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Boosting ICT technology development and commercialization

Preliminary study on the state of local ICT equipment manufacturing in Uganda

THE REPUBLIC OF UGANDA
MINISTRY OF ICT & NATIONAL GUIDANCE

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Acknowledgements

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The research was undertaken by ITU Expert Martin Waidhuba under the framework of the project and its deliverables. Technical input, feedback and guidance have been provided by the ITU and Ministry of ICT and National Guidance project team members and experts in Government Ministries, agencies, institutions, and across Uganda's digital ecosystem.

Disclaimer

[1] Government of Uganda and International Telecommunication Union (ITU) joint project 'Technical Assistance and Training to Uganda on National ICT Development Strategy' (2021-2024), supported by the Global Development and South-South Cooperation Fund (GDSSCF) and ITU's ICT Development Fund (ICT-DF): http://www.itu.int/go/uganda-digital-transformation

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Foreword

The rapid evolution of Information and Communication Technology (ICT) is reshaping global industries, driving digital transformation, and redefining economic paradigms. As the demand for advanced digital infrastructure, smart devices, and high-performance computing continues to rise, the strategic development of ICT manufacturing and commercialization is critical to ensuring technological self-reliance, market competitiveness, and industrial sustainability.

This strategic report and **preliminary study on the state of local ICT equipment manufacturing in Uganda** provides a structured framework for advancing ICT manufacturing and commercialization by analyzing key industry trends, supply chain dynamics, and technological innovations. It examines the current state of ICT manufacturing, identifies gaps in local value chains, and proposes targeted interventions to enhance domestic manufacturing capabilities, improve research-to-market pathways, and accelerate the adoption of cutting-edge technologies.

This report proposes five key focus areas, namely: i) Policy and regulation – Establish a conducive environment for ICT equipment manufacturing to stimulate production and attract investors; ii) Infrastructure development – Establish well-facilitated ICT manufacturing industrial parks; iii) Capacity building – Align academic curricula with industry needs to address the skills gap and ensure appropriate workforce availability; iv) Market expansion – Leverage international and regional trade frameworks to scale production and access broader markets; and v) Innovation and technology transfer – Partner with global ICT firms to transfer knowledge, improve local skills, and promote advanced manufacturing.

This report serves as a technical blueprint for policymakers, industry leaders, and investors, providing data-driven insights and actionable strategies to drive the sustainable growth of the ICT sector. By fostering collaboration between government agencies, private firms, and research institutions, we can build a robust digital manufacturing ecosystem that supports import substitution, economic diversification, job creation, and global competitiveness.

The future of ICT manufacturing and commercialization lies in strategic innovation, technological excellence, and forward-thinking policy implementation. We trust that this report will serve as a catalyst for informed decision-making and a guide to positioning the ICT industry as a key pillar of industrial and economic development.

Hon. Dr. Chris Baryomunsi
Minister of ICT and National Guidance

Foreword

It is my pleasure to present this report under the project 'Technical Assistance and Training to Uganda on National ICT Development Strategy', a collaboration between the Government of Uganda and the International Telecommunication Union (ITU), supported by the Global Development and South-South Cooperation Fund (GDSSCF) and the ITU ICT Development Fund (ICT-DF).

Through carefully co-crafted interventions in support of the country's vision to transform Uganda into a digitally enabled society that is innovative, productive and competitive, the project has applied a three-pronged approach focusing on the development of policy recommendations, enabling capacity development, and the implementation of pilot projects.

In recent years, Uganda has witnessed tremendous growth in its digital economy, reflecting broader trends across the African continent and globally. The increased access to digital technologies, new opportunities that connectivity has brought, and the surge in digital services are fuelling rapid advancements on how citizens engage with one another and with vital government services. These developments also bring new challenges, requiring policymakers and regulators to rethink strategically and build enabling policy and regulatory frameworks that are future-ready and adaptable to this ever-changing landscape. Moreover, digital skills remain an essential need for citizens to meaningfully participate in the digital space and for professionals to fully leverage the potential of digital technologies in addressing socio-economic challenges. This has been a critical aspect of the implementation of the policy interventions within this project.

This project, co-created and initiated in support of Uganda's ambitious digital transformation journey, stands as an example of how focused and meaningful partnerships can lead to impactful change. We have witnessed the results of the policy interventions and the impact of the significant capacity development in the country. I believe the efforts will continue to impact Uganda's transformation for years to come.

I encourage ITU Member States across the African continent and globally as well as development partners to join forces and invest in digital transformation for social and economic growth. The Telecommunication Development Bureau stands ready to continue supporting countries on their digital transformation journeys with impactful project implementation and partnerships which are essential for achieving universal and meaningful connectivity and digital transformation for all.

Dr Cosmas Luckyson Zavazava
Director of the Telecommunication Development Bureau
International Telecommunication Union

Foreword

We want to express our sincere gratitude to all individuals and organizations who contributed to the **preliminary study on the state of local ICT equipment manufacturing in Uganda** and the development of this report aimed at boosting ICT manufacturing and commercialization in Uganda.

First and foremost, we extend our appreciation to the International Telecommunication Union (ITU) and the Global Development and South-South Cooperation Fund (GDSSCF) of the People's Republic of China for their invaluable financial support and technical guidance throughout this research. Special thanks to the Consultant, ITU Team, and the Government of Uganda Team led by the Ministry of ICT and National Guidance for their expertise, insights, and contributions, which greatly enhanced the depth and relevance of this report. Their commitment to excellence has ensured the delivery of a comprehensive and insightful report.

We are also grateful to industry experts, policymakers, researchers, and all stakeholders who provided valuable data, case studies, and feedback that helped shape the report. Their knowledge and experience have been instrumental in identifying the proposed key strategies for fostering ICT manufacturing and commercialization in Uganda.

This report is a collective effort, and we hope it serves as a valuable resource in advancing ICT manufacturing and commercialization in Uganda for a more connected and innovative future.

As we embark on this endeavour, the achievement of the recommendations depicted in this report will highly depend on collaborative efforts by all stakeholders. Through collaboration, we can establish a progressive and innovative ICT sector, ultimately strengthening economic resilience and technological sovereignty – the trajectory of digital transformation in Uganda is contingent upon the deliberate and strategic actions taken today by every stakeholder attuned.

Dr. Amina Zawedde (PhD)
Permanent Secretary
Ministry of ICT and National Guidance
Government of Uganda

Executive summary

The study on the current state of local ICT equipment manufacturing in Uganda represents an exploration of Uganda's potential to develop a dynamic and competitive local ICT equipment manufacturing sector. The study was undertaken in the context of the Government of Uganda and ITU joint digital transformation project 'Technical Assistance and Training to Uganda on National ICT Development Strategy' (2021-2024), supported by the Global Development and South-South Cooperation Assistance Fund. As such it aligns seamlessly with the country's Vision 2040 and key national frameworks such as the Third National Development Plan (NDPIII) and the Digital Uganda Vision. At its core, this study seeks to provide actionable insights and recommendations to foster technological self-reliance, drive economic diversification, and create meaningful employment opportunities.

Uganda's ICT manufacturing sector is still in its infancy. The nation remains heavily reliant on imported components, which creates cost inefficiencies and limits competitiveness. However, national policies such as Vision 2040 have emphasized the transformative potential of the sector. What is required is a cohesive strategy to translate these aspirations into measurable outcomes. Through this study, we have aimed to bridge this gap by conducting an in-depth evaluation of the current ecosystem, consulting stakeholders, and benchmarking against regional peers such as Kenya and Rwanda.

Key findings

Stakeholder consultations revealed critical challenges that must be addressed[2]. These include limited infrastructure, constrained financing options, and a mismatch between industry needs and workforce capabilities. Despite these barriers, there is significant opportunity for Uganda to establish itself as a regional ICT manufacturing hub. Technology transfer, regional trade agreements, and partnerships with global ICT firms all present viable avenues for growth.

Uganda's ICT manufacturing sector, while holding significant potential for economic transformation and job creation, faces challenges such as reliance on imported components, limited access to finance, and skills gaps. However, Uganda's strategic location, stable macroeconomic environment, liberalized trade policies, and vibrant business landscape, combined with the availability of tax incentives, make it a destination for foreign direct investment(FDI).The attraction and leveraging of FDI can address the challenges faced by providing crucial capital, technology transfer, and expertise, as well as fostering linkages with the local economy and facilitating access to regional and global markets.

Lessons from Kenya and Rwanda underline the importance of innovation hubs, public-private partnerships, and targeted policy incentives. Kenya's experience with iHub and Rwanda's Kigali Innovation City demonstrate how tailored ecosystems can drive both technological and economic development. These regional success stories provide clear and practical guidance that Uganda can adapt to its unique context.

[2] Insights from stakeholder engagements and benchmarking against Kenya and Rwanda informed these findings and recommendations.

The findings of this study highlight both the potential and the challenges within Uganda's ICT equipment manufacturing sector. While national policies and initiatives are in place to support growth, the sector is characterized by a reliance on imported components, hindering competitiveness. Inadequate research and development investment limits innovation and the development of local capabilities. Furthermore, access to finance remains a major constraint, with high lending rates and limited access to credit disproportionately affecting small and medium-sized enterprises (SMEs), where only 8.9 per cent have access to loans compared to 35.2 per cent in Kenya.

Strategic recommendations

The path forward requires a focus on seven interconnected priorities:

1. **Policy and regulation** – Develop a dedicated policy for ICT equipment manufacturing, supported by fiscal incentives such as tax breaks and grants to stimulate local production and attract investors.
2. **Infrastructure development** – Establish industrial parks specifically designed for ICT manufacturing, equipped with reliable utilities and high-speed broadband connectivity.
3. **Research and development capabilities** – Prioritize investments and policies that strengthen R&D within the ICT equipment manufacturing sector.
4. **Capacity building** – Align academic curricula with industry needs by creating vocational training programmes to address the skills gap, ensuring a workforce ready for high-value ICT manufacturing roles.
5. **Market expansion** – Leverage regional frameworks such as the African Continental Free Trade Area (AfCFTA) to scale production and access broader markets on the African continent.
6. **Innovation and technology transfer** – Partner with global ICT equipment manufacturing firms and draw lessons from successful emerging markets, which has prioritized R&D and implemented policies to foster a thriving electronics manufacturing sector.
7. **Maximize the benefits of FDI** – Implement policies that actively promote backward linkages, skills development, and technology transfer from FDI, ensuring greater integration with the local economy; develop a comprehensive policy framework that integrates FDI into Uganda's broader industrial strategy, encompassing trade, taxation (leveraging available incentives), infrastructure, and human capital development, and negotiate FDI agreements that align with national development goals, promote responsible investment, and mitigate potential risks, ensuring that FDI contributes to sustainable and inclusive industrialization.

Outcomes and deliverables

The study delivers a comprehensive assessment of Uganda's ICT ecosystem and presents strategic frameworks for growth. It also highlights actionable recommendations derived from extensive stakeholder engagement. Implementing these strategies will:

- strengthen Uganda's manufacturing capabilities and reduce dependency on imports;
- generate employment and enhance workforce skills in alignment with emerging industry demands;
- improve Uganda's competitiveness in regional and global markets by fostering sustainable practices.

Next steps

The findings from this study provide a roadmap for Uganda to strategically position itself as a leader in ICT manufacturing within East Africa and on the continent. Immediate priorities include scaling infrastructure investments, operationalizing ICT industrial zones, and ensuring effective policy implementation. Additionally, fostering international partnerships and aligning with global standards will be critical to driving the country's growth in this sector.

This study stands as a pivotal step in Uganda's journey toward technological independence and economic transformation. By building on the outlined strategies, Uganda has a unique opportunity to shape its future as a competitive player in the regional and global ICT manufacturing landscape.

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1 Introduction

1.1 Overview of the study

This study was undertaken in the context of the Government of Uganda and ITU joint digital transformation project 'Technical Assistance and Training to Uganda on National ICT Development Strategy' (2021-2024), supported by the Global Development and South-South Cooperation Assistance Fund. This study was designed to provide technical assistance and strategic recommendations aimed at enhancing Uganda's technological and industrial capacity by laying the groundwork for a local ICT equipment manufacturing sector. Grounded in Uganda's Vision 2040 and the Third National Development Plan (NDPIII) (Government of Uganda, 2020), the study focused on delivering actionable insights and frameworks to guide future development efforts, with a focus on creating a foundation for sustainable development in the ICT sector.

While the study was conceptualized and initiated under the framework of NDPIII (Government of Uganda, 2020), its outcomes align with the strategic priorities outlined in the Fourth National Development Plan (NDPIV), which emphasizes agro-industrialization, tourism development, mineral-based industrial development, and science, technology, and innovation (STI). The inclusion of ICT as a cornerstone within the STI pillar highlights its transformative potential in enabling Uganda's socio-economic progress. The overarching theme of NDPIV, "Sustainable industrialization for inclusive growth, employment, and wealth creation," complements the study's contributions toward fostering industrialization, promoting innovation, and preparing Uganda's ICT manufacturing sector for future growth.

This study also formed a crucial component of the broader initiative outlined in the ITU and Government of Uganda joint study on "Technical assistance and training to Uganda on the National ICT development strategy". Specifically, the study contributed to Component 1 – Policy and strategy recommendations, focusing on Uganda's ICT industry development. This included a dedicated sub-component that provided strategic policy and recommendations to enhance ICT industry growth, covering key areas such as e-waste management, innovation ecosystems, and entrepreneurship support mechanisms.

The study seeks to address gaps within Uganda's ICT manufacturing ecosystem, providing insights to guide local innovation and production, and recommending sustainable practices to support long-term development objectives.

The study was enabled by a structured approach that included:

- collaboration with government ministries, private sector entities, academia, and international partners to ensure inclusive and shared ownership;
- analysis of existing policies and infrastructure, leading to actionable recommendations for strengthening the ICT manufacturing ecosystem;
- evaluation of Uganda's ICT sector performance, supported by insights from successful regional and international models;
- elaboration of strategies to scale manufacturing, drive technology adoption, and support ecosystem development.

The insights and recommendations in this report aim to provide a roadmap for advancing Uganda's ICT manufacturing sector, aligning it with national priorities and positioning it as a competitive player in the regional and global markets.

1.2 Purpose of the study

The purpose of the study is to provide a comprehensive account of the current state of local ICT equipment manufacturing in Uganda, capturing key findings, and recommendations. The report serves to:

- summarize the objectives, scope, and methodology of the study, and key activities undertaken;
- present findings from stakeholder engagements, including qualitative insights from local and regional participants;
- analyze the current state of Uganda's ICT equipment manufacturing ecosystem, identifying key challenges and opportunities;
- offer actionable policy and strategy recommendations to support the development of a robust local ICT manufacturing sector;
- align the study's outcomes with Uganda's broader development goals as articulated in Vision 2040, NDPIII, and NDPIV frameworks.

By documenting these elements, this report provides stakeholders with a reference point to guide future initiatives aimed at strengthening Uganda's ICT manufacturing sector.

1.3 Scope and objectives

The scope of this study was defined by its focus on delivering technical assistance and strategic recommendations to advance Uganda's ICT equipment manufacturing sector. Within the limited timeframe, the study undertook targeted activities to achieve the following objectives:

- Conduct a comprehensive review of Uganda's ICT manufacturing ecosystem, including its challenges, opportunities, and key stakeholders.
- Facilitate meaningful engagements with government agencies, private sector players, academia, and development partners to gather insights and foster collaboration.
- Compare Uganda's ICT manufacturing practices with those of regional peers like Kenya, and Rwanda to identify competitive strategies and best practices.
- Provide actionable recommendations to strengthen national policies, enhance the business environment, and encourage investment in ICT manufacturing.
- Propose strategies to integrate innovate, foster technology transfer, and embed sustainability principles within Uganda's ICT manufacturing processes.

The scope of this study was designed to lay a strong foundation for advancing Uganda's ICT manufacturing capabilities while aligning with national and regional priorities. By achieving these objectives, the consultancy aims to provide a strategic framework that stakeholders can build upon to realize long-term growth and competitiveness in the ICT sector.

2 Methodology

This section outlines the methodology employed in the ICT technology development and commercialization study to generate evidence-based findings and actionable recommendations. The approach used was systematic and comprehensive, incorporating diverse methods to ensure a thorough analysis of Uganda's ICT equipment manufacturing sector. The methodology involved stakeholder engagement, policy and ecosystem review, market analysis and benchmarking, and data validation and synthesis.

2.1 Stakeholder engagement

Understanding the perspectives of diverse stakeholders was central to this study. To begin, structured interviews and focus group discussions were conducted with representatives from government agencies, private sector organizations, academia, and development partners. These conversations brought forward a variety of viewpoints, shedding light on the complexities of ICT equipment manufacturing in Uganda.

While multi-stakeholder forums and dedicated workshops were initially planned to enhance collaboration and validate preliminary findings, time constraints and delayed responses from some stakeholders limited these activities. Instead, preliminary findings of this study were presented at the closure event, for the larger umbrella project to which this study contributes. The event provided an opportunity for engaging a subset of stakeholders in discussions, and cross-sectoral dialogue.

The Ministry of Information and Communications Technology and National Guidance (MoICT&NG), as the project owner and key facilitator provided overarching guidance and strategic direction, ensuring the study's alignment with national priorities. Its role was pivotal in supporting the project's objectives but distinct from that of other stakeholders who were actively interviewed or surveyed.

The International Telecommunication Union (ITU), as the technical implementor of this study, played its role in ensuring the project's execution adhered to international standards and methodologies. ITU provided technical oversight and contributed its expertise in ICT policy development and commercialization strategies.

Additionally, qualitative data was collected through surveys distributed to key industry stakeholders. This approach enabled gathering of detailed insights into the challenges they face, such as limited access to financing and inadequate infrastructure, as well as opportunities for growth, including regional market integration.

2.2 Policy and ecosystem review

Analysing Uganda's policy environment and broader ecosystem formed a critical component of this study. This step ensured that the recommendations of this study were well-grounded in existing strategies and aligned with national and international goals.

National policy analysis – Key national policies and strategies were reviewed to understand Uganda's aspirations and priorities for ICT development. These included:

- Vision 2040, which outlines the transformative role of ICT in modernizing Uganda and achieving a prosperous society.

- National Development Plans (NDPIII, NDPIV), which emphasize the integration of ICT in sustainable industrialization and digital transformation initiatives.
- The National ICT Policy and Digital Uganda Vision, as well as the Digital Transformation Roadmap (2023-2028) which detail strategic frameworks for fostering local innovation, building ICT infrastructure, and improving service delivery across the nation.

International frameworks – In addition to national strategies, the study examined global and regional frameworks to ensure alignment with broader development agendas. These included:

- Sustainable Development Goal 9 (Industry, Innovation, and Infrastructure), highlighting ICT as a driver for industrial growth and innovation.
- The African Continental Free Trade Area (AfCFTA), which opens opportunities for regional trade and collaboration in ICT manufacturing.
- ITU Connect 2030 Agenda sets a global vision for sustainable and inclusive ICT-driven growth.

This review identified gaps and opportunities within Uganda's policy and ecosystem, providing a foundation for recommendations that address both local needs and global trends effectively.

2.3 Market analysis and benchmarking

Market analysis and benchmarking were crucial in evaluating Uganda's ICT manufacturing sector within a regional and global context. This process provided valuable insights into competitive positioning and potential growth strategies.

The study benchmarked Uganda's ICT manufacturing practices against successful models in Kenya, Rwanda, and other emerging markets. Kenya's robust ecosystem for ICT startups and Rwanda's heavy investment in digital infrastructure served as critical reference points. These comparisons focused on identifying lessons learned, such as enabling policies, access to financing, and public-private partnerships that could be adapted to Uganda's context. Rwanda's Smart Rwanda Master Plan, for instance, showcased how digital transformation initiatives can drive ICT sector growth.

A detailed analysis of market potential revealed key demand drivers for ICT products in Uganda, including a growing middle class, increased adoption of digital tools, and a rising need for locally manufactured devices. The assessment also identified gaps in the current manufacturing ecosystem, such as limited local value addition and dependence on imports. Opportunities for scaling manufacturing through regional trade agreements such as the AfCFTA and partnerships with global technology companies were highlighted. These findings underscored the need for targeted investments in skills development, supply chain optimization, and infrastructure enhancements to support Uganda's ambition of becoming a regional ICT manufacturing hub.

2.4 Data validation and synthesis

The study utilized a robust approach to analyse the qualitative data collected through various methods. Online survey data, face-to-face interview scripts, and recorded audio interviews formed the core data sources. The audio recordings were uploaded to Amazon S3 for secure storage and subsequently transcribed using Amazon Transcribe. In addition, written notes from workshops and meetings were incorporated into the analysis.

Once transcribed, the data was systematically processed using a thematic coding approach. ChatGPT, an AI language model developed by OpenAI, was used to assist with the coding and analysis. The transcripts and survey responses were fed into the model to identify recurring themes, patterns, and key insights. Codes were assigned to segments of text based on predefined categories such as challenges, opportunities, and stakeholder priorities. This method allowed for an organized and consistent analysis, facilitating the identification of commonalities and unique perspectives.

Through iterative review and synthesis, the coded data provided a rich analytical foundation to draw actionable insights and deductions. This systematic approach ensured the findings were both comprehensive and reflective of the diverse stakeholder input, ultimately supporting evidence-based policy recommendations and strategies for the ICT sector.

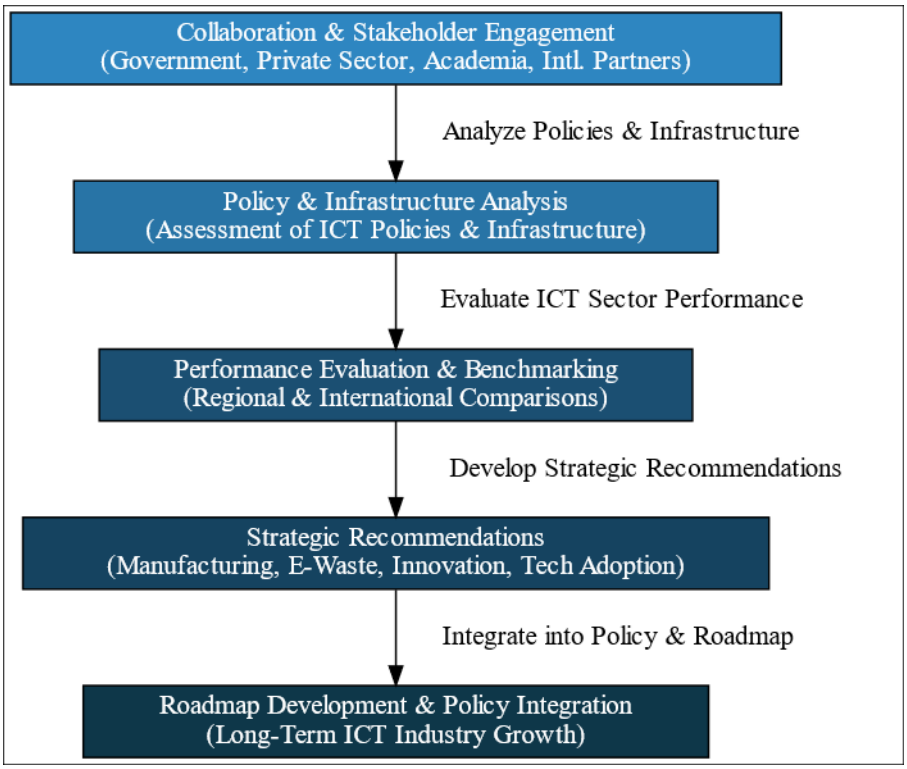
2.5 Methodological rigor and limitations

The methodology ensured inclusivity by engaging diverse stakeholders across multiple sectors. However, limitations included reliance on secondary data in cases where primary data was unavailable and challenges in achieving a balanced representation of all stakeholder categories.

