know how to teach honestly."

Students also describe generational and adaptation gaps:

"The lecturers are old school and they simply cannot adapt... there is no young lecturers."

As frequently mentioned, lectures appear disconnected from the recent developments in the tech world and industry. As a result, lecturers do not appear competent and confident supervising up-to-date student projects and because reject students' forward looking project ideas:

"My model is from H ... [the lecturer is] like what's H ... that's not okay, that's not allowed."

Students appear painfully aware that quite often the theoretically oriented curricula offered by universities fall short of equipping them with skills that the job market needs, such as for example problem solving:

"In N University, we are not taught how to solve problems. We are not taught about what the industry has to offer."

A Nigerian ICT specialist confirms a similar pattern, noting that ICT education in Nigeria remains largely theory-oriented and that students often acquire practical skills independently:

"ICT education in Nigeria is more theory oriented, with very little practical things. Students usually have to learn most practical things on their own."

An Armenian academic staff member similarly notes that the gap between higher education and industry is partly caused by the different pace of change in academia and the ICT labour market:

"A gap exists because industry needs change rapidly, while academic adjustments take time to show impact. Foundational topics remain stable, but technical content requires constant updating."

Degree programmes **remain often theoretical** because of **the infrastructure constraints, offering limited exposure to applied development environments, modern software stacks, artificial intelligence workflows, or cloud-based infrastructures**. As the university sector has been rapidly expanding, public universities in particular may lack the resources to provide high quality relevant ICT education. One business representative in Kenya explained the situation as follows:

"... there are a number of universities that came about as a result of the 2010 Constitution. So, every county was given a right to create its own university. So, you had quite a series of sprouting universities, public universities."

Consequently, companies **increasingly bypass formal education channels** and **engage directly with students** through bootcamps, hackathons, and industry-led training initiatives. Large technology firms effectively “pre-select” talent by embedding their own training programmes within universities, while smaller local startups struggle to compete for a limited number of skilled graduates. Companies with a muscle, as they suggested, can enter a university, run their activities on their own and hire the talent they need without any connection too university curricula, teaching and procedures. As one Kenyan business representative candidly explained:

“I think that’s very clearly the situation. And what I’m seeing, I’m doing that as well, is that I’m going into universities and I’m holding boot camps and hackathons and training guys on AI because the universities are not doing it. They’re not part of the curriculum.”

At the same time, in face of a large and growing number of **ICT graduates job opportunities remain limited**. This on the one hand creates a massive pool of talent from which employers can cherry-pick the few they need, but unfortunately this also feeds graduate unemployment or leads graduates to applying for jobs that strictly speaking would not require university level ICT education. One public sector representative in Kenya offered a rather telling example related to the Presidential Digital Talent Programme, hiring people to teach basic computer use at community-based ICT hubs:

“... thousands of people who are qualified up to 10,000 applying for it and you realise that we have so many all diverse from bachelor of IT business, computer science and out of that we are at task to only select 400 you can imagine from 10,000 all the way to 400 because that is what the programme supports.”

6.2 The role of quality assurance

Quality disparities across the institutions further exacerbate the problem. Although more than 30 universities in Kenya offer ICT-related degrees, employers consistently identify only five to six institutions—such as the University of Nairobi, Kenyatta University, JKUAT, Dedan Kimathi University of Technology, and Strathmore University – as reliable sources of employable graduates (Commission for University Education, 2025). Many newer or less-resourced universities, despite their formal accreditation, are perceived as producing graduates with limited practical competence (Karanja et al., 2021).

Views expressed by students and confirmed by several industry representatives stand in stark contrast with explanations given by the staff of the Commission of University Education, the official accreditation agency in Kenya. CUE accredits all university degree programmes once every four years, confirming, among other things, that the programmes that have been co-developed in partnership with industry representatives (Commission for University Education, 2014a). However, considering the recent extremely rapid developments in the ICT field, the **review cycles may appear too long to allow dynamic curriculum development** (OECD, 2026). It is not necessarily certain that CUE has all the administrative and other resources available to organise some four thousand curriculum reviews, including site visits, during each review cycle. Despite the efforts by CUE, industry–university collaboration in Kenya does not appear strong. Although CUE’s programme accreditation procedures explicitly include consultations with business representatives, it does not seem to be making the expected impact on ICT training (Commission for University Education, 2014a). Employers, in a manner similar to some of the students, report limited involvement in curriculum co-design, while academic staff often lack recent industry experience, further widening the gap between teaching and practice (Sánchez Puerta et al., 2018).

A similar issue appears in Armenia and Nigeria, although through different regulatory arrangements. In Armenia, quality assurance and accreditation are managed by the National Centre for Professional Education Quality Assurance, which conducts mandatory institutional accreditation and voluntary programme accreditation, while higher education institutions also operate under licensing and national qualification requirements (ENQA, 2024). Although this does provide a formal quality framework, the evidence suggests that approval processes and regulatory procedures can slow the ability of universities to respond quickly to technological and labour-market changes. In Nigeria, the National Universities Commission regulates academic programmes through national standards, including the Benchmark Minimum Academic Standards and the newer Core Curriculum and Minimum Academic Standards framework (National Universities Commission, 2024). Under the CCMAS model, 70% of the core curriculum is centrally determined, while 30% is left for university-level adaptation, which gives institutions some flexibility but still limits rapid curriculum responsiveness in fast-changing ICT fields (Solomon, 2024). In both countries, **quality assurance systems therefore help maintain formal academic standards, but they do not automatically guarantee graduates' practical work-readiness, fast curriculum renewal, or strong alignment with employer needs.**

Similar issues related to relative ineffectiveness of the national quality assurance mechanisms in the context of rapidly developing technology fields such as ICT were also reported in both Armenia and Nigeria for the purposes of the current study. Evidence from Armenia confirms that regulatory and accreditation-related procedures may slow the ability of universities to respond quickly to labour-market and technological change. An Armenian faculty member reported:

“Regulatory processes can slow curriculum responsiveness. Changes in higher education regulations have introduced new approval procedures for launching programs, including waiting periods and unclear administrative processes.”

According to a Nigerian university representative, their case provides a comparable example on how regulatory and accreditation frameworks shape curriculum design, while still leaving only limited room for rapid institutional adaptation to emerging technological and labour-market needs:

“Curriculum design is predominantly influenced by national government policies. Historically, the curriculum was fully determined by the Benchmark Minimum Academic Standards (BMAS), which defined 100% of the program structure. More recently, a revised framework known as Core Curriculum and Minimum Academic Standards (CCMAS) has been introduced, where 70% of the curriculum is determined by government regulations, while 30% is developed by the university.”

In both cases programme accreditation mechanisms meeting widely agreed upon international models have been put in place. However, while the application of these models has succeeded in determining adequate academic course content and developing reasonably high-quality curricula, they appear insufficient for the ICT degree programmes to follow the rapid pace of technological development, meet the needs of the job market for specific skills and the societies at large for creativity, initiative and entrepreneurship.

Estonia used centralised accreditation of individual study programmes from 1997 to 2009. Following a transition in 2009–2011, the system combined mandatory institutional accreditation with regular quality assessment of study programme groups. Under the Higher Education Act adopted in 2019, regular assessment of all study programme groups was phased out, and institutional accreditation became the main form of periodic external quality assurance. Higher education institutions may open additional programmes within the study programme groups and levels in which they already hold the right to provide instruction, without separate external evaluation (Estonian Quality Agency for Higher and Vocational Education, 2022).

6.3 Pathways of talent formation

Despite the structural constraints, the talent sought by the most competitive employers in Armenia, Kenya and Nigeria is generally available. One of the reasons being the sheer numbers of ICT graduates the higher education sectors are producing. Out of the thousands of graduates every year, the leading businesses are well positioned to identify the exceptional talent they desire. As one business representative in Kenya explained:

“And there is exceptional talent coming out of universities, but that is by some law of averages, because we have a million people coming out of full-time education every year. ...So just by law of averages, you’re going to get some geniuses, right? It’s the nature of it is. The representative attributed exceptional graduates’ success primarily to their own initiative and abilities, with formal education providing part of their preparation.”

However, while this talent pool largely meets the needs of the industry, the skills profiles of the vast majority of the hundreds of thousands of ICT graduates produced each year are not sufficient to drive large-scale ICT-supported economic growth, nor does the majority of them appear employable internationally. In this sense, **significant segments of higher education appear to be primarily concerned with absorbing rapidly growing numbers of youth** representing highly diverse educational backgrounds, and **are not necessarily well positioned to offer high-quality, labour market-relevant education.**

Some students for example portray Kenyan university learning as partially effective but incomplete: **strong in community formation and access, weaker in industry alignment, practical depth, and adaptive pedagogy.** As one of them colourfully expressed, even high-achieving students who rely solely on what the university provides face a significant risk of remaining unemployed. University becomes a space where motivated students find one another and build informal support groups. Echoing a business representative’s emphasis on students’ own initiative, one student argues that the university’s main value lies in the relationships it enables:

“We are not really here because of N University per se, but because of the meaningful friendships... if you make meaningful friendships in university, then it really doesn’t matter what the university teaches.”

They suggest that these students’ friendship groups allow them to compensate for institutional limitations and take the initiative together in looking for additional learning opportunities:

“We’re very, very proactive with each other... if I see an opportunity... I’m going to pass it forward.”

Students describe vividly the extra steps they take to acquire the skills that would enable them to succeed in a highly competitive labour market. **To compensate for the shortcomings in university teaching, and to become employable, self-driven students may engage in various extra-curricular activities.** Some students attend bootcamps and other forms of practical training. One student report:

“I had to do extra training on the side, besides the university studies... I went to a boot camp... you learn software engineering, nothing else... the practical of software engineering.”

Doing so, they sometimes must choose between their formal studies or more productive extra-curricular activities:

"Am I going to go to N University for class or am I going to go for my bootcamp classes... which was more beneficial?"

Quite often students also use YouTube and other self-learning tools:

"You have to look for other ways, and those other ways are the boot camps, it's YouTube, it's being practical, and it's going to hackathons."

The students we interviewed often mention hackathons as a way of learning, particularly appreciating small, up to 5€ equivalent award money, free t-shirts and pizza meals as strong incentives to participate:

"I was very, very active in doing stuff like hackathons... I was doing some short courses... and that's how actually I got the qualifications to get the job that I'm doing right now."

Students stress the significance of early work experience:

"Work experience gives you everything that school does not."

They also stress the importance of developing self-confidence and overcoming doubt they may experience, often being first in their families attending higher education. Some students, however, also mention insecurity and the courage it takes to identify available opportunities and apply for them:

"I don't really think that I have what it takes... I'm just afraid of applying..."

Students, perhaps **somewhat in contrast with procedures and regulations of the formal higher education systems, see employability as being built through practice, visibility, networking, certifications, and confidence, often to be gained outside the formal university structures.**

From their side, industry representatives also confirm that this would exactly be the talent they are looking for. As a business representative in Kenya explained:

"...what makes those guys stand out a lot, ... it's often having strong student tech communities. So that can be a Google Developers Club, it can be an IEEE group or something like this, but having tech communities on campus, student organised. They won't have help from university and help from faculty, but basically student-organised groups. That is why I see most of the people I would be employing would be mostly coming from that."

They continued:

"I would have been recruiting telecoms engineers, network engineers, software engineers, people coming out who have got their own knowledge, they've gone online and got their own knowledge from Cisco Academy or whatever, or they've taken part in groups."

Armenian industry representatives also emphasise internships, hackathons, and collaborative activities as mechanisms that expose students to real challenges while helping companies identify talent:

“Industry participation through internships, collaborative activities, and initiatives such as hackathons can strengthen alignment. These formats expose students to real challenges and allow companies to identify talent.”

Students often perceive university as a necessary platform providing credentials, allowing to build peer networks, and offering a formal structure for their studies. Yet the studies are seen as insufficient on their own for full professional preparation. Students repeatedly describe needing to compensate for institutional gaps through self-directed learning, peer collaboration, and seeking various forms of external training.

Even critical students recognise that university provides structure, legitimacy, and foundational knowledge. One student acknowledges that given the constraints on university resources; efforts are being made to reflect labour market needs:

“I think they were trying to align us to what’s important in the market.”

Findings from Kenya suggest also differences between public and private universities. While public universities appear to have fewer resources than their private counterparts, they seem to be more flexible, leaving more room for student initiatives and extracurricular activities. More resourceful private universities are stricter on class attendance and other aspects of campus life. One of the students offered a conclusion that appears representative of the student experience across the sector as a whole:

“Whatever is being taught is not enough.”

As the higher education sectors in Kenya, Nigeria and Armenia have expanded rapidly, particularly over the past fifteen years, their **capacity to offer high quality education has been stretched and not all teaching staff members appear well qualified to teach at the university level. This has led to institutional difficulties in supervising cutting-edge technology projects, with a further impact on the graduates’ readiness to meet the needs of industry and the society at large.** While the strengths mentioned by students are primarily social and structural; weaknesses are predominantly pedagogical and industry-alignment related. An Armenian academic staff representative, for example, argues for closer industry collaboration:

“Stronger collaboration with industry through capstone projects would improve readiness. If final-year projects are linked to real industry problems and co-supervised by industry professionals, students would gain practical exposure and improve their employability.”

There also appears to be a generational issue with many senior level civil servants not well versed with IT, as the business representative continued:

“So, I’m a digital native, but most people who are in leadership roles, in industry and government particularly, are not digital natives.”

Chapter 7

Contribution of DE II project to the skills profiles of recent Kenyan ICT graduates and potential for Kenya and other countries

This chapter identifies the professional ICT skills and soft or transferable skills developed by DE II Kenyan participants while being placed in Estonian IT companies in February-May 2026. It also indicates how these skills could complement first the ICT curricula in Kenya, but also other countries covered by the study – Armenia, Nigeria and Estonia. Finally, we also draw some suggestions how the skills developed during the DE II project might contribute towards reaching the national ICT and economic development goals.

The analysis is based on the final DE II presentation event at Tallinn University on the 14th May 2026, concluding the work of 20 selected participants on eight real-life assignments with eight Estonian companies – FleetGuru, Latitude59, ADM, the Institute of Baltic Studies, Poco Museum, Ettevõtluskeskus, Trinidad Wiseman, and kood/Jõhvi. The skills acquired by recent Kenyan ICT graduates during their four months stay in Estonia are seen in the context of the ICT curricula analysed for the purposes of this study.

7.1 Assignments

#1 FleetGuru: Redesigning the fleet management experience

The FleetGuru assignment focused on improving how fleet managers access and interpret operational data. The team identified that FleetGuru had useful data, but users needed to move through too many screens, tables, and lists before reaching actionable answers. The team conducted interviews, heuristic audits, and competitive analysis, redesigned the landing page and dashboard, and introduced an AI chatbot ADO for natural-language interaction with fleet-management data.