By integrating qualitative and quantitative approaches, the methodology facilitated a holistic understanding of Uganda's ICT manufacturing landscape, creating a foundation for impactful policy recommendations and actionable strategies.

Figure 1 outlines the study's methodology, starting with stakeholder engagement across government, private sector, and academia. It then examines policies and infrastructure, identifying gaps and opportunities. Benchmarking follows, comparing Uganda's ICT sector with regional and global standards (emerging markets). Strategic recommendations focus on local manufacturing, innovation, and e-waste management. Finally, a roadmap is developed for sustainable ICT industry growth, integrating policy actions to enhance long-term sector development and competitiveness.

Figure 1. Graphic representation of the study methodology – Local ICT equipment manufacturing in Uganda



Source: Study methodology

3 Introduction to the current state of local ICT equipment manufacturing in Uganda

3.1 Background and context

Uganda's journey toward fostering a robust local ICT equipment manufacturing sector is deeply rooted in its aspirations to transform from a predominantly agrarian economy to an industrialized and knowledge-drive society. Guided by Vision 2040 and the National Development Plan III (NDPIII), the country's strategic emphasis on science, technology, and innovation (STI) underscores the critical role local ICT equipment manufacturing plays in catalysing socio-economic transformation. These national blueprints envision the establishment of local ICT equipment manufacturing capabilities not only to reduce reliance on imports but also to drive technological self-sufficiency, create employment, and position Uganda as a competitive player in the regional and global ICT markets (MoICT&NG, 2023a; NPA, 2020).

This section of the report aims to provide an analytical overview of the current landscape of local ICT equipment manufacturing in Uganda. It examines the progress made, identifies active players and pilot initiatives in the sector, and assesses challenges and opportunities pivotal to advancing local manufacturing. Additionally, it explores Uganda's alignment with regional and global practices, offering insights into business and financial development strategies essential for fostering sustainable growth in this sector (Great Sands Consulting Ltd., 2020 and MoICT&NG, 2023a).

The discussion encompasses the following:

- A comprehensive review of entities engaged in local ICT equipment manufacturing and their contributions to the local ecosystem.
- An evaluation of policy frameworks and public-private partnerships supporting the industry.
- Identification of bottlenecks hindering sectoral growth, such as skills gaps, infrastructure limitations, and supply chain inefficiencies.
- Opportunities arising from regional initiatives such as AfCFTA and international partnerships aimed at technology transfer (Ministry of Trade Industry and Cooperatives 2020).

Strategic relevance

The emphasis on local ICT equipment manufacturing aligns with Uganda's broader socio-economic goals of industrialization and inclusive growth. The sector holds the potential to:

- Accelerate economic development by substituting imports with locally manufactured ICT products, thereby improving trade balances (MoICT&NG, 2023a).
- Drive innovation and technology adoption across various industries, leveraging synergies with the ICT innovation ecosystem, research institutions, and industrial parks (NITA-U, 2022).
- Create a skilled workforce equipped to meet the demands of emerging digital economies, ensuring long-term sustainability and resilience (ITU-D, 2022).

3.2 Overview of stakeholders and initiatives

Uganda's efforts to establish a thriving local ICT equipment manufacturing sector have been bolstered by several key stakeholders and initiatives. These entities and programmes are the backbone of Uganda's ambition to transition from an import-reliant economy to a technology-driven manufacturing hub. This section explores their contributions in greater depth.

Engo Holdings Group and SIMI Technologies

Engo Holdings Group and SIMI Technologies stand out as leaders in Uganda's nascent ICT manufacturing landscape (SIMI Mobile, 2019). By setting up assembly plants for mobile phones, computers, and other ICT equipment, these companies have significantly enhanced Uganda's manufacturing capacity. Their operations focus on providing local solutions while reducing the country's dependence on finished imported products. Additionally, their initiatives contribute to skill development among the local workforce, ensuring technology transfer and capacity building. These efforts align closely with Uganda's broader industrialization goals, as highlighted in the National Industrial Policy (Assembly, 2019).

National ICT Initiatives Support Programme (NIISP)

The National ICT Initiatives Support Programme (NIISP), under the Ministry of ICT and National Guidance, plays a pivotal role in fostering innovation and entrepreneurship within Uganda's ICT sector. By supporting startups and small enterprises, the program bridges the gap between innovation and market readiness. Beneficiaries such as Innovex Limited, which develops IoT-enabled systems, and Meera Semiconductor and Electronics Limited, specializing in electronic components, exemplify NIISP focus on empowering local innovators (MoICT&NG, 2023a).

NIISP also facilitates partnerships with academic and research institutions to accelerate technology commercialization. By providing funding and technical mentorship, the program addresses critical gaps in the ICT ecosystem, such as limited research-to-market pathways. Furthermore, its ability to attract public and private investments underscores its strategic importance in scaling Uganda's ICT manufacturing capabilities.

Science, Technology and Innovation Secretariat (STI)

The Science, Technology and innovation (STI) Secretariat plays a crucial role in advancing Uganda's ICT manufacturing ambitions. Through its National Science, Technology, and Innovation Plan, the secretariat supports R&D initiatives that facilitate technology transfer and local innovation. The National Research and Innovation Fund (NRIF) managed by the secretariat provides financial and technical support to startups and SMEs, enabling the development and commercialization of ICT hardware and software products.

STI also spearheads the establishment of science and technology parks which include ICT-focused zones offering technical expertise and infrastructure for manufacturing. By partnering with academia and institutions such as the Uganda Industrial Research Institute (UIRI), STI fosters innovation tailored to local manufacturing needs. Moreover, its advocacy for the Buy Uganda Build Uganda (BUBU) policy aligns with efforts to promote local content development in the ICT sector.

Through initiatives addressing capacity building, sustainable manufacturing practices, and e-waste management, STI complements the work of other ministries and stakeholders. These contributions ensure that Uganda's ICT manufacturing sector benefits from a robust ecosystem of innovation and technical support.

Public-private partnerships

The role of public-private partnerships (PPPs) cannot be overstated in Uganda's ICT manufacturing development. International collaborators such as Japan International Cooperation Agency (JICA) and ITU provide essential support in policy advisory, workforce training, and technology transfer. These partnerships have been instrumental in aligning Uganda's manufacturing aspirations with international best practices (Ministry of ICT and National Guidance, 2023).

For instance, JICA initiatives include training programmes targeting mid-level technical skills required for ICT assembly lines, while ITU has supported (among others) national e-waste management and sustainable production practices efforts. Additionally, agencies such as Germany Agency for International Cooperation (GIZ) support capacity building and innovation hubs to enhance Uganda's competitiveness. Similarly, United States Agency for International Development (USAID) has provided funding and technical support to boost ICT-related entrepreneurship, further contributing to development of the sector.

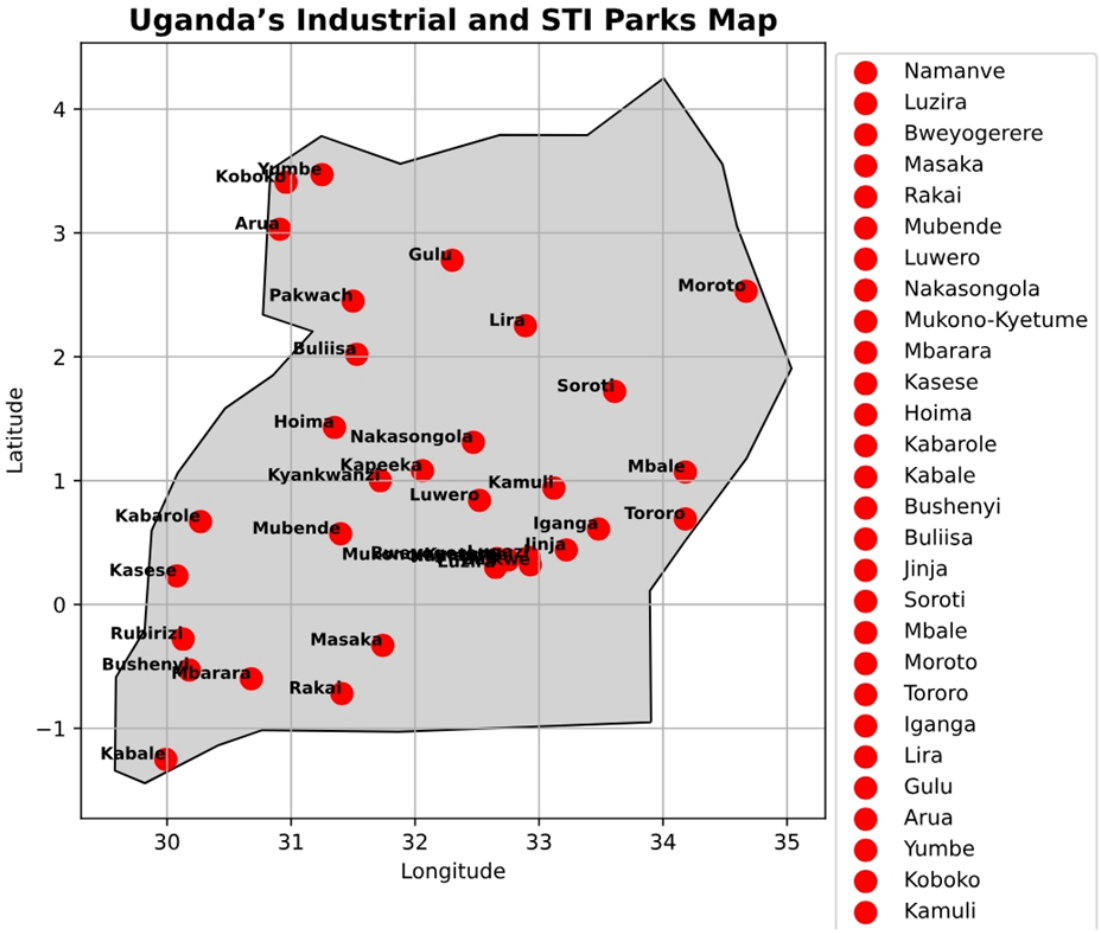
Beyond the players above, Uganda's ICT manufacturing sector benefits from contributions by other stakeholders detailed in the Annex on stakeholder engagement. This includes research institutions, innovation hubs, and investment agencies such as the Uganda Investment Authority (UIA). Their roles range from providing financing and technical expertise to fostering regional integration through platforms, such as AfCFTA, the East African Community (EAC), and Common Market for Eastern and Southern Africa (COMESA). Partnerships with organizations such as African Development Bank (AfDB) and United Kingdom Foreign, Commonwealth and Development Office (FCDO) have also enabled infrastructure and policy improvements critical for the ICT sector growth.

The combined efforts of these players highlight the importance of a multi-stakeholder approach to ICT manufacturing. By integrating domestic capacity building, international partnerships, and policy support, Uganda is laying the foundation for a sustainable and competitive ICT manufacturing sector. However, a continuous focus on infrastructure, skills enhancement, and market access will be critical to achieving the country's long-term objectives in this sector.

Industrial and science, technology, and innovation parks as catalysts for ICT growth

Uganda's industrial and science, technology, and innovation (STI) parks are pivotal in driving economic development and are increasingly significant for the growth of the ICT sector and local ICT equipment manufacturing. The development of these parks aligns with Uganda's Vision 2040 and the Third National Development Plan (NDP III), which aim to increase sustainable development, productivity, and value addition (UIA, 2021). These parks are designed to provide the necessary infrastructure and services to facilitate efficient and low-cost production of goods and services, which is essential for attracting investments in ICT manufacturing (UIA, 2019).

Figure 2. Uganda Industrial and Science, Technology and Innovation Parks



Note: The designations employed and presentation of material in this publication, including maps, do not imply the expression of any opinion whatsoever on the part of ITU concerning the legal status of any country, territory, city or area, or concerning the delimitations of its frontiers or boundaries.

Source: UIA. (2021). Status of UIA Industrial Parks

Adapting parks for ICT equipment manufacturing and R&D

To effectively support local ICT equipment manufacturing and strengthen the country's R&D efforts, industrial and STI parks need to be adapted to meet the specific requirements of the sector (Francis, 2018). This includes:

- Providing reliable and high-capacity electricity, high-speed internet connectivity, and advanced logistics and warehousing facilities is crucial (Further Africa, 2021). The design of facilities should also consider the need for cleanrooms and environmentally controlled spaces required for electronics manufacturing.
- STI parks should include dedicated spaces for R&D activities, such as laboratories, prototyping centers, and testing facilities. These facilities should be equipped with advanced equipment and technologies to support innovation in ICT manufacturing.
- Integrating technology and innovation hubs within industrial and STI parks can foster collaboration between manufacturers, researchers, startups, and academic institutions. These hubs can provide access to shared resources, such as prototyping facilities, testing labs, R&D support, and technology transfer offices (UNCST, 2023).

- Establishing vocational training and skills development centers within or near industrial and STI parks can help address the skills gap in the ICT sector. These centers can offer specialized training programs in areas such as electronics assembly, quality control, maintenance, and R&D-related skills.
- Drawing in major electronics manufacturers and leading R&D institutions can catalyze the growth of the local ICT ecosystem. This can be achieved through targeted investments promotion and incentives, as well as by creating a conducive regulatory environment.
- Encouraging PPPs in the development and management of industrial and STI parks can leverage private sector expertise and investment to create sustainable and efficient facilities that support both manufacturing and R&D.

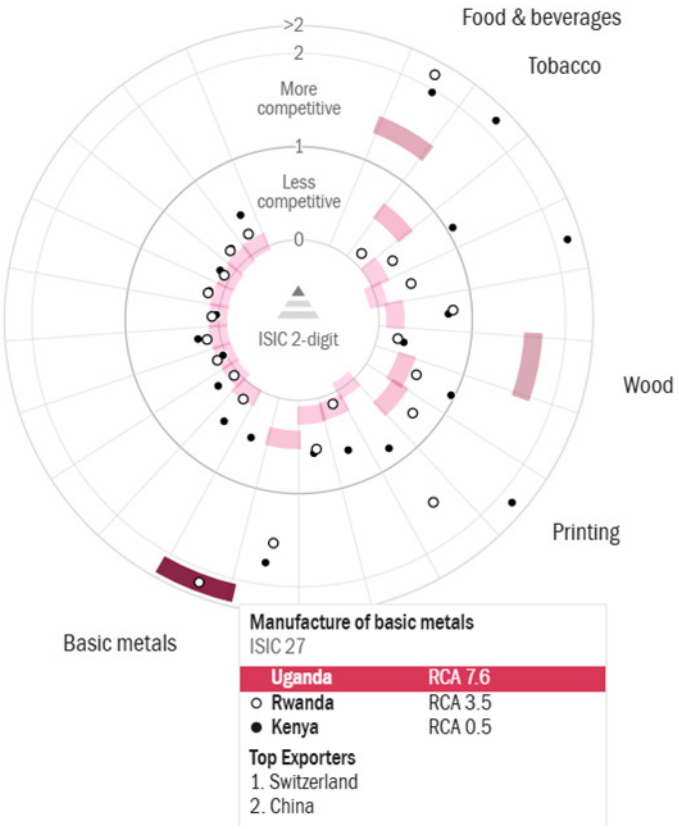
Emerging investment opportunities

Uganda's ICT sector presents emerging investment opportunities driven by its expanding industrial base, government incentives, and increasing demand for locally manufactured ICT equipment. The availability of raw materials, rising industrial production, and trade access through AfCFTA position Uganda as a potential hub for ICT hardware manufacturing. Key opportunities include establishing ICT equipment production plants, R&D centres, and technology hubs, supported by policies such as BUBU and funding for science, technology, and Innovation. With a growing ecosystem of investors and targeted industrial policies, Uganda is well-placed to attract both domestic and foreign investment into its ICT manufacturing sector.

Positioning Uganda as a regional leader – Strategic relevance

Uganda's manufacturing sector has experienced significant growth, with the industrial sector contributing 27.4 per cent to GDP as of 2024 and manufacturing activities expanding by 11 per cent in the last quarter of the 2023/24 financial year (ChimpReports, 2024). Additionally, the Industrial Production Index reached 136.4 in the third quarter of 2024 as shown in Figure 3, which reflects an upward trajectory that underscores Uganda's expanding industrial base. While this growth remains modest compared to regional peers such as Rwanda, it signals untapped potential for diversification, particularly in ICT equipment manufacturing.

Figure 3. Manufacturing-industry competitiveness: Uganda, Kenya, and Rwanda



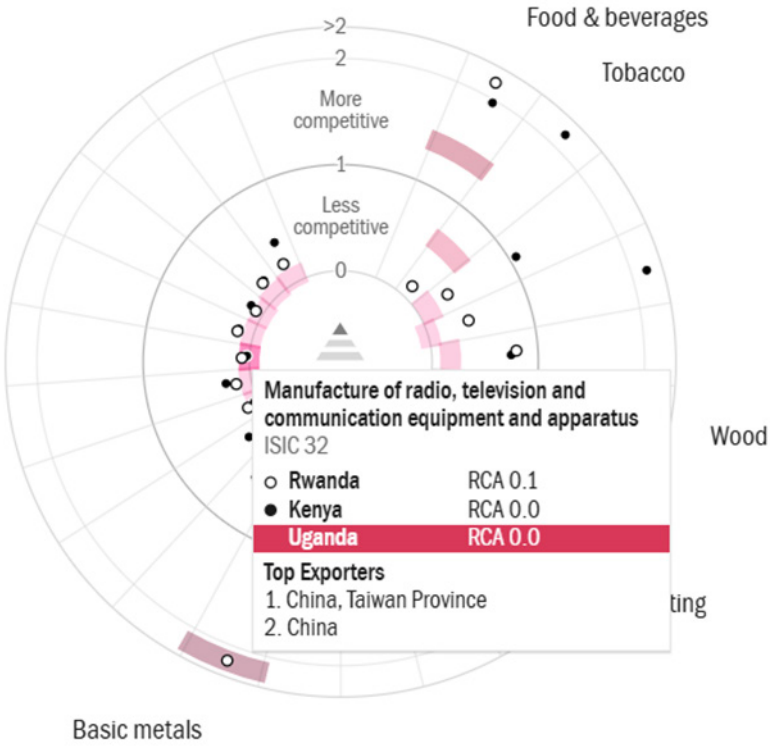
Source: UNIDO, 'Industrial Analytics Platform'; https://iap.unido.org/data/competitive-industries?p=UGA&s=KEN&t=RWA

A key advantage for Uganda in this sector is its export strength in basic metals as shown in Figure 3, which are critical raw materials in the production of ICT hardware, including circuit boards, cables, and connectors. Leveraging this domestic supply chain yield several benefits for Uganda's ICT manufacturing ambitions:

- Cost efficiency and supply chain stability – Locally sourced metals reduce dependence on imports, cutting production costs and ensuring a stable supply of raw materials for ICT manufacturers.
- Value addition and economic growth – Instead of exporting raw metals, Uganda can invest in value addition by refining and utilizing these materials in local ICT production, boosting industrial output and creating employment opportunities.
- Attracting investment – The availability of key raw materials strengthens Uganda's case for attracting foreign direct investment in ICT equipment manufacturing, as companies seek reliable supply chains.

Figure 4 shows export competitiveness of some Ugandan industries using the revealed comparative advantage (RCA). The RCA indicates the importance of a product (ICT equipment) in a country's export basket compared to the product's importance in world trade. An RCA value greater than 1 indicates that the product contributes a greater than average share to the country's exports.

Figure 4. Telecommunication/ICT equipment industry competitiveness: Uganda, Kenya, and Rwanda



Source: UNIDO, 'Industrial Analytics Platform'; https://iap.unido.org/data/competitive-industries?p=UGA&s=KEN&t=RWA

Uganda can capitalize on its growing industrial sector, local resource availability, and strategic market access within the EAC and AfCFTA, and position itself as a competitive ICT manufacturing and R&D hub. Bridging its current gap in the ICT sector – indicated by a revealed comparative advantage (RCA) of 0.0 as seen in Figure 4 – will require targeted investment in manufacturing zones, skills development, and technology transfer initiatives. If well-executed, these efforts can reduce reliance on imports, enhance export capabilities, and drive socio-economic transformation through a thriving ICT industry.

3.3 Challenges

Despite notable progress in establishing a local ICT equipment manufacturing sector, several challenges persist. Hence, addressing these barriers is crucial for the development of a sustainable and competitive ecosystem.

- One of the significant challenges is Uganda's heavy reliance on imported components for ICT manufacturing where over 90 per cent of required materials are imported, resulting in inflated production costs and reduced competitiveness in both local and international markets (Uganda Investment Authority (UIA), 2018). This dependence highlights the need for policies and incentives aimed at developing domestic production capabilities, particularly for critical components. Strategic partnerships with international manufacturers could also be instrumental in fostering technology transfer and local production.
- Infrastructure deficiencies present another major obstacle. The limited availability of reliable power supply, inadequate transport networks, and poorly developed industrial zones constrain the growth and productivity of existing manufacturing facilities (Great

Sands Consulting Ltd., 2020). For instance, inconsistent electricity supply and high logistics costs significantly reduce operational efficiency. Addressing these challenges will require prioritization of ICT-specific infrastructure development within national strategies, including targeted investments in industrial parks and energy infrastructure.