#2 Latitude59: Speaker onboarding and event management

The Latitude59 assignment addressed the fragmented speaker onboarding process for a major technology conference. The team developed a structured platform with separate organizer and speaker sides. It included onboarding tracking, session management, transport information, reminders, scheduling, calendar invitations, media-kit functions, magic-link access, and state-based speaker progress tracking.

#3 ADM/GovStack: Kenya Starter for digital government services

The ADM/GovStack assignment focused on GovStack-based digital government services. The team developed “Kenya Starter,” a modular registration-service architecture that could support public services such as TVET registration, scholarship applications, and national ID registration. The solution used Drupal for the back end and Next.js for the front end. It was designed to be affordable, reusable, customizable, and interoperable.

#4 Institute of Baltic Studies: Digital inmate handbook

The Institute of Baltic Studies assignment addressed how prison rules and information could be made accessible, understandable, and navigable for inmates in a secure environment. The team created a tablet-based portal for the prison intranet, with clear categories, accessibility modes, chatbot support, text-to-speech, a medical assistant decision flow, a release fund calculator, FAQs, glossary, and guided assistants for procedures such as applying for work or study.

#5 Poco Museum: Personalized audio guide

The Poco Museum assignment focused on creating a personalized, accessible, and multilingual audio-guide experience. The team observed how visitors move through museums and developed an app where visitors can select available time, interests, preferred themes, and age group. The app then generates a personalized route and provides real-time audio stories about artworks.

#6 Ettevõtluskeskus: Automated cohort management

The Ettevõtluskeskus assignment focused on automating repetitive administrative tasks in small education centres. The team used n8n to automate onboarding, sending materials, collecting feedback, preparing weekly progress recaps, and providing instructors with summarized insights. They tested the workflows in a real course with 20 students and connected tools such as Telegram, email, Google Drive, GitHub templates, and a master list.

#7 Trinidad Wiseman: EcoMatch for data matching and trustworthy reporting

The Trinidad Wiseman assignment addressed the problem of inconsistent and fragmented data across spreadsheets, APIs, and information systems. The team developed EcoMatch, an AI-powered human-in-the-loop system that matches candidate data against trusted anchor data. It cleans, normalizes, scores, and weights records, creates trusted identity views, and includes audit trails for accepted, rejected, or reassigned matches.

#8 kood/Jõhvi: Rebuilding peer review in a coding school

The kood/Jõhvi assignment focused on improving peer review in a coding school without traditional teachers or lectures. The team identified that the existing review process lacked structure, criteria, examples, and guidance. They developed a Reviewer Academy and a structured code-review system supported by AI pre-review. AI was positioned as a guide, not a judge, while human reviewers retained final responsibility.

7.2 Cross-cutting professional ICT skills developed across the assignments

#1 Software and platform development

Participants developed skills in front-end development, back-end development, full-stack platform design, mobile-first applications, responsive interfaces, and modular system architecture. These skills appeared strongly in the Latitude59, ADM/GovStack, Poco Museum, Institute of Baltic Studies, and kood/Jõhvi assignments.

#2 UX/UI and human-centred design

All projects required participants to understand users, map workflows, redesign interfaces, and make digital systems easier to use. FleetGuru, Latitude59, the prison handbook, Poco Museum, and kood/Jõhvi particularly strengthened UX research, user journey mapping, interface design, and accessibility-oriented design.

#3 Data, reporting, and decision support

FleetGuru and Trinidad Wiseman especially developed skills in data interpretation, dashboards, KPIs, data matching, data cleaning, reporting reliability, and decision-support systems. These competences are central to modern ICT work because organizations increasingly depend on trustworthy data for automation, AI, and business intelligence.

#4 AI and human-in-the-loop systems

Several teams integrated or conceptualized AI-supported features: FleetGuru used a chatbot, Poco Museum explored AI-supported dynamic content, Trinidad Wiseman used AI-assisted matching, and kood/Jõhvi used AI-supported code pre-review. The common pattern was responsible AI integration, where AI supports users but does not fully replace human judgment.

#5 Automation and workflow orchestration

The Ettevõtluskeskus assignment developed strong workflow automation skills using n8n, Telegram, email, Google Drive, and GitHub. Latitude59 also involved automated reminders and calendar invitations. These assignments developed practical automation competences that are increasingly important for digital transformation.

#6 Digital public services and secure systems

The ADM/GovStack and Institute of Baltic Studies assignments developed skills in public-sector digital services, secure environments, interoperability, data separation, accessibility, and institutional constraints. These are particularly important for countries pursuing digital government modernization.

7.3 Cross-cutting soft and transferable skills developed across the programme

#1 Problem framing and analytical thinking

Participants learned to move from broad organizational challenges to clearly defined digital problems. This is visible in all assignments: FleetGuru was reframed from a dashboard issue into an answer-accessibility problem; Latitude59 was reframed from a form problem into a trust and workflow problem; kood/Jõhvi was reframed from a peer-review page problem into a learning-quality problem.

#2 Communication and stakeholder engagement

Participants worked with companies, mentors, university staff, and institutional representatives. They had to explain technical choices in non-technical terms and show how their solutions created value. This directly supports the finding that employers emphasize communication, English, adaptability, project-readiness, and the ability to function in changing technical environments.

#3 Teamwork and role coordination

The assignments required division of responsibilities across research, design, development, testing, presentation, and stakeholder communication. Participants developed experience in collaborative project execution, including hybrid and partially remote work.

#4 Adaptability and international work-readiness

Participants worked in a new country, with new organizations, under different academic and professional expectations. The Phase I report notes that the Estonia experience added practical exposure, project-based learning, and broader understanding of international academic and professional environments.

#5 User empathy and inclusion

Several assignments required attention to users with specific needs: prisoners with different literacy levels, museum visitors of different ages and interests, conference speakers with limited time, coding students needing better feedback, and instructors overloaded with administrative work. This developed human-centred and inclusive design competences.

#6 Ethical and responsible technology awareness

The projects required participants to consider security, accessibility, privacy, responsible AI, public-sector trust, and the limits of automation. This is especially visible in the ADM, prisoner handbook, Trinidad Wiseman, and kood/Jõhvi assignments.

7.4 Complementarity with ICT curricula

01 Kenya

For Kenya, the skills developed through the DE II project directly address the gap between formal education and practical work-readiness. The study indicates that Kenyan students value their education as a real academic foundation, especially in structure, mathematics, presentations, and group work, but that practical competitiveness is often developed through side projects, hackathons, boot-camps, certifications, internships, and peer networks. The DE II assignments would complement Kenyan ICT curricula by making practical skills more systematic within formal education.

The most relevant curriculum additions would be:

- » Real company-based software projects;
- » Public-sector digital-service design;
- » Applied UX/UI and user research;
- » Data cleaning, matching, reporting, and dashboard development;
- » AI-supported but human-controlled systems;
- » Workflow automation and low-code/no-code orchestration;
- » Cybersecurity and secure data-handling basics;
- » Product thinking and entrepreneurship;
- » Structured internships and industry-based thesis projects.

Considering these additions would reduce the dependence on extracurricular learning and help more students develop work-ready skills before graduation.

02 Nigeria

Assignments similar to those of the DE II assignments would complement Nigerian ICT curricula by offering a model for scalable practical learning.

For Nigeria, the key curriculum contributions would be:

- » Project studios linked to real public and private-sector problems;
- » Virtual internships and remote company challenges;
- » Low-cost automation assignments;
- » Public-service platform design;
- » Applied data management and reporting;
- » Practical software development with constrained resources;
- » AI-supported productivity tools;
- » Employability-oriented communication and teamwork training.