- A mismatch between industry needs and the available technical expertise further complicates efforts to grow the sector. Uganda's workforce often lacks the skills required to operate advanced manufacturing technologies or engage in high-value ICT production activities (JICA, 2022). This gap necessitates the implementation of targeted vocational training programmes, collaborations with technical institutions, and skill-enhancement initiatives in partnership with global ICT firms. Building a robust talent pipeline is essential to support the industry's long-term growth.
- Fragmented policy and regulatory frameworks also impede progress. While various policies address industrialization and ICT development, limited coordination among stakeholders results in inefficiencies and redundancies. A more integrated approach to policy implementation, with clear roles and responsibilities across ministries and agencies, will be critical for aligning efforts and achieving tangible outcomes.
- Access to finance is major challenge for Uganda MSME businesses over the last two decades (Jefferis et al., 2020), a category in which most of ICT equipment manufacturers and assemblers currently fall. High borrowing costs limit investment and growth, disproportionately impacting SMEs. Studies show that only 8.9 per cent of Ugandan MSMEs have loans, compared to 35.2 per cent in Kenya, contributing to a significant financing gap (IFC, 2023). Additionally, credit conditions are tightening, further hindering sector development (BoU, 2024).
- Inadequate investment in research and development (R&D) poses a significant challenge to fostering innovation and advancement within Uganda's ICT equipment manufacturing sector. Stakeholders have expressed concern that limited R&D funding restricts the ability of local companies to develop new technologies and compete effectively. This challenge is not unique to Uganda. For example, in India, a country selected as a suitable emerging market to benchmark with Uganda in this study, a strong policy framework with significantly increased public funding for research and development is crucial to support the growth of the ICT equipment (electronics) manufacturing industry (Francis, 2018). To address these interconnected challenges effectively, a comprehensive approach that integrates infrastructure development, targeted policy reforms, capacity-building initiatives, and financial support mechanisms is essential. Such an approach will lay the groundwork for a resilient and competitive ICT equipment manufacturing sector in Uganda.

3.4 Opportunities

Uganda's ICT equipment manufacturing sector holds substantial potential, driven by key opportunities that could transform the sector into a regional powerhouse. The alignment of Uganda's national strategies with regional and international frameworks underscores these possibilities, paving the way for growth and competitiveness.

Attracting FDI to drive industrial transformation

Foreign direct investment presents a significant opportunity for Uganda to drive its industrial transformation and achieve sustainable economic growth as recently reported by the ministry of finance (MoFPED-UG, 2024) and Uganda Revenue authority (URA, 2024). Moreover, industrialization is a key differentiator between developed and developing countries and a crucial pathway to reducing wealth disparities (Chen et al., 2024). Uganda's National Industrial Policy and other national frameworks recognize the transformative potential of the ICT sector and seek to attract FDI to boost local manufacturing as explored later in this study. FDI can bring in essential capital, technology, and expertise, fostering growth in sectors like ICT, where

Uganda aims to increase local production and reduce import reliance (Infrastructure, 2023; SIMI mobile, 2019). Furthermore, FDI can stimulate job creation, enhance productivity, and improve Uganda's competitiveness in regional and global markets. The Uganda Investment Authority (UIA) actively promotes Uganda as a preferred FDI destination, highlighting the country's commitment to leveraging FDI for industrial development (Rupiny, 2024; UIA, 2022, 2023).

Expanding regional markets

One of the most significant opportunities lies in the expanding of regional markets facilitated by AfCFTA. This agreement provides access to a vast consumer base across Africa, comprising over 1.3 billion people, with a combined GDP of approximately 3.4 trillion (Ministry of Trade Industry and Cooperatives, 2020). Uganda's strategic geographic position within East Africa makes it an ideal hub for exporting ICT products to regional markets such as the Democratic Republic of Congo, Kenya, Rwanda, and Tanzania.

By capitalizing on the AfCFTA framework, Uganda can position itself as a leader in ICT equipment manufacturing within the region. The elimination of tariffs under the agreement promotes export-oriented growth, enabling local manufacturers to competitively price their products for regional consumers (Kararach et al., 2023). Furthermore, the increasing demand for affordable ICT devices in Africa's rapidly growing digital economy offers significant market opportunities. To leverage this potential, manufacturers in Uganda must prioritize compliance with international quality standards and invest in scaling their production capacity (GreatSands & MoICT&NG, 2020).

Supportive policies

The Uganda Government has introduced several supportive policies that create a conducive environment for investments in ICT manufacturing. The BUBU policy emphasizes the promotion of locally produced goods and serves, incentivizing both public and private sector entities to prioritize Uganda-manufactured ICT products (Ministry of Trade Industry and Cooperatives, 2020). By fostering domestic consumption, the policy stimulates demand and strengthens local manufacturing capabilities.

In addition to BUBU, tax incentives for manufacturers have been instrumental in attracting investment into the sector. For example, exemptions on import duties for raw materials and machinery used in manufacturing reduce production costs, enabling local firms to compete effectively with imported products (UIA, 2023). The establishment of industrial parks and free zones further enhances the attractiveness of Uganda as an investment destination, providing infrastructure and streamlined regulatory support for ICT manufacturers (MoFPED, 2023).

Innovation hubs

The development of innovation hubs and ICT zones across Uganda represents another transformative opportunity for the sector. These hubs provide a collaborative ecosystem where startups, researchers, and established manufacturers can develop and commercialize innovative ICT solutions. Examples include initiatives supported by the National ICT Initiatives Support Programme (NIISP), which fund hardware and software innovation, enabling startups to transition from prototyping to scalable production (MoICT&NG, 2023a).

Hardware innovation hubs specifically focus on the design and development of ICT equipment such as mobile devices, sensors, and computing components. By offering access

to state-of-the-art facilities, technical mentorship, and funding opportunities, these hubs foster an environment of creativity and entrepreneurship. Furthermore, the integration of these hubs into larger industrial zones ensures that innovations can seamlessly transition into commercial manufacturing pipelines (GreatSands & MoICT&NG, 2020).

The presence of these hubs not only promotes technology-driven entrepreneurship but also attracts foreign investors and technology partners. By creating a vibrant ecosystem for innovation, Uganda can strengthen its competitive advantage in the ICT manufacturing sector while contributing to job creation and technological self-sufficiency (JICA, 2022).

3.5 Alignment with national and international policy frameworks

This study aligns strongly with both national and international frameworks, demonstrating its relevance to Uganda's socio-economic goals. This alignment underscores the study's strategic role in fostering local ICT equipment manufacturing, driving innovation, and contributing to national peace and security as guided by the Prime Minister of Uganda during NDPIV preparatory engagements and NDPIII midterm review (Office of the Prime Minister (OPM) a, 2023). These discussions highlighted the importance of aligning the National Planning Authority strategies with political leadership priorities and peace-building efforts to achieve socio-economic transformation. Mapping these strategic interests reinforces the alignment of this study with Uganda's broader development goals and its relevance to national policy priorities as referred in Figure 5.

Figure 5. Significance of boosting Uganda's local ICT equipment manufacturing to key national development goals

Source: Study findings

3.6 Policy and regulatory review

Policy and regulation are pivotal to shaping the development and commercialization of Uganda's ICT equipment manufacturing sector. In recent years, Uganda has recognized the potential of ICT as a driver of socio-economic transformation, as outlined in key national strategies such as Vision 2040, the Third National Development Plan (NDPIII), and the Digital Uganda Vision. However, for Uganda to establish itself as a regional hub for ICT equipment manufacturing, it is essential to assess and strengthen its policy and regulatory frameworks to ensure they are conducive to growth, innovation, and sustainability.

This subsection aims to critically examine the current policy and regulatory environment influencing local ICT equipment manufacturing. By reviewing national policy documents and global frameworks aligned with this work, this literature-based analysis identifies gaps, opportunities, and actionable strategies for regulatory enhancement. It also assesses alignment with broader developmental goals such as economic growth, job creation, and technological self-sufficiency.

3.7 Review of key national policies

Table 1 provides a summary of the key national policies relevant to Uganda's ICT equipment manufacturing sector. These policies include Vision 2040, the Third National Development Plan, the National ICT Policy, and other strategic frameworks that establish the foundation for promoting innovation, local manufacturing, and sustainable development within the ICT sector. Each policy is reviewed in terms of its objectives, key provisions, and its alignment with the overarching goals of enhancing local ICT equipment manufacturing capabilities.

Table 1. A review of Uganda's national policies and strategies for ICT equipment manufacturing

Policy and strategic frameworks	
National ICT Policy (2014)	The National ICT Policy 2014 emphasizes enhancing research and innovation in ICT product applications, and services to drive industrial development. This aligns with Uganda's broader development objectives under the Third National Development Plan and Vision 2040, which prioritize industrialization and technological self-sufficiency. Key objectives include expanding ICT infrastructure, fostering public-private partnerships, and creating a conducive environment for local ICT equipment manufacturing according to (MoICT&NG, 2014). This policy framework directly supports the current study aimed at strengthening Uganda's ICT manufacturing capacity to meet domestic and regional market demands.
National Industrial Policy (2020)	The National Industrial Policy 2020 focuses on addressing bottlenecks in industrial development through infrastructure development, human capital improvement, and the promotion of local manufacturing, including ICT products. The policy emphasizes creating an enabling environment for ICT manufacturing by investing in specialized industrial parks, supporting research and development, and fostering public-private partnerships. It also advocates targeted fiscal incentives to encourage local production of ICT equipment and reduce dependency on imports. By aligning with global best practices and regional integration frameworks such as the African Continental Free Trade Area (AfCFTA), the policy aims to position Uganda as a competitive hub for ICT manufacturing in East Africa (Ministry of Trade Industry and Cooperatives, 2020)

Table 1. A review of Uganda's national policies and strategies for ICT equipment manufacturing (continued)

Policy and strategic frameworks	
Third National Development Plan (NDPIII)	The Third National Development Plan policy framework prioritizes sustainable industrialization and job creation through local manufacturing. ICT manufacturing is seen as a key driver of economic growth and technological self-sufficiency. NDPIII focuses on creating an enabling environment for ICT manufacturing by supporting infrastructure development, enhancing research and development, and providing Fourth National Development Plan (NDPIV) is expected to build upon these strategies by placing greater emphasis on advanced technologies, fostering innovation ecosystems, and integrating Uganda into regional and global ICT value chains. These combined strategies aim to solidify Uganda's position as a competitive player in ICT equipment manufacturing within East Africa (NPA, 2020; Office of the Prime Minister (OPM), 2023, Robert Lwasa, 2023)
Vision 2040	Vision 2040 aims to transform Uganda into a modern, prosperous country with ICT as a core sector for economic growth. It stresses the need for infrastructure and technological advancements to support local manufacturing. Vision 2040 identifies ICT as a transformative sector that can drive innovation, economic diversification, and competitiveness. To achieve this, the strategy advocates for significant investments in ICT infrastructure, human capital development, and the establishment of technology parks and innovation hubs. These interventions are crucial for fostering ICT equipment manufacturing and commercialization, enabling Uganda to reduce reliance on imports and build a sustainable, technology-drive economy. (NPA, 2023)
Digital Uganda Vision (DUV)	Digital Uganda Vision provides a comprehensive framework for integrating ICT into all sectors to drive digital transformation and industrial growth, including local ICT manufacturing. However, while the Digital Uganda Vision outlines ambitious strategies for ICT sector growth, it lacks specific, actionable initiatives directly supporting ICT equipment manufacturing. The framework primarily focuses on broad digital adoption across sectors without targeted support for manufacturing capacity, supply chain development, or technology transfer. This gap limits the scalability and competitiveness of Uganda's local ICT manufacturing industry. Strengthening policy mechanisms, offering fiscal incentives, and fostering industry-academic collaboration are necessary to translate the DUV digital ambitions into tangible manufacturing outcomes (MoICT&NG, 2018)

Table 1. A review of Uganda's national policies and strategies for ICT equipment manufacturing (continued)

Policy and strategic frameworks	
Digital Transformation Roadmap (2023-2028)	The Digital Transformation Roadmap (2023-2028) is focused on enhancing digital infrastructure, cybersecurity, innovation, and entrepreneurship to support the growth of Uganda's ICT industry. It also provides a robust foundation for guiding Uganda's digital development; however, it requires strategic alignment with manufacturing policies to effectively support local ICT equipment manufacturing. While the roadmap outlines ambitious goals for digital transformation, it must be translated into actionable programmes that directly tackle challenges such as limited access to capital, weak technology transfer mechanisms, and insufficient manufacturing infrastructure. Leveraging the roadmap to prioritize policies that foster local production, strengthen supply chains, and enhance technology transfer is crucial. This study is thus essential in identifying these gaps and developing policy and strategic recommendations to bridge them, ensuring that the roadmap contributes meaningfully to the growth and commercialization of Uganda's ICT equipment manufacturing sector (Ministry of Trade Industry and Cooperatives, 2020; MoICT&NG, 2018, 2023a; NPA, 2020)

3.8 Gaps in existing policy and regulatory frameworks

This section identifies critical gaps within the existing policy and regulatory frameworks impacting Uganda's ICT equipment manufacturing sector. By analysing the current challenges and unmet needs, it outlines targeted recommendations to address these deficiencies.

Table 2 provides a detailed assessment of how specific policies and regulations influence key areas such as investment, innovation, skills development, and market growth. The table serves as a foundational reference for understanding the effectiveness of existing strategies and highlights areas requiring immediate action to promote sustainable industry growth.

Table 2. Policy impact analysis on Uganda's local ICT equipment manufacturing sector

Policy/strategy	Impact on ICT equipment manufacturing	Rationale for an ICT equipment manufacturing policy
National ICT Policy (2014)	National ICT Policy 2014 shares a foundational framework supporting ICT infrastructure development and innovation. However, it lacks specific implementation mechanisms targeting ICT equipment manufacturing, limiting the policy's ability to spur industrial growth. Strengthening enforcement strategies and providing incentives for ICT manufacturing would be essential to operationalize the framework.	A revised policy would provide targeted support, incentives, and infrastructure development specifically for ICT equipment manufacturing, while addressing gaps in the current policy framework.

Table 2. Policy impact analysis on Uganda's local ICT equipment manufacturing sector (continued)

Policy/strategy	Impact on ICT equipment manufacturing	Rationale for an ICT equipment manufacturing policy
National Industrial Policy (2020)	National Industrial Policy 2020 emphasizes industrialization and manufacturing but requires stronger alignment between policy objectives and sector-specific actions in ICT manufacturing. A focus on technology transfer, local value addition, and supply chain development remains underdeveloped, creating gaps in achieving substantial progress.	A dedicated policy would provide a focused approach, addressing specific issues like technology transfer, intellectual property rights, specialized skill development, and infrastructure needs of the ICT sector.
Buy Uganda Build Uganda (BUBU) Policy	The Buy Uganda Build Uganda (BUBU) Policy promotes local production and consumption. However, it does not cater for the specific needs of the ICT equipment sector, which requires specialized technology, skills and global competitiveness.	A dedicated policy may consider specific incentives, standards and certification requirements.
National Business Process Outsourcing (BPO) Policy	The National Business Process Outsourcing (BPO) Policy focuses on service delivery and does not adequately address the specialized needs of the ICT equipment manufacturing sector, particularly in areas such as manufacturing engineering services. The BPO policy overlooks critical functions within ICT equipment manufacturing that do not require extensive physical infrastructure but heavily rely on high-level skillsets. These include, but are not limited to: printed circuit board design and layout; research and development; product design and prototyping; embedded systems development; quality control and testing protocols; software development for hardware integration.	A policy could include provisions to promote manufacturing engineering services as a distinct BPO business case. By integrating these manufacturing engineering services into a targeted BPO framework, Uganda can leverage its growing skilled workforce to offer these services to both domestic and international clients.
Third National Development Plan (NDPIII)	The Third National Development Plan offers strategic direction for industrialization, but implementation gaps persist due to limited financing and inadequate infrastructure. Efforts to integrate ICT manufacturing into broader industrial development plans are insufficient and require targeted interventions.	A dedicated policy could provide the targeted interventions needed to fully integrate ICT manufacturing into broader industrial development plans, addressing the financing and infrastructure gaps that hinder effective implementation of NDPIII goals in this sector.

Table 2. Policy impact analysis on Uganda's local ICT equipment manufacturing sector (continued)

Policy/strategy	Impact on ICT equipment manufacturing	Rationale for an ICT equipment manufacturing policy
Fourth National Development Plan (NDPIV)	The Fourth National Development Plan builds upon NDPIII by placing greater emphasis on advanced technologies, fostering innovation ecosystems, and integrating Uganda into regional and global ICT value chains.	A dedicated policy could provide specific mechanisms and programmes to leverage the NDPIV emphasis on technology and innovation to directly support the growth of ICT equipment manufacturing. This would involve creating targeted initiatives, incentives, and support structures tailored to the unique needs of this sector, ensuring that it effectively contributes to and benefits from the national development agenda.
Vision 2040	Vision 2040 provides long-term goals for ICT growth but lacks immediate actionable strategies for scaling ICT equipment manufacturing. It further identifies ICT as a transformative sector for driving innovation, economic diversification, and competitiveness, while stressing the need for infrastructure and technological advancements to support local manufacturing. Enhanced coordination between short-term initiatives and Vision 2040 objectives is necessary to catalyse industry growth	A dedicated policy could provide the specific strategies and action plans needed to translate the long-term vision of Vision 2040 into concrete steps for developing the ICT equipment manufacturing sector, ensuring that the sector's growth aligns with the national vision.
Digital Uganda Vision (DUV)	Digital Uganda Vision (DUV) articulates a broad digital transformation agenda but falls short in offering direct support for ICT manufacturing. DUV sets out Uganda's development priorities, including sustainable industrialization and job creation. ICT manufacturing is seen as a key driver of economic growth and technological self-sufficiency. As such, it offers strategic direction for industrialization, but implementation gaps persist due to limited financing and inadequate infrastructure. Efforts to integrate ICT manufacturing into broader industrial development plans are insufficient and require targeted interventions.	A dedicated policy could provide the targeted interventions needed to fully integrate ICT manufacturing into broader industrial development plans, addressing the financing and infrastructure gaps that hinder effective implementation of NDPIII goals in this sector.

Table 2. Policy impact analysis on Uganda's local ICT equipment manufacturing sector (continued)

Policy/strategy	Impact on ICT equipment manufacturing	Rationale for an ICT equipment manufacturing policy
Digital Transformation Roadmap (2023-2028)	Digital Transformation Roadmap (2023-2028) presents opportunities to drive ICT industry growth but needs to translate its goals into actionable manufacturing support programmes. Clear integration with manufacturing policies, supply chain development, and infrastructure investment are required to stimulate local ICT equipment production.	Clear integration with manufacturing policies, supply chain development, and infrastructure investment are required to stimulate local ICT equipment production.

3.9 Challenges and opportunities related to policy and regulatory frameworks

Uganda's ICT equipment manufacturing sector faces several challenges that hinder its alignment with previously set policy frameworks designed to support local ICT development (MoICT&NG, 2014). These challenges include limited technical infrastructure, which constrains the ability to support advanced manufacturing processes. Additionally, gaps in specialized ICT-related skills persist, slowing the development of a comparative local workforce capable of driving innovation and production. This leads to the dependency on imported components and limits the growth of a fully localized manufacturing ecosystem. Furthermore, the weak involvement of the private sector exacerbates these issues, as insufficient investment and engagement reduce the sector ability to scale up and meet policy objectives.

Despite these challenges, there are significant opportunities to advance the sector and align it with policy intentions (Ministry of Trade Industry and Cooperatives, 2020). The growing regional demand for affordable ICT devices presents a substantial market opportunity for local manufacturers (Assembly, 2019). Uganda's supportive government policies, including tax incentives and regulatory adjustments, provide a conducive environment for investment, whereas partnerships with international stakeholders offer pathways for technology transfer, helping bridge gaps in both skills and infrastructure. Moreover, the increasing emphasis on ICT in regional and global development strategies underscores its potential to drive socio-economic growth in Uganda.

However, the challenges in implementing these frameworks highlight a critical issue, that is, the gap between policy formulation and practical execution. While Uganda has formulated ambitious policies, such as Vision 2040 and the National ICT Policy, the absence of streamlined processes and effective enforcement mechanisms has limited their impact. For example, despite the clear intentions in Vision 2040 to drive industrialization and technological innovation, challenges such as inadequate funding, lack of coordination among implementing agencies, and insufficient monitoring mechanisms have hindered progress (NPA, 2023).

Although Uganda's ICT sector shows growth, a significant gap between policy objectives and outcomes remains. Stronger implementation strategies and cross-sectoral collaboration are needed according to (Ministry of Information and Communications Technology & ConnectedUganda@2020, 2015). Despite steady contributions to GDP, the sector's potential

is underutilized due to implementation challenges as reflected here (ChimpReports, 2023; Uganda Bureau of Statistics (UBOS), 2022). Enhancing infrastructure, fostering private sector engagement, and translating policy frameworks into action are essential to address these issues.

3.10 Review of global policy and strategic frameworks

A review of global policy and strategic frameworks can be found in Table 3.

Table 3. A review of global policy and strategic frameworks

Global frameworks	Review	Impact on Uganda's ICT equipment manufacturing landscape
SDG9	SDG9 focuses on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation	SDG9 provides a pathway to integrate ICT manufacturing into Uganda's economic transformation while ensuring sustainability, inclusivity, and technological advancement
AfCFTA	AfCFTA shares a unified African market, reducing tariffs and streamlining cross-border trade policies.	AfCFTA enables and enhances Uganda's opportunities for access to regional markets, promotes value addition, and facilitates competitive local manufacturing sectors to position Uganda as a key supplier.
ITU Connect 2030 Agenda	ITU Connect 2030 Agenda emphasizes global connectivity, digital inclusion, and sustainable ICT ecosystems.	ITU Connect 2030 Agenda supports localization of ICT manufacturing through skills development, attracting foreign investment, and strengthening international collaborations.

Collectively, these global frameworks underscore the importance of leveraging innovation, regional cooperation, and sustainable industrial practices to drive Uganda's ICT equipment manufacturing growth. By aligning national strategies with these frameworks, Uganda can accelerate its journey toward becoming a leader in ICT technology development and commercialization.

4 Stakeholder engagement

The stakeholder engagement process outlined in this study was structured to facilitate a participatory and inclusive framework for advancing Uganda's local ICT equipment manufacturing sector. This approach effectively integrates perspectives from critical stakeholders, encompassing government officials, representatives from the private sector, academia, and development partners. The objective is to establish a robust and actionable framework for the development and commercialization of ICT technologies within Uganda.