Because Nigeria operates at a much larger scale than, for example, Kenya, and even more so than Armenia and Estonia, these skills need to be embedded in scalable formats: hackathon-to-prototype models, industry challenge banks, virtual project supervision, and structured university-employer partnerships.

03 Armenia

Assignments similar to those of the DE II would complement Armenian ICT curricula by strengthening the transition from technical knowledge to applied innovation.

For Armenia, the strongest curriculum value would be in:

- » Product-oriented software engineering;
- » AI-supported digital services;
- » Human-in-the-loop data and assessment systems;
- » Deployment-oriented project work;
- » Startup-oriented digital product design;
- » International client communication;
- » UX/UI and customer discovery;
- » Advanced data quality and reporting systems.

Armenia needs advanced technical content and stronger mechanisms that connect technical competence with real-world deployment, international markets, and innovation-oriented problem solving. It needs stronger mechanisms that connect technical competence with real-world deployment, international markets, and innovation-oriented problem solving.

04 Estonia

Although Estonia is a mature digital economy where ICT is already embedded in state capacity, public services, and the wider digital economy, its ICT education would also benefit from mainstreaming skills supported by projects such as DE II. The main challenge in Estonia is sustaining a sufficient specialist talent pool for a small but highly digitalized labour market. Assignments similar to DE II would complement Estonian ICT curricula in three ways:

First, they reinforce the need for applied, company-based, and public-sector project learning. Estonian ICT education already has strong applied elements, but the assignments show how valuable it is for students to work on real problems from logistics, events, prisons, museums, education, data reporting, and coding schools.

Second, they support cross-sector digital transformation competence. Estonia needs programmers for ICT companies and ICT specialists who can further digitalise public administration, culture, education, justice, logistics, and business services. It needs ICT specialists who can further digitalize public administration, culture, education, justice, logistics, and business services that would lead to the next stage of economic growth.

Third, they strengthen international and multicultural work-readiness. The programme shows that international ICT talent can contribute to Estonian organizations when supported through mentoring, structured assignments, and company engagement. This is directly relevant for Estonia's talent needs and for its role as a digital cooperation partner.

7.5 Contribution of DE II project to national ICT and economic development goals

01 Kenya

The skills acquired through DE II strongly support Kenya's ICT and economic development goals, as they align closely with the goals of digital transformation, public-service modernization, entrepreneurship, digital skills development, as well as youth employability. For example, the ADM/GovStack assignment is directly relevant to Kenya's digital government agenda. The project developed a reusable and modular public-service registration architecture that could support TVET registration, scholarship applications, and national ID registration. Such skills can help Kenya build more affordable, interoperable, and scalable digital public services.

FleetGuru and Trinidad Wiseman support private-sector productivity. They show how ICT talent can improve decision-making, data reliability, reporting, and operational efficiency. These competences are important for business digitalization and economic competitiveness. Ettevõtluskeskus and kood/Jõhvi support digital education and skills development. They show how automation, structured peer review, and AI-supported feedback can improve learning environments. This is of particular importance for Kenya, as ICT workforce growth depends on universities, training centres, bootcamps, and alternative learning pathways. Finally, the programme strengthens international employability of qualified ICT staff. Participants developed the ability to work with European companies, communicate across cultures, and present professional solutions. This supports Kenya's potential as a source of globally competitive ICT talent. In this sense, DE II makes a valuable contribution to Kenya's development goals by helping transform ICT education from theoretical preparation into practical, exportable, and development-oriented capability.

02 Nigeria

Expanding the DE II ICT graduate mobility programme to Nigerian participants would contribute to the country's economic development by addressing graduate employability, digital inclusion, public-sector modernization, and scalable ICT workforce development.

Nigeria's challenge is to ensure that graduates can apply their knowledge in real work environments. Current study suggests that Nigerian graduates often require additional training after graduation because practical readiness is constrained by infrastructure, large class sizes, and unequal access to digital resources.

Digital Explorers-type assignments would contribute by:

- » Exposing students to real organizational problems;
- » Building applied software, data, and automation skills;
- » Strengthening remote-work and international collaboration readiness;
- » Supporting public-service digitalization;
- » Improving entrepreneurship and innovation capacity;
- » Helping universities connect more systematically with employers.

For Nigeria, the biggest impact would be achieved through scalability. The model should be adapted into formats that can reach large numbers of students through project-based modules, virtual internships, and industry challenge platforms.

03 Armenia

Although Armenian ICT graduates did not participate in the DE II mobility programme, having analysed examples of Armenian ICT curricula and its developmental needs, the study also suggests how Armenia and perhaps other countries in the wider European Neighbourhood could benefit from launching or joining similar initiatives. In particular, the skills developed through DE II would support the country's movement toward a more innovation-oriented and internationally connected ICT economy.

Digital Explorers-type assignments would help by connecting students and young professionals with real product development, international clients, AI-supported tools, UX research, and data-driven services.

The most relevant contribution to Armenia would be:

- » Strengthening export-oriented ICT service capacity;
- » Improving graduate readiness for international software and data projects;
- » Supporting startup and product-development culture;
- » Developing AI and human-in-the-loop competences;
- » Linking universities more closely with industry and international partners.

This would support Armenia's economic development by moving ICT education closer to the needs of high-growth firms, startups, and international digital markets.

04 Estonia

Participating in the project entails for Estonia further benefits - it contributes to talent attraction, international cooperation, and cross-sector digital transformation. Estonia's ICT sector and public services need skilled specialists, and the programme demonstrates how international talent can support Estonian organizations while also gaining skills that can circulate back to partner countries. The assignments also support Estonia's international development cooperation priorities by creating practical cooperation with Kenya and other partner countries. The closing reflections from the presentation event explicitly framed the students' prototypes and experiences as evidence that can be shown to decision-makers to demonstrate the value of continued cooperation between Kenya and the Baltics.

7.6 Participants' Feedback on DE II Project

The following section is based on the responses DE II project participants' questionnaire administered in May 2026, before the group returned to Kenya. The responses show that the **DE II programme had a strong personal, professional, and career-development impact, especially through the relocation to Estonia component**. Participants report having gained technical skills; experienced a different digital society, a professional work culture, and a wider set of career possibilities. Estonia functioned for them as a "living learning environment" where participants could observe how advanced digital systems, trust-based institutions, startup ecosystems, and international workplaces operate in practice.

The main benefit repeatedly mentioned is **exposure**. Participants describe Estonia as a highly digital, innovative, and well-organised society that expanded their understanding of what is possible in technology, work, education, and public systems. Many participants said the experience changed their mindset, increased their confidence, and helped them see themselves as capable of competing in international ICT environments. Several also highlighted that they now better understand European work culture, professional standards, digital governance, and startup ecosystems. Company visits to organisations such as Bolt, Pipedrive, and Genius Sports helped participants visualise future career opportunities and understand how technology companies operate in real contexts.

A second important theme is **personal transformation**. Participants reported becoming more resilient, independent, confident, and open-minded. The experience helped them rethink their long-term goals, including pursuing master's studies, returning to Estonia for work or study, starting a company, or engaging more actively in their local communities. Some participants also reflected on Estonia's direct communication style, trust-based culture, and civic responsibility, comparing these experiences with their home context in Kenya. This suggests that the programme supported employability and broader civic, cultural, and personal learning.

In terms of skills and competencies, the answers show a combination of **technical, professional, and soft-skill development**. On the technical side, participants mentioned improved coding, full-stack development, backend development, systems architecture, database design, API development, automation tools such as n8n, server deployment, UX awareness, explainable AI, data analytics, and technical documentation. On the professional side, they gained experience in product development, project ownership, problem discovery, validation, user-centred design, stakeholder interviews, product iteration, and scalable solution development.

The most frequently repeated **cross-cutting competencies** are communication, teamwork, problem-solving, adaptability, critical thinking, time management, self-discipline, professional networking, personal branding, interview confidence, leadership, and cross-cultural collaboration. Participants also emphasised learning how to present themselves professionally, tailor CVs, tell their professional story, pitch ideas, network effectively, and apply for jobs more strategically. These are directly relevant for finding ICT jobs in Kenya, but also for continuing studies or employment in Europe.

The logic emerging from the answers is that the DE programme works as a **career-acceleration and mindset-expansion mechanism**. It combines international exposure, practical ICT learning, company engagement, cultural immersion, and professional networking. As a result, participants return with stronger technical abilities, clearer career goals, better professional confidence, and a broader understanding of how digital societies and global technology markets function. The programme creates value by improving employability and helping participants design their future career paths with greater ambition, direction, and international perspective.

7.7 Logical circle from curricula to DE II and back

The DE II assignments create a **full logical circle between ICT curricula, practical skills development, labour-market readiness, and national development goals**. ICT curricula in Estonia, Kenya, Armenia, and Nigeria provide foundational technical knowledge. However, the study demonstrates that formal curriculum content is not sufficient on its own. The real challenge is the transition from education to work. The DE II assignments tested this transition in practice. Participants had to apply their knowledge in real company and institutional settings, solve concrete problems, communicate with stakeholders, and produce functional prototypes.

The assignments have revealed which skills are most important for work-readiness: applied software development, UX/UI, data quality, automation, AI-supported systems, secure digital services, public-sector interoperability, product thinking, teamwork, adaptability, communication, and ethical awareness. These skills can be fed back into ICT curricula. They indicate that universities should strengthen project-based learning, real employer assignments, internships, industry-based thesis work, human-centred design, responsible AI, and transversal skills. Stronger curricula would contribute to national goals: Kenya and Nigeria would benefit from scalable practical training and improved employability; Armenia would benefit from stronger innovation and export-oriented ICT capacity; and Estonia would benefit from international talent, stronger company cooperation, and continued digital leadership.

Accordingly, DE should be understood as an integrated mobility, curriculum-feedback, and talent-development mechanism. It shows what graduates **need to know**, what they **need to be able to do**, and **how international project-based learning can strengthen both individual careers and national ICT ecosystems**.

Conclusions

This report shows that ICT education and labour-market alignment must be understood as a full pathway that cannot be described merely by means of a simple comparison of curricula. Across Estonia, Kenya, Armenia, and Nigeria, ICT is recognized as a strategic development field, but each country faces different structural conditions. **The comparison confirms that all four countries treat ICT as more than a technology sector. ICT is linked to national modernization, economic development, labour-market competitiveness, digital governance, and international cooperation** (OECD, 2026).

The analysis of ICT education shows that the selected universities provide relevant Computer Science and ICT foundations. Tallinn University offers an applied software-and-data-oriented Bachelor profile. TalTech represents deeper Master-level specialization in Computer Science and Artificial Intelligence. Kenyatta University provides a broad public-university Computer Science curriculum with strong technical and mathematical foundations. Strathmore University combines technical breadth with a more explicit professional, ethical, and work-facing orientation. The American University of Armenia demonstrates a structured and specialization-oriented model with strong mathematics, data, and AI-related elements. The University of Lagos provides broad formal technical coverage, but its effectiveness is constrained by implementation conditions such as infrastructure, class size, and practical training limitations (World Bank, 2015).

Across the countries, formal programmes include many relevant topics. However, the real difference lies in how these elements are taught, practiced, and assessed in connection to employers' needs for skills. **Project-based assignments and other practice-oriented exercises conducted in well-equipped environments together with faculty exposure to industry's applications of the latest technologies, and employer feedback are decisive for turning curriculum content into equipping students with work-ready competences** (Sánchez Puerta et al., 2018).

Validation evidence provided by recent Kenyan ICT graduates participating in the DE II project support this conclusion. They often described their previous education as a strong academic foundation, while also emphasizing that that practical competitiveness was often developed through side projects, hackathons, bootcamps, certifications, internships, and peer learning.

This view was also echoed by representatives of both the private and public sectors in across the countries, **highlighting the need for stronger practical learning opportunities and closer cooperation between universities and employers**. Evidence from Estonian host companies further suggested that Kenyan students are well capable of contributing meaningfully within the context of real project environments when provided with adequate guidance and supportive feedback. In Armenia and Nigeria, private-sector stakeholders in a similar manner emphasised that employability increasingly depends on adaptability, practical experience, communication skills, and exposure to rapidly changing technologies. Finally, experience from the Ambassador Track demonstrated that successful talent mobility relies on technical skills, institutional trust, administrative support, intercultural readiness, and clearly structured pathways.

The study also shows that **transferable skills are central to the employability of ICT graduates**. Technical knowledge remains essential, but employers and stakeholders repeatedly emphasized communication, teamwork, adaptability, problem-solving, high professional ethos, English-language confidence, intercultural awareness, and the ability to work independently. These skills are especially important for international mobility and cross-border ICT work. Therefore, ICT education should not treat transferable competencies as additional or optional. They need to be integrated into projects, internships, assessment, and employer-facing learning activities.

Another important conclusion is that **public and private higher education institutions may differ in flexibility, responsiveness, and practical orientation, but ownership type alone does not explain the differences in the quality of education.** Some private institutions may adapt faster, integrate employer-facing components more explicitly, or operate with smaller class sizes. Public universities, however, often play a major role in broad talent production and national development. The decisive factors are not whether an institution is public or private, but whether it has the capacity to update programmes, provide practical learning, maintain dynamic quality assurance, co-operate with employers, and support students in developing real professional competence (ENQA, 2024).

The **DE project emerges from the study as an important bridge between ICT ecosystems.** Its value lies not solely in facilitating student and professional mobility, but in connecting education, practical training, workplace exposure, mentoring, intercultural learning, and ecosystem cooperation. Through its integrated approach, it strengthens students' academic confidence, professional readiness, and international exposure, while providing companies with access to motivated talent and opportunities to assess skills in real work environments.

At the same time, the project helps universities identify the extent to which their curricula support work-readiness and highlights areas requiring further development. More broadly, it contributes to talent circulation, digital transformation, and international cooperation across partner countries.

On the final account, the study concludes that **future cooperation in ICT education should move beyond curriculum development based on narrow curriculum comparison and short-term mobility. The strongest model would be an integrated education-to-work pathway that combines curriculum development, practical immersion, employer-linked projects, mentoring, quality assurance, mobility support, and post-programme continuity.** Institutionalising practices based on such a model can help Kenya, Armenia, Nigeria, and Estonia respond to different but connected ICT challenges: talent shortages, youth employment, practical readiness, digital transformation, and international competitiveness. The success of ICT education depends on close ecosystem-wide cooperation in which universities and other partners make distinct contributions.

Recommendations

01 EU and other international and donor organizations

#1: Design ICT talent partnerships as full education-to-employment pathways.