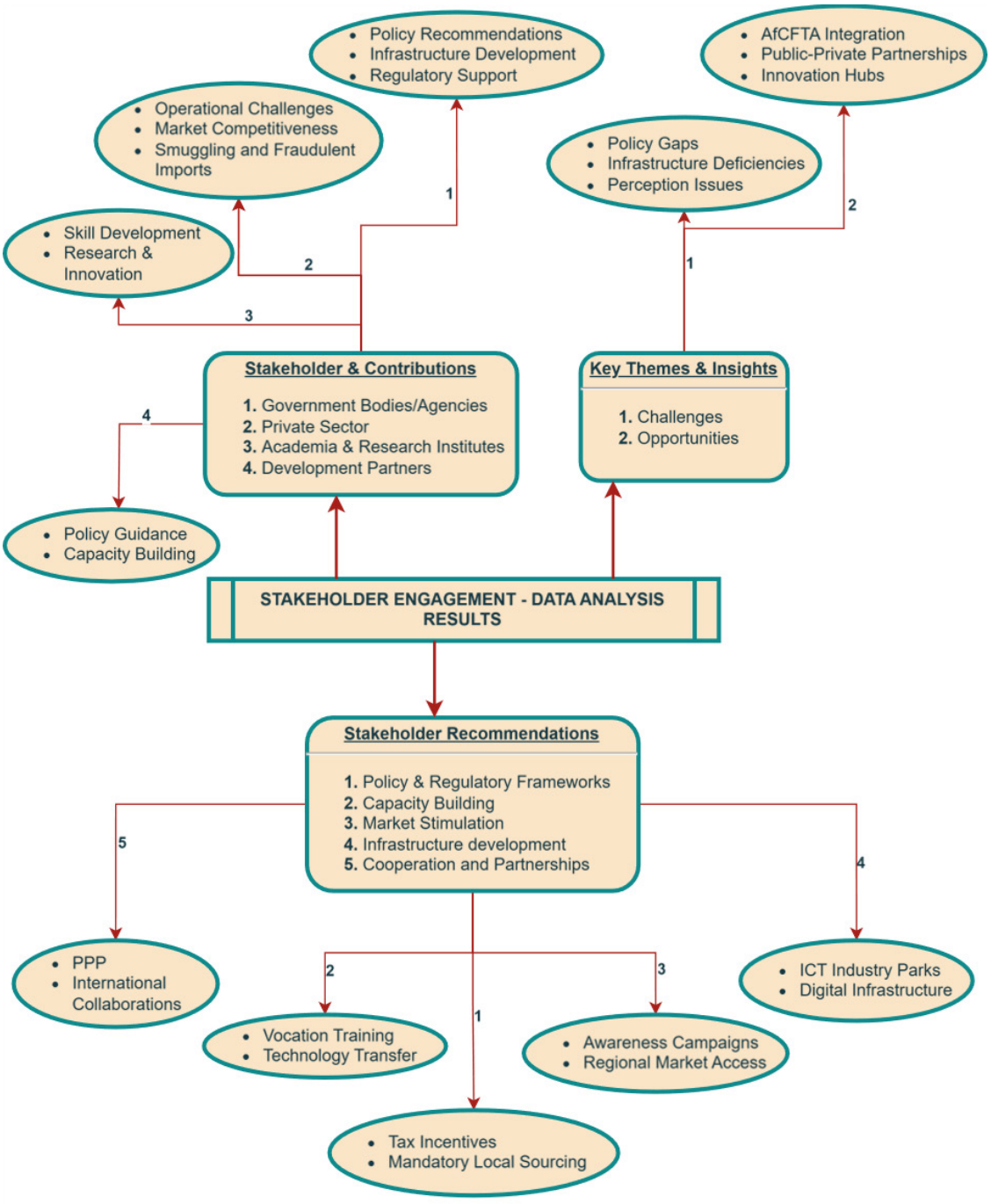
Figure 6 provides a visual summary of the qualitative data analysis derived from the stakeholder engagement activities. This analysis was conducted through a combination of face-to-face interviews and online surveys, targeting local stakeholders identified at the project's inception. The findings from the stakeholder engagement process are significant and foundational. They reveal essential insights and actionable recommendations that will be elaborated upon in the following subsections. Through this rigorous engagement, we are poised to make informed decisions that will catalyse growth in Uganda's ICT equipment manufacturing sector.

The figure presents insights gathered from various stakeholders, including government agencies, private sector actors, academia, and development partners. The visualization categorizes responses based on key themes such as policy recommendations, challenges, and opportunities in Uganda's ICT equipment manufacturing sector. The figure is significant for several reasons:

1. It aggregates responses from different stakeholder groups, ensuring that multiple perspectives are represented in decision-making processes.
2. By visually mapping stakeholder inputs, the figure highlights recurring themes and priorities that must be addressed to foster the development of local ICT equipment manufacturing.
3. The insights derived from this analysis inform strategic policy recommendations that align with national objectives such as the Third National Development Plan (NDPIII) and the Digital Uganda Vision.
4. The visual representation ensures that all key stakeholders are acknowledged, and their contributions to the engagement process are documented for transparency and accountability.
5. This figure servers as an essential tool for policy-makers and industry leaders to formulate targeted interventions that support the sustainable growth of Uganda's ICT manufacturing industry.

In summary, Figure 6 plays a critical role here in translating qualitative stakeholder feedback into actionable insights, guiding policy formulation and strategic planning in Uganda's ICT equipment manufacturing landscape.

Figure 6. Data analysis output



Source: Study findings

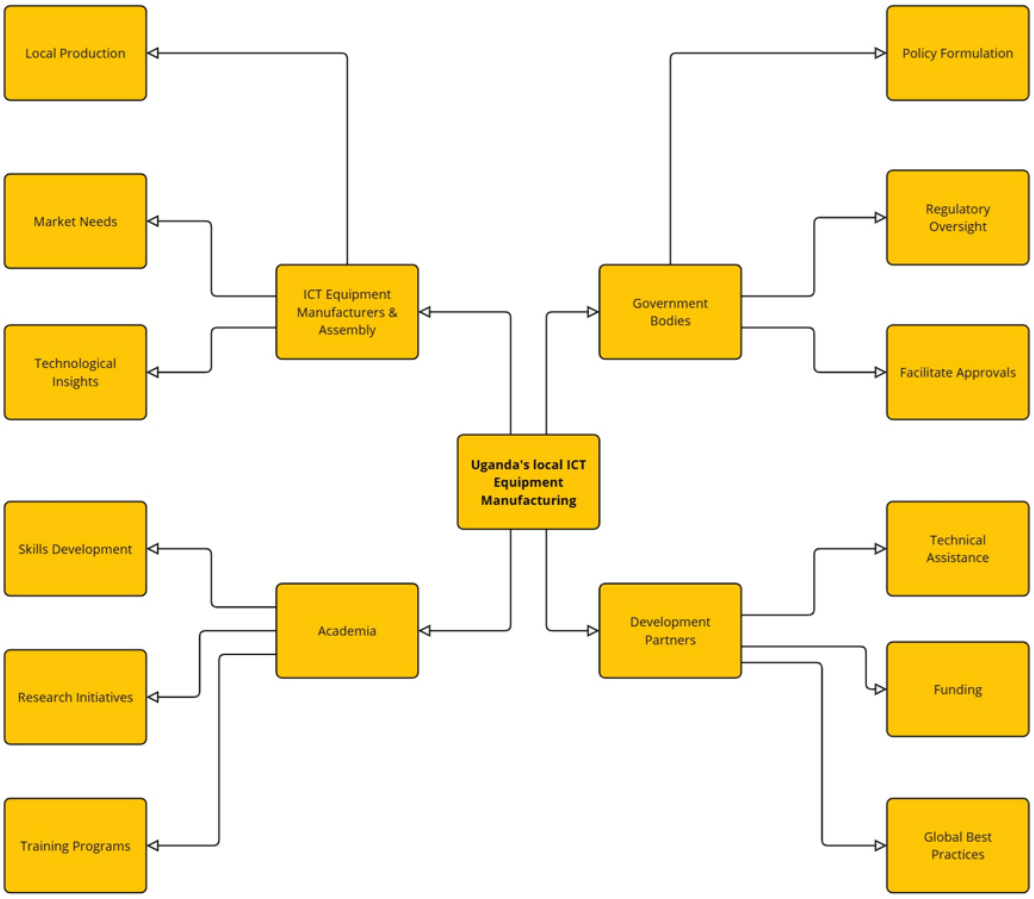
4.1 Stakeholder mapping, roles and responsibilities

This section delineates the specific contributions of each stakeholder group as illustrated in the stakeholder map in Figure 7. The figure represents a stakeholder map that visually illustrates the key actors involved in Uganda's ICT equipment manufacturing ecosystem. It categorizes stakeholders into distinct groups such as government bodies, private sector players, academia,

development partners, and standards bodies. Each stakeholder's role is defined, highlighting their influence and level of engagement within the local manufacturing landscape.

The stakeholder mapping below further represents how stakeholders interact and influence each other. By categorizing stakeholders based on their roles and influence, the figure helps prioritize engagement strategies. This representation also seeks to demonstrate alignment with national policy frameworks such the Digital Uganda Vision and the Third National Development Plan (NDPIII), both of which emphasize the importance of multi-stakeholder collaboration in driving ICT development. It facilitates benchmarking and best practices by highlighting key players, including development partners whose involvement reflects global best practices in fostering local ICT equipment manufacturing.

Figure 7. Stakeholder map



Source: Study findings

4.2 Stakeholder groups and contributions

4.2.1 Government ministries and regulatory agencies

Key agencies such as the Uganda Business Registration Services Bureau (URSB), and National Planning Authority (NPA) provided input through online surveys and face-to-face engagements. Additional contributions were made by Uganda Manufacturer's Association (UMA) and Uganda

Industrial Research Institute (UIRI). Notably, agencies such as the Uganda Communications Commission (UCC), Ministry of Trade, Industry, and Cooperatives (MTIC), Ministry of Science, Technology and Innovation (MSTI), and Uganda Investment Authority (UIA) were contacted but did not contribute directly to the engagement process. The following are key highlights identified through the engaging ministries, departments, and agencies (MDAs).

- **Policy recommendations:** Stakeholders proposed incentives such as tax reductions and exemptions to encourage the production of locally manufactured ICT products. These measures are aimed at lowering production costs, thereby enhancing the competitiveness of local products in the market. Stakeholders emphasized that such incentives could attract investment in the ICT sector, spur innovation, and create employment opportunities. They highlighted the importance of bridging the gap between imported and domestically produced goods to foster a sustainable local manufacturing ecosystem.
- **Infrastructure development:** Stakeholders highlighted the need for establishing and appropriately facilitating ICT industrial parks, as critical to fostering localized production and creating an ecosystem that supports the end-to-end manufacturing of ICT equipment. Furthermore, the integration of national digital infrastructure was emphasized to ensure seamless connectivity and operational efficiency. This would not only attract investment but also enable Uganda to position itself as a regional ICT hub.
- **Regulatory support:** Stakeholders emphasized the importance of streamlining the process for intellectual property registration to foster local innovation. Simplified and efficient procedures were identified as key to encouraging innovators and entrepreneurs to protect their creations, which in turn can drive technological advancements and bolster confidence in the ICT manufacturing sector. This support would reduce bureaucratic barriers and create an environment where creativity and industrial development can thrive.

4.2.2 Private sector

Private stakeholders, including ICT equipment manufacturers and assemblers such as SIMI Mobile Technologies, MicroFuse Computer Technologies, Lwera Electronics and Semi-Conductors, Innovex Ltd., Intellisys Uganda Ltd., and Neriko Electronics, actively participated in the engagement process through surveys and interviews. Others were contacted but did not respond to the invitation to be part of the data gathering for the study. Their contributions provided a detailed understanding of operational and market challenges, along with recommendations for improving local ICT equipment manufacturing. The following are key highlights identified through the engaging this stakeholder category:

- **Operational challenges:** Stakeholders highlighted that the high costs of components and raw material imports significantly impact production budgets, making locally manufactured ICT products less competitive. Unstable electricity supply remains a pressing issue, leading to frequent interruptions in production cycles, increased costs of alternative power sources, and operational inefficiencies. Additionally, the limited availability of locally sourced components constrains manufacturers, forcing reliance on imports, which increases lead times and further elevates costs. Addressing these challenges would require targeted interventions such as incentives for local raw material (and components) production, investments in reliable energy infrastructure, and the development of a robust local supply chain.
- **Market competitiveness:** Stakeholders expressed concern over public misconceptions regarding the quality of locally manufactured ICT products, which are often perceived as inferior to imports. This perception negatively impacts consumer confidence and demand for local products. Furthermore, the influx of imported goods, often priced competitively due to economies of scale, creates additional barriers for domestic manufacturers to penetrate the market. Stakeholders emphasized the need for robust awareness campaigns to highlight the quality and reliability of locally made ICT products,

alongside implementing standards and certifications to build trust among consumers and institutions.

- **Illegal imports:** Concerns were also raised about how ICT equipment into Uganda illegally as this not only creates unfair competition for legitimate manufacturers but also undermines government revenue by avoiding import taxes. This practice disrupts market stability and discourages investment in the local ICT equipment manufacturing sector.

4.2.3 Academia and research institutions

Engagement with institutions such as ISBAT University revealed a focus on strengthening academic-industry linkages. Their participation highlighted the importance of aligning research efforts with the practical needs of ICT manufacturers and fostering skill development to meet industry demands. Other institutions such as Makerere University, Uganda Technology and Management University (UTAMU), and Kyambogo University were also contacted. Contributions emphasized the need for enhanced collaboration to develop cost-effective and innovative solutions for ICT equipment manufacturing. Highlights include skill development and research and innovation:

- **Skill development**: Stakeholders identified the critical need to develop industry-aligned curricula to ensure that graduates are equipped with relevant skills required by the ICT manufacturing sector. They emphasized the importance of fostering partnerships between academic institutions and the private sector to create specialized training programmes that address current and emerging technological demands. Capacity building programmes, including internships, apprenticeships, and certification schemes, were also highlighted as essential mechanisms to bridge the skills gap and enhance workforce readiness for the growing ICT industry.
- **Research and innovation**: Stakeholders highlighted the importance of collaboration on ICT innovation hubs as a central strategy for fostering technological advancements and supporting the development of prototypes. These hubs were seen as critical environments for startups and researchers to experiment with new ideas, test solutions, and refine their designs for practical applications. By leveraging these hubs, Uganda could establish a strong foundation for ICT product innovation, thereby enhancing its competitiveness in both local and regional markets. Stakeholders also recommend linking these hubs to academic institutions and private sector players to ensure a continuous exchange of expertise and resources.

4.2.4 Development partners and international organizations

Development partners offered insights into capacity building, technology transfer, and policy alignment. JICA highlighted its ongoing ICT Industry Promotion Study in Uganda among others. JICA contributions provided a benchmark for leveraging international expertise to support local ICT equipment manufacturing efforts. Organizations such as the European Union (EU), Korean International Cooperation Agency (KOICA), German Agency for International Cooperation (GIZ), Commonwealth Secretariat, Swedish International Development Cooperation Agency (SIDA), and Trademarks East Africa (TMEA) were also contacted. Organizations such as ITU through technical assistance to the Government of Uganda shared insights into international best practices. Key highlights include policy guidance and capacity building:

- **Policy guidance**: Stakeholders emphasized the critical need to align Uganda's ICT strategies with international best practices to ensure the country remains competitive in the global market. This alignment was seen as essential to fostering a conducive environment for innovation, enabling the adoption of globally recognized standards, and facilitating cross-border collaboration. By adopting proven frameworks and

methodologies, stakeholders believe Uganda can better position itself as a regional ICT leader, attract foreign investment, and accelerate the development of its local ICT equipment manufacturing sector.

- **Capacity building**: Stakeholders emphasized that programmes targeting skills transfer, technology adoption, and export-oriented manufacturing are pivotal for fostering growth in Uganda's ICT sector. They highlighted the necessity of structured training initiatives to equip workers with the technical competencies required for high-quality production. Additionally, stakeholders called for collaborative partnerships with international experts to ensure knowledge sharing and the adoption of modern manufacturing practices. This would enable local industries to meet global standards and enhance Uganda's competitiveness in regional and international markets. They also commented on existing efforts such as the Ministry of ICT partnership with Japan International Cooperation Agency (JICA) under the ICT Industry Promotion Study (UJ-Connect), which serve as a significant step towards aligning training initiatives with sectoral needs.

4.3 Insights derived from stakeholder engagement

4.3.1 Challenges identified by stakeholders

Policy gaps

Stakeholders identified a significant disconnect between Uganda's national industrial policies and the specific needs of the local ICT sector. This misalignment has resulted in fragmented efforts to support ICT equipment manufacturing, with inadequate incentives for innovation and industrial growth. Stakeholders emphasized the necessity for a cohesive policy framework that integrates ICT equipment manufacturing as a priority sector, aligning it with broader national goals such as job creation, export growth, and technological advancement. They also recommend periodic reviews and consultations with industry players to ensure policies remain relevant and responsive to sectoral changes.

Infrastructure deficiencies

Stakeholders identified the lack of specialized industrial zones for ICT equipment manufacturing as a significant barrier to growth. These zones are crucial for creating a conducive environment where manufacturers can access shared resources such as advanced machinery, reliable energy, and streamlined logistics. Without such infrastructure, manufacturers face higher operational costs and inefficiencies, limiting their ability to compete in both regional markets. Stakeholders recommended targeted government investment to establish and equip industrial zones tailored to ICT equipment manufacturing, ensuring that they meet global standards and attract both local and international investors.

Perception issues

Stakeholders raised concerns about a pervasive negative bias against locally manufactured ICT products, which are often perceived as inferior in quality compared to imported goods. This bias undermines consumer-confidence and discourages procurement from local manufacturers. Stakeholders suggested targeted awareness campaigns to educate consumers about the quality and reliability of locally produced products. They also recommended the establishment of quality assurance frameworks and certifications to validate the standards of local ICT goods, which could build trust and credibility among buyers and institutions.

4.3.2 Opportunities identified by stakeholders

In the context of Uganda's current local ICT equipment manufacturing sector, several identified opportunities stand out, particularly in relation to regional market potential. Stakeholders have recognized Uganda's strategic location within East Africa as a pivotal advantage that positions the country to become a regional hub for ICT equipment manufacturing. AfCFTA presents a unique opportunity for Uganda to expand its market reach significantly. By capitalizing on this regional integration, the country can enhance export-oriented growth strategies that not only elevate the local sector but also strengthen its presence in the broader east Africa market.

Another intrinsic opportunity lies in fostering innovation and advancing technology through collaboration with international partners. Stakeholders have underscored the importance of investing in research and development (R&D) as a critical pathway to enhance technological capabilities. Moreover, there is a clear opportunity to create a conducive environment that nurtures startups and innovation hubs specifically focused on ICT equipment. This initiative can galvanize local talent and stimulate growth within the sector, enabling Uganda to stay ahead in a rapidly evolving technological landscape.

Public-private partnerships (PPPs) have also emerged as a significant opportunity for driving growth within the local manufacturing sector. Engaging in strategic partnerships between government entities and private sector stakeholders can facilitate resource sharing and technology transfer. This collaboration is essential for developing the necessary infrastructure to support the manufacturing of ICT equipment, thereby enhancing operational capabilities and output.

Lastly, stakeholders have identified the potential for policy reforms that align Uganda's regulatory framework with global standards. Such revisions are critical for positioning Uganda as a competitive destination for investment in the ICT sector. By implementing policies that promote transparency, innovation, and sector growth, Uganda can attract both local and foreign investment, further solidifying its status within the regional and global ICT ecosystem.

4.4 Recommendations derived from stakeholder engagement

The stakeholder recommendations summarize insights from various groups, including government agencies, private sector entities, academia, and development partners. The goal of these recommendations is to tackle identified challenges and take advantage of opportunities to improve Uganda's local ICT equipment manufacturing sector.

Policy and regulatory frameworks

Engagement with key stakeholders in this study has identified several critical areas where policy and regulatory frameworks can be enhanced or introduced to support the growth of Uganda's ICT equipment manufacturing sector. First and foremost, the implementation of tax incentives is essential. By offering exemptions on import duties for raw materials and machinery, the government can significantly lower production costs and encourage local investments. Stakeholders pointed out that current taxation on imported materials used in prototype development imposes a financial burden during critical stages when innovators are yet to realize profits.

Moreover, it is imperative to reform Uganda's procurement policies to favour local ICT manufacturers. Stakeholders unanimously stress the need for a mandate on local sourcing within

government procurement processes, particularly under the BUBU initiative. Such a provision would ensure that government ministries, departments, and agencies prioritize domestic products, effectively supporting local industry growth.

Additionally, there is a pressing need to raise awareness among private sector players regarding existing governmental policies that impact their operations. Simplifying regulatory processes, including intellectual property registration, is crucial to promote innovation and entrepreneurship in the ICT sector. By facilitating easier compliance with regulations, the government can create a more conducive environment for local manufacturers.

Finally, addressing the challenges presented by smuggling is vital for boosting the market for locally manufactured ICT equipment. Stakeholders recommend strengthening border controls and customs regulations, establishing dedicated anti-smuggling task forces, and implementing advanced tracking systems to enhance enforcement. These measures will not only protect local manufacturers but also contribute to a fairer competitive landscape in the ICT equipment market.

Capacity building

Stakeholders have identified critical gaps in the current state of human capital development that must be addressed to enhance local ICT equipment manufacturing in Uganda. A primary recommendation is the creation of vocational training and customized industry certification programmes. These programmes should be specifically designed to cater to Uganda's ICT equipment manufacturing sector, aligning with both local industrial needs and international standards. By developing a skilled workforce, we can ensure that the region is well-equipped to meet the demands of a rapidly evolving technology landscape.

Moreover, while notable international manufacturers such as ENGO Holdings Limited, Huawei, and HiSense have established a presence in Uganda, there remains a concerning underutilization of the local skilled labour force. This limitation hampers effective technology transfer, which is essential for fostering innovation and competitiveness within the local market. To address this issue, stakeholders propose robust collaborations with international partners aimed at facilitating technology transfer and providing advanced training programmes. Such partnerships will empower local manufacturers with access to modern production methodologies and best practices, thereby significantly enhancing their operational capabilities and market positioning.

In conclusion, the collaboration between stakeholders to develop targeted vocational training and foster international partnerships for technology transfer is imperative. These initiatives are not merely recommendations; they are essential strategies that will transform Uganda's ICT equipment manufacturing landscape, ultimately fostering economic growth and self-sustainability in the sector. Addressing these gaps with confidence will position Uganda as a competitive player in the global ICT manufacturing arena.

Market stimulation

Uganda's market struggles to produce goods for export and meet local demand (Obwona et al., 2014). Stakeholders suggest promoting locally made ICT equipment, addressing quality misconceptions, and leveraging regional market access through initiatives such as AfCFTA. They also recommend establishing ICT Innovation hubs to support startups and develop new technologies.

Infrastructure development

Stakeholders recommended investment towards the establishment of specialized industrial zones for ICT equipment manufacturing. These zones should provide shared resources such as advanced machinery, reliable energy, and streamlined logistics. Moreover, the development of industrial parks aligns with Uganda's Vision 2040 and the Third National Development Plan, which aim to increase sustainable production, productivity, and value addition in key growth areas. Targeted facilitation is required for these industrial parks to be fit for local ICT equipment manufacturing.