EU and donor-funded ICT mobility initiatives should be designed as complete education-to-employment pathways that integrate mobility, training, and recruitment. The findings show that effective talent mobility depends on the whole pathway: curriculum alignment, practical training, employer engagement, mentoring, skills recognition, mobility preparation and post-program continuity. Work-readiness is broader than graduation alone and includes communication, English proficiency, adaptability, project-readiness and the ability to work in changing technical environments. The recommendation fits directly with the EU Talent Partnerships framework.

#2: Connect ICT mobility schemes with EU digital skills, micro-credential and regional cooperation instruments.

Future ICT mobility programmes should be explicitly connected with existing EU digital skills and cooperation instruments, including the Digital Education Action Plan 2021–2027, the European approach to micro-credentials, Erasmus+ International Credit Mobility, EU4Digital and the Digital Europe Programme. The report shows that ICT employability is built through a combination of formal degrees, practical projects, bootcamps, certificates, internships and workplace learning. Therefore, mobility schemes should combine cross-border mobility with transparent recognition of learning and practical skills. For Armenia, EU4Digital is especially relevant because it already supports digital transformation and skills development in the Eastern Partnership region. For Kenya and Nigeria, the same logic can be applied through EU-Africa skills partnerships, Talent Partnerships, Erasmus+ capacity-building actions and skills-recognition mechanisms linked to European labour-market expectations.

02 National Governments

#1: Align ICT higher education reforms more closely with national digital economy, employment and innovation strategies.

National governments should ensure that ICT higher education reform is directly connected to national digital transformation, employment and innovation strategies. The findings show that Kenya, Nigeria and Armenia all have strong ICT development ambitions, but also face different structural challenges. Kenya and Nigeria need scalable mechanisms for practical training, inclusive digital access and stronger graduate employability, while Armenia needs deeper specialization, innovation capacity and faster adaptation to technological change. National digital economy strategies should therefore position ICT higher education as a central instrument of economic development.

#2: Create national systems for recognizing competencies, micro-credentials, industry certificates and practical ICT skills.

National governments should create transparent mechanisms for the professional recognition of ICT competencies acquired through formal, non-formal, and informal learning pathways. The report shows that formal degrees remain important, but many students become employable through additional learning, including internships, hackathons, boot-camps, online certificates, industry certificates, open-source work and portfolios. This recommendation is fully aligned with the Council Recommendation on a European approach to micro-credentials, which promotes the transparent, portable and quality-assured recognition of short learning experiences and is consistent with Europass Digital Credentials and future digital skills passport approaches. Such mechanisms will make the skills of candidates from partner countries more visible, comparable and usable for international recruitment.

#1: Include practical work-readiness and industry cooperation as formal accreditation criteria for ICT programmes.

Higher education accreditation and quality assurance agencies should assess the quality of theoretical and technical content and the extent to which ICT programmes produce practically work-ready graduates. The findings identify the transition from formal education to effective labour-market readiness as the main challenge. Accreditation criteria should therefore include evidence of internships, industry-based projects, employer advisory boards, capstone projects, student portfolios, graduate tracking, staff industry exposure and continuous feedback from employers.

#2: Require regular curriculum updates in relation to AI, data, cybersecurity and changing ICT labour-market needs as identified by employers.

Accreditation and quality assurance agencies should require ICT programmes to demonstrate regular, evidence-based curriculum renewal carried on in cooperation of prospective employers of ICT graduates. This report shows that ICT labour markets are changing rapidly because of AI, automation, data-intensive systems, cybersecurity needs and changing workplace expectations. Entry-level ICT work is becoming more demanding because AI tools increasingly perform tasks that were previously assigned to junior developers. Therefore, ICT programmes should regularly update content in areas such as artificial intelligence, data analytics, cybersecurity, cloud technologies, software engineering practices, data protection and professional communication.

04 Universities

#3: Consider shifting from compulsory government-lead programmatic accreditation of ICT degree programmes to voluntary accreditation by relevant professional bodies.

Replacing rigid centralised programmatic accreditation with voluntary, industry-led certification removes bureaucratic inertia from rapidly evolving ICT curricula. The traditional review cycles are too slow, suppressing timely academic modernization. Estonia's successful institutional-only oversight framework eliminates redundant costs while maintaining system-wide quality. Introducing voluntary accreditation by engineering and ICT professional bodies involving employers' representatives would directly bridge the current gap between universities and the tech sector. This shift empowers faculties to align courses dynamically with shifting market standards. It replaces low-value administrative compliance with market-driven accountability, producing industry-ready graduates while giving universities the agility needed to lead the global digital economy.

#1: Redesign ICT curricula around project-based, work-based and industry-connected learning.

Universities should preserve strong theoretical foundations while making practical and industry-connected learning a central part of ICT programmes. The report shows that students value formal academic preparation, especially in mathematics, programming, systems knowledge and structured learning. However, they also indicate that practical competitiveness is often developed outside the formal curriculum through side projects, hackathons, bootcamps, certifications and internships often provided informally by employers, and peer networks. Such practices should be institutionalised by universities, integrating real company problems, project-based assignments, work-based learning, service-based learning, practical laboratories, hackathons and industry-supervised thesis projects into regular coursework.

#2: Foster further ties between ICT faculty and businesses.

The study suggests that ICT faculty have often only limited experience concerning the latest advances in the field and their particular industrial applications. Universities should consider creating industry partnerships that would allow seconding faculty for extended periods, for example for a period of a semester, to companies and offer teaching opportunities to high level ICT professionals.

#3: Develop interdisciplinary degree programmes that combine ICT with other specialisations.

The study suggests that ICT programmes often constitute silos on their own, not related to other possible fields of application of ICT technologies. In partnership with representatives of other sectors and national higher education regulators, universities should consider creating degree programmes that combine ICT with other fields of study, such as for example agriculture, medicine, public administration, business administration and others. This would enable the training of ICT specialists capable of introducing digital tools in other sectors to increase productivity and create jobs, while also equipping business managers with advanced ICT competencies. Breaking the silos between the fields of study would be paramount for the purposes of deeper integration of ICT in the economy, services and public administration, and for a large-scale job creation.

#4: Use Erasmus+ International Credit Mobility and capacity-building projects to support student exchange, curriculum development, staff development, and university-industry cooperation.

Universities should use international mobility projects for student and staff exchange, curriculum modernisation, joint course design, staff development, and university-industry cooperation. Mobility becomes more valuable when it changes institutional practice through joint modules, international capstone projects, industry-based thesis topics, staff training, shared quality assurance practices and employer engagement. By connecting mobility with curriculum reform, universities in partner countries can strengthen practical ICT education while European and Baltic institutions gain better access to prepared, internationally oriented ICT talent.