Stakeholders also recommended enhancement of national digital infrastructure to support seamless connectivity and operational efficiency, as this will enable Uganda to position itself as a regional ICT hub. Emphasis was placed on the importance of robust digital infrastructure to drive innovation, improve service delivery, and promote digital inclusion.

Collaboration and partnerships

Public-private partnerships (PPP): In the current landscape of ICT equipment manufacturing in Uganda, a significant disconnect exists between government agencies and private sector stakeholders. Many government entities are unaware of the private players engaged in the design and production of ICT equipment. Conversely, private sector actors often lack familiarity with the policy frameworks and incentives established by the government to support their efforts. This lack of communication and awareness indicates a critical need for enhanced collaboration among these groups.

The interviews conducted with various stakeholders have elucidated this gap and highlighted the challenges faced by independent players within the sector. Each entity is currently operating in isolation, which hampers collective progress and innovation. To address these challenges, there is a compelling case for the establishment of public-private partnerships. Such collaborations would enable stakeholders to pool their resources, expertise, and networks, leading to more effective strategies for overcoming key barriers in ICT equipment manufacturing.

By fostering PPPs, stakeholders can create a more cohesive ecosystem where information and support flow seamlessly between the public and private sectors. This approach not only ensures that all parties are informed and engaged but also strengthens the manufacturing capacity of the ICT industry in Uganda. Ultimately, these partnerships have the potential to drive sustainable growth, enhance competitiveness, and facilitate the development of cutting-edge ICT solutions tailored to local needs.

International collaboration: In the context of enhancing collaboration and partnerships, stakeholders participating in this study have underscored the importance of strengthening relationships with developing partners and international organizations. This strategy serves as a robust mechanism for accessing funding, technical expertise, and best practices.

A pertinent example of this approach is the engagement with Japan's International Cooperation Agency in Uganda. Commitment to enhancing the capacities of Ugandans through knowledge transfer, specialized training, and targeted funding aligned with JICA core strategic interests as a diplomatic partner to Uganda were noted. This partnership exemplifies the kind of collaborative framework that can significantly advance development objectives and ensure the effective utilization of resources in pursuit of mutual goals.

General observations from stakeholder engagement: This section consolidates stakeholder recommendations, offering a roadmap for addressing challenges and capitalizing on opportunities to build a robust and sustainable local ICT equipment manufacturing sector in Uganda. The insights gathered through interviews and surveys underscore the importance of collaborative efforts among government agencies, private sector entities, academia, and development partners. Stakeholders emphasized that a cohesive strategy integrating policy reforms, capacity building, and infrastructure development is critical to driving innovation and achieving long-term growth. By leveraging regional market potential and fostering public-private partnerships, Uganda can position itself as a leader in ICT equipment manufacturing within East Africa. These recommendations are designed to align with national priorities and international best practices, ensuring a resilient and inclusive manufacturing ecosystem.

5 Findings of the study

This section presents the critical outcomes of the study conducted to evaluate the state of Uganda's local ICT equipment manufacturing industry. Grounded in the strategic priorities outlined in Uganda Vision 2040, the Third National Development Plan, and the Digital Uganda Vision, the findings focus on the potential for industrial transformation through ICT. The Study integrates perspectives from government bodies, industry stakeholders, academia, and development partners to identify strengths, weaknesses, opportunities, and challenges shaping the sector. It further provides a comparative analysis with regional and global benchmarks to contextualize Uganda's position in the ICT manufacturing landscape. These findings aim to inform actionable strategies for fostering local manufacturing capabilities, driving technological self-sufficiency, and contributing to sustainable socio-economic growth.

5.1 Market and ecosystem analysis

This section provides a detailed exploration of the market landscape and ecosystem surrounding Uganda's ICT equipment manufacturing sector. It evaluates the internal and external factors influencing the industry, including the regulatory environment, infrastructure, stakeholder dynamics, and emerging market trends. The analysis seeks to highlight the competitive positioning of Uganda's ICT manufacturing sector and identify areas for strategic intervention.

5.1.1 SWOT analysis of Uganda's local ICT equipment manufacturing

An analysis of the strengths, weaknesses, opportunities and threats (SWOT) of Uganda's local ICT equipment manufacturing ecosystem (Figure 8) shares useful insights for consideration. As a framework is crucial for understanding how Uganda can harness its potential while addressing existing challenges to position itself as a regional leader in ICT equipment manufacturing.

Figure 8. SWOT analysis of Uganda's ICT manufacturing sector

Source: Study findings

Strengths

Uganda boasts of a highly supportive policy environment that has been pivotal in fostering the growth of its ICT equipment manufacturing sector. National Policies, including the Uganda Vision 2040 and the Third National Development Plan (NDPIII), prioritize industrialization and Digital Transformation Roadmap (2023-2027), prioritize industrialization and digital transformation as integral components of socioeconomic progress (MoICT&NG, 2023a; NPA, 2020). Uganda Vision 2040 identifies ICT as a critical enabler for transforming the economy into a knowledge-driven and industrialized state within three decades. Similarly, NDPIII provides a roadmap for sustainable industrialization, emphasizing the establishment of ICT parks, local manufacturing initiatives, and innovation-driven economic strategies (NPA, 2020, 2023). The alignment of these policies with broader global trends highlights Uganda's commitment to becoming a competitive player in the ICT domain.

Emerging ICT Infrastructure investments, such as the National Backbone Infrastructure (NBI), further contribute to Uganda's connectivity, although its current utilization is limited primarily to government offices. Expanding this network to industrial parks and manufacturing hubs has been identified as a potential catalyst for improving ICT manufacturing capabilities (MTIC, 2014; NITA-U, 2022). While the NBI offers high-speed connectivity and robust data transfer capabilities, its direct impact on local ICT equipment manufacturing is constrained by restricted access for private sector players and manufacturing hubs. Expanding NBI availability to industrial zones and manufacturers could enable its integration into supply chains, thereby enhancing the sector capacity to meet global standards (MoICT&NG, 2022; NITA-U, 2010).

The availability of a skilled and dynamic workforce is another significant strength. Institutions such as the Uganda Institute of Information and Communication Technology (UICT) and partnerships with organizations such as the Japan International Cooperation Agency (JICA) have contributed to a pool of professionals well-versed in ICT and related technical fields (JICA, 2022). This

talent base ensures that manufacturers have access to the expertise required for competitive production and innovation.

Moreover, local manufacturing initiatives such as BUBU create a conducive environment for the growth of indigenous industries. By prioritizing locally made goods in public procurement, BUBU not only promotes demand but also fosters confidence among manufacturers to invest in quality and scale (GreatSands & MoICT&NG, 2020). Collectively, these strengths position Uganda as a promising hub for ICT equipment manufacturing in the east Africa region.

Weaknesses

Despite its strengths, Uganda's ICT manufacturing sector faces significant weaknesses that impede its ability to compete on a global scale. Chief among these is the sector's reliance on imported components. The absence of local supply chains for critical parts significantly increases production costs and limits opportunities for value addition according to work done by (GreatSands & MoICT&NG, 2020). This dependency on imports not only reduces profit margins but also exposes manufacturers to the volatility of international markets.

Operational costs, including electricity and logistics, remain prohibitively high, further eroding the competitiveness of Uganda's ICT sector. Energy costs in Uganda are among the highest in the region, discouraging both local and foreign investors from establishing manufacturing plants. Logistics inefficiencies, driven by inadequate transport networks and high fuel prices, exacerbate these challenges, making the final cost of locally manufactured ICT products uncompetitive compared to imported alternatives (Ministry of Trade Industry and Cooperatives, 2020).

The country's research and development (R&D) capacity and innovation ecosystem also lag behind global standards. While institutions such as UICT provide training, Uganda lack well-established research hubs and innovation centres dedicated to ICT manufacturing. This gap limits the ability of the sector to generate proprietary technologies and customize products for regional and global markets (NPA, 2020).

Finally, quality assurance mechanisms remain undeveloped. Compliance with international standards is critical for accessing export markets, yet Uganda's certification infrastructure struggles to meet these requirements. This limitation not only hampers market access but also undermines consumer trust in locally manufactured ICT products.

Opportunities

Regional and global trends offer Uganda numerous opportunities to bolster its ICT manufacturing sector. The AfCFTA agreement is a game-changer, providing Uganda with access to a vast regional market. By leveraging this framework, Ugandan manufacturers can expand their reach across Africa, tapping into growing demand for ICT equipment in emerging markets (NPA, 2020).

Digital transformation initiatives within Uganda present another significant opportunity; government programmes focusing on e-government, digital services and smart infrastructure are creating increased demand for ICT equipment. These projects provide local manufacturers with a ready market, incentivizing them to scale up production and diversify their product offerings (MoICT&NG, 2023a).

Uganda's partnership with global technology leaders also holds promise as seen from the collaborative initiatives with organizations (such as ITU and JICA) that have laid the groundwork for technology transfer, capacity building, and the development of local expertise. Such collaboration can drive innovation and enhance the competitiveness of Ugandan ICT products on the global stage (JICA, 2022).

Threats

However, Uganda's ICT manufacturing sector faces substantial threats that could hinder its growth, say regional competition from more aggressive players such as Kenya and Rwanda, poses a significant challenge. These countries have more advanced ICT ecosystems, better infrastructure, and streamlined regulatory frameworks, making them attractive destinations for investors (NPA, 2020).

Economic volatility, particularly in the form of fluctuating exchange rates, poses another threat. As a net importer of raw materials and components, Uganda's manufacturing costs are highly susceptible to currency devaluation, which can erode profit margins and discourage investment (GreatSands & MoICT&NG, 2020).

Global supply chain disruptions, as witnessed during the COVID-19 pandemic, also highlight vulnerabilities in Uganda's reliance on imports. Reports from the Uganda Investment Authority emphasize the need for diversified local production capabilities to mitigate such risks Delays in accessing critical components can stall production, jeopardizing the ability to meet demand and maintain competitiveness by manufacturers (NPA, 2020)

Finally, persistent infrastructure gaps in rural areas undermine the sector ability to scale. Limited access to reliable electricity, transport, and broadband in key regions restricts the establishment of manufacturing hubs outside urban centres, thereby concentrating development and limiting nationwide impact. By addressing these weaknesses and threats while capitalizing on its strengths and opportunities, Uganda can position itself as a regional leader in ICT equipment manufacturing.

5.1.2 Supply chain opportunities and challenges

Opportunities in the supply chain for ICT equipment manufacturing

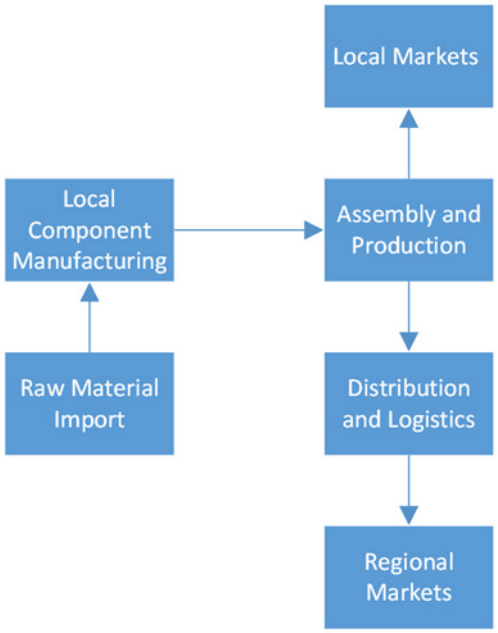
Uganda's ICT equipment manufacturing supply chain presents several untapped opportunities that, if harnessed effectively, could significantly boost local production and competitiveness. Key among these is the potential for regional integration and trade. AfCFTA offers Uganda access to a vast regional market, providing local manufacturers with opportunities to expand their customer base and achieve economies of scale (NPA, 2020). Through this framework, Uganda can also collaborate with neighbouring countries to optimize supply chain logistics and source raw materials more cost-effectively.

The growing demand for ICT products domestically and regionally presents another opportunity. With the Uganda Government digital transformation initiatives and the increasing penetration of digital services, the demand for ICT equipment such as computers, networking devices, and mobile phones is expected to rise. This surge in demand creates a favourable environment for manufacturers to establish and scale local production facilities.

In addition, the BUBU policy emphasizes the procurement of locally manufactured goods in public and private sectors (MTIC, 2014). This policy can stimulate demand for domestically produced ICT equipment, encouraging manufacturers to establish local supply chains and reduce dependency on imports (MTIC, 2014; Shepherd et al., 2016).

Furthermore, opportunities exist in technology transfer and skills development through collaboration with international partners. Programmes supported by development partners and international organizations have facilitated capacity building and knowledge transfer, enabling local manufacturers to adopt advanced manufacturing techniques and integrate into global value chains (MoICT&NG, 2023; MoICT&NG, 2024).

Figure 9. Local ICT equipment manufacturing supply chain



Source: Study findings

Figure 9 illustrates the local ICT equipment manufacturing in Uganda, highlighting the key stages from raw material acquisition to market distribution:

- **Raw material import**: This stage involves importing essential raw materials that are not locally available, such as rare earth metals, semiconductors, and other electronic components. Uganda currently relies heavily on these imports due to limited local production capacity. Efficient sourcing and importation are crucial to ensure uninterrupted supply chains and cost-effective manufacturing.
- **Local component manufacturing**: Once raw materials are imported, they are processed into intermediate components locally. This includes activities such as the production of printed circuit boards, casings, and wiring. Developing local component manufacturing reduces dependency on external suppliers, fosters local industrial growth, and creates job opportunities. It also encourages technology transfer and innovation within the country.
- **Assembly and production**: At this stage, the locally manufactured components and imported parts are assembled into final ICT products such as computers, mobile devices, and networking equipment. Establishing efficient assembly lines is vital for scaling production and meeting both domestic and regional demand.
- **Distribution and logistics**: Once products are manufactured, they enter the distribution phase, which involves warehousing, transportation, and supply chain management.

Efficient logistics ensure timely delivery to retailers, minimize operational costs, and improve competitiveness in local and regional markets.

- **Local markets**: Manufactured ICT products are first introduced to the local Ugandan market. Strengthening the local market base is crucial to fostering consumer confidence in locally made products, boosting demand, and supporting the growth of the domestic ICT sector.
- **Regional markets**: Finally, products are distributed to regional markets particularly within the East African Community and through frameworks such as the African Continental Free Trade Area. Expanding into regional markets is essential for achieving economies of scale, enhancing Uganda's export capacity, and positioning the country as a competitive ICT manufacturing hub in Africa.

Importance of a robust supply chain

Developing a robust local supply chain, as implied in Figure 9, is critical to reducing Uganda's reliance on imported ICT equipment and components. Currently, Uganda heavily depends on foreign sources for raw materials and essential electronic parts, which not only exposes the sector to global supply chain disruptions but also inflates production costs due to import tariffs and logistical challenges. By localizing key aspects of the supply chain, Uganda can foster greater self-sufficiency, mitigating risks associated with fluctuating international markets and ensuring a more stable foundation for the ICT manufacturing sector.

The expansion of local supply chains significantly contributes to job creation and skills development within Uganda. Each stage from raw material processing and component manufacturing to assembly, distribution, and logistics – generates employment opportunities that span technical, managerial, and operational roles. Furthermore, the demand for specialized skills in electronics engineering, supply chain management, and quality assurance stimulates educational institutions to tailor their curricula to meet industry needs. This alignment between education and industry not only equips the workforce with relevant skills but also fosters innovation and technological advancement in the ICT sector.

A well-developed supply chain plays a pivotal role in boosting Uganda's economic growth. Enhanced industrial productivity driven by efficient supply chain operations attracts both local and foreign investment, fostering a favourable business environment. Increased manufacturing output contributes directly to the national gross domestic product (GDP), while the growth of auxiliary industries – such as logistics, packaging, and quality control further amplifies economic benefits.

Additionally, localized production reduces the trade deficit by substituting imports with domestically produced ICT equipment. Optimizing the supply chain also enhances Uganda's regional competitiveness. By streamlining production processes and reducing operational costs, Uganda can position itself as a key ICT equipment supplier within the East African Community (EAC) and beyond. This competitive edge is particularly crucial considering neighbouring countries such as Kenya and Rwanda, which have already made significant strides in ICT manufacturing. Leveraging regional trade agreements, such as AfCFTA, Uganda can expand its market reach, fostering regional integration and collaboration.

Furthermore, strengthening local supply chains facilitates the integration of sustainability and circular economy principles into ICT manufacturing. Whereas efficient resource management, recycling, and the reuse of components can minimize environmental impact and promote sustainable industrial practices. The ability to recover valuable materials from e-waste and

reintegrate them into the production cycle not only conserves natural resources but also reduces the cost of raw materials, creating a more resilient and eco-friendly manufacturing ecosystem.

This structured approach to supply chain development not only fortifies Uganda's local ICT manufacturing ecosystem but also aligns with the broader national objectives outlined in the National Development Plan III and Vision 2040. These strategic frameworks emphasize industrialization, technological innovation, and sustainable economic growth as pillars for Uganda's development. By focusing on robust supply chain management, Uganda can achieve these goals, positioning itself as a leader in the regional ICT manufacturing landscape while driving inclusive and sustainable national growth.

5.1.3 Challenges in the supply chain for ICT equipment manufacturing in Uganda

Despite the above opportunities, significant challenges persist in Uganda's ICT equipment manufacturing supply chain. A major challenge is the lack of a robust local component manufacturing base. Most ICT components, such as semiconductors and printed circuit boards, are imported, leading to high production costs and vulnerability to global supply chain disruptions (GreatSands & MoICT&NG, 2020). This dependency also affects lead times, making it difficult for manufacturers to respond quickly to market demands.

Another critical challenge is the inadequate infrastructure to support efficient manufacturing and distribution. While the National Backbone Infrastructure (NBI) provides a strong digital connectivity framework, its restricted accessibility primarily to government institutions limits its broader application for private manufacturing hubs (NITA-U, 2022a). Moreover, unreliable transport networks and high energy costs further exacerbate logistical inefficiencies, making local production less competitive compared to imports (Shepherd et al., 2016).

The sector also faces challenges related to quality assurance and standardization. Uganda's certification and quality control mechanisms for ICT products are not fully aligned with international standards. This misalignment hinders the ability of local manufacturers to export their products to competitive markets and reduces consumer confidence in locally produced ICT equipment (MoICT&NG, 2023).

Finally, limited access to financing poses a significant barrier to developing the supply chain. High interest rates and limited venture capital investment in the ICT manufacturing sector make it difficult for entrepreneurs to invest in infrastructure, technology, and skilled labour necessary for competitive production (Great Sands Consulting Ltd., 2020; MoICT&NG, 2020).

Recommendations

To address these challenges and maximize supply chain opportunities, several strategies can be adopted:

1. Promoting Local Component Manufacturing – Developing incentives for local production of ICT components such as semiconductors and printed circuit boards can reduce dependency on imports and lower production costs.
2. Enhancing Infrastructure – Expanding the accessibility of the National Backbone Infrastructure to include private manufacturing hubs and industrial parks can improve connectivity and operational efficiency.

3. Strengthening Quality Assurance – Aligning Uganda's certification frameworks with international standards can enhance market access and consumer trust in locally manufactured ICT equipment.
4. Facilitating Access to Finance – Establishing targeted funding programmes and venture capital initiatives can support entrepreneurs in scaling their operations and investing in innovative technologies.
5. Regional Collaboration – Leveraging AfCFTA to establish partnerships with neighbouring countries can optimize supply chain logistics and enhance access to regional raw materials and markets.

By addressing these supply chain challenges and capitalizing on available opportunities, Uganda can position itself as a competitive hub for ICT equipment manufacturing in the region.

5.1.4 Comparative insights from Rwanda's and Kenya's ICT equipment manufacturing ecosystems

Rwanda and Kenya have made remarkable strides in shaping the ICT landscape of East Africa, offering valuable lessons for Uganda's growing ICT equipment manufacturing sector. Through their strategic initiatives, robust policy frameworks, and collaborative ecosystems, these countries have set benchmarks that Uganda can learn from. By examining their experiences, Uganda can uncover practical insights to enhance local ICT equipment manufacturing, focusing on key areas such as policy alignment, infrastructure development, innovation ecosystems, regional integration, public-private partnerships, and quality assurance.

Rwanda ICT ecosystem

The Rwanda ICT ecosystem stands out due its strategic focus on innovation and policy-driven development. The Smart Rwanda Master Plan plays a central role in integrating ICT into vital sectors including education, health, and governance, while also laying the groundwork for industrial growth (Rwanda Ministry of ICT and Innovation, 2015). The country's significant Investment in infrastructure, particularly its nationwide 4G LTE network covering over 96 per cent of the population, has established a strong foundation for ICT industries to thrive. In addition, Rwanda has implemented policies aimed at advancing ICT manufacturing. These include tax incentives for technology imports and grants for local manufacturing startups.

A standout example of Rwanda's success is the Kigali Innovation City, which has evolved into a major hub for ICT manufacturing and innovation. By attracting global technology firms and partnering with organizations such as the World Bank and JICA, Rwanda has fast-tracked technology transfer and capacity building. According to literature reviews, these partnerships have enabled local companies to set up assembly lines for ICT equipment, such as computer and mobile phones, with a focus on affordability and quality (BrandIconImage, 2019). This had led to a 15 per cent increase in locally produced ICT goods between 2018 and 2022. However, Rwanda still faces challenges due to its limited industrial base and small domestic market size. To overcome these constraints, the country has leveraged platforms such as AfCFTA to expand its production and tap into larger markets (Mendez-Parra & Agarwal, 2023). As a result, Rwanda's ICT exports have grown by 20 per cent over the past three years, highlighting the benefits of regional integration.

Kenya ICT ecosystem

Kenya often referred to as the 'Silicon Savannah' has built a dynamic ICT sector, particularly in equipment manufacturing. This progress is backed by a proactive policy environment and strong private sector involvement. Kenya's ICT Authority Master Plan focuses on promoting digital literacy, e-governance, and infrastructure development, with flagship projects such as the National Optic Fibre Backbone Infrastructure (NOFBI), ensuring high-speed internet access across the country (Dean et al., 2020). Additionally, Kenya's policies to support local ICT manufacturing have encouraged the establishment of assembly plants for computers and smartphones by offering tax exemptions on essential raw materials and machinery (Kenya Ministry of ICT, 2019).