References

1. African Development Bank. (2020). Gender disparities in Africa's labor market. <https://www.afdb.org/en/documents/publications/gender-disparities-africas-labor-market>
2. American University of Armenia. (2022). BS in Computer Science. <https://catalog2022-23.aua.am/bs-in-computer-science/>
3. ANQA. (2024). Accreditation. National Center for Professional Education Quality Assurance Foundation. <https://www.anqa.am/en/accreditation>
4. Armenian IT Industry Report. (2023). Skills gap analysis in Armenia's technology sector. Enterprise Incubator Foundation.
5. Audit Chamber of the Republic of Armenia. (2023). Current report about the audit results of digital transformation (digitalization) process of the Republic of Armenia.
6. Barcevičius, E., Bobrovnikova, E., Samardjiski, K., & Skubiejūtė, G. (2025). Baltic labour markets' talent needs and absorption capacities: Gap analysis study. OSMOS Global Partnerships.
7. Billett, S. (2024). Constituting integration in work-integrated education and learning. Studies in Continuing Education. Advance online publication. <https://doi.org/10.1080/0158037X.2024.2363262>
8. Chervyakov, D., Poluschkin, G., & Fanyan, H. (2025). IT sector monitor Armenia (Policy Briefing No. 03). BE Berlin Economics GmbH.
9. Commission for University Education. (2014a). Commission standards and guidelines. https://www.cue.or.ke/index.php?Itemid=238&download=7%3Auniversity-standards-guidelines&id=8%3Auniversity-standards-guidelines&option=com_phocadownload&view=category
10. Commission for University Education. (2025). Accredited universities in Kenya. <https://imis.cue.or.ke/RecognitionAndEquationforQualifications/AccreditedUniversities>
11. Computer Professionals Registration Council of Nigeria. (2024). Accredited institutions and programmes. <https://www.cpn.gov.ng/metro?ref=metro%2Fcontent&show=55>
12. De Simone, M., & Manolio, F. A. (2024). Digital skills in Nigeria: A summary of the population's skills and the availability of digital infrastructure in schools. World Bank.
13. e-Governance Academy Foundation. (2022). Kenya digital readiness: A journey towards human-centred digitalisation.
14. Enterprise Incubator Foundation, Armenian National Agrarian University, Fund of Armenia Relief, & CIVITTA AM CJSC. (2022). Mapping baseline study: The labor market mismatch and the skill gaps in Armenia.
15. ENQA. (2024). ANQA - National Centre for Professional Education Quality Assurance Foundation. European Association for Quality Assurance in Higher Education. <https://www.enqa.eu/membership-database/anqa-national-centre-for-professional-education-quality-assurance-foundation>
16. Estonian Quality Agency for Education. (2019). The right to organise studies in the existing and new higher education institutions.

17. Estonian Quality Agency for Higher and Vocational Education. (2022). Self-assessment report for agency targeted review 2022.
18. Estonian Association of Information Technology and Telecommunications. (2024). Smart Estonia: Three goals for ensuring Estonia's future success. <https://itl.ee/en/smart-estonia/>
19. Estonian Quality Agency for Education. (2023a). Assessment report on fulfilling the requirements of the secondary condition of institutional accreditation: Tallinn University. https://haka.ee/wp-content/uploads/TLU-IA-Secondary-condition-report_21.03_Final.pdf
20. Estonian Quality Agency for Education. (2023b, June 5). Decision of fulfilment of the secondary condition of institutional accreditation, Tallinn University. https://haka.ee/wp-content/uploads/TLU-IA-KT-otsus_EN.pdf
21. Eurydice. (2026). Estonia: AI Leap initiative to enhance learning and teaching. <https://eurydice.eacea.ec.europa.eu/news/estonia-ai-leap-initiative-enhance-learning-teaching>
22. European Training Foundation. (2022). National qualifications framework – Armenia. <https://www.etf.europa.eu/sites/default/files/document/Armenia.pdf>
23. Federal Ministry of Communications and Digital Economy. (2020). National digital economy policy and strategy (2020–2030).
24. Federal Ministry of Education, Nigeria. (2019). National implementation guidelines for ICT in education. <https://education.gov.ng/wp-content/uploads/2019/08/NATIONAL-IMPLEMENTATION-GUIDELINES-FOR-ICT-IN-EDUCATION-2019.pdf>
25. Federation of Kenya Employers. (2023). Skills needs survey report.
26. ICT Authority. (2022). The Kenya National Digital Master Plan 2022–2032.
27. ICT Authority. (2025, June 22). 47 ICT centres and 1,450 hubs nationwide to bridge digital divide and spur innovation. <https://ict.go.ke/47-ict-centres-and-1450-hubs-nationwide-bridge-digital-divide-and-spur-innovation>
28. Inside Higher Ed. (2016). Armenian higher education in the European Higher Education Area. <https://www.insidehighered.com/blogs/world-view/armenian-higher-education-european-higher-education-area>
29. International Telecommunication Union. (2021). Armenia: Digital data, resilience and policy assessment.
30. Journals Scholar Publishing. (2017). The role of the National Universities Commission. https://journals.scholarpublishing.org/index.php/ASSRJ/article/download/938/pdf_90/2769
31. Karanja, F., Ngau, P. M., Opiyo, R., Siriba, D., Njoroge, K., Nyete, A., Obiero, J., & Mwero, J. (2021). Tracer study on destination of engineering graduates from public and private universities in Kenya.
32. Kenyatta University. (n.d.-a). Computer Science, Bachelor of Science [Unpublished internal curriculum document].
33. Kenyatta University. (2025). Directorate of Quality Management Systems. <https://qms.ku.ac.ke/>

34. Kenyatta University. (2026a, January 21). Student course evaluation semester I, 2025/2026. <https://www.ku.ac.ke/student-course-evaluation-semester-i-2025-2026/>
35. Kenyatta University. (2026b, March 11). KU launches a programmes review tracking system. <https://www.ku.ac.ke/ku-launches-a-programmes-review-tracking-system/>
36. Kood. (2025). Locations in Estonia. <https://kood.tech/asukohad/>
37. Kood/Jõhvi. (2025, January 14). Bridging the skills gap: kood/Jõhvi graduates meet industry demands. <https://kood.tech/artiklid/bridging-the-skills-gap-kood-johvi-graduates-meet-in-dustry-demands/>
38. Kutsekoda / OSKA. (2024). Information and communication technology monitoring study: Key findings.
39. Marshall, S., Blaj-Ward, L., Dreamson, N., Nyanjom, J., & Bertuol, M. T. (2024). The reshaping of higher education: Technological impacts, pedagogical change, and future projections. Higher Education Research & Development, 43(3), 521-541. <https://doi.org/10.1080/07294360.2024.2329393>
40. Mets, U., & Viia, A. (2021). Tulevikuvaade tööjõu- ja oskuste vajadusele: Info- ja kommunikatsioonitehnoloogia valdkond. SA Kutsekoda.
41. Mets, U., Viia, A., & Ruusa, L. (2024). Tulevikuvaade tööjõu- ja oskuste vajadusele: Info- ja kommunikatsioonitehnoloogia. Seirearuanne. SA Kutsekoda.
42. Ministry of Education and Research. (2025, February 25). AI Leap programme to bring AI tools to all schools. <https://www.hm.ee/en/news/estonia-announces-groundbreaking-national-initiative-ai-leap-programme-bring-ai-tools-all>
43. Ministry of High-Tech Industry of the Republic of Armenia. (2021). Digitalization practices across the SME policy spectrum of the Republic of Armenia.
44. Ministry of Information, Communications and Technology. (2019). National information, communications and technology (ICT) policy.
45. Ministry of Information, Communications and the Digital Economy. (2025). Kenya AI Strategy 2025-2030.
46. MyGov. (2026, March 4). Kenya on track to achieve digital superhighway vision. <https://mygov.go.ke/index.php/kenya-track-achieve-digital-superhighway-vision-says-ps-tanui>
47. National Bureau of Statistics. (2024). Nigeria labor force survey annual report 2023.
48. National Bureau of Statistics Nigeria. (2024). Labour force statistics: Q4 2023. <https://nigerianstat.gov.ng>
49. National Open University of Nigeria. (2024). Policy on accreditation in the National Open University of Nigeria. https://dqa.nou.edu.ng/wp-content/uploads/2024/11/NOUN-POLICY-ON-ACCREDITATION-DAP_Corrected.pdf
50. National Universities Commission, Nigeria. (2015). Benchmark minimum academic standards for undergraduate programs in Nigerian universities: Education. <https://ikcoedm.edu.ng/bmas%20education%20nuc.pdf>

51. National Universities Commission, Nigeria. (2023). Guidelines for e-learning in Nigerian universities (Revised). <https://www.nuc.edu.ng/wp-content/uploads/2024/06/Guidelines-for-e-Learning-in-Nigerian-Universities-April-2023-Revised-FINAL.pdf>
52. National Universities Commission, Nigeria. (2024). Accreditation technical report view. <https://www.nuc.edu.ng/accreditation-tech-report-view>
53. Nigerian Communications Commission. (2023). Baseline study on the level of digital skills in Nigeria: Women, youth, and the physically challenged.
54. OECD. (2026). OECD Digital Education Outlook 2026: Exploring effective uses of generative AI in education. OECD Publishing. <https://doi.org/10.1787/062a7394-en>
55. Psience. (2017). Tööandjate rahulolu-uuring IKT õppekavade lõpetanutega.
56. Republic of Kenya. (2018). National Broadband Strategy 2018–2023.
57. Republic of Kenya. (2019). Digital economy blueprint: Powering Kenya’s transformation.
58. Sánchez Puerta, M. L., Johansson de Silva, S., & Rizvi, A. (2018). Kenya: Capturing skills requirements and assessing skills gaps in the modern economy, firms’ perspective. World Bank.
59. Sebastião, L., Tirapicos, F., Payan-Carreira, R., & Rebelo, H. (2023). Skill profiles for employability: (Mis)understandings between higher education institutions and employers. *Education Sciences*, 13(9), 905. <https://doi.org/10.3390/educsci13090905>
60. Solomon, A. (2024). The 12–4 education reform: Navigating institutional readiness and curriculum transition in Nigerian universities. *International Journal of Management and Social Science Research*. <https://www.ijmsssr.org/paper/697b8b9640262.pdf>
61. Strathmore University. (n.d.). Informatics and computer science, Bachelor of Science [Unpublished internal curriculum document].
62. Strathmore University. (2024). Annual report 2023. <https://strathmore.edu/wp-content/uploads/2024/08/SU-AR-2023-E-Booklet-Interactive.pdf>
63. Strathmore University. (2025, January 22). Quality Assurance Administrator Department. <https://strathmore.edu/wp-content/uploads/2025/01/Advert-Quality-Assurance-Administrator.pdf>
64. Strathmore University. (2026). Code of governance. <https://strathmore.edu/wp-content/uploads/2026/03/Code-of-Governance-Updated.pdf>
65. Strathmore University Business School. (2024, April 2). The journey to AACSB accreditation. <https://sbs.strathmore.edu/the-journey-to-aacsb-accreditation-strathmore-university-business-schools-path-to-excellence/>
66. Tallinn University. (n.d.-a). Computer Science, Bachelor of Science [Unpublished internal curriculum document].
67. Tallinn University. (2023). Tallinn University quality framework. https://www.tlu.ee/sites/default/files/TUKO/veeb/failid/TLU_Quality_Framework_2023.pdf
68. Tallinn University. (2025b). Quality assurance. <https://www.tlu.ee/en/quality-assurance>

69. Tallinn University of Technology. (n.d.). Computer Science, Master of Science [Unpublished internal curriculum document].
70. TalTech. (2025, July 7). Record number of engineering applications. <https://taltech.ee/en/news/record-number-engineering-applications>
71. Trinity University. (2015). Core curriculum minimum academic standards for computing programs. <https://www.trinityuniversity.edu.ng/wp-content/uploads/Computing.pdf>
72. Tushar, H., & Sooraksa, N. (2023). Global employability skills in the 21st century workplace: A semi-systematic literature review. *Heliyon*, 9(11), e21023. <https://doi.org/10.1016/j.heliyon.2023.e21023>
73. UNESCO. (2019). Recommendation on open educational resources (OER). UNESCO. <https://www.unesco.org/en/legal-affairs/recommendation-open-educational-resources-oer>
74. UNESCO. (2025). Higher education country profile: Armenia. <https://www.unesco.org/sites/default/files/medias/fichiers/2025/06/HED-country-profile-armenia.pdf>
75. UNESCO Institute for Statistics. (2021). Women in science, technology, engineering and mathematics in Sub-Saharan Africa. <http://uis.unesco.org/en/topic/women-science>
76. United Nations Armenia. (2025). Digital connectivity: Leaving no one behind.
77. University of Lagos. (n.d.). Computer Science – Bachelor of Science: University program skill offering matrix [Unpublished internal curriculum document].
78. University of Tartu. (2025, July 7). Applications increased by 16%. <https://ut.ee/en/news/number-applications-study-university-tartu-increased-16>
79. World Bank. (2015). Nigeria: Skills for competitiveness and employability.
80. World Bank. (2020). Realizing Armenia’s high-tech potential.
81. World Bank. (2023). World development indicators: Youth unemployment rate. <https://data.worldbank.org/indicator/SL.UEM.1524.ZS>
82. World Bank. (2025a). Kenya | Data. <https://data.worldbank.org/country/kenya>
83. World Bank. (2025b). Estonia | Data. <https://data.worldbank.org/country/estonia>
84. World Bank. (2025c). Estonia – Economy. <https://data360.worldbank.org/en/economy/EST>
85. World Bank. (2025d). Population ages 0–14 (% of total population). <https://data.worldbank.org/indicator/SP.POP.0014.TO.ZS>
86. Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, 16, Article 39. <https://doi.org/10.1186/s41239-019-0171-0>
87. 3MTT Nigeria. (2024). 3 Million Technical Talent programme. <https://3mtt.nitda.gov.ng/>

Appendix 1. Overview of Source Evidence for Report

Study Programs

Country: Kenya, Estonia, Armenia, Nigeria

Source: 2 universities from Kenya and Estonia; 1 university from Armenia and Nigeria

Number: 6 study programs analysed

Desk Research

Country: Kenya, Estonia, Armenia, Nigeria

Source: Policy documents; ministry publications and official reports; institutional and academic reports; strategic and analytical studies

Number: 50 documents

Interviews (Labour Market, Policy, and University Staff)

Country: Kenya

Source: Policy representatives and university staff

Number: 13 interviews (5 policy representatives and 8 university staff)

Student Interviews

Country: Kenya, Estonia

Source: Students from Kenya participating in the DEProgram

Number: 26 students (16 students: 1 group interview in Kenya and 2 group interviews in Estonia, 10 individual students' interviews)

Focus Groups

Country: Kenya

Source: Private-sector companies and public-sector representatives

Number: 2 focus groups with 8 participants

Armenia Interviews

Country: Armenia

Source: Industry and university staff; class observation

Number: 4 interviews (2 industry and 2 university representatives) and 1 class observation

Nigeria Interviews

Country: Nigeria

Source: Industry and university staff

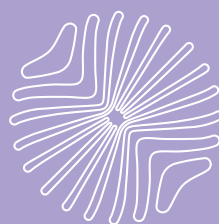
Number: 5 interviews (4 industry and 1 university representatives)

DE Case Study

Country: Kenya, Armenia, Estonia

Source: Ambassador track representatives; Estonian DE university staff; Estonian DE company staff

Number: 4 Ambassador track representatives (3 from Kenya and 1 from Armenia); 2 university staff members; 2 company staff members



**Digital
Explorers**



www.digitalexplorers.eu



info@osmos.lt



[digital-explorers](#)