Insights from Kenyan stakeholders, gathered through qualitative surveys, highlight the critical role of innovation hubs such as the Nairobi iHub in nurturing ICT manufacturing. Respondents pointed to partnerships with global firms such as Huawei and Microsoft as having been key to setting up production units for local and regional markets. These collaborations have driven a 25 per cent growth in ICT hardware production from 2017 to 2021(Dean et al., 2020; Kenya Ministry of ICT, 2019). Furthermore, government-backed projects such as Konza Technopolis have created over 10 000 direct jobs, demonstrating how targeted infrastructure investments can transform the ICT sector. Despite these successes, respondents noted challenges related to regulatory inefficiencies and cybersecurity risks, emphasizing the need for streamlined policies and enhanced cybersecurity frameworks to sustain growth.

Lessons for Uganda

Uganda could draw important lessons from the experiences of Kenya and Rwanda to strengthen its ICT equipment manufacturing sector. These lessons focus on areas where Uganda can take practical steps to accelerate growth:

- **Policy alignment and strategic vision**: Rwanda's Smart Rwanda Master Plan and Kenya's ICT Master Plan show the importance of cohesive, long-term strategies. Uganda's Digital Uganda Vision (DUV) can be refined to better align with global trends and regional frameworks, such as the East African Community's (EAC) Model ICT Policy and Industrialization Policy. This alignment will ensure that Uganda's growth is coordinated the regional goals. For instance, Kenya's focus on digital literacy has strengthened its ICT workforce – a strategy Uganda can adopt to build its own talent pool. Similarly, Rwanda's tax incentives provide a blueprint for encouraging local ICT manufacturing and foreign direct investment.
- **Infrastructure development**: High-speed internet and reliable broadband are critical to a thriving ICT sector. Uganda's National Backbone Infrastructure (NBI) should expand to cover industrial parks and manufacturing hubs, taking inspiration from Kenya's National Optic Fiber Backbone Infrastructure (NOFBI) and Rwanda's extensive 4G LTE network, which covers over 95 per cent of the population. By participating in regional projects such as the East Africa Regional Digital Integration Project (EA-RDIP), Uganda can further improve connectivity and streamline supply chains. Kenya's investment in NOFBI has reduced internet costs by 30 per cent, a benefit Uganda could replicate to lower operational expenses for her ICT equipment manufacturers.
- **Fostering innovation ecosystems**: Rwanda's Kigali Innovation City and Nairobi's iHub highlight the value of innovation hubs in fostering entrepreneurship and product development. Uganda can establish similar centers with funding mechanisms, mentorship programmes, and partnerships with global technology firms to nurture local talent and ideas. These hubs should prioritize hardware startups and collaborations between academia and the private sector. Kenya's Konza Technopolis offers a great example of

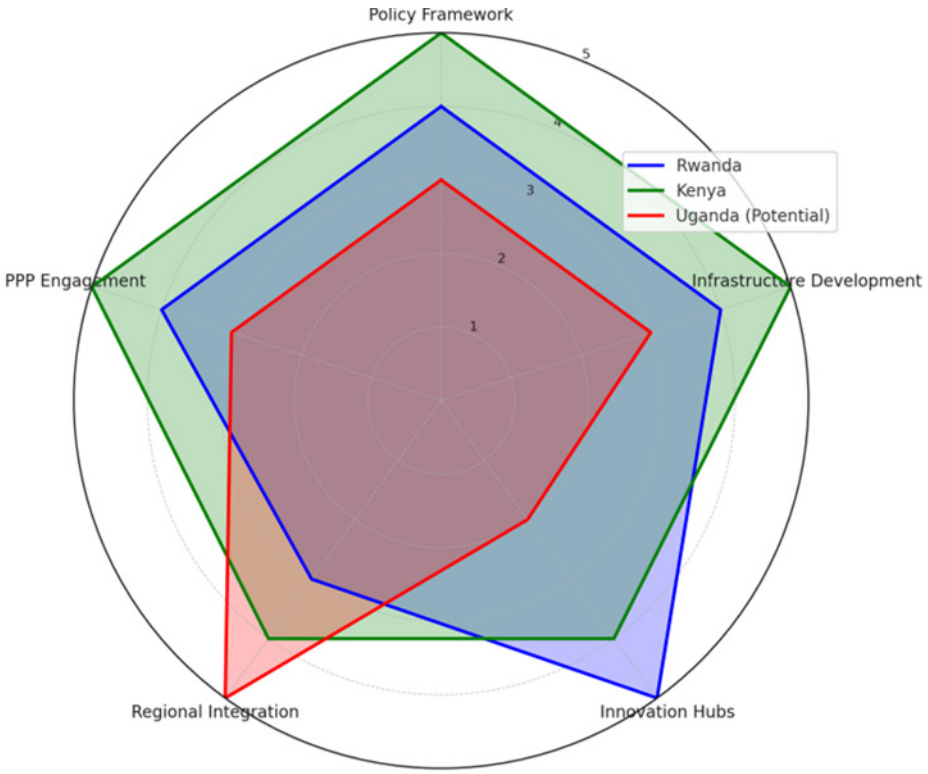
how smart city concepts can be integrated into innovation ecosystems, which Uganda could adapt to foster a vibrant startup environment.

- **Regional integration for market access**: Uganda has the potential to benefit significantly from leveraging both AfCFTA and the East African Community (EAC) initiatives to broaden her market reach and streamline regional trade. AfCFTA offers Uganda a continent-wide platform for market expansion, while the EAC collaborative digital and industrial policies present opportunities to develop cross-border value chains. It is crucial for Uganda to coordinate closely with her Ministry of East African Community Affairs to fully capitalize on these frameworks. Moreover, Rwanda's 20 per cent growth in ICT exports through AfCFTA exemplifies the benefits Uganda could achieve, facilitating the efficient entry of locally manufactured ICT products into new markets (Mendez-Parra & Agarwal, 2023).
- **Public-private partnerships**: The success stories from Kenya and Rwanda highlight the importance of public-private partnerships in advancing ICT manufacturing. Uganda should prioritize partnerships with private sector players and international organizations to attract investment, facilitate technology transfer, and implement scalable projects. For instance, Kenya's collaboration with Huawei has led to the establishment of several ICT manufacturing plants – a model, Uganda could adopt to boost her manufacturing capabilities.
- **Quality assurance and standardization**: Kenya's challenges with regulatory inefficiencies (Dean et al., 2020; Kenya Ministry of ICT, 2019) underscore the necessity for Uganda to develop robust quality assurance frameworks that align with international standards. To ensure local products remain competitive in both regional and global markets, it is essential to implement effective quality controls. Rwanda's success in establishing standardized certification processes serves as an exemplary model for Uganda, enhancing product credibility and facilitating entry into international markets.

By adopting these lessons and tailoring them to Uganda's specific needs, the country can position herself as a leader in ICT equipment manufacturing. This approach will not only drive economic growth and create jobs but also support Uganda's goal of achieving technological self-sufficiency. These strategies are aligned with Uganda's National Development Plans, the Digital Uganda Vision, and broader regional development objectives.

Figure 10 compares the ICT ecosystems of Kenya, Rwanda, and Uganda based on five key dimensions: policy framework, infrastructure development, innovation hubs, regional integration, and public--private partnership engagements.

Figure 10. Comparative analysis of regional ICT ecosystems



Source: Study findings

Observations

Kenya and Rwanda are seen to exhibit strong performance in their policy frameworks, infrastructure development, and innovation hubs, which are reflected by higher scores on the chart. Kenya particularly excels in PPP engagement due to robust partnerships with global firms such as Huawei and Microsoft, alongside its vibrant private sector. While Uganda scores lower, in areas such as innovation hubs and infrastructure development, its strong Regional Integration score highlights opportunities through AfCFTA and EAC initiatives. This potential reflects Uganda's need to build on existing frameworks (e.g., Digital Uganda Vision), expand broadband infrastructure, and foster innovation hubs such as those in Kenya and Rwanda.

5.2 Global partnerships driving local ICT growth

Uganda's ICT sector has grown significantly through strategic collaborations with global technology firms, highlighting its capacity to attract international partnerships that can directly benefit local ICT equipment manufacturing. Key initiatives by Huawei, Qualcomm, and other global players underscore the country's potential to leverage these relationships for technological advancement, capacity building, and infrastructure development.

The UJ-Connect Project, a collaborative initiative between JICA and Uganda's Ministry of ICT and National Guidance, has been instrumental in strengthening Uganda's ICT sector. By facilitating business matching and fostering innovation, the UJ-Connect initiative links Ugandan ICT startups and enterprises with leading Japanese technology firms. This partnership fosters knowledge exchange and capacity building, creating opportunities for Uganda's ICT sector to adopt advanced practices and align with international standards (JICA, 2023).

Global technology leaders such as Huawei have also made significant contributions to Uganda's ICT ecosystem. For instance, Huawei has deployed 5G networks in collaboration with MTN Uganda and HIMA Cement. This deployment highlights the integration of advanced telecommunications infrastructure into industrial applications, improving operational efficiency through real-time data transmission. Furthermore, the Huawe Digital Village Prototype project, which includes smart classrooms, learning centres, and solar-powered smart photovoltaics, is transforming rural areas by bridging the digital divide and showcasing the potential for local ICT equipment manufacturing to meet domestic demands (Huawei, 2023).

Qualcomm has reinforced Uganda's innovation ecosystem through its Make in Africa Startup Mentorship Program. By mentoring Ugandan startups such as Karaa and Microfuse, Qualcomm has provided support in business planning, engineering, and intellectual property management. These efforts are pivotal in fostering innovation-driven ICT manufacturing, particularly in developing affordable and accessible computing and hardware solutions tailored to regional needs (Qualcomm, 2023).

Further infrastructural advancements have been made through collaborations with Google and Facebook (Meta). Google's affiliate C-Squared has installed over 1 000 kilometres of fibre-optic cable in Kampala, enhancing internet connectivity and reducing data costs. Similarly, Facebook, in partnership with Airtel Uganda, has laid over 800 kilometres of fibre-optic cable in northern Uganda, significantly improving digital access and creating an environment conducive to ICT innovation (Trade.gov, 2023).

Additionally, the partnership between the Uganda Institute of ICT (UICT) and EON Reality has introduced artificial intelligence-based solutions into the education sector, including the EON AI Assistant. This collaboration equips Ugandan students and professionals with cutting-edge skills, fostering a workforce capable of supporting advanced ICT manufacturing processes (EON Reality, 2023).

These global partnerships collectively underscore Uganda's growing readiness to integrate international expertise into its ICT ecosystem. They provide critical infrastructure, technical knowledge, and innovation-driven opportunities that could serve as a foundation for establishing a robust ICT manufacturing sector. By continuing to attract and nurture such collaborations, Uganda can strengthen its position as a regional leader in ICT equipment manufacturing.

5.2.1 Insights in ICT equipment manufacturing from other regions – India

India has established itself as a global leader in ICT equipment and electronics manufacturing, leveraging comprehensive policy frameworks, technology hubs, workforce skilling, and export-oriented strategies. Uganda can draw critical lessons from India's journey to inform its own efforts to develop a thriving local ICT equipment management sector. Below is an exploration of India's key practices, supported by relevant literature.

Policy and strategic incentives: India's success is driven by a robust policy environment, notably the *Make in India* initiative, launched in 2014. This flagship program emphasizes local manufacturing, export promotion, and the reduction of import dependence, especially in the ICT and electronics sectors. Key incentives include tax benefits, subsidies for technology adoption, and reduced corporate tax rates for manufacturing startups (Ministry of Commerce & Industry, 2024).

Uganda could implement similar policies to encourage investment in ICT manufacturing. Expanding existing frameworks such as the BUBU policy to include technology-specific incentives could help attract both foreign and local investors to Uganda's ICT manufacturing ecosystem.

Development of technology hubs and industrial clusters: India has strategically established electronics manufacturing clusters (EMCs) under its *National Policy on Electronics*. These clusters, such as those in Bangalore, Hyderabad, and Noida, provide shared infrastructure, logistics, and R&D support to ICT and electronics manufacturers (NITI Aayog, 2024; OECD, 2010) They also attract multinational corporations (MNCs) such as Apple, Samsung, and Foxconn, while nurturing a strong base of domestic manufacturers. Uganda could replicate this by creating ICT-focused industrial clusters within its urban centres. For example, developing ICT zones in Kampala or Jinja with infrastructure for assembly, testing, and research could create economies of scale and attract investors.

Technology transfer and workforce development: India has focused heavily on technology transfer and upskilling through partnerships between government, private companies, and academic institutions. Programmes such as the *Skill India Mission* and partnerships with global technology giants such as Intel, Microsoft, and Qualcomm have trained millions of professionals in advanced manufacturing techniques and digital skills (NASSCOM, 2022; S. Divya Sree, 2023).

Uganda can adapt a similar approach by scaling initiatives such as the Uganda Institute of Information and Communications Technology (UICT) and the National ICT Initiatives Support Program (NIISP). Partnerships with international entities on projects could provide the technical know-how to build Uganda's ICT manufacturing capacity.

Export-oriented manufacturing: India's ICT sector is a significant contributor to its exports, with electronics manufacturing growing by 49 per cent year-on-year as of 2022 (ESC, 2022) The country has achieved this by integrating into global supply chains, establishing quality assurance mechanisms, and fostering competitive manufacturing costs.

Uganda can leverage its membership in AfCFTA to position itself as a regional hub for ICT equipment manufacturing. By focusing on international quality standards and engaging regional markets, Uganda could enhance its export potential and reduce reliance on imported ICT products.

Support for SMEs and startups: India has cultivated a thriving ecosystem for SMEs and startups through initiatives such as the Startup India program. This program offers funding, mentorship, and market linkages to early-stage companies in ICT and electronics manufacturing. Dedicated incubators and accelerators, such as the Electropreneur Park, have further supported innovation in hardware and ICT solutions (NASSCOM, 2022).

For Uganda, establishing hardware-focused incubators and aligning programmes such as NIISP with SME needs could drive innovation. Supporting startups to develop ICT hardware tailored to the needs of regional markets would increase local value addition and enhance competitiveness.

Sustainability and circular economy practices: India has embraced sustainable manufacturing through its E-Waste Management Rules (2016) and programmes promoting energy efficiency and resource recycling in ICT production. Companies in India are incentivized to adopt

eco-friendly practices and comply with regulations that encourage resource efficiency (World Economic Forum (WEF), 2021; Zetwerk, 2024).

Uganda could integrate sustainability into its ICT manufacturing strategy by adopting circular economy principles, such as e-waste recycling and renewable energy. Collaborations with international organizations, such as ITU and UNEP, can support Uganda's efforts to implement these practices effectively.

Relevance to Uganda

India's approach to ICT equipment manufacturing offers Uganda a comprehensive blueprint for policy design, infrastructure development, and workforce skilling. By adopting similar strategies and tailoring them to Uganda's local context, the country can build a robust ICT manufacturing industry aligned with Vision 2040 and National Development Plans (NDPIII, NDPIV).

5.3 Technology and innovation adoption

The adoption of technology and innovation is critical for Uganda to transition from a nascent ICT equipment manufacturing sector to one capable of competing regionally and globally. This section examines the current technological capacity, the role of innovation hubs and ICT zones, and provides recommendations for skilling and technology transfer to address existing gaps and leverage opportunities.

5.3.1 Assessment of current technological capacity in Uganda

Uganda's current technological capacity in ICT equipment manufacturing remains underdeveloped. While foundational infrastructure such as the National Backbone Infrastructure provides connectivity across the country, its prioritization of government institutions limits its impact on industrial zones and private manufacturers. The lack of consistent access to high-speed broadband in industrial parks constrains the adoption of advanced manufacturing technologies such as automation, robotics, and Internet of Things (IoT) systems. Facilities such as the Uganda Industrial Research Institute (UIRI) offer some technological support, but their focus has yet to fully encompass the needs of ICT manufacturing.

Additionally, the R&D ecosystem in Uganda is underfunded and disconnected from industrial applications. Universities such as Makerere University have initiated ICT-related programmes, but these remain predominantly academic and fail to translate into actionable solutions for ICT manufacturing (GreatSands & MoICT&NG, 2020). Stakeholder engagements reveal that while Uganda produces a steady stream of ICT graduates, their training does not align with the practical demands of the manufacturing sector. The absence of continuous professional development opportunities further limits the workforce capacity to adopt and implement emerging technologies.

5.3.2 Role of innovation hubs and ICT zones

Innovation nubs and ICT zones are pivotal in fostering collaboration, skills development, and the commercialization of technology. In Uganda, hubs such as Outbox and Hive Colab focus on nurturing startups and promoting entrepreneurships in ICT. However, these hubs primarily emphasize software innovation, with limited attention to hardware development. This restricts their direct influence on ICT equipment manufacturing.

Lessons from Kenya and Rwanda demonstrate the transformative potential of well-structured innovation ecosystems. Kenya's iHub has fostered partnerships between startups and global firms, leading to locally assembled ICT products. Similarly, Kigali Innovation City in Rwanda integrates academia, industry, and government efforts, creating a holistic approach to ICT innovation. These models underscore the importance of aligning innovation hubs with industrial goals.

The establishment of ICT zones in Uganda, such as the Kampala Industrial Business Park (KIBP), holds promises for boosting local manufacturing. However, stakeholders highlighted inefficiencies in infrastructure, including inconsistent power supply and limited broadband access, which undermine the effectiveness of these zones. Addressing these deficiencies is crucial for ICT zones to act as catalysts for technology-drive manufacturing.

5.3.3 Recommendations for skilling and technology transfer

To address the gaps identified and build a robust ICT manufacturing ecosystem, Uganda must implement targeted strategies for skilling and technology transfer. Educational institutions should collaborate with industry players to redesign curricula that incorporate practical training in ICT equipment assembly, maintenance, and manufacturing processes. Partnerships with global organizations such as JICA, which have supported skilling initiatives in Rwanda, offer a valuable template for Uganda.

Continuous professional development programmes should be established to upskill the existing workforce in emerging technologies, including IoT, artificial intelligence, and automation. Collaboration with the international and regional organizations, stakeholder and development partners could facilitate training programmes and capacity building workshops tailored to Uganda's needs.

Dedicated technology transfer centres should be established within industrial parks and ICT zones to foster partnerships with global technology firms. These centres can facilitate knowledge sharing, joint ventures, and licensing agreements. Kenya's success in leveraging partnerships with companies such as Huawei and Microsoft to enhance local manufacturing provides a compelling model for Uganda.

Existing innovation hubs should expand their focus to include hardware development alongside software development or related innovation. This requires funding for prototyping facilities and partnerships with global hardware manufacturers. Kigali Innovation City's integrated model, which combines academia, industry, and government collaboration, serves as an example for Uganda to emulate.

Finally, the introduction of tax incentives and grants would greatly boost private sector investment in R&D and workforce development. These measures have been pivotal in Kenya's ICT sector growth and can provide similar benefits to Uganda. Additionally, leveraging support from development partners can supply the technical and financial resources necessary to implement these recommendations effectively.

By addressing the technological gaps, strengthening innovation hubs, and fostering technology transfer, Uganda can lay the foundation for a competitive ICT manufacturing sector that drives economic growth and technological self-reliance.

Educational institutions

The following recommendations aim to enhance skilling and technology transfer across relevant educational institutions in Uganda:

- **Curriculum enhancement**: Educational institutions should update their curricula to include hands-on training in the latest ICT manufacturing technologies. This could involve: Integrating practical modules on robotics, automation, and 3D printing into the syllabus; Introducing workshops and seminars led by industry experts; and developing specialized courses on circular economy principles in ICT manufacturing, focusing on sustainable design, reuse, and recycling.
- **Industry partnerships**: Institutions should establish formal partnerships with ICT manufacturing companies to provide students with real-world experience. This could include: mandatory internships or co-op programmes for all students; collaborative projects where students work on solving actual industry challenges; and, guest lectures and mentorship programmes featuring industry professionals.
- **Infrastructure and resources**: Institutions should be equipped with state-of-the-art facilities and resources to support practical training. This could involve: setting up dedicated labs and workshops for ICT equipment assembly and maintenance; Investing in modern software and hardware for design and simulation; and, creating a resource center with the latest industry publications and online learning tools.
- **Faculty development**: Faculty should receive ongoing training and professional development to stay updated with the latest trends and technologies in ICT manufacturing. This could include: sponsorship for faculty to attend international conferences and workshops; industry placements for faculty to gain practical experience; and support for research collaborations with industry partners;
- **Project-based learning**: Institutions should incorporate more project-based learning into their programmes, where students work in teams to design, develop, and prototype ICT equipment. This could include: capstone projects that require students to create a functional ICT product; competitions and hackathons that challenge students to develop innovative solutions; and incubation support for students who want to commercialize their projects;
- **Certification and accreditation**: Institutions should seek accreditation from international bodies to ensure their programmes meet global standards. This could involve: aligning curricula with industry certifications (e.g., CompTIA, IEEE, CISCO); establishing partnerships with international universities for joint degree programs; and regularly reviewing and updating programs based on feedback from industry and accreditation bodies.

Moreover, there is room to improve the Uganda Institute of Information and Communications Technology (UICT) graduate training. Given the UICT unique position as an institution directly affiliated with the Ministry of ICT and National Guidance, and its status as an ITU Academy Digital Transformation Centre (DTC), UICT strategic affiliation should be leveraged to align its programs with national ICT strategies and priorities and access resources and expertise from ITU and other international organizations. It could further leverage the participation in pilot projects and initiatives led by the Ministry of ICT and National Guidance while offering specialized training programmes to government agencies and other stakeholders.

In addition, to cultivate graduates capable of propelling Uganda's ICT manufacturing sector and to establish a standard for other institutions, UICT could consider:

1. Working closely with industry partners to design and regularly update its curricula to ensure graduates possess the specific skills and knowledge required by ICT equipment manufacturers. This includes incorporating practical training in areas such as: Advanced manufacturing technologies, including Industry 4.0 concepts like cyber-physical systems

and factory automation; embedded systems design; microelectronics; hardware assembly and testing; quality control and standardization; supply chain management; data communication, rural/remote communication development, and communication networks and infrastructure, and IoT for agriculture, AI, and machine learning applications in agriculture.

2. Increasing the emphasis on hands-on learning through: mandatory internships or industrial placements in ICT manufacturing companies; project-based learning that requires students to design, develop, and prototype ICT equipment; the establishment of well-equipped laboratories and workshops that simulate real-world manufacturing environments. The UICT Innovation Bootcamp & Pitch programme, which aims to transform student projects into market-ready solutions, is a step in this direction that could be expanded.
3. Fostering stronger ties between UICT and the ICT industry through: joint research projects focused on solving industry challenges, including those in the manufacturing, digital transformation, and agro-industrialization sectors; guest lectures and workshops led by industry experts; curriculum advisory boards comprising industry representatives; collaborative development of training programess and certifications.
4. Investing in training programmes for UICT faculty to update their skills and knowledge in the latest ICT manufacturing technologies and trends. This could include: Industry attachments for faculty members; participation in international conferences and workshops; and support for research and publications in relevant fields.
5. Creating specialized centres of excellence at UICT, focusing on specific areas of ICT manufacturing, such as: electronics design and manufacturing; telecommunication equipment assembly; renewable energy technologies; and embedded systems and IoT. The centres can serve as hubs for training, research, and innovation, and can also facilitate technology transfer from international partners.

5.4 Sustainability and circular economy

Sustainability and circular economic principles are increasingly recognized as essential components in fostering a resilient and competitive ICT equipment manufacturing sector. For Uganda, integrating these principles into the ICT ecosystem not only addresses global environmental concerns, but also creates opportunities for resource efficiency, economic growth, and job creation. This section explores how sustainability and circular economy concepts can be embedded into the manufacturing processes, with a focus on reducing e-waste, optimizing resource use, and leveraging regional and global best practices.

E-waste management is a critical aspect of sustainability in ICT manufacturing. With Uganda's rising demand for ICT equipment, addressing the lifecycle of these products is essential to minimize environmental impact. According to stakeholder engagements, limited awareness and inadequate infrastructure for recycling and disposal exacerbate the e-waste challenge in Uganda. Establishing efficient collection and recycling systems, supported by policy incentives, can help mitigate these issues while fostering a circular economy (GreatSands & MoICT&NG, 2020).

Regional benchmarks provide valuable insights into adopting sustainability measures. For example, Kenya has implemented e-waste regulations that mandate producer responsibility and promote recycling initiatives (Dean et al., 2020). Similarly, Rwanda has embraced green technologies in its ICT zones, integrating resource efficiency practices into manufacturing processes (Rwanda Ministry of ICT and Innovation, 2015). These examples demonstrate the potential for Uganda to adapt similar approaches, aligning with global sustainable development goals.

Furthermore, the concept of a circular economy emphasizes designing products with longer lifespans, enabling repair, reuse, and recycling. By fostering partnerships with private sector players and international development organizations, Uganda can accelerate the adoption of circular practices. Initiatives such as repair hubs, skill-building for refurbishments, and investment in green technologies can transform the ICT manufacturing landscape while reducing environmental degradation (ITU-D, 2022).

5.4.1 e-Waste management strategies

E-waste management represents a critical component of Uganda's strategy for achieving sustainability within the ICT equipment manufacturing ecosystem. With the increasing adoption of electronic devices and a growing manufacturing sector, managing electronic waste has become a pressing issue for the country. The objective is not only to mitigate environmental harm but also to leverage e-waste as a resource for economic and technological development.

Current state of e-waste management in Uganda

Uganda generates significant quantities of e-waste annually due to increased imports of ICT products, the proliferation of low-cost electronics, and limited infrastructure for waste disposal and recycling. Despite these challenges, efforts have been made to develop a regulatory framework for e-waste management. For instance, the National Environment Management Authority (NEMA) and the Uganda Communications Commission (UCC) have spearheaded initiatives to address this issue. The introduction of the Extended Producer Responsibility (EPR) policy framework, as highlighted by ITU's collaboration with local stakeholders, underscores the importance of manufacturers taking responsibility for the entire lifecycle of their products, including end-of-life management (National Environment Act, No. 5 of 2019, 2019; UCC, 2018; UCC-NEMA-NEC, 2021).

Key facilities such as EnviroServe recycling hub in Kampala serve as models for e-waste collection and processing. However, these initiatives remain constrained by limited public awareness, inadequate funding, and lack of technical expertise. According to the Ministry of ICT and National Guidance, strategies to scale up e-waste recycling infrastructure must include public-private partnerships, incentives for recycling businesses, and greater consumer engagement (MoICT, 2016; MoICT&NG, 2023b).

Strategic interventions for effective e-waste management

1. Infrastructure expansion and capacity building: Expanding e-waste recycling facilities and integrating them into existing industrial parks or ICT zones can improve the collection, segregation, and processing of electronic waste. This aligns with Uganda's Vision 2040, which emphasizes industrialization and sustainable development (NPA, 2023).
2. Public awareness campaigns: Educating consumers about the environmental and economic benefits of proper e-waste disposal is essential. Public awareness campaigns, modelled after Rwanda's successful grassroots initiatives, can drive behavioural change and promote compliance with recycling practices.
3. Collaboration and partnerships: Partnerships with international organizations and local stakeholders can enhance knowledge transfer and funding for e-waste projects. Notably, ITU support for Uganda's Extended Producer Responsibility (EPR) framework has created opportunities for global best practices to be adapted locally.
4. Policy enforcement and incentives: Strengthening enforcement of e-waste regulations through NEMA and Uganda Communications Commission, coupled with financial

incentives for compliant businesses, can boost participation in e-waste recycling. Incentives could include tax rebates for recycling companies and reduced import tariffs for environmentally friendly technologies.

5. Technology development for material recovery: Investing in advanced recycling technologies to recover valuable materials such as rare earth metals and precious minerals from e-waste can reduce dependence on imports. Lessons from Kenya, where similar technologies have been piloted provide valuable insights.

By implementing these strategies, Uganda can establish a robust e-waste management system that not only safeguards the environment but also creates economic opportunities through resource recovery and job creation. These initiatives will form the backbone of a circular economy within the ICT equipment manufacturing sector, paving the way for sustainable industrial growth.

5.4.2 Integrating circular economy principles into local ICT equipment manufacturing

Integrating circular economy principles into Uganda's local ICT equipment manufacturing sector can revolutionize the industry by creating sustainable value chains, reducing waste, and promoting resource efficiency. The circular economy focuses on designing products and systems that maintain materials in use for as long as possible, thereby minimizing environmental harm and maximizing economic benefits. This section explores actionable strategies for embedding circular economy principles into ICT equipment manufacturing in Uganda, drawing on local challenges, regional benchmarks, and global best practices.

A critical starting point for integrating circular economy principles is the extension of product lifecycles through repair, refurbishment, and remanufacturing. Uganda has a significant market for refurbished second-hand ICT equipment, driven by affordability concerns and the lack of local production capacity. Establishing dedicated refurbishment hubs within industrial parks or ICT zones can formalize these practices, reduce e-waste, and create skilled jobs. These hubs can also support local assembly operations by supplying refurbished components, reducing dependency on costly imports and enhancing the sector resilience.

Eco-design practices must also become a standard in Uganda's ICT manufacturing sector: Designing ICT products for easy disassembly, repair, and recycling ensures a steady flow of recoverable materials. Policies incentivizing manufacturers to adopt eco-design for instance, through tax rebates or subsidies can encourage sustainable production. Lessons from the European Union's circular economy directives provide valuable guidance on adapting such policies to Uganda's context (Great Sands Consulting Ltd., 2020). Additionally, collaboration with universities and technical institutions can foster innovation in eco-friendly product designs.

Material recovery is another cornerstone of the circular economy: Uganda generates considerable e-waste, much of which contains valuable materials such as gold, copper, and rare earth elements (UCC-NEMA-NEC, 2021). Specialized recycling facilities capable of extracting and repurposing these materials can significantly reduce on raw material imports while supporting local production. These facilities should be integrated into ICT zones or industrial parks to facilitate efficient material recovery and reuse. The Uganda Green Growth Development Strategy (UGGDS) emphasizes resource recovery as a key driver of sustainable economic growth, highlighting its alignment with national development goals (NPA, 2017).

Extended Producer Responsibility (EPR) frameworks: EPR frameworks are essential to institutionalize circular economy practices. Under EPR, manufacturers bear responsibility for the

entire lifecycle of their products, including take-back schemes and recycling initiatives. Kenya's Sustainable Waste Management Act, 2022, provides a useful benchmark, as it has successfully incentivized manufacturers to invest in such systems (The Sustainable Waste Management Act 2022, 2022). Uganda's (National Environment Act, No. 5 of 2019, 2019) already includes provisions for EPR, but effective enforcement and collaboration with private sector players are required to operationalize these frameworks.

Public awareness and behavioural change are vital for the success of circular economy initiatives. Educating consumers on the environmental and economic benefits of repair, reuse, and recycling can drive demand for sustainable products and services. Rwanda's integration of circular economy principles into its education system serves as an excellent model, demonstrating how early interventions can instil long-term sustainable practices (Rwanda Ministry of ICT and Innovation, 2015). Uganda can similarly engage development partners to establish circular economy hubs that combine manufacturing, recycling, and skilling programmes.

Finally, policy frameworks must create an enabling environment for the transition to a circular economy. Uganda's regulatory landscape should be strengthened to mandate recycling targets, enforce EPR obligations, and incentivize sustainable practices through tax benefits and grants. Aligning these policies with regional and international standards, such as the African Circular Economy Alliance (ACEA), can enhance Uganda's competitiveness in the global ICT market. By integrating circular economy principles into ICT equipment manufacturing, Uganda can build a resilient, resource-efficient, and environmentally sustainable industry. These practices not only address pressing environmental challenges but also create economic opportunities by generating green jobs, reducing imports, and fostering innovation. A collaborative approach involving government, industry, and civil society will be key to achieving this vision.

5.5 Strategic framework for local ICT equipment manufacturing

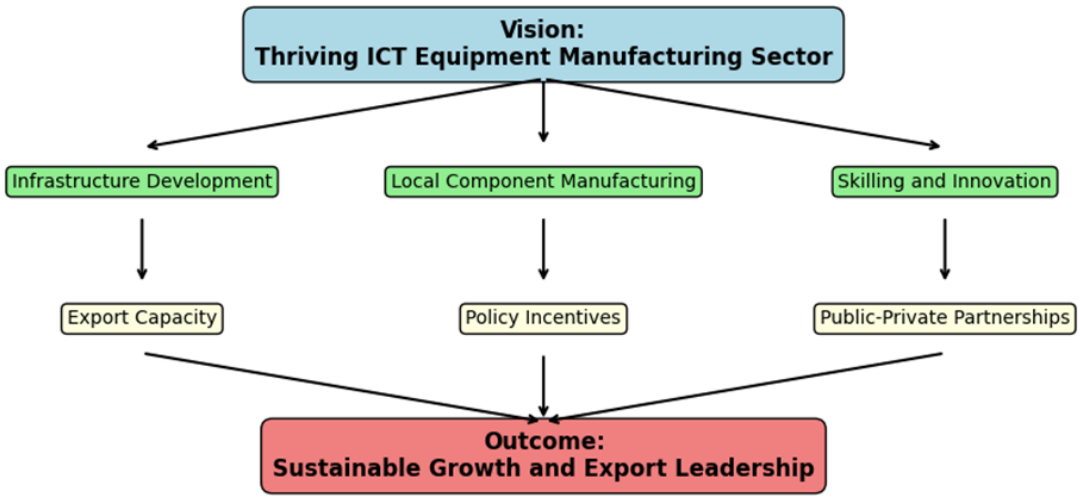
A strategic framework for local ICT equipment manufacturing in Uganda is essential to establish a competitive, sustainable, and scalable sector. This framework aims to address existing challenges, leverage opportunities for growth, and position Uganda as a regional leader in ICT manufacturing. Key focus areas include scaling manufacturing capabilities, fostering innovation, and creating a supportive ecosystem through targeted policy incentives and robust public-private partnerships.

This framework outlines key pillars for developing Uganda's ICT manufacturing sector:

1. Policy alignment – Strengthen alignment with Vision 2040, NDPIV, and international frameworks.
2. Infrastructure development – Invest in industrial parks and ICT manufacturing hubs.
3. Skills development – Partner with academia to develop specialized ICT programmes.
4. Private sector engagement – Provide incentives for local production and innovation.

Figure 11 shares an overview of the strategic framework that can guide the strengthening of local ICT equipment manufacturing going forward.

Figure 11. Strategic framework for local ICT equipment manufacturing in Uganda



Source: Study findings

5.6 Proposed recommendations for scaling ICT equipment manufacturing

Scaling ICT equipment manufacturing in Uganda requires a multi-pronged approach that addresses both immediate operational needs and long-term sectoral development goals. The following recommendations provide actionable steps for achieving scalable growth:

- **Enhancing manufacturing infrastructure**: Investment in dedicated ICT manufacturing zones, such as expanding capacity at Kampala Industrial Business Park (KIBP) and establishing new facilities in other industrial parks, can provide reliable infrastructure and utilities tailored for ICT production. These zones should prioritize high-speed internet connectivity, reliable power supply, and logistical support, aligning with the National Development Plan III (NDP III) goals.
- **Promoting local component manufacturing**: Developing local supply chains for ICT components can reduce reliance on imports and enhance cost competitiveness. Incentives for local businesses to engage in the production of semiconductors, printed circuit boards, and other key components are crucial. Partnerships with international firms can facilitate technology transfer and capacity building.
- **Fostering innovation in manufacturing processes**: Integrating advanced manufacturing technologies, such as robotics, automation, and 3D printing, can increase production efficiency and reduce waste. Collaboration with innovation hubs and academic institutions can bridge the gap between research and industrial application, ensuring the adoption of cutting-edge manufacturing techniques.
- **Building skilled workforce**: Continuous professional development programmes tailored to the ICT manufacturing sector can address the skills gap. Partnering with institutions such as UICT and Makerere University to offer specialized courses and certifications can create a talent pipeline that meets the industry's demands.
- **Strengthening export capacity**: Positioning Uganda as a regional ICT manufacturing hub requires export-oriented strategies, including compliance with international quality standards, establishing trade partnerships under AfCFTA, and promoting "Made in Uganda" products to regional and global markets.

5.7 Proposed policy incentives and public-private partnerships

Policy incentives and robust public-private partnerships (PPPs) are critical to creating a conducive environment for ICT equipment manufacturing. These measures aim to attract investment, foster innovation, and ensure sustainable growth in the sector.

Policy incentives

- **Tax holidays and rebates** – Offering tax incentives, such as exemptions on equipment imports and reduced corporate tax rates for ICT manufacturers, can attract both local and foreign investors.
- **Reduced corporate tax rates** – Implementing a preferential corporate tax rate for ICT equipment manufacturers, lower than the standard rate. The Income Tax Act (2023) could be amended to include such a preferential tax rate.
- **Exemption from import duties** – Eliminating or significantly reducing import duties on raw materials, components, and manufacturing equipment used in ICT equipment production. The East African Community Common External Tariff (EAC CET) Protocol, which allows for duty exemptions on capital goods, could be leveraged.
- **Tax credits for R&D investments** – Amending the Income Tax Act (2023) to provide tax credits or deductions for companies investing in R&D related to ICT equipment manufacturing, aligning such incentives with existing provisions for training expenditure.
- **Accelerated depreciation** – Allowing ICT equipment manufacturers to depreciate their capital assets at an accelerated rate, reducing their taxable income in the initial years of operation. The Income Tax Act (2023) provides for depreciation deductions; these could be enhanced for ICT manufacturing.
- **VAT exemptions** – Zero-rate Value Added Tax (VAT) on the export of locally manufactured ICT equipment, to make them more competitive in international markets. The VAT Act could be amended to include this provision.
- **Subsidized access to utilities** – Providing subsidized electricity and internet connectivity within ICT manufacturing zones can lower operational costs and enhance competitiveness.
- **Grants and R&D funding** – Establishing grant programmes to support research and development in ICT manufacturing can drive innovation and facilitate the development of locally relevant technologies (NPA, 2017).

Public-private partnerships

- **Infrastructure development** – PPPs can mobilize resources for developing dedicated ICT zones, ensuring state-of-the-art infrastructure tailored to manufacturing needs. The Bankable Project 2024-2025 document identifies viable PPP opportunities for infrastructure enhancement in Uganda's industrial parks (UIA, 2024)
- **Technology transfer and skilling** – Partnerships with global technology firms, such as Huawei and Microsoft, can facilitate knowledge transfer, workforce development, and the adoption of advanced manufacturing techniques(UNCST, 2023)
- **Market access and branding** – Collaborative efforts to promote "Made in Uganda" products, both regionally and globally, can enhance market access and consumer confidence. AfCFTA regional branding initiatives provide a model for such efforts (Mendez-Parra & Agarwal, 2023)

Regulatory frameworks

- Developing clear and enforceable regulatory frameworks can ensure compliance with international quality standards and environmental sustainability goals. This includes

harmonizing local policies with regional frameworks under AfCFTA and EAC initiatives (MoICT&NG, 2018).

Inclusive stakeholder engagement

- Encouraging active participation from academia, private sector players, and development partners in policymaking can foster a sense of shared ownership and drive sectoral growth. This collaboration can also align industry needs with government priorities (ITU-D, 2022; MoICT&NG, 2023).(ITU-D, 2022; MoICT&NG, 2023).

By implementing these recommendations and leveraging policy incentives and PPPs, Uganda can establish a thriving ICT equipment manufacturing sector that drives economic growth, technological innovation, and sustainable industrialization. Moreover, to ensure that the tax incentives listed above are effective and contribute to sustainable industrial development as reported by Lippitsch, C. (2024,), the following principles should be considered:

- Clear and well-publicized application and administration of tax incentives to minimize uncertainty and potential for abuse.
- Defined incentives duration to encourage timely investment and prevent prolonged reliance on government support.
- Incentives should be linked to specific, measurable outcomes, such as increased production capacity, job creation, technology transfer, or export growth.
- Tax incentives should be part of a broader strategy that includes investments in infrastructure (reliable electricity, internet connectivity, and transportation), skills development, and access to finance.

6 Implementation and monitoring for implementation of recommendations

Effective implementation and monitoring are critical components in achieving the objectives outlined in Uganda's ICT technology development and commercialization strategy. This section serves to articulate the overarching principles, approaches, and mechanisms required to successfully translate policy directives and strategic recommendations into measurable outcomes. By fostering collaboration among key stakeholders and leveraging best practices, Uganda aims to establish a robust framework for ICT equipment manufacturing that aligns with national development priorities and global standards.

Purpose and importance

The implementation and monitoring phase is designed to bridge the gap between strategy and action. This involves the operationalization of key initiatives, ensuring adherence to timelines, budgets, and quality standards. Monitoring and evaluation, on the other hand, provide a systematic approach to assess progress, identify challenges, and make data-driven adjustments to enhance performance and sustainability.

Given Uganda's commitment to transforming its ICT sector into a drive of economic growth, technology advancement, and job creation, the implementation of monitoring framework will ensure alignment with the National Development Plan III and IV, the Digital Uganda Vision, and the National Industrial Policy. It also incorporates lessons learned from regional and international benchmarks, particularly in relation to Kenya's and Rwanda's ICT ecosystems.

Key principles

- **Stakeholder collaboration**: Ensuring active participation from government entities, private sector players, academia, and development partners. Collaborative efforts will help address capacity gaps and foster a sense of shared responsibility for achieving the desired outcomes.
- **Inclusivity and capacity building**: Prioritizing the inclusion of youth, women, and marginalizing groups in ICT-related opportunities, along with a strong emphasis on developing technical skills and competencies through targeted training programmes
- **Accountability and transparency:** Establishing clear lines of responsibility, performance metrics and reporting mechanisms to ensure the judicious use of resources and continuous progress monitoring.
- **Sustainability**: Promoting environmentally friendly practices, including the adoption of circular economy principles and sustainable digital transformation strategies.
- **Adaptability**: Integrating feedback loops to allow for flexible adjustments based on emerging challenges and opportunities such as changes in market dynamics or technological advancements.

6.1 Proposed monitoring and evaluation framework

The monitoring and evaluation framework will be rooted in measurable indicators tied to this study's goals, including economic impact, employment generation, technological transfer and export growth. Key monitoring activities include:

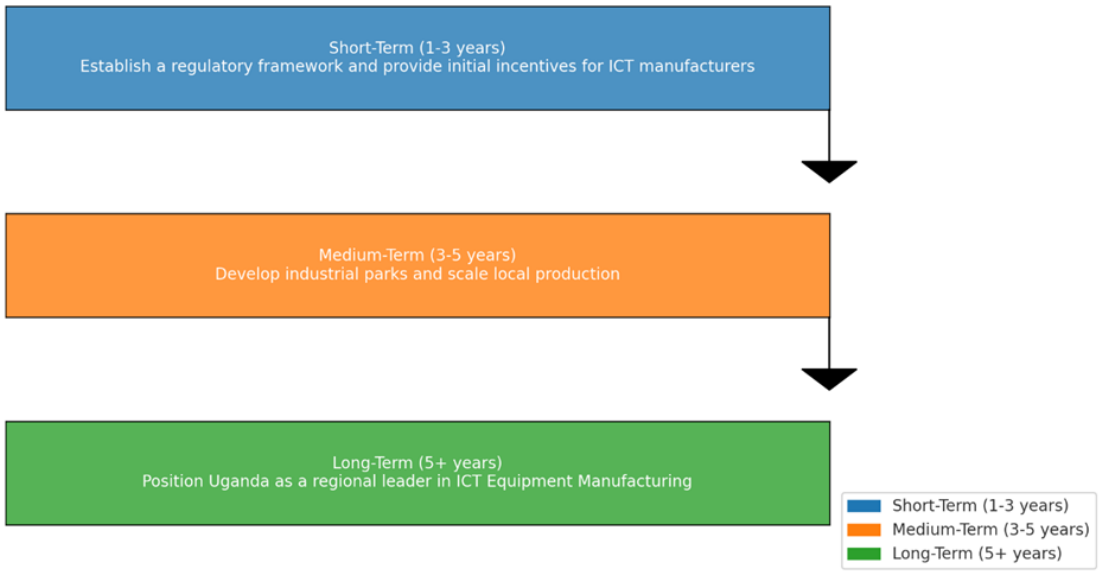
- **Baseline data collection**: Establishing benchmarks for critical indicators at the start of the implementation phase.
- **Periodic progress reviews**: Conducting quarterly and annual reviews to assess alignment with the project key performance indicators (KPIs).
- **Stakeholder feedback mechanisms**: Gathering insights from all involved parties to ensure the inclusivity and relevance of the implementation process.
- **Reporting and dissemination**: Preparing regular reports that communicate progress, challenges and proposed interventions to stakeholders and the public.

By embedding these principles and methodologies, Uganda aims to achieve a transformative impact in its ICT equipment manufacturing sector, positioning itself as a regional leader while addressing the socio-economic aspirations of its population.

6.2 Proposed implementation roadmap

The proposed implementation roadmap outlines a phased approach to developing Uganda's ICT equipment manufacturing sector. It highlights key actions across short-term, medium-term, and long-term horizons to achieve sustainable growth and competitiveness. The roadmap ensures that foundational activities are prioritized before scaling production and positioning Uganda as a regional leader. Figure 12 presents a visual representation of the roadmap, followed by a detailed explanation of its strategic components.

Figure 12. Proposed project implementation roadmap to boost current local ICT equipment manufacturing sector



Source: Study findings

The proposed implementation roadmap provides a phased approach to developing Uganda's ICT equipment manufacturing sector. Each phase addresses critical priorities, setting the foundation for sustainable growth and ensuring alignment with national development objectives. Below is a breakdown of the roadmap's structure and its intended outcomes.

Short-Term (1-3 Years): Establishing the foundation

The short-term phase focuses on creating an enabling environment for the ICT equipment manufacturing sector by:

- Establishing a regulatory framework – Ensuring policies, standards, and guidelines are in place to promote fair competition, quality assurance, and investor confidence.
- Providing initial incentives – Introducing tax reliefs, grants, and other forms of support to attract local and foreign investors into the sector

Expected outcomes:

- A functional regulatory environment that encourages investment.
- Increased interest from manufacturers due to supportive incentives.

Medium-term (3-5 years): Scaling production

Building on the short-term foundations, this phase aims to expand Uganda's industrial capacity and boost production by:

- Developing industrial parks – Establishing specialized zones equipped with the necessary infrastructure to facilitate ICT manufacturing.
- Scaling local production – Supporting manufacturers to increase their output and address domestic and regional demand for ICT equipment.

Expected outcomes:

- Increased capacity for large-scale manufacturing.
- Job creation and economic activity spurred by industrial park development.
- Enhanced competitiveness in the regional ICT market.

Long-term (5+ years): Achieving regional leadership

The final phase seeks to position Uganda as a leading regional player in ICT equipment manufacturing by:

- Fostering export competitiveness – Encouraging manufacturers to access regional and international markets through improved product quality and trade partnerships.
- Establishing Uganda as a regional hub – Leveraging frameworks such as AfCFTA to drive regional exports and investment.

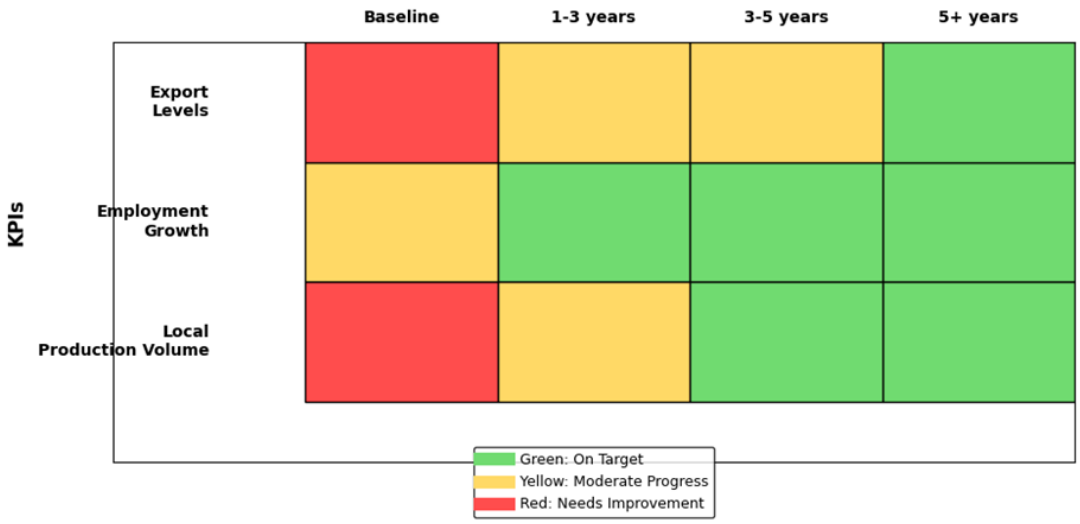
Expected outcomes:

- Recognition of Uganda as a regional leader in ICT manufacturing.
- Strengthening economic ties within Africa through export growth.
- A self-sustaining ICT manufacturing ecosystem that contributes significantly to GDP.

Thus, this roadmap establishes a clear pathway for Uganda to achieve its vision of becoming a regional ICT manufacturing leader, with each phase building momentum toward sustainable growth.

Monitoring and evaluation framework (KPIs)

Figure 13. Monitoring and evaluation framework to boost the local ICT equipment manufacturing sector



Source: Study findings

Figure 13 illustrates the monitoring and evaluation framework for boosting local ICT equipment manufacturing sector in Uganda. As such, it monitors the progress of key project indicators KPIs (key performance indicators) across the four timeline stages: Baseline,1-3 years, 3-5 years, and 5+ years. The traffic-light colour scheme indicates performance levels for each KPI during the specified timeline stages.

Key components

KPIs

- Local production volume: Tracks the progress in manufacturing ICT equipment locally to reduce imports and promote self-reliance.
- Employment growth: Evaluates the sector's contribution to creating job opportunities within the ICT manufacturing ecosystem.
- Export levels: Measures the ability of Uganda's ICT equipment manufacturing sector to enter and sustain export markets.

Timeline stages

- Baseline: Represents the initial state before interventions.
- 1-3 Years: Highlights short-term targets and outcomes.
- 3-5 Years: Tracks medium-term progress as the sector scales production.
- 5+ Years: Focuses on long-term achievements including positioning Uganda as a regional leader in ICT equipment manufacturing.

Traffic-light indicators (grid colours)

- Green: Indicates the KPI is "on target", signalling satisfactory performance.
- Yellow: Denotes "moderate progress", signalling that improvements are needed but are underway.
- Red: Signals "needs improvement", highlighting areas requiring immediate attention to meet project goals.

7 Risk assessment and mitigation strategies for implementation of recommendations

The success of Uganda's ICT equipment manufacturing initiative depends on identifying and addressing potential risks that may hinder its progress. A comprehensive risk assessment ensures that all critical challenges are anticipated and mitigated effectively, thereby safeguarding the project's objectives and ensuring its alignment with the country's broader developmental goals under the National Development Plans (NDPIII and IV) and the Digital Uganda Vision (DUV).

This section therefore explores the risks associated with implementing and sustaining local ICT equipment manufacturing in Uganda. It outlines key challenges, such as funding gaps, regulatory delays, competition from imported goods, and skill shortages, which have the potential to derail the initiative if left unaddressed. The subsequent subsections present a structured mitigation framework aimed at addressing these challenges through strategic interventions. These interventions include allocating dedicated budgets, streamlining regulatory processes, fostering public-private partnerships, and investing in workforce development.

By adopting proactive risk management and mitigation strategies, Uganda's ICT sector can build a resilient ecosystem that not only sustains local manufacturing efforts but also enhances the country's global competitiveness in the ICT industry. The insights and recommendations provided in this section serve as a roadmap for mitigating potential pitfalls and ensuring the success of the ICT equipment manufacturing initiative.

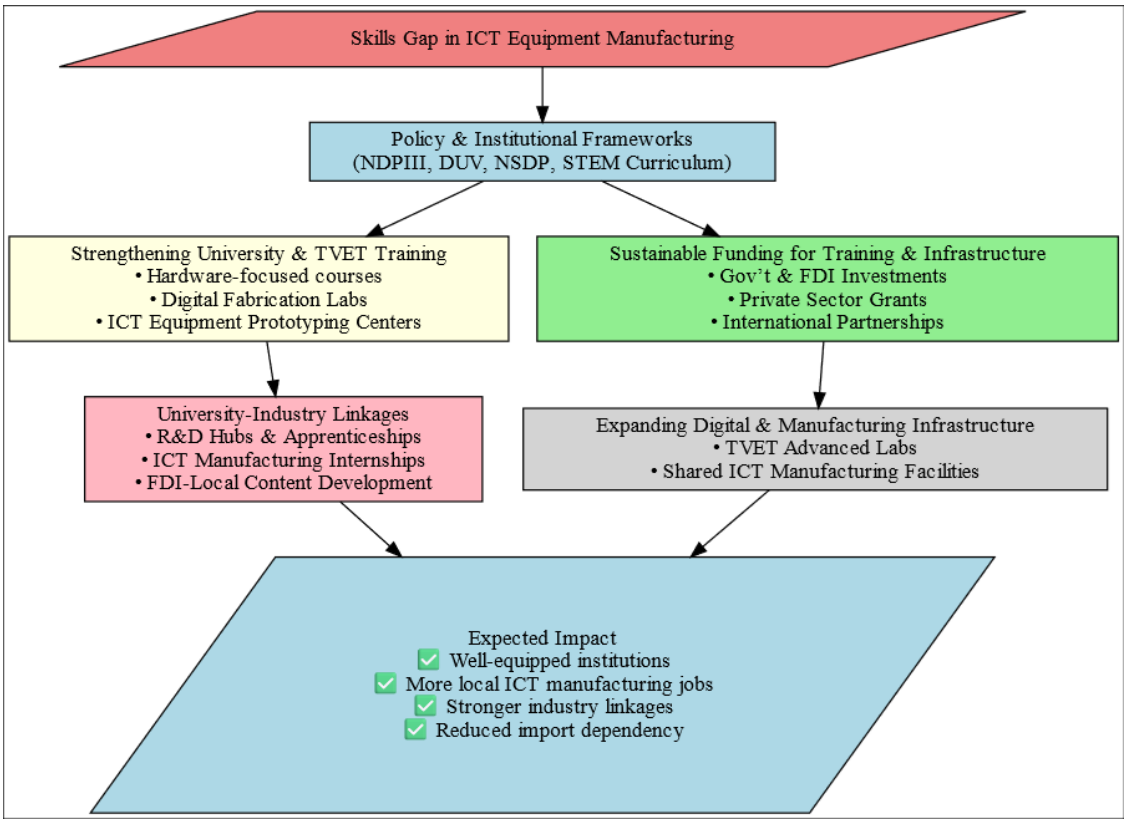
7.1 Identified risks

The successful implementation of Uganda's ICT equipment manufacturing initiative is contingent upon addressing several critical risks. The following risks have been identified as significant challenges to the progress of boosting local ICT equipment manufacturing in Uganda:

- **Insufficient funding and investment**: Securing adequate funding remains a significant challenge for the local ICT equipment manufacturing sector. Limited financial resources can impede critical activities such as infrastructure development, research and development, and scaling production capabilities. According to the Ministry of Finance, Planning and Economic Development (MoFPED), the 2023/2024 Budget Framework paper highlights that limited fiscal space and inconsistent funding streams constrain investment in ICT projects (MoFPED, 2023). Additionally, the Bank of Uganda Financial Stability Report identifies insufficient private sector credit allocation as a key impediment to scaling capital-intensive ventures such as local manufacturing initiatives (BoU, 2023).
- **Regulatory delays**: Delays in obtaining regulatory approvals and navigating bureaucratic processes pose a major risk to the initiative. Regulatory inefficiencies, including protracted timelines for implementation, permits, and certifications, can deter investors and impede project execution. The Uganda Private Sector Development and Jobs Report by the World Bank (2019) underscores the critical need to simplify bureaucratic procedures, particularly for private sector-led initiatives, to promote investment and foster industrial growth. Furthermore, the Private Sector Investment Survey 2023 highlights the importance of addressing administrative bottlenecks to create a more conducive business environment for both domestic and foreign investors (BoU, 2023b).
- **Market competition for imports**: Uganda's local ICT equipment manufacturing faces intense competition from imported products. These imports, often priced lower due to economies of scale or subsidization, make it challenging for local manufacturers to gain a foothold in the market. Bank of Uganda import/export reports reveal the country's high dependence on imported ICT equipment, adversely affecting the competitiveness of locally manufactured products (BoU, 2023a). Furthermore, regional policies under the East African Community (EAC) sometimes disadvantage local manufacturers by imposing minimal tariffs on imports, allowing foreign goods to dominate domestic markets (EAC, 2023; UNECA, 2016).
- **Skills shortages**: A well-prepared workforce is fundamental to the growth of Uganda's ICT equipment manufacturing sector. However, a persistent skills gap exists in areas such as advanced manufacturing, hardware engineering, and quality assurance. Uganda has introduced a competence-based curriculum at all levels of education, emphasizing practical skills, critical thinking, and applied knowledge to align with industry needs. The revised secondary school curricula, and the expansion of science, technology, engineering, and mathematics (STEM) and technical vocational education (TVET) programmes aim to produce graduates with relevant expertise. Despite these efforts, challenges remain in tracking the effectiveness of educational outcomes in relation to workforce demands. The Ministry of Education and Sport National Skills Development Plan (MoES, 2019) and the Digital Uganda Vision underscore the need for targeted workforce development programmes. The lack of structured pathways linking education to employment, particularly in ICT hardware prototyping, design, and research and development (R&D), limits Uganda's ability to capitalize on foreign direct investment and reduce reliance on imported ICT equipment.

Addressing these risks requires coordinated efforts across stakeholders, including government bodies, private sector participants, and educational institutions.

Figure 14. ICT skills strategy for ICT equipment manufacturing in Uganda



Source: Study findings

7.2 Mitigation framework

To address the risks identified and ensure the sustainable development of Uganda's ICT equipment manufacturing sector, the following mitigation strategies are proposed:

- **Allocate dedicated budgets for ICT equipment manufacturing initiatives**: Establishing a dedicated budget line within the National budget for ICT equipment manufacturing is crucial. This funding can support infrastructure development, research and development (R&D), and capacity building initiatives. The Ministry of Finance, Planning and Economic Development (MoFPED) should work closely with the Ministry of ICT and National Guidance to prioritize these initiatives. Public-private co-financing mechanisms can also be explored to supplement government funding and attract additional investment from the private sector.
- **Streamline regulatory processes**: Optimizing regulatory frameworks is critical for fostering a business-friendly environment. The Uganda Investment Authority (UIA) has advanced this effort through its One Stop Centre (OSC), which integrates licensing, permits, and certifications into a centralized and efficient system, accessible via the eBiz-platform. The Uganda business Registration Services Bureau (URSB) complements this by facilitating intellectual property (IP) services, including patenting, trademarking, and innovation protection. Enhancing collaboration between UIA, URSB, and ICT stakeholders will fortify IP protection, deter counterfeiting, and streamline approval workflows. Regularly updating these systems based on stakeholder input will ensure alignment with sector needs and global standards.

- **Promote public-private partnerships (PPPs)**: Public-private partnerships can play a pivotal role in overcoming funding and operational challenges. Partnerships between the government, academia, and the private sector should be encouraged to foster innovation, share resources, and reduce costs. For example, joint ventures can be formed to establish ICT manufacturing hubs, while academia can collaborate with industry to align curricula with market needs. Additionally, leveraging PPPs to attract foreign direct investment can enhance technology transfer and capacity building.
- **Invest in workforce development**: Addressing the skills gap requires a multifaceted approach involving education reform, vocational training, and on-the-job mentorship programmes. The Ministry of Education and Sports should work with the Ministry of ICT and National Guidance to revise curricula to include advanced manufacturing, hardware engineering, and quality assurance training. Partnerships with international institutions can also be established to provide specialized training programmes. Furthermore, incentives such as scholarships and apprenticeships should be offered to encourage participation in ICT-related fields.

By implementing these mitigation strategies, Uganda can create a resilient and competitive ICT equipment manufacturing sector, fostering economic growth and reducing reliance on imports. The successful execution of these frameworks will require coordinated efforts from all stakeholders, including government agencies, private enterprises, and educational institutions.

8 Recommendations and future directions

This final section of the report synthesizes the insights, analyses, and stakeholder inputs gathered throughout the study. It provides a comprehensive roadmap for strengthening Uganda's ICT manufacturing sector by translating strategic insights into actionable pathways. The recommendations outlined here aim to establish Uganda as a leading hub for ICT equipment production in East Africa, leveraging its unique geographic position, policy frameworks, and human capital to achieve sustainable growth and regional leadership. The section is structured into strategic recommendations and opportunities for export and regional leadership, offering a detailed and forward-looking vision for the future.

8.1 Strategic recommendations

To build a resilient ICT manufacturing sector, Uganda must adopt a comprehensive and actionable strategy that aligns with its national development goals and regional ambitions. A critical priority is the operationalization of the proposed national ICT equipment manufacturing strategy, ensuring that it is not only a policy document but a transformative guide for the industry. This strategy must be spearheaded by a dedicated taskforce capable of coordinating efforts across sectors, addressing challenges, and monitoring progress toward industrial growth.

The strategy's phased implementation should begin by focusing on foundational capabilities. This includes establishing assembly facilities, fostering local partnerships, and developing targeted training programmes to address skills gaps. Overtime, Uganda can evolve toward advanced manufacturing, such as producing semiconductors and ICT hardware components. This gradual evolution will enable integration into high-value global supply chains and reduce dependence on imports. Periodic evaluations will be essential to identify bottlenecks and adjust priorities to ensure consistent progress.

Regional trade partnerships under AfCFTA provide Uganda with a unique opportunity for market expansion. Aligning domestic manufacturing standards with regional benchmarks will enhance Uganda's competitiveness. Furthermore, addressing logistical challenges, such as transport inefficiencies and trade bottlenecks, will facilitate smoother cross-border commerce. By fostering collaborations with neighbouring countries, Uganda can strengthen knowledge-sharing networks and integrate regional supply chains, thereby elevating its position as a leader in ICT equipment manufacturing within East Africa.

Developing an attractive investment climate is of paramount importance. Offering competitive tax incentives, such as exemptions on imports of raw materials and machinery, can significantly lower entry barriers for investors. Furthermore, providing subsidized access to utilities such as electricity and broadband will help reduce operational costs, addressing a longstanding challenge faced by manufacturers. Expanding financial mechanisms, including concessional loans and innovation grants, is essential to empower local startups and SMEs to scale their operations effectively. Additionally, the BUBU policy should be enforced rigorously, ensuring a consistent demand for locally produced ICT equipment through government procurement initiatives.

8.2 Opportunities for export and regional leadership

Uganda's strategic location in East Africa positions it as a natural hub for ICT manufacturing and regional trade. To capitalize on this geographical advantage, substantial investments in logistical infrastructure are required. Enhancing transport networks, modernizing ports, and streamlining customs processes will reduce trade costs and improve export efficiency. The establishment of dedicated ICT manufacturing zones and export processing areas with regulatory and operational support tailored to manufacturers will further attract global investments and bolster Uganda's position in the regional market.

Strategic collaborations with multinational corporations offer Uganda an avenue to acquire advanced manufacturing capabilities and integrate into international value chains. By incentivizing joint ventures and co-branded initiatives that prioritize technology transfer and skill development, Uganda can accelerate its industrial maturity. Such partnerships will not only enhance local expertise but also improve the competitiveness of Uganda's ICT products on the global stage.

The ability to produce affordable, high-quality ICT devices tailored to regional needs represents a significant growth opportunity. Uganda's manufacturers should prioritize cost efficiencies while maintaining high standards of quality, ensuring their products meet international benchmarks. Collaborating with organizations such as the Uganda National Bureau of Standards (UNBS) will be critical in certifying product reliability and safety. Focused efforts on niche markets – such as educational technologies, agricultural ICT tools, and healthcare innovations can further distinguish Uganda's offerings. Affordable e-learning tablets for schools and precision farming tools for smallholder farmers are examples of products that can tap into underserved yet rapidly expanding markets.

Investing in marketing and branding will be essential to build trust and recognition for Ugandan-made ICT products. Regional campaigns that emphasize innovation, affordability, and reliability will strengthen consumer confidence and drive demand. By fostering a strong identity for its ICT products, Uganda can position itself not only as a manufacturing hub but also as a leader in shaping East Africa's technological landscape.

Through these targeted strategies, Uganda has the potential to transform its ICT manufacturing sector into a cornerstone of economic development. The outlined recommendations aim to drive technological innovation, create sustainable employment opportunities, and secure Uganda's place in the global digital economy. These efforts align with the aspirations of Vision 2040 and ensure that Uganda remains a competitive and dynamic player in the evolving ICT industry.

Annex A: Glossary of Terms and Abbreviations

Abbreviations

AfCFTA	African Continental Free Trade Area
BUBU	Buy Uganda Build Uganda
DUV	Digital Uganda Vision
EAC	East African Community
ICT	information and communication technology
ITU	International Telecommunication Union
JICA	Japan International Cooperation Agency
MDA	ministries, departments, and a
MoICT&NG	Ministry of Information and Communications Technology and National Guidance
MTIC	Ministry of Trade, Industry, and Cooperatives
NBI	national backbone infrastructure
NDPIII	Third National Development Plan
NDP IV	Fourth National Development Plan
NIISP	National ICT Initiatives Support Programme
NITA-U	National Information Technology Authority Uganda
NRIF	National Research and Innovation Fund
PPPs	public-private partnerships
R&D	research and development
SDG9	Sustainable Development Goal 9
STEM	science, technology, engineering, and mathematics
STI	Science, technology, and innovation
UCC	Uganda Communications Commission
UIA	Uganda Investment Authority
UICT	Uganda Institute of Communication and Technology
UIRI	Uganda Industrial Research Institute
URSB	Uganda Business Registration Services Bureau

Terms and definitions

African Continental Free Trade Area (AfCFTA) – A trade agreement that aims to create a single market for goods and services across Africa, reducing tariffs and promoting regional trade.

Buy Uganda Build Uganda (BUBU) – A Ugandan government initiative promoting the consumption of locally manufactured products to support domestic industries and economic growth.

Capacity building – The process of enhancing skills, knowledge, and resources to improve productivity in ICT manufacturing and other industries.

Circular economy – A production model that focuses on recycling, reusing, and reducing waste in manufacturing processes.

Digital transformation – The integration of digital technology into business, government, and social processes to improve efficiency and innovation.

E-waste management – The proper disposal and recycling of discarded electronic equipment to reduce environmental impact

Innovation hub – A dedicated space for startups, researchers, and entrepreneurs to develop new ICT products and solutions.

Intellectual property (IP) – Legal rights that protect innovations, including patents, trademarks, and copyrights, in ICT equipment manufacturing.

Localization of ICT Equipment – The process of establishing domestic manufacturing capabilities to reduce reliance on imported technology.

National Backbone Infrastructure (NBI) – Uganda's core ICT network providing fixed broadband connectivity for government (and private sector use).

National Development Plan III (NDPIII) – Uganda's strategic framework for industrialization, job creation, and socio-economic transformation, including ICT sector growth.

National ICT Initiatives Support Programme (NIISP) – A government program that funds and mentors ICT startups to promote local innovation.

Public-private partnerships (PPPs) – Collaborative efforts between government agencies and private enterprises to develop ICT infrastructure and services.

Research and development (R&D) – Activities focused on innovation and improvement of ICT products and manufacturing processes.

Science, technology, and innovation (STI) – A sector in Uganda's development strategy that promotes industrialization through advanced technological solutions.

Supply chain optimization – The improvement of logistics, sourcing, and production processes to enhance efficiency in ICT manufacturing.

SWOT analysis – A strategic evaluation tool that identifies Strengths, Weaknesses, Opportunities, and Threats in ICT equipment manufacturing.

Technology transfer – The process of sharing technical knowledge and expertise from international ICT firms to local manufacturers.

Value addition – Enhancing the worth of raw materials through manufacturing processes to create higher-value ICT products.

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